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Technical skills for packaging sales

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TECHNICAL SKILLS FOR PACKAGING SALES

BY

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ABSTRACT

TECHNICAL SKILLS FOR PACKAGING SALES

This study addresses technical skills for packaging sales. Based on the results of the study, a training manual and course of instruction have been developed to introduce an innovative approach to packaging sales. "Technical Skills for Packaging Sales" defines the packaging sales professional, or PSP, a new kind of professional combining the skills of the salesperson with expertise of an engineer. Firmly grounded in the customer--comes-first philosophy, the PSP is a problem solver, able to evaluate any packaging application to satisfy the customer's needs. "Technical Skills for Packaging Sales" explains an engineer's approach to packaging, including analyzing details, writing specifications, reading drawings, evaluating materials, understanding manufacturing machinery, flow-charting applications, solving problems, and writing proposals. The addition of the engineering perspective to the sales person's selling skills creates a versatile PSP. It also establishes a common ground between the two professionals and builds a long term working relationship with the common goal of solving the packaging problem.

Dedicated to my parents, Joseph and Lucille Beck, for the positive influence they had on my educational career

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PREFACE

"Technical Skills for Packaging Sales" introduces an innovative approach to packaging sales. A new kind of professional, the PSP, combines the skills of a salesperson with expertise of an engineer. Firmly grounded in the customer comes first philosophy, the PSP is a problem solver, able to evaluate any packaging application to satisfy the customer's needs. This manual is for the newly hired packaging sales representative, the sales and marketing student who desires a career in packaging sales, the packaging engineering student considering a career change to packaging sales, and the veteran packaging sales representative who wants to learn new ways of solving packaging applications.

During my 15 years of packaging sales experience, I have become increasingly aware of a technical skills gap between the packaging sales representative and the packaging engineer. The packaging sales representative spends a great deal of time and energy learning the how to sell and how to increase sales volume. Generally, packaging sales management does not have the luxury of time or resources to give the new salesperson extensive training in product knowledge. Consequently, the packaging salesperson learns most of the product knowledge through trial and error during the sales career. Most of the technical aspects of product knowledge come from working on new applications and from product demonstrations in sales meetings. As a result of this limited technical product knowledge, most packaging sales representatives have sold packaging based primarily on price, not on the appropriateness of the application.

The packaging engineer, on the other hand, has specified packaging based primarily on technical specifications. The packaging engineer views packaging as a crucial component of a quality product. The packaging engineer is concerned with protecting the product at every stage of its transmission from manufacturing to final disposal. The packaging engineer selects the appropriate packaging material to satisfy the need of the application. The packaging engineer believes that if the appropriate packaging material is specified based on the needs of an application, then the price of the packaging material will be in line with the application.

It is readily apparent how these two philosophies contribute to the gap between sales and engineering. The technical skills gap can be closed by providing the packaging sales representative with the engineering tools to communicate effectively the appropriate problem solving information to the engineer. It is assumed that the packaging sales representative already possesses professional selling skills of probing, qualifying, opening, presenting and handling objections, closing and achieving credibility. "Technical Skills For Packaging Sales" adds an engineer's methodology to the packaging sales representative's credentials, transforming the sales representative into a Packaging Sales Professional (PSP).

"Technical Skills for Packaging Sales" includes an engineer's methodology in analyzing details, writing specifications, reading drawings, evaluating materials, understanding manufacturing machinery, flow-charting applications, solving problems, and writing proposals. The engineer's perspective establishes a common ground between the two professionals and builds a long term working relationship with the common goal of solving the packaging problem.

Any company that has adopted a Total Quality Management (TQM) philosophy will find a PSP to be an asset. Both the packaging company and the customer benefit from the PSP's ability to analyze packaging in a detailed and professional manner.

PART I

THE PACKAGING SALES PROFESSIONAL EXPLORED

The packaging sales representative is becoming a significant new profession as the role of packaging is changing. Appropriate packaging has an economic impact on the sales of a company, and allows the product to arrive safely at destination. Currently, a gap exists between the packaging engineer and the packaging sales representative. The gap can be closed by expanding the knowledge of the sales representative to include the engineer's perspective. This is done by expanding the sales representative's product knowledge. At this point the sales representative, becomes a Packaging Sales Professional (PSP).

A. THE IMPORTANCE OF THE PACKAGING INDUSTRY

1. What are the current roles of packaging?
2. What are the cost effects of appropriate packaging?
3. What impact does packaging have on the economy?

1. What are the current roles of packaging?

* Packaging protects the product from environmental hazards.

"Packaging is one system whose objective is to protect the contained product against an always hostile environment of water, water vapor, air, oxygen, microorganisms, insects other intruders, dirt, pilferage, and so on -- for a constant competition exists between man and his or her surroundings" (Sacharow and Brody 1).

EXAMPLE: Quality Railway Signal manufactures electronic railway switching racks. The racks are delivered by ship to an overseas customer. After the racks arrive, they are stored outdoors until use, one year later. Quality Railway Signal has ownership of these racks until their customer is ready to use them. The electronics in the switching racks are extremely moisture sensitive. The packaging materials had to be designed to protect the racks' electronic parts from moisture damage from the sea and any variation of temperature and relative humidity for this time period. If the racks become damaged by moisture prior to use, Quality Railway may lose the customer, or incur devastating replacement costs.

* Packaging protects the product from the distribution hazards.

Packaging is designed to provide the safe transportation of a product from its point of production to its ultimate consumption. The distrubution system is full of many destructive hazards that can destroy a product. Appropriate packaging will protect the product from shock and vibration, impact, compression, and abrasion.

EXAMPLE: When the crate containing Quality Railway Signal's electronic railway switching rack is lowered onto the ship's deck by overhead crane, a sudden impact occurs as the crate is set down on the deck. In order to protect the rack from this impact, the appropriate type and thickness of packaging material is placed between the rack and the crate's floor.

* Packaging motivates the customer to purchase, to use, and to repurchase.

The packaging helps promote the product. Photographic companies for example, spend millions of dollars on materials for packaging photographic films to entice the customer. It must have an aesthetic appeal, provide easy opening, and protect against early light exposure. Appropriate packaging provides the essentials so that the customer will purchase the product again.

EXAMPLE: Eastman Kodak packages the #120 professional photographic film in light tight, easy opening printed aluminum foil pouches. The professional photographer is assured of the film's quality before purchasing the product because the pouches provide a light barrier against early exposure. During a shoot, the easy opening feature provides fast and easy retrievel of the film. The professional look of the package enhances the photographer's professional image.

* Packaging protects people from the dangers of the product.

Hazardous wastes are very harmful to people. The legal profession has established rules and regulations for the safe containerization and transportation of these products. Appropriate packaging is used to protect people who may come in contact with the danagerous waste products.

EXAMPLE: Novon Corporation ships all terrian vehicle batteries to the armed forces in the Middle East. The batteries are a hazardous Class 8 corrosive material and must be packaged according to specific shipping regulations including proper labeling. A specially designed label with the word CORROSIVE printed in large letters is placed on the outside of the packaging container. The label instructs all personnel who are involved in this shipment to be aware of the hazardous material inside the packaging container.

* Packaging communicates the attributes of the product contained.

Advertising firms and sales promotion agencies view packaging as a means of communication. Generally, customers have a need for using a product. Appropriate packaging describes the actual use and tells the customer what can be expected as a result of using the product.

EXAMPLE: SmithKline Beecham Corporation manufactures "Aquafresh" toothpaste. The printing on the packaging tells the customer the toothpaste fights cavities, freshens breath, and helps remove plaque. As a result, customers purchase the product because they know what they can expect to happen from using this product.

* Packaging protects the product until the time of use.

The shelf life of products varies as much as products vary. Customers wanting to use a product immediately may need the same packaging as the customer who wishes to use the product one year from now. Then again, some customers designate the packaging based on indepth research on the shelf life time. Appropriate packaging provides protection for the shelf life of the product.

EXAMPLE: Nylon resin, an extremely moisture absorbing material, is manufactured by Signal Corporation. Signal designs packaging specifications to protect the nylon from moisture absorption. These specifications may be based on the storage time before the customer's actual use. If the customer requests the nylon to be packaged for over one year shelf life, Signal packages this product in a very high moisture barrier bag. On the other hand, if the customer is using the nylon on a just-in-time basis, Signal may elect to reduce the moisture barrier properties of the bag to protect the nylon against moisture absorption for less than 30 day shelf life. The customer benefits from either situation because the appropriate packaging material was specified based on the customer's need.

* Packaging provides an environmentally safe package.

Environmentalists are concerned about the use and disposal of packaging materials. The ozone layer, land fills, and water ways are constantly being evaluated by environmentalists. They have good reason for concern, because if the environment is seriously damaged, people will not survive. Recycling, biodegradability, reuse, and source reduction are processes that can reduce the harmful effects to the environment. Appropriate packaging protects the environment and saves these precious resources.

EXAMPLE: Superwood Corporation has led the way for the recycling of metallized and foil laminate flexible structures by producing plastic wood. The recycling process combines these used flexible structures from consumer and industrial sources to produce plastic lumber that can replace wood in a variety of useful applications, such as park benches, wood pallets, and picnic tables.

* Packaging allows efficient use of the product contents.

The shape of the packaging material that contains the product has a major impact on the total efficient use of the product. Some customers need quick access and want to use all the product with very little waste. The appropriate packaging can provide the customer with these needs.

EXAMPLE: The Durkee-French Foods Corporation packages French's Mustard in squeezable bottles. A customer can quickly squeeze out the proper amount of mustard and efficiently use all of the contents of the bottle.

* For more information on the current roles of packaging refer to Raphael 43-60.

2. What are the cost effects of appropriate packaging?

* Appropriate packaging reduces warehousing costs.

Warehousing costs are lowered because packaging allows the warehouseperson to make the most efficient use of space. Properly unitized pallet loads can be stacked high without falling over. The unitized pallet loads are transported quick and efficiently. Damaged product is kept at a minimum.

EXAMPLE: H. Ice Company packages ice in polyethylene bags. The pillow shape and slippery surface of the bags make them difficult to stack and transport on pallets. In order to give the bags uniformity on the pallets, each load is stretch wrapped. Stretch wrapping allows the pallet load to be stacked and easily transported without tipping over. The appropriate packaging enables H. Ice full utilization of warehouse space and reduces product damage from transportation.

* Appropriate packaging prevents loss of human lives.

Without packaging, it would be impossible to safely transport products that are crucial to the general public. The list of potentially harmful products includes highly corrosive liquids, gaseous and flammable products, sterlized utensils, and cancer-causing materials. If these products are not packaged properly, the effects are disastrous.

EXAMPLE: King Bag Company manufactures bags used for asbestos removal. The bags allow asbestos, a carcinogen, to be transported and disposed of without coming in contact with the employee involved in the removal. The appropriate packaging contains the harmful product and protects the employee.

* Appropriate packaging prevents the costs of "doing it over"

The farther a product is in the distribution process, the more expensive the corrections become. "Doing it over" includes the following costs: material and manufacturing, selling, advertising, administration, accounting, freight, and in some cases loss of customer.

EXAMPLE: In the electronic semi-conductor industry, static controlled packaging prevents ESD damage to the electronic chips. If damage of a chip is detected at chip stage, the repair cost may only be the cost of the chip. If the damage is detected in the field, the failure cost per chip is 100 times the cost of the chip. Records also indicate that failure has led to accidental deaths of pilots and technicians (Beck 26).

* Appropriate packaging prevents a loss of revenue.

  Products that are packaged properly arrive at destination ready for use. Inadequately packaged products such as fresh fruits and vegetables shrink and weigh less at destination due to moisture loss. A loss of revenue occurs as a result of this type damage. Packaging cuts down on the moisture loss and therefore cuts down on the shrinkage of the product.

  EXAMPLE: Bera Brothers, a distributor of fruits and vegetables, sells potatoes by weight. Potatoes are packaged in moisture barrier containers. If the potatoes weigh less as a result of moisture loss, then Bera Brothers loses revenue. The appropriate packaging prevents the potatoes from drying out and prevents a loss of revenue.

* Appropriate packaging prevents underprotection or overspending.

  If a product is not packaged adequately, it may get damaged as it goes through the distribution system. This situation creates unexpected replacement costs and worse yet, a dissatisfied customer. As a result, many companies choose to overprotect their product to ensure safe transportation. This situation may satisfy the customer, but it creates company overspending.

  EXAMPLE: B.A. Corporation builds $150,000 radio systems and takes a minimum of 6 months to build each system. These radio systems are shipped to many different countries. Overpackaging of the radio systems has allowed B.A. customers to receive these high cost radio systems free from damage. However, overpackaging has resulted in overspending of packaging materials and has cost B.A. Corporation a considerable amount of money. The appropriate packaging reduced overspending and at the same time continued to prevent product damage.

* Appropriate packaging lowers distribution costs.

  "Packaging does lower distribution costs by reducing damage and spoilage, by reducing freight and handling charges, and in many cases by eliminating or reducing the number of sales clerks necessary to sell a product" (Raphael 9).

EXAMPLE: H.C. Corporation purchased 5000 polyethylene bags from Barrier Pak Inc. with the freight terms F.O.B. Destination. (Barrier Pak pays the freight charges.) The bags are packaged 1000 per box. Each box of bags weighs 10 lbs. Barrier Pak shipped one large box containing all five boxes. The total freight charges were $15.23. If Barrier Pak had shipped 5 separate boxes, the freight charges would have been $6.65/box or $33.25 total. The appropriate packaging reduced the Barrier Pak's freight costs by $18.02, which produced a 54% savings.

* Appropriate packaging affects a company's profits.

Profit is equal to all sales revenues minus all the costs (P= R-C). The examples above illustrate appropriate packaging's ability to increase sales revenues and decrease a company's costs. Packaging affects a company's profits.

EXAMPLE: Barrier Pak's sales revenue for the H.C. order amounted to $606.00. Barrier Pak's product and shipping costs for one large box of bags amounted to $405.25, which is made up of 390.00 product costs and $15.25 shipping costs. The profit from this order amounted to $606.00 - $405.25 = $200.75. If Barrier Pak had shipped 5 individual boxes, the profit for the order would have been reduced to $182.75 ($606 -$423.25). By shipping one large box, Barrier Pak increased its profit by 10%.

* For more information on the cost effects of packaging refer to Sacharow and Brody 443 - 465.

3. What impact does packaging have on the economy?

* The use of packaging materials is growing each year.

According to a Bret Biggers, a leading expert at the Flexible Packaging Association, "Packaging had a 1990 output of about $80 billion and a growth rate of approximately 3% annually on a real basis. Packaging constitutes less than 2% of the Gross National Product(GNP)". By 1995, flexible packaging alone could reach as high as $15 billion, according to research from the Flexible Packaging Association (Zuck 40).

* The top 100 companies in America spent over $29.3 billion for packaging in 1990. See TABLE I.1

"Packaging surveyed 250 companies to ascertain the amount spent on packaging materials for use during calendar-year 1990 to package all products sold in the U.S., including the value of self-manufactured containers. Everything from primary containers, labels, and closures to folding cartons, corrugated cases and stretch film was considered" (Spaulding 26).

* Packaging uses a significant amount of raw materials.

Our country uses,"more than 7% of our steel, 15% of our aluminum, and 70% of the non-flat glass outputs, a quarter of all plastics produced, slightly over half of all paper, and 85% or more of the nation's paperboard are utilized. As such, packaging is the country's largest single user of round glass, paperboard, and plastics; it is third largest user of steel and a significant consumer of aluminum"(Sacharow and Brody 5).

* JIT production has increased the amount of packaging materials used.

Many companies have changed their manufacturing philosophies. Companies used to manufacture product in large quantities to create stock for potential sales. Today, companies are strictly manufacturing to immediate customer need. This practice is called Just-in-time production (Schonberger 4). As a result, Just-in-time (JIT) delivery has come into existence. JIT decreased the size of the package, but increased the amount of packages delivered. An increase in the number of packages has resulted in a change in packaging material as well as an increase in the amount of packaging material used.

TABLE I.1

THE PACKAGING 100

1991 Rank	Rank last year	Company & Headquarters	Packaging Expenditures [$ Millions]	% Change from last year	Industry by SIC
1	1	Philip Morris Cos., Inc., New York, NY	$2,605 00	1.42%	20 21
2	2	Anheuser-Busch Companies, Inc., St. Louis, MO	2,435 00	5.87	20
3	3	PepsiCo, Inc., Purchase, NY	1 577 00	7.95	20
4	4	Procter & Gamble Co., Cincinnati, OH	1 557 00	12.38	20 26 28
5	5	Coca-Cola Co., Atlanta, GA	1,258 00	8.29	20
6	6	Coca-Cola Enterprises, Inc., Atlanta, GA	1,128 00	3.78	20
7	7	RJR Nabisco, Inc., New York, NY	987 00	8.60	20 21
8	8	Seagram Co. Ltd., Montreal, Quebec	731 00	2.54	20
9	19	ConAgra, Inc., Omaha, NE	635 00	81.43	20
10	10	Unilever US Inc., New York, NY	630 00	21.20	20 28
11	9	Sara Lee Corp., Chicago, IL	585 00	1.74	20 22 23 28
12	14	Nestle USA, Inc., Glendale, CA	565 00	8.11	20 28
13	11	Adolph Coors Co., Golden, CO	531.30	8.50	20 32 33 34
14	17	Eastman Kodak, Rochester, NY	424 00	11.58	28 29 35 36 38
15	13	Brown-Forman Inc., Louisville, KY	421 00	1.32	20 31 32 39
16	16	Campbell Soup Co., Camden, NJ	408 00	7.09	20
17	15	Borden, New York, NY	402 00	.50	20 28
18	18	Stroh Brewing Co., Detroit, MI	395 00	8.52	20
19	23	American Home Products Corp., New York, NY	380 00	19.12	20 28 38
20	24	General Mills, Minneapolis, MN	356 00	13.02	20
21	26	Grand Metropolitan plc, Minneapolis, MN	331 00	11.99	20
22	28	Cadbury Schweppes Inc., Stamford, CT	323 00	15.36	20
23	27	Clorox Co., Oakland, CA	322 00	9.15	20 28 34
24	22	G. Heileman Brewing Co., La Crosse, WI	300 00	−7.69	20
25	—	Del Monte USA, San Francisco, CA	294 00	5.00	20
26	29	Revlon Group Inc., New York, NY	280.00	5.09	28
27	12	Whitman Corporation, Chicago, IL	278 00	−35.14	20 34 36 37
28	30	H.J. Heinz Co., Pittsburgh, PA	261 00	8.75	20
29	32	Ocean Spray Cranberries, Plymouth, MA	248 00	7.54	20
30	31	Quaker Oats Co., Chicago, IL	239 00	.12	20 39
31	33	S.C. Johnson & Son, Racine, WI	226 00	4.63	28
32	34	Kellogg Co., Battle Creek, MI	222 00	5.21	20
33	34	Johnson & Johnson, New Brunswick, NJ	212 00	10.99	26 28 30 38
34	36	Dean Foods Co., Franklin Park, IL	195 00	8.33	20
35	35	Du Pont de Nemours & Co., Wilmington, DE	194 90	5.35	22 28 29 30 38
36	—	Sherwin-Williams, Cleveland, OH	189 00	7.39	28
37	—	Allied-Signal Inc., Morristown, NJ	188 00	.65	30 34 35 36 37
38	46	Colgate-Palmolive Co., New York, NY	187 00	3.89	20 28 32
39	43	Hershey Foods Corp., Hershey, PA	180 50	12.13	20
40	37	Dow Chemical USA, Midland, MI	180 00	0.00	28 29 30
41	42	Warner-Lambert Co., Morris Plains, NJ	178 50	10.49	20 28
42	38	Geo. A. Hormel & Co., Austin, MN	175 17	5.38	20
43	41	Bristol-Myers Squibb, New York, NY	175 00	8.21	20 28 36 38
44	54	Tyson Foods Inc., Springdale, AR	173 91	44.32	20
45	39	American Cyanamid, Wayne, NJ	172 50	5.76	20 28 38
46	40	CPC International, Englewood Cliffs, NJ	169 50	5.94	20
47	45	Ralston-Purina Co., St. Louis, MO	163 00	5.54	20 36
48	50	Dr. Pepper/Seven-Up Co., Dallas, TX	161 00	21.35	20
49	47	Cosile & Cooke Inc., Los Angeles, CA	160 00	10.13	20
50	20	Avon Products Inc., New York, NY	150 00	−55.64	28

Source: Spaulding 30-31

THE PACKAGING 100

1991 Rank	Rank last year	Company & Headquarters	Packaging Expenditures ($ Millions)	% Change from last year	Industry by SIC
51	44	**General Motors Corp.**, Detroit, MI	$149 00	−6.88%	37
52	49	**Dial Corp.**, Phoenix, AZ	142 00	3.65	20 28
53	—	**Pet, Inc.** , St. Louis, MO	136 00	4.82	20
54	51	**Mars, Inc.**, Hackettstown, NJ	135.00	3.85	20
55	55	**Iowa Beef Processors, Inc.**, Dakota City, NE	134 50	11.90	20
56	52	**Keebler Co.**, Elmhurst, IL	134 00	3.13	20
57	53	**3M Co.**, St. Paul, MN	133 00	2.69	26 28 38
58	59	**Exxon Corp.**, Irving, TX	121 00	13.58	28 29
59	58	**International Business Machines**, Armonk, NY	120 50	6.02	35
60	56	**Ford Motor Co.**, Dearborn, MI	120 00	.10	37
61	—	**Bayer USA Inc.**, Pittsburgh, PA	109.50	5.29	20 28 30 38
62	60	**American Brands, Inc.**, Old Greenwich, CT	108 00	3.35	20 21 34 39
63	—	**McCormick & Co., Inc.**, Hunt Valley, MD	100 00	5.26	20 30
64	64	**Schering-Plough Corp.**, Madison, NJ	93 00	8.14	28
65	62	**PPG Industries Inc.**, Pittsburgh, PA	92 00	.55	28 32
66	—	**Chevron Corp.**, San Francisco, CA	91 00	14.65	28 29
67	65	**Mobil Corp.**, Fairfax, VA	90 50	10.37	28 29
68	63	**General Electric Co.**, Fairfield, CT	90.00	0.00	34 35 36 37
69	—	**Motorola, Inc.**, Schaumburg, IL	88 00	8.64	35 36 37
70	—	**Gold Kist, Inc.**, Atlanta, GA	86 50	−1.84	20 28
71	68	**Chiquita Brands International**, Cincinnati, OH	85 50	7.72	20
72	61	**Pfizer, Inc.**, New York, NY	85 00	1.19	28
73	—	**Cosmair**, New York, NY	84 00	5.33	28
74	66	**Tenneco Inc.**, Houston, TX	83 00	2.09	28 37
75	69	**Sunkist Growers, Inc.**, Sherman Oaks, CA	82 00	10.07	20
76	—	**Bausch & Lomb**, Rochester, NY	76 50	9.41	28 38
77	74	**Morton International**, Chicago, IL	76.00	17.83	20 28 30 37
78	—	**Reckitt & Colman plc**, London, England	75.50	16.15	20 28
79	67	**Texaco, Inc.**, White Plains, NY	75 00	−6.37	28 29
80	82	**The Black & Decker Corp.**, Towson, MD	73.00	35.19	30 34 35 36
81	77	**Merck & Co.**, Rahway, NJ	70.50	15.57	28 38
82	70	**Land O'Lakes, Inc.**, Arden Hills, MN	70 00	0.00	20 28
83	73	**Gerber Products Co.**, Fremont, MI	69 50	6.92	20 22 23 31 39
84	72	**Monsanto Co.**, St. Louis, MO	69 00	1.47	20 28 29 30 36
85	75	**Baxter Healthcare Corp.**, Deerfield, IL	68 00	10.46	22 28 38
86	79	**Shell Oil Co.**, Houston, TX	62 00	3.33	28 29
87	76	**Chrysler Corp.**, Highland Park, MI	61 50	−.10	37
88	78	**Universal Foods Corp.**, Milwaukee, WI	60 50	.33	20
89	80	**SmithKline Beecham plc**, Philadelphia, PA	60 00	10.29	28
90	83	**Alberto-Culver Co.**, Melrose Park, IL	58 50	10.84	20 28
91	84	**Amoco Corp.**, Chicago, IL	58 00	16.00	29
92	89	**Olin Corp.**, Stamford, CT	55 00	16.12	28 33 34 37 39
93	81	**The Stanley Works**, New Britain, CT	54 50	.46	30 32 34 35 36
94	88	**Wm. Wrigley Jr. Co.**, Chicago, IL	52 00	7.18	20
95	—	**Levi Strauss & Co.**, San Francisco, CA	51 00	4.19	22 23
96	86	**Whirlpool Corp.**, Benton Harbor, MI	50 25	1.01	36
97	85	**Riceland Foods, Inc.**, Stuttgart, AK	50 00	0.00	20
98	91	**Abbott Laboratories**, Abbott Park, IL	49 93	13.84	20 28 38
99	98	**Corning Inc.**, Corning, NY	47 80	20.09	32 37 38
100	90	**Interstate Brands Corp.**, Kansas City, MO	46.50	2.61	20

* Overseas companies are forcing American companies to change their packaging habits and spend more on packaging.

  American companies ship vast amounts of product overseas. These products have to be packaged properly in order to be protected from the treacherous seas. In addition, countries like Germany are demanding that the packaging be environmentally safe (Sacharow 48). Since Americans have not been able to produce environmentally safe packaging economically, they are spending mega dollars to satisfy this giant customer.

* Packaging will increase as a result of beverage container market increases.

  "By 1995, the US beverage container market is expected to exceed 183 billion units, up from 170 billion units in 1990" (Zuck 70). Key containers in this market such as the large soft drink container will see growth rates around 2% annually. Food beverage containers are expected to grow at 2.1%. Wine container demand is forecasted to grow at a 1.6% rate (Zuck 70-71).

* Major film converters are preparing for increased demand with expansions of their production facities.

  "A three-story, 200-ft.-long, 10-ft.-wide coater is being installed at Mobil Chemical Co.'s second largest plant in Shawnee, OK. It is expected to add more than 20 million lb. to its coated oriented polypropylene films, capabilities worldwide, which is currently about 80 million lb" (Zuck 71).

  "Westlake Petrochemicals Corp., Houston TX, started up up a one-billion pound ethylene plant near Lake Charles, LA" (Zuck 71).

  "Plastics Suppliers, Columbus, OH, opened a converting and distribution facility in Mississauga, Canada, called Plastic Suppliers of Canada" (Zuck 71).

* For more information regarding the economic impact of packaging refer to Sacharow and Brody 4 - 11.

PART I - THE PACKAGING SALES PROFESSIONAL EXPLORED

B. A MAJOR PROBLEM WITH THE CURRENT PACKAGING INDUSTRY

1. How do most packaging sales representatives sell materials?

2. How do packaging engineers specify the appropriate packaging material?

3. What are the results of the two different perspectives of packaging?

1. How do most packaging sales representatives sell materials?

* Historically, most packaging sales representatives have sold their materials based on price.

Traditionally, packaging sales companies and their customers have viewed the function of packaging simply as a means for containing the product. Their lack of in-depth knowledge about the importance of packaging has left the packaging sales representative to sell packaging materials based mainly on the price. Likewise the customer has based the decision mainly on price.

Two reasons explain the packaging sales representative's price oriented approach.

REASON 1: Generally, packaging sales companies hire new sales representatives with little or no packaging experience. After being hired, the packaging sales representative receives very little technical training. Most of the technical knowledge comes from working on new applications and from product demonstrations in sales meetings. The packaging sales representative perceives management as being more concerned about increasing sales volume than solving a packaging application. In many cases this perception is accurate. With the lack of technical expertice and perceived pressure from the sales management, the packaging sales representative resorts to the only reliable means of making the sale, selling on price. Packaging sales companies frequently sell materials at very low profit margins, with the goal of selling more volume to a customer.

REASON 2: From a customer's standpoint, the packaging function has not had much emphasis. The customer's main objective has been to obtain packaging material at the lowest possible price. Little thought has been given to an effective means of purchasing packaging materials. In 1969, Raphael pointed out that, "The packaging function is scattered throughout the company organization in far too many instances today. It is fragmented with people reporting to many different departments. This does not make for efficient packaging"(97). In 1992, Raphael's belief still exists in many companies. As a result of this decentralization, packaging materials have been bought and specified by non-packaging buyers, and shipping dock and warehouse personnel. None of these people have the technical background or expertise for making such important decisions.

The lack of packaging engineering at some companies aggravates the problem in industry. Packaging engineering has been limited to the large corporations where there has been cost justification for such a position. "There has been a dragging of feet by both universities and industry in recognizing packaging as a Profession"(Raphael 213).

Many times customers consider packaging materials to be the last item needed for a particular product. This situation has forced the buyer to be in a rush for the material and leaves the packaging sales representative very little time to perform value added selling. Combine the customer's lack of emphasis on packaging with the inexperience of the packaging sales representative, and the end result is packaging bought and sold on price.

2. How do packaging engineers specify the appropriate packaging material?

* Packaging engineers view packaging as a crucial component for a quality product. They see their function as finding the appropriate packaging material to satisfy the need of the application.

* Packaging engineers are concerned with protecting the product at every stage of its transmission from manufacturing to customer disposal.

* Packaging engineers specify packaging to perform the following functions:

  - to protect the product's critical elements against shock, vibration, impact and pressure.

  - to allow the product to survive through wind, rain, and snow.

  - to provide protection through the transportation system, whether it be conveyor, towmotor, truck, boat, or plane.

  - to guard the product against the hot summer temperatures and cold wintery nights.

  - to protect against the light rays of the sun and dew from the humidity in the air.

  - to act as barriers against microorganisms or molecules not seen by the human eye.

  - to protect people from cancer-causing agents or flammable liquids.

  - to provide long term storage, so when the product is used, it is ready to be used.

  - to motivate the customer to purchase or try the product.

  - to bring out the customer's enthusiasm.

  - to meet consumer demands and government laws.

  - to reduce a company's costs and provide growth for the company.

* Packaging engineers believe that if they specify the appropriate packaging materials based on the needs of an application, then the price of the packaging material will be in line with the application.

* For more information regarding a packaging engineer's function refer to Sacharow and Brody.

3. What are the results of the two different perspectives of packaging?

* Since the packaging sales representative sells packaging based on price and the packaging engineer specifies packaging materials based on application, these two people will have problems conducting business because of their different mind sets. Listed below are possible problem areas with interpersonal communication that result from the two different perspectives.

STEREOTYPING
The packaging engineer tends to view the packaging sales representative as a "typical salesperson" who will promise anything to make the sale. The packaging sales representative views the engineer as a perfectionist who is always making changes to product design.

MISCOMMUNICATION
If the packaging sales representative misunderstands what is required for the application, the packaging engineer may receive an inappropriate material.

CONFLICTS
When the packaging engineer and the packaging sales representative miscommunicate on the material specifications, controversy is sure to arise. They are quick to blame each other for problems.

MISTRUST
The packaging engineer lacks confidence in the packaging sales representative who does not adequately understand how the material used in the application.

LACK OF RESPECT
The packaging engineer lacks respect for the packaging sales representative who does not demonstrate adequate product knowledge.

LACK OF COOPERATION
The packaging engineer tends to resist working with the packaging sales representative who sells strictly on price.

FRUSTRATION
The packaging sales representative gets frustrated by repeated requests from the manufacturing team to return to the packaging engineer for more information. The packaging engineer gets frustrated when the packaging sales respresentative continually returns for more information.

* Business problems occur as result of the packaging sales representative and the packaging engineer's inability to work together.

LOST SELLING TIME
The packaging sales representative loses valuable selling time by returning to the packaging engineer for details missed in the initial visit.

INACCURATE PRICING QUOTES
The packaging sales representative who does not obtain the appropriate material specifications will quote inaccurate prices.

CUSTOMER COMPLAINTS
The packaging sales representative is sure to have customer dissatisfaction if the material specifications do not meet the packaging engineer's needs.

DELIVERY ON TIME DELAYS
The packaging sales representative has a difficult time satisfying the customer's on time delivery requirements by not getting the appropriate details from the packaging engineer the first time.

MATERIAL RETURNS
The packaging material will be returned if it does not meet the engineer's specifications.

LOSS OF SALES
The packaging sales representative loses sales after continuous customer complaints and material returns.

LIMITED GROWTH
The packaging sales representative's growth is limited because of the inability to increase sales.

PART I - THE PACKAGING SALES PROFESSIONAL EXPLORED

C. THE REASONS FOR THE GAP IN THE PACKAGING INDUSTRY

1. What are sixteen characteristics of a successful packaging sales representative?

2. What are fourteen characteristics of a successful packaging engineer?

3. What are the differences that currently exist between the packaging sales representatives and packaging engineers?

1. What are sixteen characteristics of a successful packaging sales representative?

1. A successful packaging sales representative builds a chain of customers (Schonberger 1).

   "Everybody has a customer at the next process (where your work goes next)" (Schonberger 1). Building a chain of customers means building a support staff at the salesperson's company as well as building long term relationships with the final customer. Everybody is dedicated to serving and fulfilling the needs of the next person. At the salesperson's company, the salesperson is dedicated to the following customers: sales assistants, inside customer service, quality control, manufacturing, shipping and receiving, accounting, and management. Satisfying the needs of the next person in the selling process results in 100% satisfaction at the final customer.

2. A successful packaging sales representative's first concern is to solve the packaging problem.

   The salesperson's first objective is to solve the packaging problem. If the customer's packaging problem is solved quickly and accurately, a sale is sure to follow.

3. A successful packaging sales representative thinks in terms of a long term relationship with the customer.

   A salesperson who thinks long term is concerned about meeting the customer's short term as well as long term needs. A long term relationship thinker qualifies each account, solves the problem first, provides quick responses, counsels the customer and ensures customer satisfaction.

4. A successful packaging sales representative has the ability to ask questions and provoke answers that develop the salesperson's point of view.

   The salesperson agrees with the statement made by the customer, but then gets the customer to listen to an alternate point of view. "Yes, that's a good point, but have you considered ...."

5. A successful packaging sales representative is alert and aware of the conversation.

   The salesperson is listening to the words and constantly appraising the forces that are motivating the customer. An effective sales call consists of 75% listening skills.

6. A successful packaging sales representative is enthusiastic and eager to sell.

   The salesperson protrays an image of an individual who is ready for action. The salesperson is ready to take part in the customer's project and is eager to contribute expertise. The enthusiasm is contagious and the customer is half sold as a result of these actions.

7. A successful packaging sales representative opens the sales call with a smile.

   The salesperson who enters the customer's office with a smile has removed a large portion of the sales barrier. A warm smile invites the customer to participate in the conversation.

8. A successful packaging sales representative has leadership ability.

   The salesperson is in control of the sales presentation, tactfully raising the customer's interests and answering the customer's objections. With a guiding hand, the salesperson works with the customer one step at a time to reach the ultimate goal -- to solve the problem

9. A successful packaging sales representative is sincere.

   A customer knows when a salesperson is being honest. Most customers start off feeling defensive. As a result, the salesperson's first task is to show sincerity. The salesperson pays close attention to the customer's words and answers the needs as they arise.

10. A successful packaging sales representative responds to questions with modest and confident answers.

    The salesperson answers the customer's questions or concerns with calm consideration. The salesperson analyzes the customer's words, evaluates the pros and cons, and gives a thoughtful reply.

11. A successful packaging sales representative has the ability to think quickly and accurately.

    " Every good salesman has worlds of preparation long before he's ever called on to speak. He's never at a loss for words. The simple fact is he knows more about his product, his customer, his market than anyone else in the place -- more often than not including his boss" (Still and Cundiff 64).

12. A successful packaging sales representative is patient.

    Most salespeople are not patient. The salesperson who is calm, thinking and willing to wait for the right moment recognizes the opportunity to use product knowledge.

13. A successful packaging sales representative is optimistic.

    A salesperson needs to expect the best possible outcome when calling on a customer. The salesperson has to think and believe that the problem can be solved. The salesperson must, however, be willing to put in the effort needed to achieve this goal.

14. A successful packaging sales representative is persistent.

    A salesperson continuously faces rejections and objections, and becomes an expert at roadblocks. The salesperson has to possess a stick-to-it-iveness (Still and Cundiff 65).

15. A successful packaging sales representative possesses the characteristics of the customer.

    "Behavioral science research suggests that, with regard to a particular company, the more the salesman's physical characteristics, other objective characteristics, and personality-related factors resemble those of the buyers he is to deal with, the greater the chance the salesman has for success"(Still and Cundiff 62).

    EXAMPLE: Economy Paper Company, a paper and packaging distributor, assigns key accounts based on the sales representative's background, personality, and level of sales experience. For instance, a sales representative who possesses a extensive background in shipping and receiving would be assigned a trucking firm account. As a result of this methodology, Economy Paper's sales representative resembles the personality trait of the customer and provides quick and accurate responses to customer questions.

16. A successful packaging sales representative asks for the order.

    A salesperson presents a product to a customer. A salesperson thoroughly investigates the application, talks about the features and benefits, responds to all questions and objections, solves the problem, and closes the sale by asking for the order.

* For more information regarding the characteristics of a successful sales representatives refer to Still and Cundiff 62 - 65.

2. What are fourteen characteristics of a successful packaging engineer?

1. A successful packaging engineer is a problem solver.

   The packaging engineer solves packaging problem by using educational background, past experience, process analysis, employee involvement, foresight and gut instinct.

2. A successful packaging engineer is technically competent.

   A packaging engineer is hired by a corporation for the engineer's technical knowledge. The engineer focuses in a specific area and becomes the resident expert.

3. A successful packaging engineer is methodological.

   A packaging engineer works by a standard set of practices and principles to solve a packaging problem. The methods are generally employed in a logical order in order to uncover the negatives in the distribution system.

4. A successful packaging engineer is cooperative.

   A packaging engineer is relied upon by many departments. The engineer works with the sales and marketing group to determine the most economical way to package the product. The engineer also works side by side with the shipping personnel to make sure the product arrives safely at destination.

5. A successful packaging engineer is versatile.

   In order to be cooperative, the engineer must also be able to turn competently from one task to the next. The engineer wears several hats and works with several nonpackaging personnel for the common goal of cost effective packaging.

6. A successful packaging engineer has the ability to write effectively.

   One form of communication is writing. The packaging engineer has to write the packaging specification effectively so that all persons clearly understand what is written.

7. A successful packaging engineer is enthusiastic.

   A packaging engineer is ready to tackle the daily problems. Because average laymen do not understand the technical aspects of packaging, they come to the engineer to answer their packaging needs. The engineer gets excited because of the clients' tremendous interest in packaging technology.

8. A successful packaging engineer uses sound judgement.

   A packaging engineer makes decisions based on facts or well educated assumptions. As a result, the engineer minimizes the potential problems. Product safety rests heavily on engineer's shoulders.

9. A successful packaging engineer is a long term thinker.

   A packaging engineer has to think about the entire life cycle of the product. Before making a determination on the packaging requirements, the engineer learns about product characteristics, manufacturing process, distribution system, storage conditions, and disposal considerations.

10. A successful packaging engineer is organized.

    A packaging engineer has to pull together all the facts in a orderly manner to draw a visual picture of the life of the product. Formulating a visual picture is an effective means of anticipating all the potential hazards the product is likely to face.

11. A successful packaging engineer is inventive.

    A packaging engineer is always looking for a better way of packaging a product for the benefit of the customer. The engineer creates new packaging for aesthetic appeal, cost reduction, safe transportation and longer term storage.

12. A successful packaging engineer is confident.

    A packaging engineer lets the final result do the talking. When given a task to perform, the engineer works at the details, solves the problem and moves on to the next step. The final visible result is positive, and that is what counts.

13. A successful packaging engineer is loyal.

A packaging engineer makes decisions and performs packaging duties all for the benefit of the company. "Survey data from the Electromech development laboratory show that the goals of engineers are generally in harmony with the aims of the business" (Ritti 48).

14. A successful packaging engineer is communicative.

Throughout the work day, the packaging engineer speaks to several nonpackaging personnel. The engineer must speak in layman's terms so that the person can visualize what has happened as a result of on going participation. From this participation, each person becomes a partner in the process of shipping the product and satisfying the customer.

* For more information regarding the characteristics of a successful engineer refer to Danielson 24.

3. What are the differences that currently exist between the packaging sales representatives and packaging engineers?

* A major problem exists in today's packaging environment; the packaging sales representative and packaging engineer are different. They are different in objectives, educational background, personality traits, and focused dedication. In order to decrease these differences and build a common ground, the sales representative needs to learn about the packaging engineer and the engineer's methodology. Listed below are some of the key differences between the packaging sales representative and the packaging engineer.

1. SALES REPRESENTATIVES' objectives are concerned with selling.

   ENGINEERS' objectives are concerned with engineering tasks.

   The packaging sales representative's objectives are focused on product sales, sales growth, market share, market position, and gross profit. On the other hand, the packaging engineer tasks focuses on customer's requirements, product specifications, safety factors, variation of material strength, machine tolerances, and statistical tolerances of components (Weinrauch and Anderson 293).

2. SALES REPRESENTATIVES are perceived as type A personalities. Type A people tend to be attentive to people, expressive, impulsive, adaptable (Eyseneck 134).

   ENGINEERS are perceived as type B personalities. Type B people tend to be intelligent, cultured, conscientious, perservering, smart, (Eyseneck 134).

   Packaging sales representatives are people oriented and packaging engineers are methods oriented. Whether the packaging professional is a type A or type B personality, the type of personality allows the professional to excel at his choosen field. However, having different personality traits presents a challenge in dealing with the other type of person.

3. SALES REPRESENTATIVES may possess a post high school degree.

   ENGINEERS by definition possess a post high school degree.

   Historically, the packaging sales representative possesses anywhere from a high school degree up to and including a graduate degree. On the other hand, the packaging engineer generally possesses at least a four year packaging degree.

4. SALES REPRESENTATIVES do not understand engineers' methodology.

   ENGINEERS lack respect for sales representatives(Weinrauch and Anderson 292).

   Packaging sales representatives and packaging engineers are on two different levels of thinking. The educational benefits of the engineer have caused many sales representatives frustration. On the other hand, as a result of this educational difference, the packaging engineer lacks respect for the salesperson.

5. SALES REPRESENTATIVES are generalists.

   ENGINEERS are detail oriented.

   Packaging sales representatives satisfy customers' needs by many different products. Consequently, they learn the generalities about products so that the sale can be consummated and they can move on to the next product. On the other hand, the packaging engineer continuously focuses on learning the details concerning a narrow range of products.

6. SALES REPRESENTATIVES speak in terms of sales and marketing.

   ENGINEERS speak in terms of producing a quality product.

   The language depends on the professional's duties and responsibilities. Packaging sales representatives think and talk about sales quotas, sales volume, close ratio, commissions, competition and prices. On the other hand, packaging engineers think and talk about application requirements, material strengths and weaknesses, testing methods, manufacturing techniques, environmental concerns and cost reductions.

7. SALES REPRESENTATIVES want to provide a unique technical product.

   ENGINEERS want to specify a simple, technically-consistent, competitive and cost effective product.

   Packaging sales representatives want to provide a unique product to reduce competition. On the other hand, packaging engineers want to reduce costs by specifying a competitive product.

8. SALES REPRESENTATIVES are inexperienced with packaging specifications.

   ENGINEERS work with packaging specifications every day.

   The packaging sales representative has not taken the time to learn about details such as packaging specifications. On the other hand, the packaging engineer uses specifications to varify all incoming packaging materials on a daily basis.

9. SALES REPRESENTATIVES are perceived by engineers to promise anything to make the sale.

   ENGINEERS will promise only what they know can be delivered.

   Due to the strong competitive nature of packaging sales, many sales representatives will promise anything to make the sale. Many promises are not kept because the salesperson has not obtained all the facts before making the promise. On the other hand, the packaging engineer focuses on the facts, completes the steps, and delivers the promise.

10. SALES REPRESENTATIVES look at end result instead the means.

    ENGINEERS look at means to the end result.

    Many packaging sales representatives are so sure of making the sale that they neglect the details and intermediate steps. On the other hand, the packaging engineer works toward a goal one step at a time.

11. SALES REPRESENTATIVES consider price the first priority.

    ENGINEERS consider price to be the last priority.

    Price is a key factor in any packaging sale. Many packaging sales representatives will first sacrifice the price before selling on value. This method is quick and easy. On the other hand, the packaging engineer is interested in solving a packaging need. If the packaging material solves the need, the price becomes secondary.

12. SALES REPRESENTATIVES make quick decisions based on assumptions, looking for the short term fix.

    ENGINEERS make decisions after the gathering the facts.

    Many packaging sales respresentatives work under a crisis management. They are usually anxious to make the sale and their decisions are based on assumptions rather than facts. As a result, problems arise that could have been solved had the proper facts been uncovered. On the other hand, packaging engineers calmly make decisions based on factual information. This methodology minimizes the potential problems and produces a long term fix.

13. SALES REPRESENTATIVES' management is less trusting. (Weinrauch and Anderson 293).

    ENGINEERS' management is more trusting. (Weinrauch and Anderson 293).

    The packaging sales manager manages different types of sales people. It is common to find an inexperienced sales representative selling on the same team as the experienced professional. The sales manager developes a nontrusting attitude for the inexperienced until the salesperson is guided to professional status. On the other hand, the package engineering management works with professional engineers and technicians. This working relationship breeds trust between the management and subordinate.

* A major goal of a packaging sales representative is to sell products. A major goal of a packaging engineer is to specify products. When calling on an engineer don't try to sell the engineer. Instead, work with the engineer on solving a problem and getting the product specified. In order to accomplish this task, the salesperson must think like the engineer.

PART I - THE PACKAGING SALES PROFESSIONAL EXPLORED

D. BUILDING A PACKAGING SALES PROFESSIONAL (PSP)

1. What is the starting place for building a packaging sales professional (PSP)?

2. What are the professional characteristics of the PSP?

3. What are the roles of the PSP?

4. What benefits can a PSP offer to the packaging industry?

1. What is the starting place for building a packaging sales professional(PSP)?

* The first step in building a packaging sales professional(PSP) is establishing an appreciation for the qualities, tasks, and talents shared by the packaging sales representative and the packaging engineer. Rather than focusing on the differences between the two, it is more useful at this point to look closely at the similarities. Surprisingly, the two areas of expertise have much in common in their working with materials, customers, and duties and responsibilities. Acknowledging common methods, values and techniques is an important first step in laying a foundation for this new professional category. Listed below are seventeen common traits that the packaging sales representative and packaging engineer share.

1. The packaging sales representative and packaging engineer solve problems.

   The packaging sales representative has a tremendous opportunity to solve packaging problems, especially since packaging is in its infancy stages. The salesperson is relied upon by the customer to come up with solutions. The packaging engineer by definition designs an efficient system to produce a quality product. In order to design an efficient system, the engineer is sure to find problems that must be corrected.

2. The packaging sales representative and packaging engineer focus on customer service.

   The packaging sales representative makes sure the customer is quickly provided with accurate information. Time is important. The quicker the customer receives accurate information, the faster the sales representative will receive an order. The packaging engineer quickly responds to the customer to insure no delays in product shipment. The product cannot be shipped without accurate packaging information. A delay in product shipment results in a delay of sales revenue for the company.

3. The packaging sales representative and packaging engineer must see the right people in order to satisfy the need.

   The packaging sales representative presents the product to the person(s) who makes the decision to specify or to buy. The packaging engineer presents the proposal to the person(s) who is going to benefit from the engineering task.

4. The packaging sales representative and packaging engineer utilize all they learn about the customer's motives to convince that person to buy, if appropriate.

   The packaging sales representative listens for the customer's packaging reasons for specifying the product. If the need is satisfied, a sale is soon to follow. The packaging engineer listens intensely to the client's packaging problem. If the solution is presented, the client will buy into the solution.

5. The packaging sales representative and packaging engineer perform market research on the product.

   The packaging sales representative should know the total sales and market potential, its best known customers, its yearly sales record, where it is approved, why customers are using it, and when to introduce it. The packaging engineer should know how long it has been in existence, how well it is accepted, what other companies are using it, what the problems are, how it has solved needs, and if a next generation is coming.

6. The packaging sales representative and packaging engineer use a features and benefits technique.

   The packaging sales representative is taught at the early stage of a sales career to bring out the features and benefits in a sales presentation. When a packaging engineer implements a change to a product or process, the engineer accentuates the features of the change and shows how the client or product will benefit. In the same way, an engineer's challenge is to overcome people's resistance to change as a new method or product change is introduced.

7. The packaging sales representative and packaging engineer continuously search for a better idea through "competitive benchmarking" (Schonberger 24).

   The packaging sales representative and packaging engineer work in a very competitive market. The representative continues to search for better ways of servicing the customer in order to stay ahead of the competition. One of the packaging engineer's responsibilities is to reduce cost. Continued cost reductions results from better ideas which enable the engineer's company to be the best at servicing the customer.

8. The packaging sales representative and packaging engineer work under a code of ethics.

"Ethics are the measure of a person's adherence to such principles as honesty, loyalty, and fairness" (Hampton and Zabin 121). Today's packaging sales representative knows that he is but one of several offering similar products to the customer and that one of his most persuasive points in winning customers is his adherence to a set of business and personal ethics (Hampton and Zabin 122). Likewise the packaging engineer, is expected to adhere to the code of ethics in his close daily contact with people in his organization.

9. The packaging sales representative and packaging engineer have a planned strategy to meet their objectives.

The packaging sales representative sets up a territorial daily schedule in order to get in as many quality sales calls as possible. The representative may use a different methodology for each call, which requires a careful preplanning. Likewise the packaging engineer uses a planned strategy for identifying the principle causes of trouble in a packaging system. Process control techniques aid the engineer in designing an efficient packaging system (Wadsworth et al. 354 - 406).

10. The packaging sales representative and packaging engineer need input from the other professional.

The packaging sales representative brings the engineer new ideas and products to improve the current packaging system. The packaging engineer increases the sales representative's chances for repeat sales by specifying the product in the purchase order.

11. The packaging sales representative's and packaging engineer's performance is measured quantitatively.

The success of the packaging sales representative is measured by the amount of sales revenue that is generated for the company. The success of the packaging engineer is measured by the cost reductions that are implemented in the packaging system.

12. The packaging sales representative and the packaging engineer are part engineer and part salesperson.

    The packaging sales representative is taught how to demonstrate products. However, the more details the representative can demonstrate, the better chances of success. The packaging engineer knows how to create an efficient packaging system. However, the engineer must be able to sell the other people on the ideas.

13. The packaging sales representative and packaging engineer strive for excellence.

    The packaging sales representative knows that if the company strives for excellence the chances of success increase. The representative values producing a quality product, making on time deliveries, selling at competitive prices, exhibiting professionalism, and developing a customer-comes-first attitude. The packaging engineer, in turn, wants to become partners with the vendor who strives for excellence.

14. The packaging sales representative and packaging engineer adopt a philosophy of key account management.

    The packaging sales representative improves the sales revenue by focusing on a select number of accounts, known as Key accounts. Key account management improves communications, builds long term relationships and provides the account the kind of service expected by the customer. For the same reasons, the packaging engineer focuses on a select number of packaging problems and works deligently at solving them.

15. The packaging sales representative and packaging engineer are business partners.

    The packaging sales representative and packaging engineer work toward a common goal to solve the application with the appropriate packaging material. They accomplish this goal by bouncing ideas off each other, communicating the pros and cons of optional materials and being open to the other's thoughts.

16. The packaging sales representative and packaging engineer use the Pareto principle in achieving success.

    The Pareto principle suggests that most effects come from relatively few causes. The packaging sales representative knows that typically 80% of the sales revenue comes from 20% of the customer base or 20% of the products sold. The packaging engineer knows that typically 80% of the problems come from 20% of the causes. According to Anthony Montone, President of Barrier Pak Inc., "As sales companies move toward a TQM philosophy, the principle begins to change from 80/20 to 90/10."

17. The packaging sales representative and packaging engineer are product knowledgeable.

    The packaging sales representative provides solutions to problems as a result of extensive product knowledge. At a minimum, the representative should know what the product is made of, for the basic materials used in the product are an indication of its strength, durability and quality. The representative should know how the product is fabricated, for the manufacturing process determines the value of the product. The representative should be able to explain the basic manufacturing process and quality control measures taken to insure uniformity and precision. If the operation is complex, then the representative should be able explain it in terms simple enough to understand, but detailed enough to be thoroughly descriptive. The representative should know how the product works and how long the product will last. If the clients are technical-minded, the representative should be able to " talk their language."

    A major part of the packaging engineer's responsibility revolves around extensive product knowledge. The engineer with thorough product knowledge writes packaging specifications, specifies materials, recommends alternative materials, designs manufacturing processes, chooses the appropriate distribution system and determines a cost effective product. The packaging engineer is expected to know all the possible details from the manufacturing and distribution of the product up to the and including its disposal.

2. What are the professional characteristics of the PSP?

* According to Mary E. Guy, in quoting Moore, six characteristics separate a professional from a non-professional (Guy 10). These characteristics can be applied to the new Packaging Sales Professional (PSP). The PSP uses comprehensive product knowledge to create a new packaging sales image, build credibility, and solve packaging applications.

1."A professional is someone who practices a full-time occupation (although there are exceptions, including those members of the professional workforce who work part time)."

The PSP is a full time professional. The PSP focuses professional energies on continuously learning about packaging. The PSP dedicates a full time effort using worthy technology to solve problems and to improve the packaging sales representative's image.

2."A professional must possess esoteric but useful knowledge skills, based on specialized training or education of exceptional duration."

The PSP possesses specialized training in the packaging field that enables the professional to solve the application problems. The Rochester Institute of Technology School of Packaging provides this specialized training and the proper credentials in order for the packaging sales representative to become a packaging sales professional. Customers need a PSP who is problem solver, not an order taker. As a result, the PSP recognizes that on-the-job training is no longer enough to satisfy this need.

3."The professional is expected to exhibit a service orientation, to perceive the needs of clients that are relevant to his competence, and to attend to those needs by competent performance."

The PSP is perceived as a professional who can help solve a customer's problem, even if there is no immediate monetary reward at the conclusion of the research. The professional is expected to solve packaging problems that are within the PSP's skill level and to speak the truth on those applications that are beyond the PSP's level of expertise. For those applications the PSP can solve, the PSP solves them, just as promised.

4."A professional is someone who has a commitment to a calling in which the requirements of membership include adherence to an enduring set of normative and behavorial expectations."

The PSP loves the work. The PSP has an enthusiastic and energetic attitude towards tackling new packaging problems. The PSP spends many hours continuously learning about new technology. This professional jumps into the application with a focused dedication. The rewards are internal as well as external, and include a sense of self-worth and accomplishment. The PSP accepts the unwritten expectations of professional behavior in packaging sales and tries to live up to them.

6."A professional holds membership in an organization which was created for the sole purpose of protecting and enhancing the interests of the calling."

The PSP becomes a member of packaging professional associations related to the packaging field. "The professional associations can exert tremendous social and political influence through disseminating knowledge, updating members on current trends, bringing professionals together through meetings where papers are presented and accrediting and establishing standards of ethics, conduct, and training" (Van Glinow 38). A PSP profits personally and professionally from membership in such organizations as Institute of Packaging Professionals, Society of Packaging and Handling Engineers, and Rochester Area Packaging Association.

7."The professional, by virtue of his exceptional knowledge, proceeds by his own judgement and authority, thus enjoying autonomy restrained by responsiblity."

The PSP is given the freedom to perform necessary research and to attack the packaging problem. The PSP is viewed by PSP's management and the non-packaging customer as an expert in the packaging field. Since the PSP understands the relationship between the packaging material and the application, the PSP is relied upon by the packaging engineer as a technical partner in solving the packaging problem.

* For more information regarding the characteristics of a professional refer to Van Glinow.

3. What are the roles of the PSP?

* The packaging sales professional performs many functions for the client. The roles of the PSP have a significance that is not unique to a professional. However, the professional is unique in the packaging industry as the PSP protrays a new image of the packaging sales representative. The PSP's concerns are based on the client-comes-first basis. Listed below are seven roles that the PSP performs as a professional in the field of packaging.

1. INVOLVES CUSTOMERS
   The PSP involves customers, much like the TQM philosophy involves employees. Together, the PSP and the customer take ownership in problem solving. They form a focused team, recording everything that goes wrong, joining others in finding ways to fix chronic problems, and continuously monitoring and controlling what is not yet fixed (Schonberger 7).

2. IDENTIFIES WITH THE CLIENT
   The PSP is concerned about the client's packaging problem. The PSP asks questions in order to identify the needs and problems that face the packaging engineer. The PSP analyzes the application in order to uncover the negatives in the system. When making a decision on material recommendation, the PSP considers the client's needs first.

3. INTERPRETS INFORMATION
   The PSP accurately translates the application information which is received from the packaging engineer to fabrication information needed by the PSP's own manufacturing team. The PSP quickly communicates material specifications back to the packaging engineer in order to perform the function of solving the application.

4. NEGOTIATES CONTRACTS
   The PSP's obligation to the buyer is to deliver packaging materials that conform to the purchase contract. This means that the goods must be of the quality and quantity specified in the contract. If upon inspecting the goods the buyer finds that they do not conform to the contract, the buyer may reject them or may request some type of enumeration. The decision to reject or accept a shipment is based on the factual information given to buyer by the PSP. The PSP is a valuable asset to a company because of the ability to differentiate a quality product from a product that does not conform to specifications.

5. UPHOLDS INTEGRITY
   The PSP performs day by day duties and responsibilites to a code of ethics. A profesional's code of ethics may conflict with an organization's deceptive - either real or perceived - marketing of products and services (Von Glinow 36). The PSP will not jeopardize the reputation that has been earned as a professional.

6. EDUCATES CLIENTS
   The PSP educates the nonpackaging and packaging people who are involved in the application so that there is a feeling of confidence. Specialized training enables the PSP to translate technical information into layman's terms so that the client can make an accurate decision. As a result, the client comes to the PSP for professional guidance and approval.

7. CONTINUES DEVELOPMENT
   The PSP is dedicated to the packaging field. The PSP continues to learn through new applications and advanced training. The PSP stays well informed on new developments of packaging materials to stay ahead of the competition in the packaging industry. As a result, the clients look to PSP as a forecaster in the packaging industry.

* For more information regarding the roles of a professional refer to Guy.

4. What benefits can the PSP offer to the packaging industry?

* The PSP is a sales and engineering asset to any packaging company primarily because the PSP offers a comprehensive approach to any sales call. The following scenario illustrates the effectiveness of a product knowledgeable PSP.

At a Bulk and Powder Trade show, Barrier Pak Inc. exhibited their high moisture barrier liners which are used to protect extremely moisture sensitive products. A purchasing agent from an acrylic polymer powder manufacturer approached Barrier Pak's PSP with questions about a moisture absorption problem with their Acrylic Polymer powder. The purchasing agent explained that their customers had been complaining about damage to the powder due to excess moisture. In order to uncover possible problem areas, the PSP asked a series of application questions. He inquired about such factors as the material currently used for liners, the length of time the powder stayed in the liners, the means of transporation, and the destination. The purchasing agent explained that Low Density Polyethylene (LDPE) liners held the powder for up to one year and the product is transported by ship to Germany. Based on the information received from the purchasing agent, the PSP could analysis the problem and offer a solution.

The PSP realized the moisture barrier properties of the current liners had to be improved in order to protect the powder from long exposure and moist environments. In addition, the PSP's experience with international packaging law indicated that the packaging materials had to be environmentally friendly according to Germany's Green Laws.

The needs of the application could be met with a higher barrier liner. However, a higher barrier liner would increase the purchasing agent's packaging material cost. Anticipating an objection, the PSP carefully explained the inappropriateness of the current liners and the resulting loss of product and customers. The PSP pointed out that in the long run the more expensive barrier liner would be more cost effective.

Because of his product knowledge, the PSP could explain why the current liner was not working well. He pointed out that Low Density Polyethylene(LDPE), a standard packaging material, is a short term (up to 60 days) moisture barrier because of its long chain molecule structure. The chains form crystalline(dense) and amorphous(loosely held) areas in the material. Moisture will permeate the amorphous areas of the material over a period of time. Many factors affect the period of time, including, the powder's moisture absorption rate, and the outside environment, in this case the moisture from the ocean.

The PSP was able to back this statement regarding the short term moisture characteristic with the LDPE's Water Vapor Transmission Rate(WVTR) performance specification. The specification showed the rate at which moisture vapor will pass through a material under a specified ASTM E 96 test method. LDPE is at a rate of 1.5gms/100 sq.in./24hours.

The PSP recommended an advanced laminate high barrier liner to solve the absorption problem. He backed this recommendation with laminate's WVTR performance specification, a rate .02gms/100sq.in./24hours.

The PSP compared the WVTR's and showed the purchasing agent the laminate higher barrier liner would allow only .02gms of moisture to permeate versus 1.5 gms. for the LDPE. By reducing the moisture vapor permeance, the higher barrier would eliminate moisture damage to the powder.

The purchasing agent, satisfied by the PSP's comprehensive analysis and assured that the needs of the application would be met, proceeded to trial order the PSP's higher priced barrier liners.

* The Barrier Pak sales professional in the preceding scenario demonstrated several key benefits a PSP can offer to the packaging industry.

1. The PSP's knowlege of packaging material advancements enable him to be more than an order-taker.

   The PSP sells packaging materials based on the needs of the application. Historically, it was common for the packaging sales representative to walk into the customer's office and ask if he needed any packaging materials. Standard packaging materials and lack of awareness allowed the sales representative to be an order-taker. Today, because of continuous advancements in materials, the PSP must work for the order by demonstrating how packaging will solve the packaging problem.

   EXAMPLE: The PSP exhibited the qualities of more than an order-taker by asking vital questions to uncover the needs of the application. After analyzing the needs, the PSP used product knowledge and experience to specify the appropriate packaging material to solve those needs.

2. The PSP educates the customer about alternative packaging materials.

   Historically, customers used standard packaging materials for protecting environmentally sensitive products. Glass, for instance, was utilized for packaging many pharmaceutical products. Today, the customer can select from many different plastic packaging materials for protecting those same products. In fact, so many options are available the customer needs the expertise and guidance in selecting the appropriate packaging material.

   EXAMPLE: The PSP spent time educating the purchasing agent about the current material to make sure the customer understood why there should be an improvement in the moisture barrier properties. The PSP explained the properties of the advanced barrier material. The PSP needed to guide the customer in making the appropriate choice of packaging material.

3. The PSP minimizes damage to the product.

   The PSP decreases damage to shipments by recommending the appropriate packaging materials for the particular mode of transportation. "One result of automation and increased speed, coupled with human carelessness and improper packaging, has been a steady rise in damaged shipments in all forms of transportation systems (Raphael 205).

EXAMPLE: The PSP reduced the customer's damage by specifying appropriate barrier material for long term storage and ship transportation.

4. The PSP recommends packaging materials based on performance specifications.

   The PSP translates material characteristics into performance specifications. "For many years packaging standards have been based on specifications for materials. There is now a move towards producing specifications based on performance requirements for materials, containers, and finished packs (Briston and Neill 245).

   EXAMPLE: The PSP convinced the customer to order liners based on the WVTR performance specification comparison.

5. The PSP is well versed in current laws and requlations.

   The PSP continuously stays up-to-date on rules and regulations that affect the customer, such as the ones governed by the US Food & Drug Administration (FDA). "A month ago, the FDA sent warning letters to the three food firms for making no-cholestrol claims on the labels of their vegetable oils. No vegetable product contains any cholesterol, but all vegetable oils are 100% fat, the key dietary culprit in heart disease" (Macarthur 153).

   EXAMPLE: The PSP was concerned about the destination of the powder to insure the customer that the packaging material would be acceptable according to the rules and regulations of Germany.

6. The PSP bases his recommendation to a customer based on application rather than price.

   Historically, when the packaging sales representative sold packaging materials the easiest way to get an order was to have the best price. Today, the PSP has to convince the customer that his packaging material is the best material for the application even though the material price may be higher. The PSP understands that in the long run the advantages of the correct material far outweigh the minimal differences in price.

   EXAMPLE: The PSP recognized that the higher barrier material would cost the customer more money. The PSP overcame the price difference by showing the customer the benefit of using a higher barrier material, no moisture absorption to the powder.

7. The PSP shares the company's committment to Total Quality Management as it applies to a vendor reduction program.

   Purchasing departments are reducing the number of vendors from which they purchase product. The PSP who demonstrates a committment to quality is selected by the purchasing department as a possible vendor candidate in a vendor reduction program. Historically, the purchasing department bought packaging materials from any vendor who had the lowest price. Today, the purchasing department reduces the price by working with selected vendors. The PSP and the purchasing agent form a team with the common goal of price reduction through quality process and product improvements.

   EXAMPLE: The PSP demonstrated a committment to quality by taking the time to learn about the customer's product, application, and needs. The PSP then educated the client on the packaging material alternative. The customer felt confident the needs would be met and felt assured the PSP really cared about the customer. A long term trusting relationship was built as a result of this presentation.

PART I - THE PACKAGING SALES PROFESSIONAL EXPLORED

E. THE PACKAGING SALES PROFESSIONAL AND PRODUCT KNOWLEDGE

1. Why is product knowledge important?

2. What effect does product knowledge have on product demonstration ?

3. How much product knowledge is needed?

1. Why is product knowledge important?

* The PSP's most important selling tool is product knowledge.

  A sale is made only when the presentation solves the customer's problem or fills the customer's needs. Product knowledge is the key to answering the problem or need.

  EXAMPLE: MBI Corporation, a manufacturer of optical mirrors, needed a PSP's help in specifying a noncontaminating packaging material. MBI had been using Low Density Polyethylene (LDPE) material to cover the mirrors for storage and shipment. MBI was dissatisfied because the mirrors were arriving at destination with dust particles on the optical surface. MBI knew a material change was needed but had no idea what material to use. The PSP advised MBI to use a specially treated Dupont Tyvek structure; unlike LDPE, the Tyvek does not attract contamination. The PSP's extensive LDPE and Tyvek product knowledge guided MBI in making the appropriate material choice.

* Product knowledge allows the PSP to deliver a powerful presentation.

  A PSP with thorough product knowledge is confident and enthusiastic in a sales presentation. The eager PSP is ready to answer all questions concerning the product. Exhibiting product knowledge tells the customer that the PSP has faith in himself and the product. The positiveness exhibited increases the chances of closing that sale.

  EXAMPLE: A PSP gave a sales presentation to high ranking officers of the Department of Defense to obtain a packaging contract. The officers were extremely knowledgeable on military specifications. Instead of being intimidated by the officers, the product knowledgeable PSP was able to give a cohesive, compelling sales presentation citing the specifications for the material, bag fabrication, quality control and markings applicable to the packaging contract. The officers, impressed by the PSP's knowledge, enthusiasm and confidence awarded the PSP the contract.

* Product knowledge teaches the PSP an engineering methodology.

  The PSP is called upon to solve customer packaging problems, reduce the customer's material and labor costs, and provide assistance in start up programs. Working through engineering-related problems with the customer teaches the PSP to appreciate the bigger picture.

EXAMPLE: A customer who manufactures large rolls of abrasion sensitive plastics wanted to reduce the material and labor costs to package these rolls. The PSP examined the current packaging material specification and studied the packaging operation before recommending any alternatives. Based on thorough product knowledge, the PSP recommended an equilvalent material which was less costly and provided an alternative time saving sealing method to reduce labor costs.

* Product knowledge promotes "Doing it right the first time."

A PSP who acquires the exact material and fabrication specifications from the customer usually finds that the bags will be manufactured correctly the first time, thus saving time and money for the PSP, the manufacturer, and, most importantly, the customer.

EXAMPLE: A space satellite customer required class 10 clean room bags for packaging satelite components. The specifications called for the bags to be manufactured in a class 10 clean room environment. The PSP realized that if an inappropriate amount of contamination was on the bags and transferred to the components, the contamination effects would be hazardous to the astronauts and could destroy the entire mission. Upon delivery of the clean room bags, the PSP issued a Certificate of Compliance, assuring the customer the bags were manufactured to the exact specifications.

* Product knowledge enables the PSP to determine exactly what is behind the customer's motive.

Every buying decision has motives behind it (Hampton and Zabin 61-74) . The PSP with thorough product knowledge emphasizes how the product will satisfy that motive.

EXAMPLE: A customer who has an environmental motive is concerned about recycling plastic films. The PSP with thorough product knowledge knows that low density and high density polyethylene films are easily recyclable, but realizes there are many challenges to recycling plastic laminated films.

* Product knowledge enables the PSP to present to the customer the relevant features and benefits of the product.

Convincing a customer to specify one product rather than another means convincing that person that the product has precisely those features and benefits that are appealing and useful. To do this, the PSP has to know every facet of the product, so that the features of interest to a specific customer can be emphasized and in the sales presentation.

EXAMPLE: A customer requires bags to hold candy. The customer wants the users to be able to pick one piece of candy and save the rest uo to a 60 day period. The PSP recommends a polyester/polyethylene laminate for 60 day storage of the candy and a zipper closure for easy opening and closing.

* Product knowledge allows the PSP to overcome objections and resistance.

A customer's questions and objections are negatives that must be overcome in order to close the sale. As long as the customer has these negatives in mind, the sale will not be closed. The PSP overcomes these negatives with thorough product knowledge.

EXAMPLE: A customer who was shipping fully loaded electronic P.C. assemblies overseas needed a moisture barrier against the salty seas and electronic barrier against static electricity. The PSP recommended a high cost barrier bag that performed both barriers. The customer objected to the high price. The PSP overcame the cost objection by using performance specification to show how the assemblies would arrive free from moisture and electronic damage.

* Product knowledge enables the PSP to give prompt customer service.

The key to customer service is providing the customer with quick, accurate and informative answers, no matter what the question. No PSP ever knows what a prospective customer will ask, but with product knowledge the answer will be more likely to be thorough, emphatic and immediate.

EXAMPLE: A purchasing agent required printed bags for a medical electrodes. While at the purchasing agent's office, the PSP demonstrated how the bags would be manufactured. The purchasing agent satisfied by the demonstration, was ready to place the order when an engineer came into the office with a last minute detail: the bags had to be manufactured to a plus or minus 1/16" tolerance. The product knowledgeable PSP immediately responded, "we have a manufacturing tolerance of plus or minus 1/32" tolerance." The PSP was then given the order. The PSP saved valuable time and provided the customer with prompt customer service.

* Product knowledge allows the customers to make better decisions.

When a PSP exhibits thorough product knowledge, it allows the customer to make a well informed decision "to specify" or "not to specify", or to select among more than one viable option.

EXAMPLE: A manufacturer of cat litter bags needs a higher puncture resistant material to dispose of used cat litter. Their current bags puncture easily causing customer concerns. The PSP evaluated the current material, a low density polyethylene, and compared the puncture resistance to high density and linear low density polyethylenes. The PSP pointed out that both high density and linear low density provide superior puncture resistance over the low density. The high density is stiffer than linear low density allowing more weight of product to be carried in the bags. The linear low density costs less than the high density. The customer, given the facts, specified the high density material.

* Product knowledge allows the PSP to listen for unstated needs.

A PSP with thorough product knowledge focuses on listening to the words of the customer to identify both explicit and implicit needs.

EXAMPLE: A PSP made a call on RSG Corporation, a radio transmitter manufacturer. RSG received a first time overseas contract to ship 100 transmitters to Malaysia. RSG was unfamiliar with what protection the transmitters needed to be shipped overseas, so they relied heavily on the PSP. Thorough product knowledge allowed the PSP to focus on listening intensely for the requirements of the application. RSG had not anticipated the implications of shipping long distances to a moist, tropical climate. The PSP was able to prevent calamities by offering solutions to problems RSG had not identified.

2. What effect does product knowledge have on product demonstration?

* Product knowledge allows the PSP to build a solid foundation for product demonstration.

The PSP easily demonstrates the product features, while clearly explaining the benefits of the product. The demonstration flows smoothly as a result of the PSP's solid foundation. The product knowledge creates enthusiasm; enthusiasm creates a positive demonstration. Without product knowledge, a PSP will fumble with the demonstration, causing doubt in the customer's mind. The fumbling prohibits a positive direction of the product demonstration.

EXAMPLE: A PSP gave an Electrostatic Discharge(ESD) packaging demonstration to 100 chemical technicians. In order to lay a solid foundation for the packaging solution, the PSP needed to work up to the packaging solution. The PSP stated, "ESD or static electricity has caused problems such as personnel static shocks in the chemical industry. Appropriate ESD packaging offers a viable solution to this problem." The PSP demonstrated a static shock occurance in order to let the technicians see the problem. To further explain ESD, the PSP broke down the ESD definition into its intergral parts. The static shock problem became clear as a result of the indepth explanation. The technicans could now determine, prior to being zapped, how they could receive a shock in the manufacturing plant. The confident PSP then used ESD product knowledge to offer a solution to the plaguing problem. Features and benefits were demonstrated, with no questions concerning the validity of the ESD problem. However, the technicians did ask "what if" questions, but the PSP responded enthusiastically and factually, bringing them back to the original ESD explanation. When the demonstration was over, the technicians left the room with knowledge regarding the importance of packaging to the ESD problem.

* Product knowledge allows the PSP to clearly communicate technical information in the product demonstration.

"Most people are under the delusion that complexity is a sign of knowledge or a kind of sophistication. Complexity in communication means confusion; and selling is communication" (Hampton and Zabin 244). Product knowledge allows the PSP to keep the demonstration simple and in a logical order, to translate technical language to layman's terms, and to reduce the chance of being vague. The clearer the demonstration, the more the customer will absorb.

EXAMPLE: During a conductive electronic bag demonstration, a question concerning the difference between static dissipative bags and conductive bags was raised by the customer. The prepared PSP waited for this chance to demonstrate product knowledge. Both bags' surfaces possess the ability to drain a static electricity charge away from the product enclosed in the bag. However, the conductive bag's surface drains the charge faster, a result of less surface resistance. The bag's ability to drain the charge is stated on a specification sheet as surface resistivity. It is measured in ohms per square. The PSP set up a test in accordance with ASTM D 257 to demonstrate both bags' surface abilities to drain the charge. The PSP showed the customer how the conductive bag with a surface resistivity of 10 to the 5th power ohms per square, drains the charge faster than the static dissipative bag's surface resistivity with 10 to 8th power ohms per square. Since 10 to the 5th power is less than 10 to the 8th power, the resistance is less, therefore, the charge drains faster. The customer acknowledged that the point was understood. The PSP realized that if the customer understood how each bag performs as a result of surface resistivity, the right choice could be made on the appropriate type of bag.

* Product knowledge allows the PSP to tailor the demonstration to the type of customer.

The customers' needs will vary depending their job responsibilities. A product demonstration to a packaging department may contain different segments of product knowledge than a demonstration to an engineer. Product terminology, facts, features and benefits will all vary depending the type of customer.

EXAMPLE: The PSP gave a product demonstration to a potential new customer, a medical blood analyzing company. The company needed to ship blood samples in moisture protective bags. The demonstration was given in two parts, one part technically tailored for the packaging engineer and the other part with general product information for the packers. The PSP showed the engineer the material structure and demonstrated how the material performs in the distribution system. For the packers, the PSP demonstrated how to load and seal the bags. The PSP tailored the parts of the product demonstration to meet the appropriate needs of each department.

* Product knowledge allows the PSP to estimate the time needed for a demonstration.

  A well organized PSP asks the customer how much time will be allowed for the demonstration. The PSP can then select the appropriate product knowledge to put into the demonstration based on the time allowed.

  EXAMPLE: The PSP called on a busy stock exchange broker. The PSP only had 15 minutes to demonstrate the effectiveness of shipping bags. Since there was not enough time to give an entire demonstration, the PSP planned an abreviated presentation. The customer's main interest centered around safe delivery of important papers. The PSP accurately demonstrated how the bags would perform in the distribution system. The PSP showed the puncture resistance of the bag by applying constant pressure, tear resistance by applying force to tear the bag once it was punctured, and water resistance by pouring water over the bag. The customer, impressed by the bag characteristics, immediately ordered bags for a rush shipment.

* Product knowledge allows the PSP to stimulate the customer's interest in the opening of a product demonstration.

  The PSP must peak the prospective customer's interest in the first minutes of the demonstration, so that the customer will be eager to see the product. This stimulation occurs as a result of the PSP's product knowledge.

  EXAMPLE: The PSP gave a demonstration to a chemical manufacturer who was concerned about the packaging material generating a spark due to static electricity. A spark had caused an explosion in the processing plant. The PSP explained the problem could be solved by using a material which does not generate sparks. The customer became eager to see the product because of the potential life saving benefits.

* Product knowledge allows the PSP to pick the human sense that will dramatize the demonstration and draw the customer into participation.

  Customers like demonstrations because they prefer to trust their own senses rather than a salesperson's promises. Customers remember only up to 40% of what they see, but they remember up to 80% of what they see and hear (Hampton and Zabin 258)! They would rather taste than be told how something tastes, rather touch than be told how something feels, and see how a product works rather than hear a description of the process. The impressions the PSP makes are deeper and more vivid if the demonstration involves the senses. The points made are remembered longer because they penetrate further (Kirkpatrick and Russ 329).

  EXAMPLE: A PSP approached a cigar manufacturer, whose sales have been declining as a result of continued customer complaints. The cigars were drying out, losing its aroma. The PSP evaluated the application and discovered that the current packaging did not provide the appropriate aroma barrier. In a simple test, the PSP let the manufacturer smell a currently wrapped cigar. The aroma was permeating through the wrapper. The PSP explained if a customer can smell the cigar, the cigar is losing its aroma and would dry out. The PSP specified another packaging material which provides a better aroma barrier and demonstrated its barrier properties by using the same smell test. The manufacturer did not detect any aroma. The manufacturer's human senses were a key factor to analysising this packaging problem.

* Product knowledge allows the PSP to make a more effective "canned" demonstration.

  A "canned" demonstration is a presentation that is memorized. As an opening to homogenous demonstrations, it is effectively used to ensure that the PSP does not forget any critical points. However, a canned presentation has many problems: it does not exhibit the salesperson's knowledge, it does not involve a customer's participation, and it cannot be used more than once to the same customer. The PSP who has product knowledge exhibits expertise, welcomes customer questions, and provides flexible sales presentations.

EXAMPLE: A PSP's key account list consisted of 20 different military contractors who manufactured products from electronics to clothing. The PSP could use the canned demonstration to open the sales calls because they were all military accounts. However, because the products varied from each contractor, the PSP had to use different parts of product knowledge to answer any questions and provide different demonstrations.

* Product knowledge allows the PSP to demonstrate product performance.

  A PSP makes statements in a demonstration to convince the customer to specify a product. Product knowledge demonstrates to the customer that the statements are backed by performance of the product. The performance will close the sale.

  EXAMPLE: A bank purchasing agent needed tamper evident coin bags to uncover the possibility of employees illegally taking coins from the bags. The PSP stated that once the tamper evident bag was sealed with permanent bond adhesive, the bag could not be opened unless it was destroyed. The PSP demonstrated the bag's effectiveness by placing the customer's expensive watch inside the bag and sealing the bag. The customer tried to open the bag without destroying it, but failed to do so. The customer was convinced that if employees tried to open the bag it would be evident.

* Product knowledge allows the PSP to reduce the customer's opposition to purchase the product after the demonstration.

  The customer's opposition to purchase is based on the amount of negatives or concerns that have not been answered by the demonstration. Product knowledge reduces these negatives and answers the needs of the customer. Once the needs have been answered the PSP can close the sale.

EXAMPLE: The PSP knew the next sale would be a challenge. A microscope mirror manufacturer, who was satisfied with the present vendor, agreed to a demonstration on a new removable adhesive tape. The manufacturer was hesitant to change from the current tape because it worked well, with no complaints from production workers. The tape was used to attach a foam pad to the mirror's surface to protect it during delivery to the customer. The customer would remove the tape and foam. The PSP studied the current tape specifications and discovered the tape had a high adhesion strength, a property that could create a problem for the mirror's surface. The PSP applied the current tape to the mirror surface, waited a few minutes, and then pulled it off. An adhesive residue remained on the mirror surface. The PSP compared the adhesion specifications to the new tape specifications. The PSP then performed the same demonstration with the new tape. When the tape was removed, it left no adhesive residue. The PSP explained this new removable adhesive tape would eliminate any possibility of damaging the mirror from scraping or using solvents to remove the adhesive. The manufacturer, impressed by the demonstration and the PSP's detailed presentation, gave an order to the PSP.

* Product knowledge allows the PSP to end the demonstration.

The objective of a demonstration is to get the customer to specify the product. The PSP with thorough product knowledge will know when enough is said in order to reach this objective.

EXAMPLE: The PSP in the previous situation knew when to end the demonstration. Using product knowledge about adhesion specifications, the PSP opened by identifying a previously unseen problem, presented a solution to this problem, and closed with the benefit from the solution. The objective had been reached logically and professionally, the PSP had said enough.

3. How much product knowledge is needed?

* The PSP needs to think like an engineer.

An engineer's methodology includes studying product specifications, material evaluations and manufacturing processes. The PSP uses this part of product knowledge to uncover the strengths, weaknesses and limitations of the product. The life of the product is then examined to see if the product can make it through handling, distribution, storage and actual use. If a product fails during its life, generally the problem can be tracked back to this part of product knowledge.

EXAMPLE: A customer who possesses a paper copier has been complaining of receiving "shocks" when she goes to use the copier. The "shock" problem can be tracked back to the plastic outer shell of the copier. Most plastics are tremendous static producers, resulting in a "shock" under the the right conditions. In response to this customer, the professional salesperson uncovers that the plastic outer shell must be made from material that will not generate static. The material specification sheet contains the data that points out that the material's volume resistivity must be below a static generating level in order for the material not to generate a "shock". Since the copier has already been manufactured, the salesperson reports back to the customer why the "shock" problem occurs. The salesperson then recommends alternative measures for solving this problem. The customer may add an air ionizer above the copier, which neutralizes the static, or raise the humidity in the immediate environment, which reduces the static to a level where the "shock" cannot be felt. The customer becomes satisfied with the salesperson's thorough response and can be easily sold a product the next time.

* A PSP needs to learn everything about the product and continue the learning process as long as the product is sold.

The goal of product knowledge is to have a data bank full factual information that the PSP can use to open doors, solve problems, answer questions, present solutions and close presentations.

* In general, product knowledge data bank includes information under four categories, general information, product in operation, physical product, and services (Kirkpatrick and Russ 154). See TABLE I.2. Much of this information is beyond the scope of this thesis, but are important factors in the complete understanding of product knowledge. This thesis focuses mainly in the physical product category and addresses the other categories to a lesser degree.

* Part II of this thesis describes in detail the engineer's methodology when it comes to specifications, materials and manufacturing. A case study is made in reference to flexible packaging materials. The same methodology can be used no matter what type of packaging materials is sold by the PSP.

* For more information regarding product knowledge refer to Kirkpatrick and Russ 153-178.

TABLE I.2

THE FOUR CATEGORIES UNDER PRODUCT KNOWLEDGE

1. General Information

Origin and history
Research and development
Major Improvements
Identification
 Brand name
 Trademark
 Packaging
Competitive position
Availability or supply
Talking points
Related products

2. Product in Operation

Uses and applications
User benefits or satisfactions
Performance potential
Limitations
Operation and service
Cost of operating & maintaining
Cost of replacement

3. Physical Product

Sizes and weights
Colors, models, designs
Place in product line
Nature, source, cost of materials
Specifications
Method of manufacture
Quality control
Price, discounts, terms
Profit

4. Services

Credit
Shipping and delivery
Installation
Instruction for use
Maintenance
Support

Source: Kirkpatrick and Russ 154

PART II

PRODUCT KNOWLEDGE

Product knowledge is a common denominator that allows professionals to talk across professional boundaries. The salesperson, the engineer and the customer build a strong foundation for a long term relationship by sharing information concerning this common denominator. A thorough understanding of product knowledge consists of the ability to read and understand a packaging specification, to choose the appropriate packaging material, and to understand how the product is manufactured.

A. PACKAGING SPECIFICATIONS

1. What is a packaging specification?
2. What are the types of packaging specifications?
3. What are typical characteristics of a drawing?
4. How are drawings illustrated?
5. How are lines used in a drawing?
6. What are the other parts of a drawing?

1. What is a packaging specification?

* The packaging specification is the single most useful source of information for both the PSP and the engineer. Understanding the specification is essential for the development of the packaging professional.

* A packaging specification is the written document that summarizes and communicates all the technical details necessary for the manufacturing process of the product. By reading the specification, the customer and the PSP come to understand the exact requirements. The department responsible for the technical aspects of packaging usually writes the specification.

* The format of specifications varies depending on the issuing source. However, specifications usually include all or some of the following technical details.

I. SCOPE
Summary of material(s) covered in the specification.

II. APPLICABLE DOCUMENTS
Referral to other applicable documents which are utilized in conjunction with the specification.

III. REQUIREMENTS
Complete description of material(s): construction, identification marking, physical properties, mechanical, chemical properties and forms of fabrications.

IV. QUALITY ASSURANCE PROVISIONS
Outlines quality control procedures: inspection requirements, methods of sampling examination and testing procedures, allowable tolerances, and actions for "out-of-spec" materials.

V. PACKAGING
Packaging requirements necessary to ensure safe arrival of material(s) covered in the specification.

VI. NOTES
"Catch-all" for additional applicable information which has not been stated in previous sections of the specification.

* To help interpret the written language in a specification, a detailed drawing or graphic illustration is generally included in the specification.

* Packaging specifications have to be revised periodically.

  Most packaging specs are modified for some reason within a year of issuance for several possible reasons: to reduce cost, to process better on new or altered packing machinery, to improve consumer function, or to respond to legal and regulatory initiatives. When such changes are made, it is especially important to avoid ordering an obsoleted version of the specified package or material.

* The basic function of the specification is to provide enough information for each department to perform its function.

  - The supplier checks the manufacturing process specification against the user's specification to ensure that the material can be made in compliance with that specification.

  - A purchasing agent orders packaging material according to the specification.

  - The manufacturing team uses the specification to verify the accuracy of the material intended for use on a machine.

  - The shipping team verifies that the specification meets packing and shipping requirements.

  - Quality control department verifies that the material conforms to the specification.

* Specifications are vital to quality control.

  It is very difficult to specify quality, since without clarification "quality" is an abstract concept, subject to many different interpretations. As Lord Kelvin said," If you can measure that of which you speak and can express it by a number, you know something of your subject; but if you cannot measure it, your knowledge is meagre and unsatisfactory."

  EXAMPLE: When a customer needs a material that provides a moisture barrier (WVTR), what level of barrier does that customer require? Moisture barrier is a relative term, for it depends upon the customer interpretation. There is no interpretation required however when the specification calls for an WVTR of .02gms/100squared/24hours. It is imperative, therefore, that the PSP be able to translate "quality" from the abstract to a specific.

2. What are the types of packaging specifications?

* Packaging specifications differ depending on the kind of information needed by the engineer. The purpose is to insure safe transit and use of the product.

* In general, packaging specifications follow one of the three common formats.

  * GENERAL SPECIFICATION

  * DETAIL SPECIFICATION

  * PERFORMANCE SPECIFICATION

* A GENERAL specification describes the general information and allowable characteristics for all materials under a particular packaging material category.

  This specification will dictate to the supplier the types of materials under the specified category that can be used to fulfill the customer request. In some cases the specifications contain only this general information about the material required. Receiving a specification with only general information allows the manufacturer flexibility in determining specific ways to meet the requirements.

  EXAMPLE: The military is ordering bags manufactured with a Mil-B-131H (Water-Vaporproof, Flexible, Barrier) general material specification. The bag supplier can use any material that meets the general specification requirements. The bag supplier contacts a material manufacturer for guidance on the material that can be used for this order.

* A DETAIL specification covers the technical details for specified material in a particular application.

  This specification tells the supplier exactly which components to use to fabricate the material. In some cases detail specifications are issued as part of or instead of general specifications. Inclusion of detailed specifications does tend to rule out innovation and cost savings by the supplier. However, it ensures exact compliance with the customer's requirements. To specify in this manner the customer needs to be familiar in detail with the raw materials used by the packaging supplier.

EXAMPLE: When the U.S. Government buys products, it issues detail specifications based on the length of time before usage. A machine gun that is going to be used right away needs waterproof packaging. A machine gun that is going to be stored for several months needs more protection; it needs a moisture barrier. Government research, analysis, and experience has resulted in precise designation of various levels of packaging. The details assuring these various levels of protection are carefully explained in the detail specifications.

* A PERFORMANCE specification lists the packaging material requirements in terms of the desired end result rather than the type of material to be used.

  This specification allows the supplier freedom to decide the type of materials used, and to investigate more economical as well as innovative alternatives within the performance limits. It allows for competition between suppliers to produce the required quality at the lowest price. Other benefits include reducing lead time on hard to find items and builds close cooperation between supplier and customer. The main problem occurs in trying to specify performance aspects exactly enough to ensure that the finished specification covers all contingencies.

  EXAMPLE: A manufacturer needs to package the food powder in moisture barrier packaging. If the product picks up a large percentage of moisture, it becomes defective and unusable. The customer specifies a packaging material to protect this product in terms of Moisture Vapor Transmission Rate(MVTR) instead of the packaging material construction.

* The PACKAGING PROCESS and FINISHED GOODS specifications are not covered in this thesis but can be further investigated through Wiley's Encyclopedia of Packaging Technology.

* For more information regarding Packaging specifications refer to Briston and Neill 109-124.

3. What are typical characteristics of a drawing?

* A simple means of communicating information in a specification is a drawing.

  It gives a graphic illustration of the product that is needed by the customer. A drawing can stand alone as a packaging specification or it can be found in the material requirements or quality assurance sections of the specification.

* Specification drawings have four basic characteristics.

  I. COMPLETENESS
  A drawing answers every necessary question about the part or process it describes. The drawing answers questions concerning the tolerances on the dimensions, the material structure and finish, the special features of the bag.

  II. SIMPLICITY
  Drawings are uncluttered and clear. They include no decorations or extraneous information.

  III. TECHNICAL ACCURACY
  Drawings portray a technically correct design. It illustrates how all the parts will work together. Paper tends to bring out reality. If an idea will not work in practice, it usually will not lay out right on a drawing board. A drawing will not take out all the bugs, but it will eliminate a lot of them because every detail must be considered in creating the drawing.

  IV. CONSTANT REVISION
  Drawings are under constant review and revision due to changes in materials or machine design updates. When specifications change usually the corresponding drawings also change. Drawings that do not reflect all changes up to the time they are dated will cause trouble later in production.

* For more information regarding typical characteristics refer to Roadstrum 65.

4. How are drawings illustrated?

* An object may be illustrated in two general ways, by a PICTURE drawing or a MECHANICAL drawing.

PICTURE
Picture drawings are of use in studying the appearance of a part, but are not of any great use for fabrication because they are not to scale.

MECHANICAL
Mechanical drawings, on the other hand, accurately illustrate the shape of every detail of any structure. In mechanical drawings, a series of "line of sight" views are used to form the true picture. Three such views are top, front, and right side. These views are called projected views. See Figure II.1. for placement illustration on the drawing of the projected views. Most flat bags can be illustrated from the top view. However, three dimensional bags require a number of other views. The most common types of mechanical drawings are assembly, detail, and tabular.

I. ASSEMBLY DRAWING
A complete assembly drawing is a drawing of the product put together, showing all parts in their operational positions.

II. DETAIL DRAWING
A detail drawing defines each part completely so that it can be procured or manufactured to fit into the overall assembly. This is the simplist form of working drawing and must be a complete and accurate description, with carefully selected views and well-located dimensions.

III. TABULAR DRAWING
A tabular drawing is one on which the dimension values are replaced by reference letters. An accompanying table lists the corresponding dimensions for a series of sizes of the bag, thus making one drawing serve for the range covered.

* For more information regarding drawings refer to French et al. 387-391

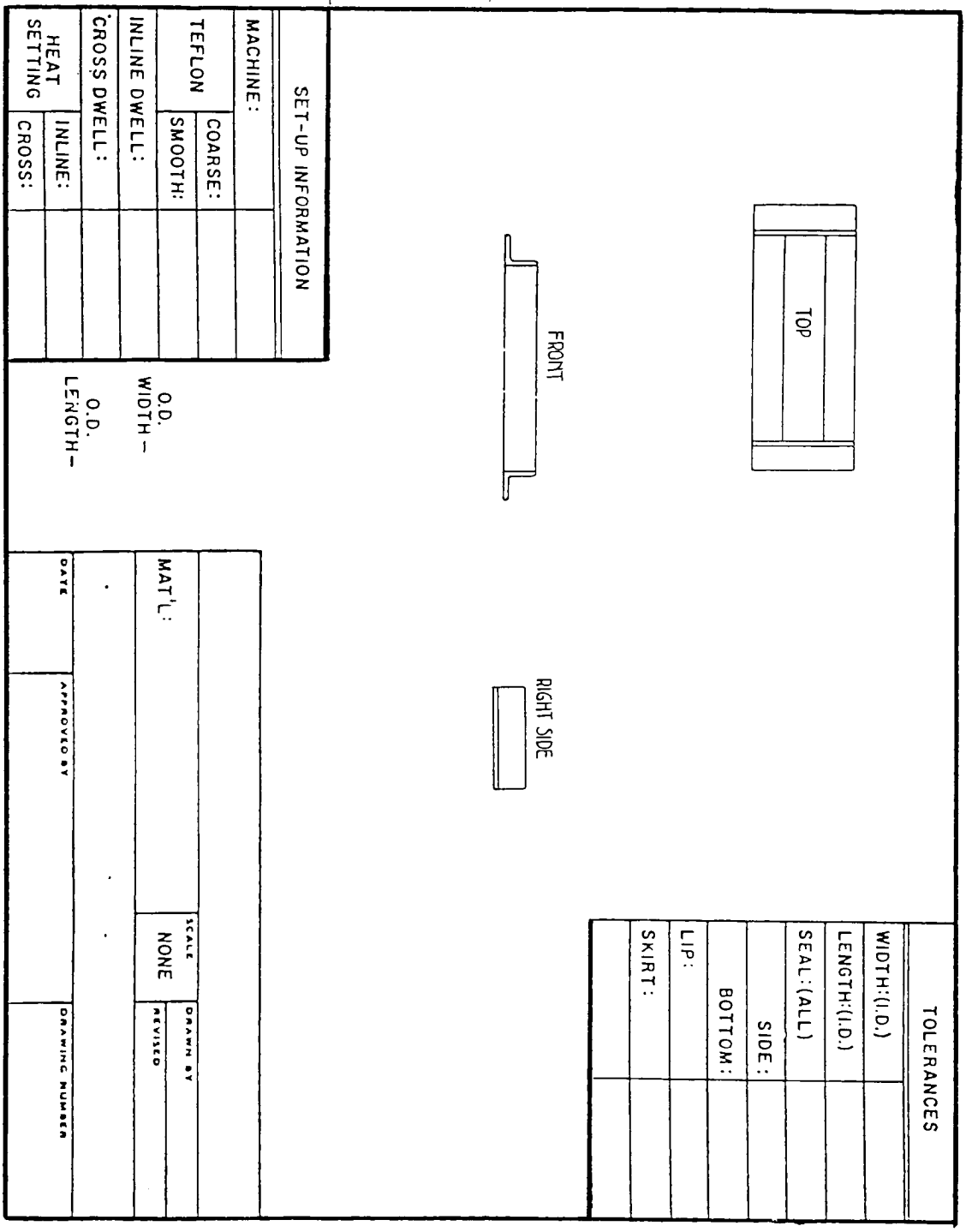


Figure II.1. Projected views on a drawing

5. How are lines used in a drawing?

* A picture is composed of a number of lines.

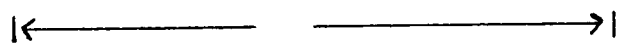
It is not necessary to learn how to draw a certain type of line or make a certain figure, but it is necessary to know what line or figure means. The following is a partial list from the "alphabet of lines".

VISIBLE OUTLINE
The visible outline of the product can be seen from the projected views.

HIDDEN LINE
The dotted line indicates the hidden outlines, surfaces, edges and corners that cannot be seen from one projected view but can be seen from a different view.

CENTER LINE
The center line is used to designate the axis of symmetry of an object. Picture

DIMENSION LINES
The dimension lines indicate the distance between two points or parts of an object. These lines are broken near the center to provide for a numeral or a fraction to indicate the length of the measurement, and arrowheads are placed at the ends to enable the reader to locate the termination of the line. The dimension lines do not touch the outline of the drawing.

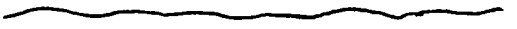


EXTENSION LINE
The extension line is used to indicate the end of the dimension.

CUTTING PLANE
A cutting plane line is used in the drawing of an object to show where the section has been removed. There are many cases, especially where there is considerable interior detail or where several pieces are shown together, in which the hidden lines become confusing or hard to read. This difficulty is avoided by using a sectional view.


Cutting Plane

SHORT BREAK LINE
A short break is used when a piece has the same dimensions for some part of its length. A segment of that unchanging section may be cut away and the ends moved closer together.


Short Break

LONG BREAK LINE
A long break line is used to indicate that the length of the cut of section extends beyond the drawing.


Long Break

* See Figure II.2. for illustration of the "alphabet of lines".

* For a more information regarding the "alphabet of lines" refer to French et al. 35.

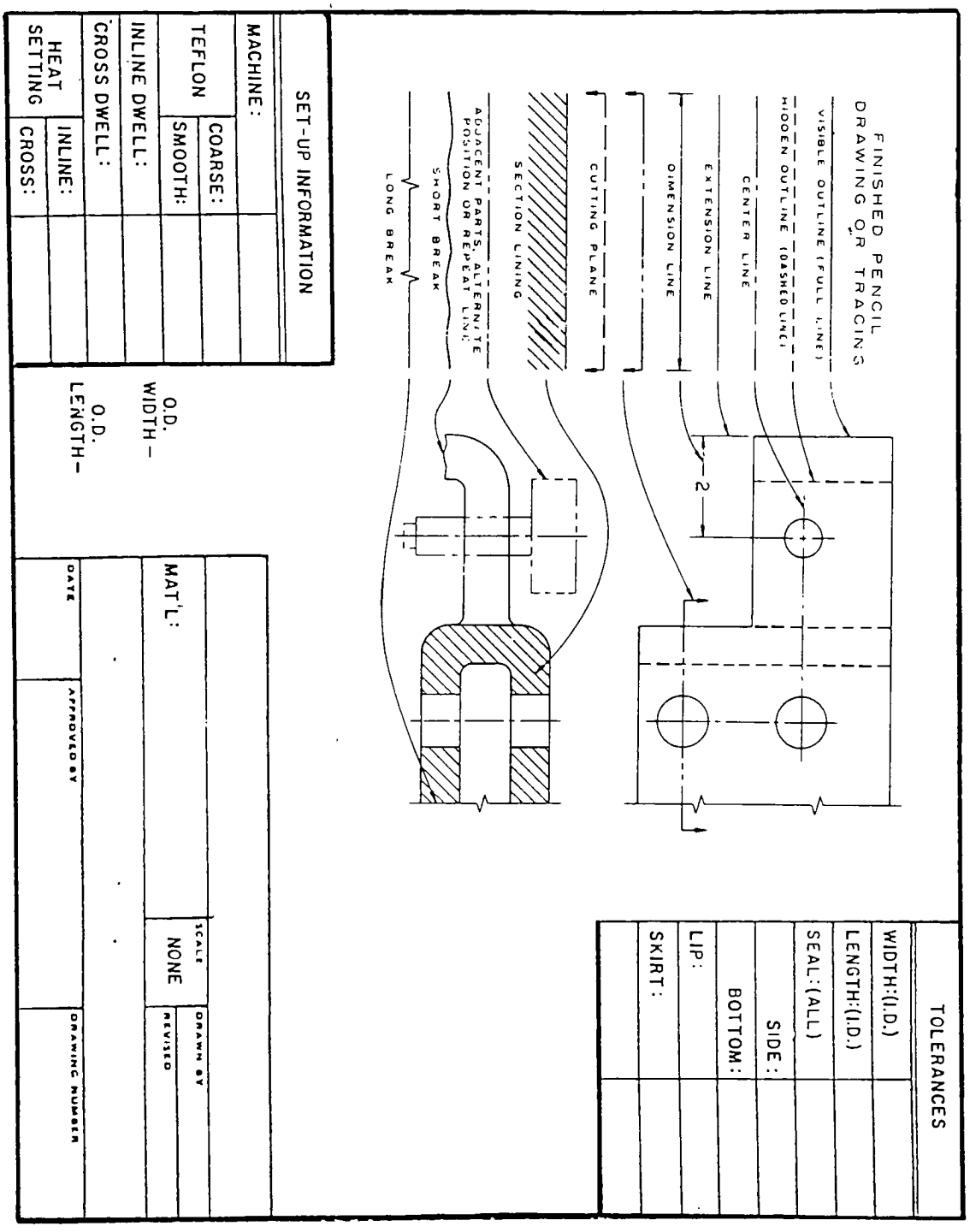


Figure II.2. "Alphabet of lines" on a drawing

Source: French et al. 35

6. What are the other parts of a drawing?

* A drawing consists of many other parts so that the engineer may communicate to manufacturing the necessary information for fabrication.

SCALES
Many bags cannot be drawn to scale because of the size involved. The bag drawing may be too large to fit on a standard sheet of paper or it may be too small making it impossible to indicate all the details. For this reason drawings are made to proportion, that is to a definite scale. The idea of cutting down every part to a convenient model size is just what is done in reduced scale drawings. Usually a Note is made on the drawing indicating the scale.

REDUCTION	NOTE
Full size	Scale 1" = 1" or no note
1/2	1/2"= 1"
1/4	1/4"= 1"
1/8	1/8"= 1"

Also other scales such as 1" = 1';1" = 3'; 1"= 10'

* For more information regarding scales refer to The Lincoln Electric Company 34.

REVISIONS TO DRAWINGS
Once a drawing has been reproduced and released for production, any changes should be recorded on the drawing and new prints issued. If the changes are extensive, the drawing may be made obsolete and a new drawing made supersedes the old drawing.

NOTES
Notes further explain important details for manufacturing this part.
1. Approved Material Description and Source of Supply
2. Fabrication Technique
3. Application Information
4. Next Assembly Steps
5. Reference Drawings

TITLE BLOCKS
A title block is the designated space on the drawing where the title belongs. All drawings used in production need title blocks. Every drafting room has its own standard form for title blocks. The title of a working drawing is usually placed in the lower right-hand corner of the sheet, the size and space varying with the amount of information to be given.

* The title block contents are:
  1. Name of company and its location
  2. Name of part
  3. Drawing number
  4. Part number
  5. Scale
  6. Assembly or Contract number (given on a detail drawing to identify the part in assembly)
  7. Signatures: names or initials of drafter, tracer, checker, approving authority, each with date
  8. Material
  9. Tolerances
  10. Number of sheets that make up the drawing
  11. Name of purchaser
  12. Date

* For a completed drawing see Figure II.3.

* For more information regarding drawings refer to French et al.

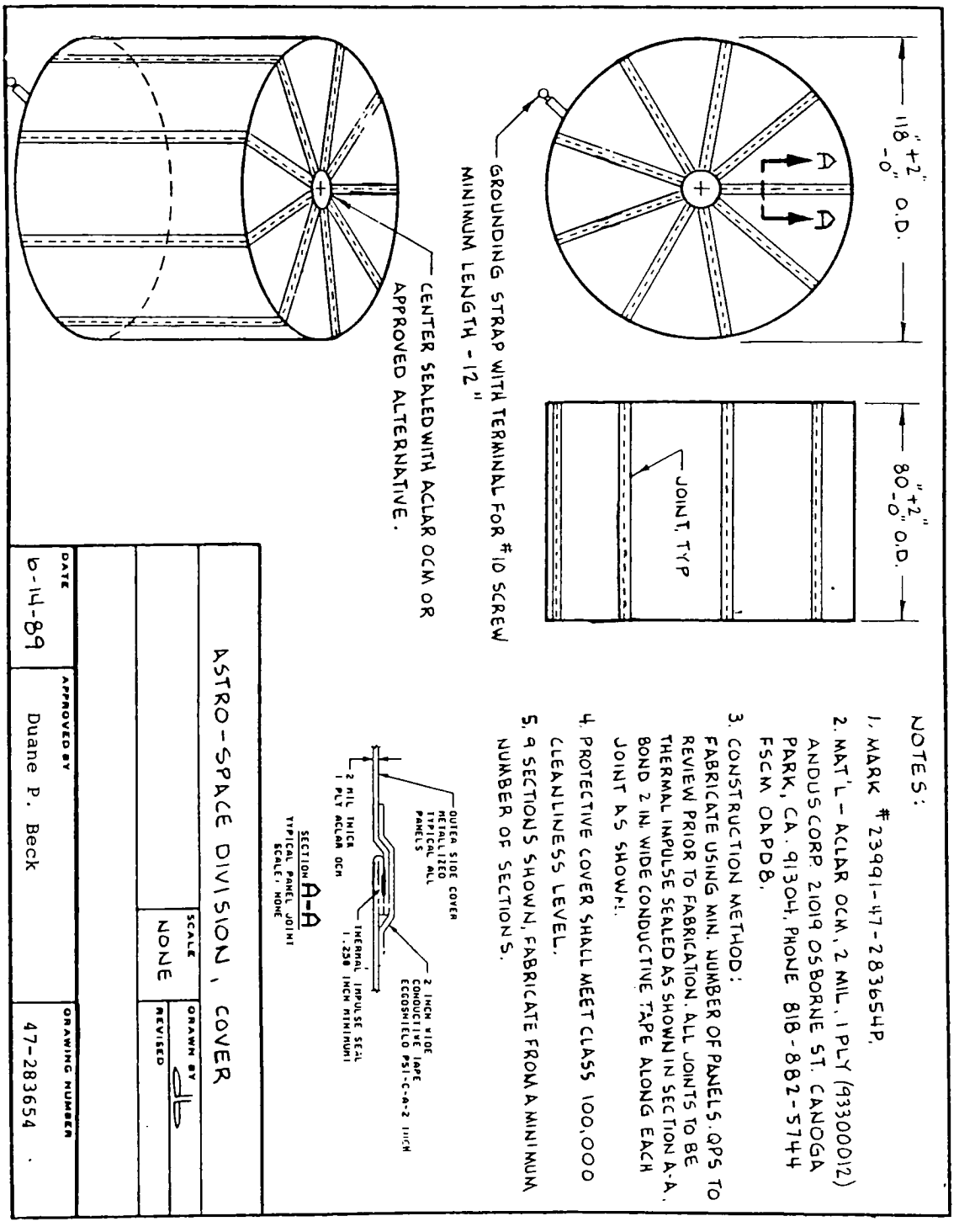


Figure II.3. Completed drawing of bag to cover a satelite

PART II - PRODUCT KNOWLEDGE

B. PACKAGING MATERIALS

1. What are the mechanical and physical requirements of a packaging material?

2. What are the barrier requirements of a packaging material?

3. How is the effectiveness of a barrier material measured?

4. How is permeability measured?

5. What are the types of transmission rates?

6. What is unique about a chemical barrier material?

7. What are the types of barrier materials?

1. What are the mechanical and physical requirements of a packaging material?

* Selection of the best material for any particular use is a matter of matching the appropriate material with the critical element(s) of the product to be packaged in order to create an effective barrier between the product and the environment.

  In order to select the appropriate material, standard equipment and test methods are used to test one material against another. Many times the prescribed test will not directly correlate to a given application, but the results of the test give the user a good starting point. The material must provide the appropriate mechanical, physical and barrier properties to ensure the end use of the product. Mechanical and physical properties are concerned with the strength of the packaging material to protect product's exterior. The barrier properties are concerned with transmission of environmental and chemical factors that affect the product's interior. The product's exterior and interior may have an effect on each other.

* Knowledge of the following basic physical and mechanical requirements of a material will give the PSP the understanding needed to discuss the client's demands.

  A. THICKNESS
  B. TENSILE STRENGTH
  C. YIELD STRENGTH
  D. ELONGATION
  E. IMPACT STRENGTH
  F. TEAR STRENGTH
  G. PUNCTURE RESISTANCE
  H. STIFFNESS
  I. ABRASION RESISTANCE
  J. FLEX RESISTANCE
  K. YIELD

A. THICKNESS
The thickness of a packaging material is the dimension between two of the object's surfaces. Thickness of a material plays a major role in all properties that are inherent in the materials. A micrometer is one type of instrument used to measure thickness. The dimension is expressed in terms of gauge, inches, or millimeters(mil.). See Figure II.4. for pictorial.

EXAMPLE: A coffee manufacturer requires a 5 mil. thick laminated material bag. The PSP's concern is the layer construction of the bag. The specification calls for a 5 mil. structure made up of a 48 gauge polyester film laminated to 4.5 mil. low density polyethylene. (Instead of asking for a "48 gauge", the specification could have expressed the thickness as .00048 in. or .5 mil.)

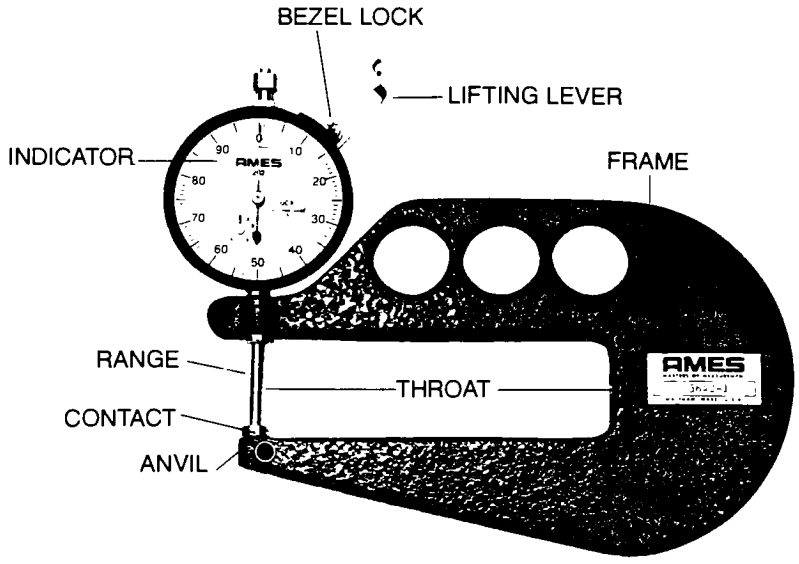


Figure II.4. THICKNESS - is measured with a micrometer (i.e. 5 = .005 inches)

B. TENSILE STRENGTH
The tensile strength is the maximum balanced stress which a material can sustain without breaking. The tensile strength must be great enough so that the material will not break when subjected to the stress likely to be encountered in the application. A tensile tester is utilized to determine the maximum stress load of a material specimen. Material is tested in accordance with ASTM D-882 and is generally stated in Lbs/Sq in. See Figure II.5 for pictorial.

EXAMPLE: A photographic film manufacturer requires bags with 1/2" seals on three sides. In order to receive the order, the PSP must assure the customer that all side seals will meet the seal strength specification. The specification requires the tensile strength of the seals to measure at 12 - 15 lbs/sq.in. If the seal strength test results are within specifications an order will follow.

C. YIELD STRENGTH
The yield strength is the tensile stress at which the first sign of non-elastic deformation occurs. The point at which this occurs is called the yield point. A large increase in elongation may result from a small increase in stress at or beyond the yield point. The tensile tester is used to measure this this initial non-elastic deformation. Material is tested in accordance with ASTM D 882 and is stated in psi (pounds per square inch). See Figure II.6. for pictorial.

EXAMPLE: A customer requires a two sided bag for a vacuum sealing application. Each side of the bag is to be made of a material with different yield points. The yield point is monitored on the bag fabricating machine by dancer rollers properly stretching the top and bottom materials. If these materials are stretched unevenly the bags will contain wrinkles in the seals, which could affect the ability of the bag to hold a vacuum.

D. ELONGATION
Elongation is a measure of a material's ability to stretch. An elongation test is considered when a material is stretched over a product in a deep draw vacuum application. A tensile tester is used to measure the percentage of stretch over the original length of the material specimen between the grips of the tester. Elongation is usually measured at break point or fracture point. Material is tested in acccordance with ASTM D 882 and is generally stated in percentage %. See Figure II.7. for pictorial.

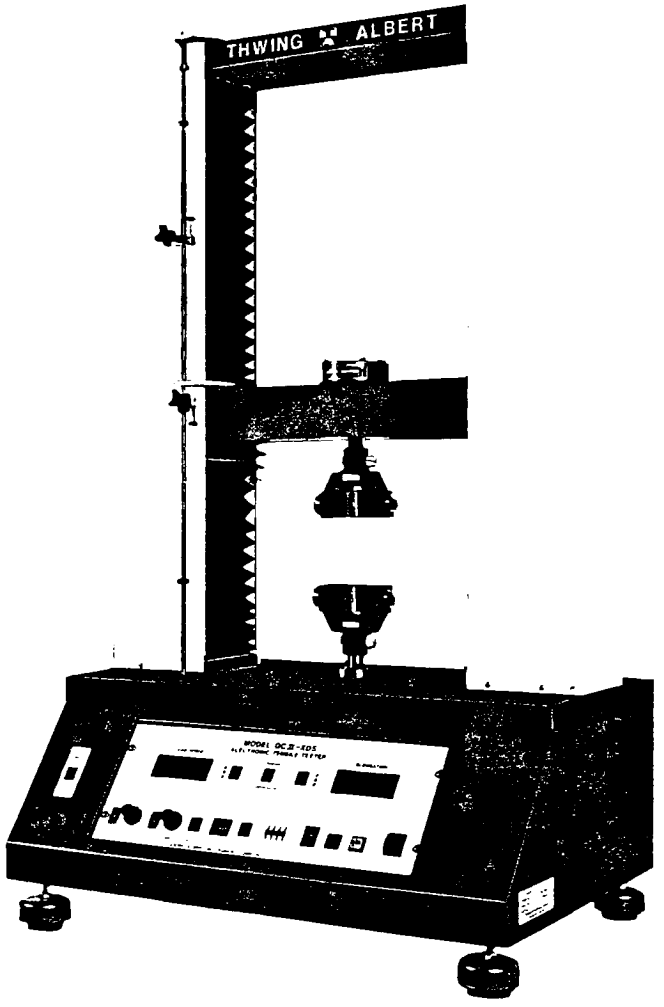


Figure II.5. TENSILE STRENGTH - Balanced stress on material

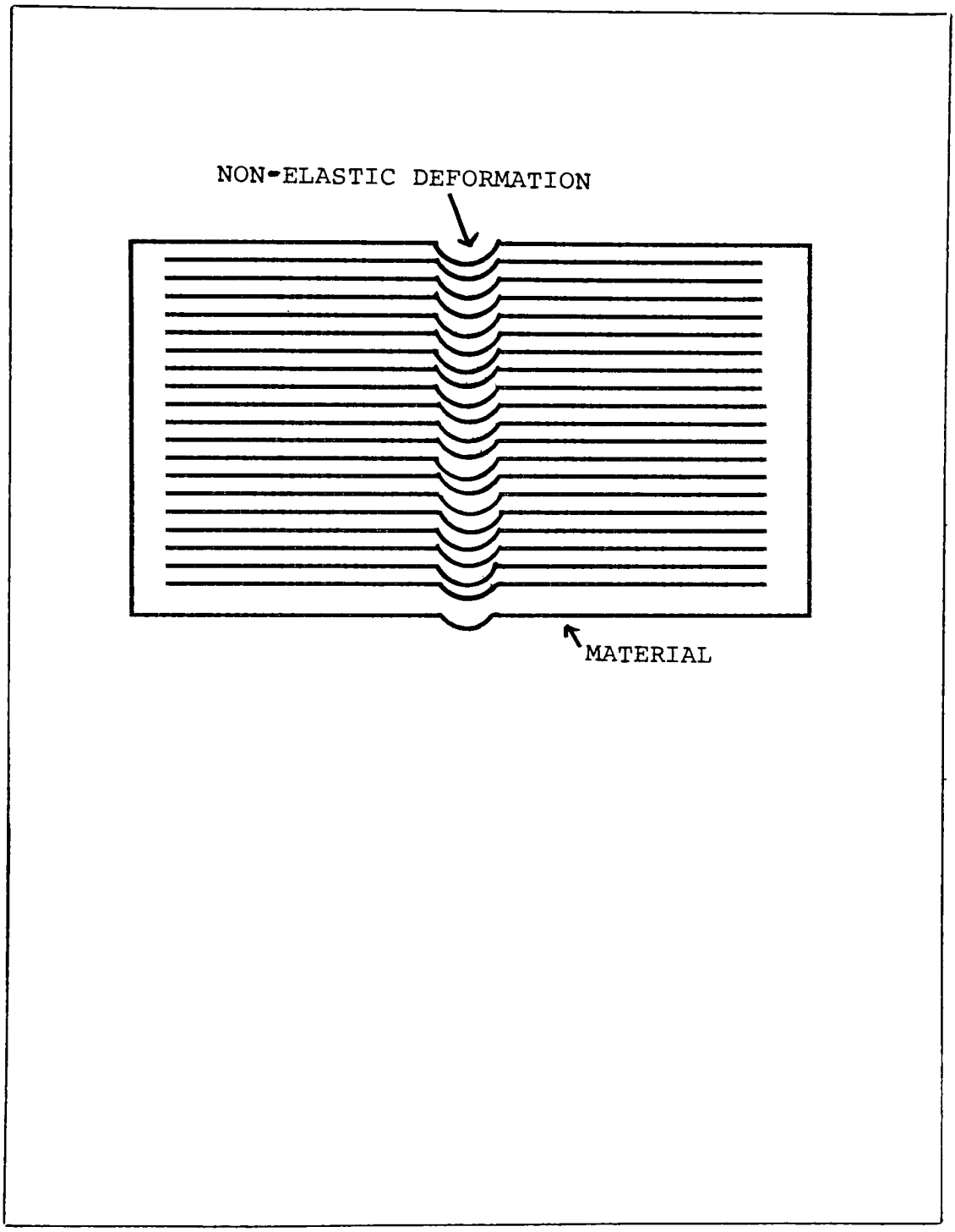


Figure II.6. YIELD STRENGTH - First sign of non-elastic deformation

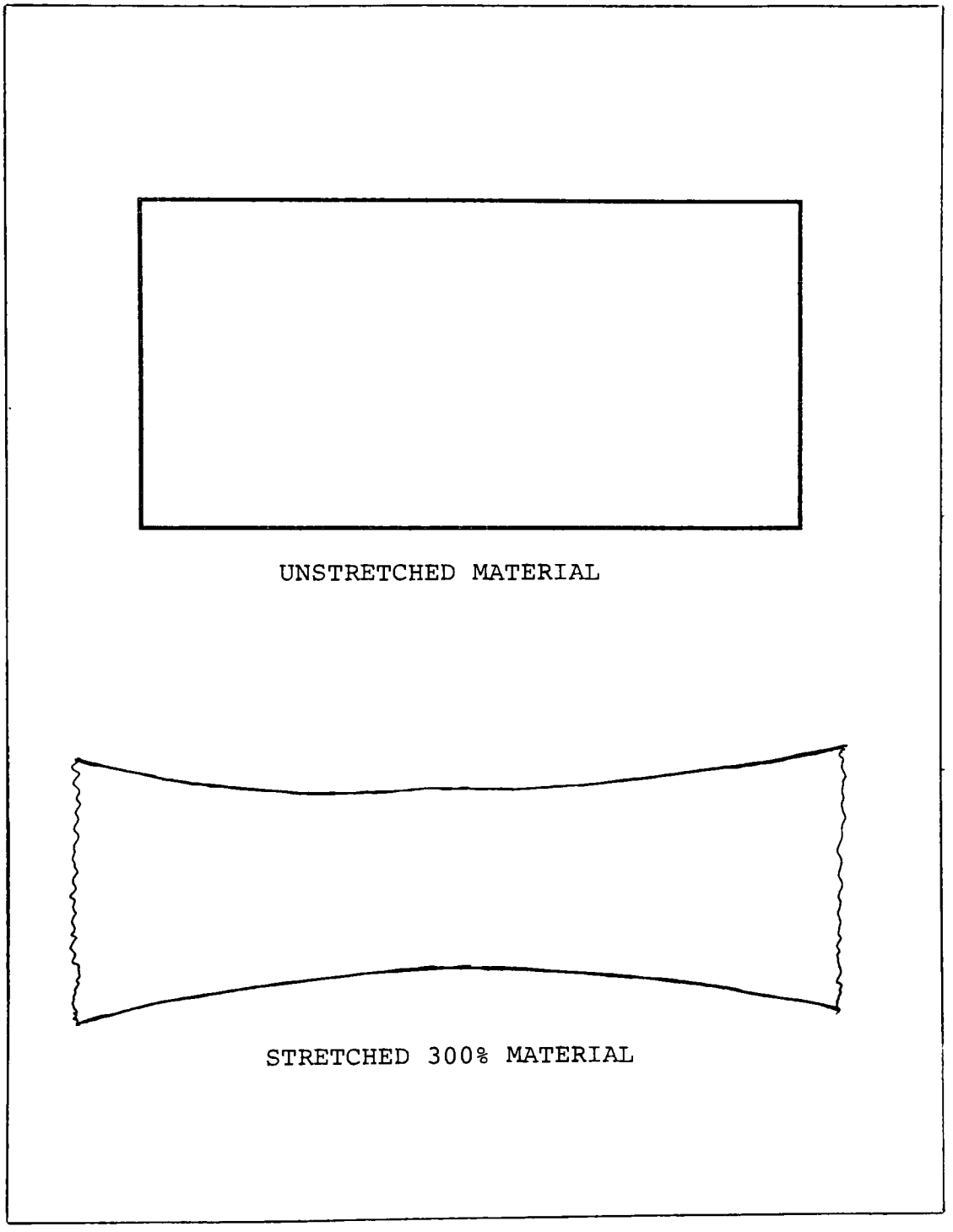


Figure II.7. ELONGATION - Ability to stretch

EXAMPLE: A foreign customer requires a bag to hold a 2" square box. The box cannot be subjected to any environmental moisture after it is packaged. A vacuum is required to pull any moisture out of the package. The deep draw puts stress on the material. If the material stretches around the box, the vacuum will hold and the box will be protected. If the material does not have the ability to stretch, the material will break once the vacuum process begins.

E. IMPACT STRENGTH

Impact strength of a material is a measure of its ability to withstand shock. The impact strength is a concern when the packaged product would be damaged if dropped. When comparing the test results of different materials, the tests must be under the same controlled conditions. The Falling Dart method is one way of measuring the impact strength of material. Material is tested in accordance with ASTM D 3420 and is stated in ft.lbs./mil. See Figure II.8. for pictorial.

EXAMPLE: A customer requires bags to hold concrete mix. The bags will be subjected to many drops. The customer does not know what material to use. The PSP selects 2 materials, low density polyethylene and linear low density polyethylene. Sample bags are fabricated to the same size. The bags are filled with concrete and dropped from the same height under the same conditions. If both materials pass the test, the customer may choose either bag or base the decision on other factors.

F. TEAR STRENGTH

Tear strength is the measure of energy needed in propagating a tear that has already been initiated by a small nick or puncture. Possible rough handling may demand that tears do not run from small snags or punctures incurred during transit. The machine direction and the transverse direction of a material are both measured in the tear strength tests. See Figure II.9. The Elmendorf Tester is used for measuring tear strength (Briston 100). Material is tested in accordance with ASTM D 1922 and is stated in grams(gm). See Figure II.10. for pictorial.

EXAMPLE: A customer requires bags to hold coal samples. The coal samples are transported by truck from the mine. The PSP's evaluation points out several potential causes of punctures: the coal's sharp edges, the truck bed's rough surface, and the vibration from the moving truck. As the puncture holes increase in size, coal samples are lost. The PSP recommends a material that once punctured does not tear any further.

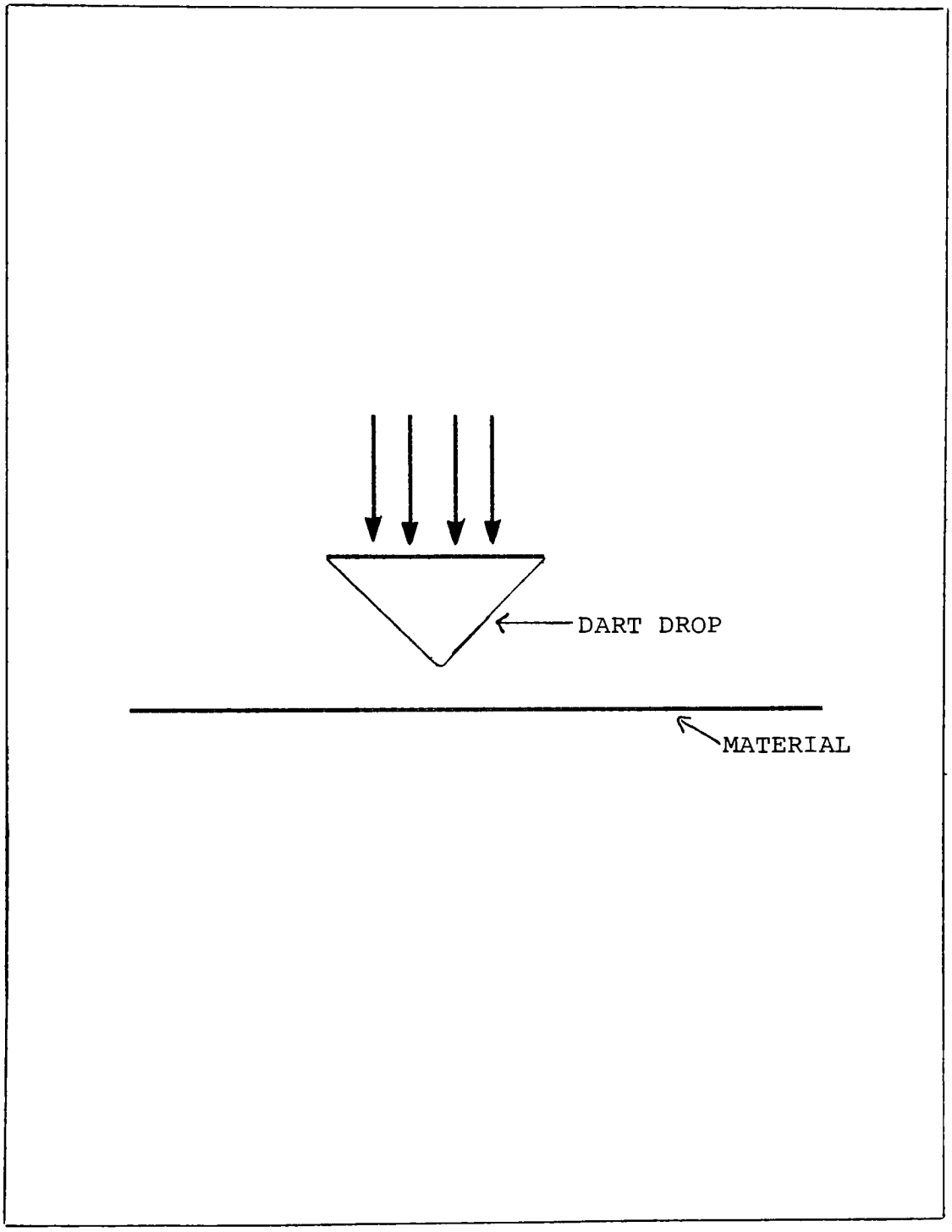


Figure II.8. IMPACT STRENGTH - Ability to withstand shock

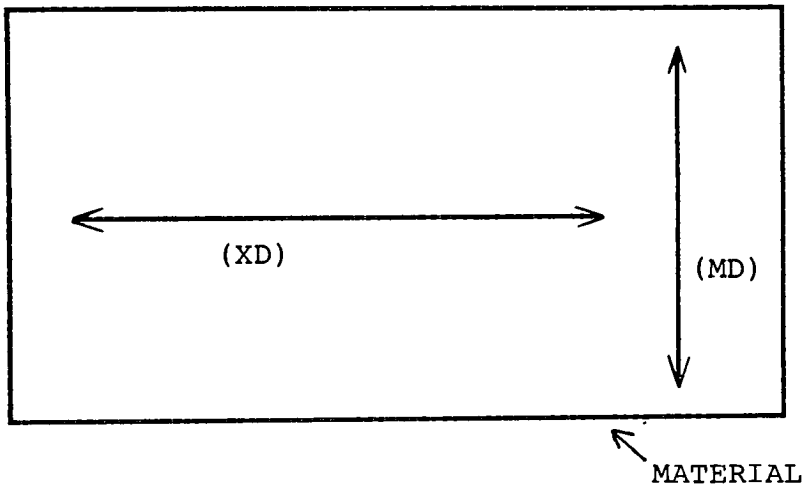


Figure II.9. MATERIAL DIRECTION - Machine direction (MD) vs Transverse direction (XD)

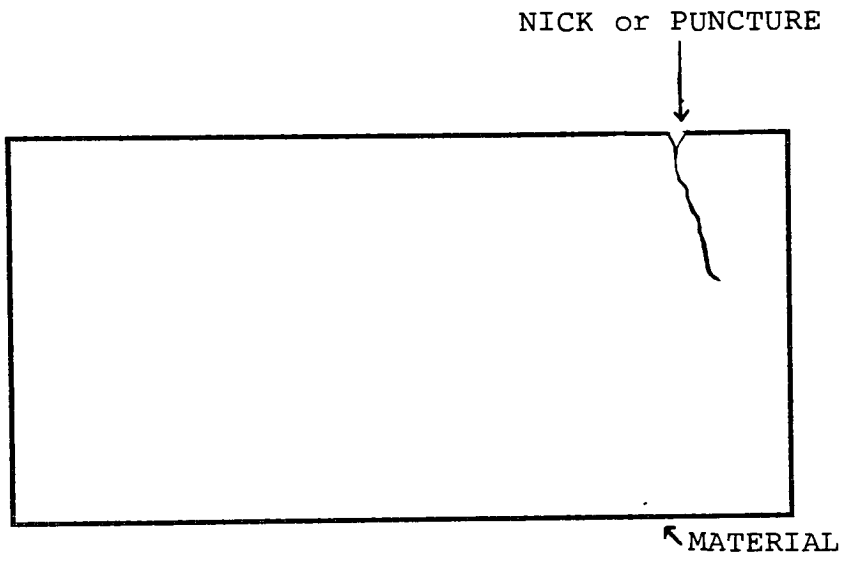


Figure II.10. TEAR STRENGTH - Energy needed in progating tear

G. PUNCTURE RESISTANCE
Puncture resistance is the ability of the material to withstand external or internal punctures that are applied at a constant pressure to the material. Puncture resistance is a concern when packing sharp edged products or products that would be damaged if punctured. See Figure II.11. for pictorial.

EXAMPLE: A customer requests Federal Express to ship valuable documents overseas. The PSP chooses a material based on the value of the customer's documents, distribution system, and the environment. The material must be puncture resistant to protect the documents against holes. The PSP recommends bags made of Dupont's Tyvek, a spunbound polyethylene material, a product already used in Federal Express envelopes.

H. STIFFNESS
Stiffness is the resistance of the material to distortion or bending. It is a compound property, depending on the thickness, as well as the inherent ridigity of the material. Stiffness has an important influence on the material's performance during the passage through a packaging machine. The Handle-O-Meter is one device for measuring the stiffness. Material is tested in accordance with ASTM D 882 and is stated in pounds per square inch(psi). See Figure II.12 for pictorial.

EXAMPLE: A customer requires bags to ship negatives by United Parcel Service. The PSP needs to consider the possiblity of the negatives being bent or creased during shipping; damaged negatives cannot be processed properly. The packaging must be stiff enough to take the abuse likely to be encountered by this mode of transportation.

I. ABRASION RESISTANCE
Abrasion resistance is the resistance of a material surface to scratching. The degree of abrasion can be determined by the loss of material weight for severe damage, but is usually measured by evidence of surface marring, such as loss of metallization on a metallized film. Material is tested in accordance with ASTM D 1242 and is stated in weight loss per 1000 cycles. See Figure II.13. for pictorial.

EXAMPLE: A customer requires conductive metallized bags for holding static sensitive products. The metallization, a coating of metal applied to the outer surface, is a static barrier provided it does not get rubbed off. An abrasion test is performed on the material prior to bag fabrication to test the durability of the metallized coating. The test simulates the abrasion likely to be encountered in the real life environment as close as possible. If the metallized coating does rub off, then the bags are no longer considered conductive.

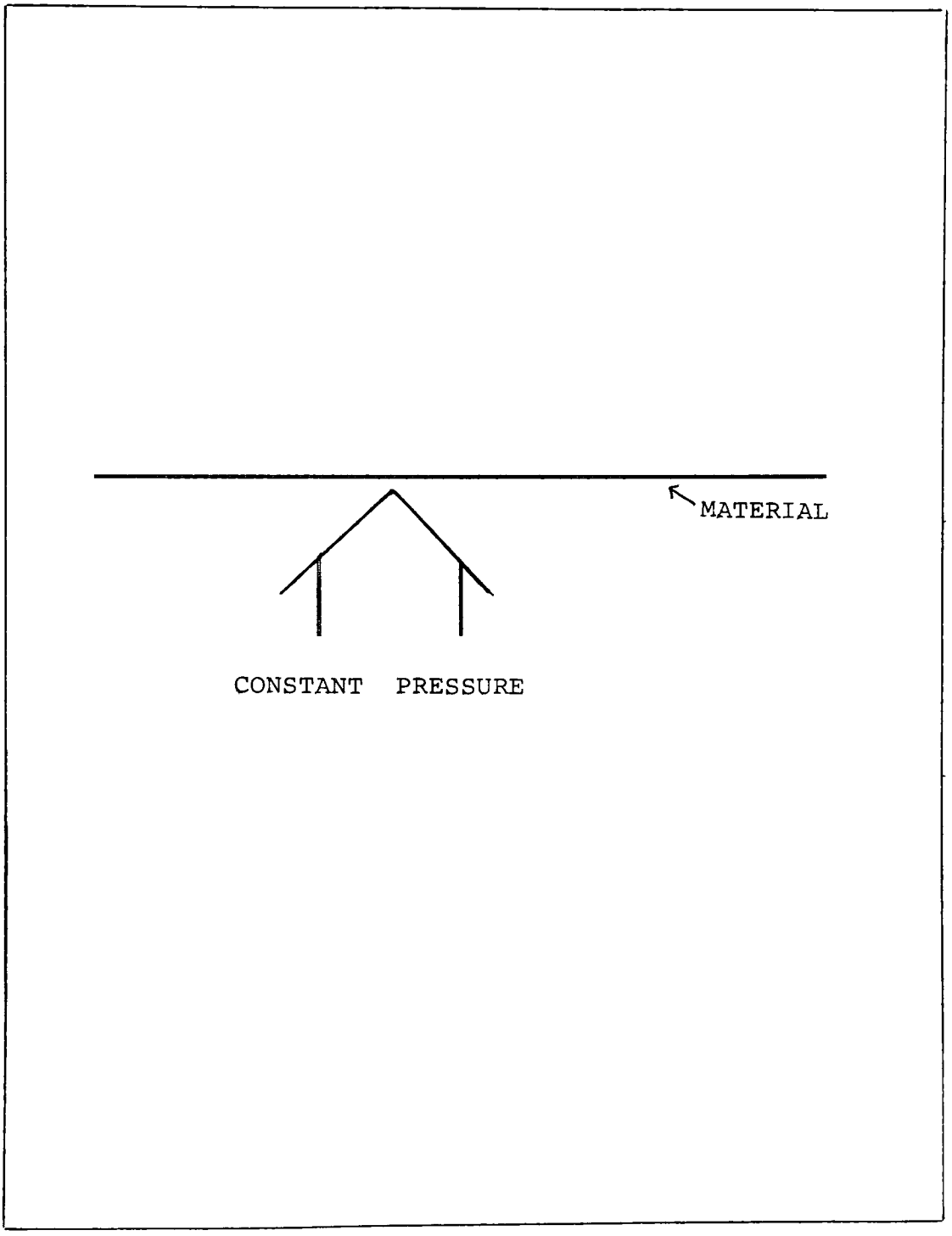


Figure II.11. PUNCTURE RESISTANCE - Ability to withstand constant pressure

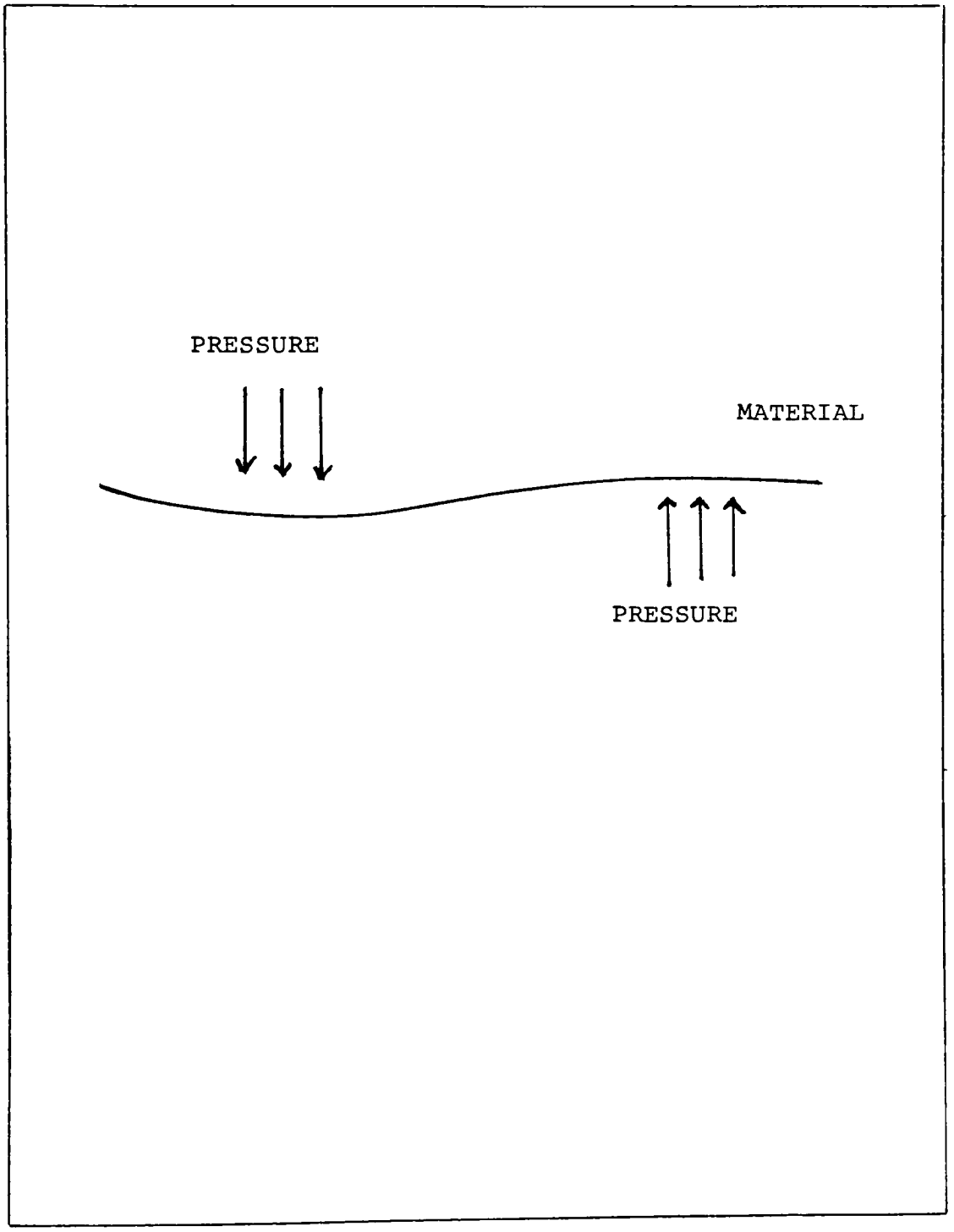


Figure II.12. STIFFNESS - Resistance to bending

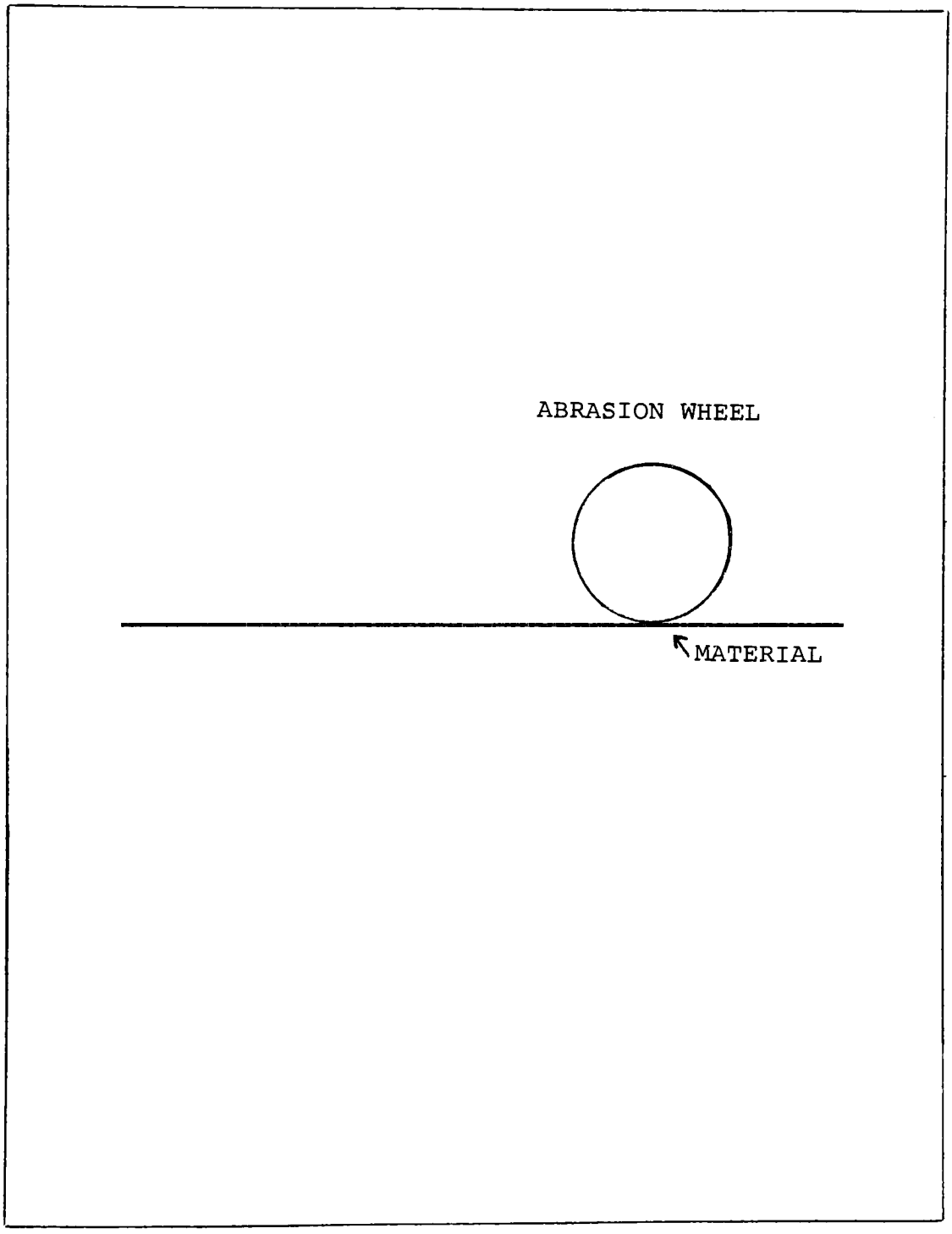


Figure II.13. ABRASION RESISTANCE - Ability to resist scratching

J. FLEX RESISTANCE

Flex resistance is the ability of the material to withstand recurring folding or creasing. The folding and creasing may lead to material fracture or in some cases, may seriously impair certain properties. One method of measuring is Schopper Folding Endurance Test (Briston 104). Material is tested in accordance with ASTM D 2176. See Figure II.14. for pictorial.

EXAMPLE: A customer requires foil laminated bags for packaging moisture sensitive chemical warfare suits. The PSP considers how the suits are loaded and packaged. The foil will be folded and creased as a result of this operation. If the foil fractures, the moisture barrier will be reduced, causing damage to the suits. The PSP considers a foil laminate that will withstand the abuse.

K. YIELD

The cost of material cannot usefully be expressed in terms of price/pound because different films have different yields, dependent on density(specific gravity). The formula for calculating in. squared/lb. is

$$27.69 / \text{specific gravity} \times \text{thickness(in.)} = \text{in}^2 / \text{lb.}(14.2\text{cm/kg})$$

EXAMPLE: The customer requires pricing information from competing vendors. The PSP needs to determine the costs of material for the pricing information. The material cost includes freight computation. The yield figure allows the PSP to calculate the total weight of the material. The total weight is used to determine the freight costs, which is added to the material cost; resulting in a total cost of material. If the freight cost was omitted the profit would diminish, and in the worst case the PSP would loose the commission from the sale.

* There are many more properties to consider when selecting materials. For more information regarding physical and mechanical properties refer to Briston.

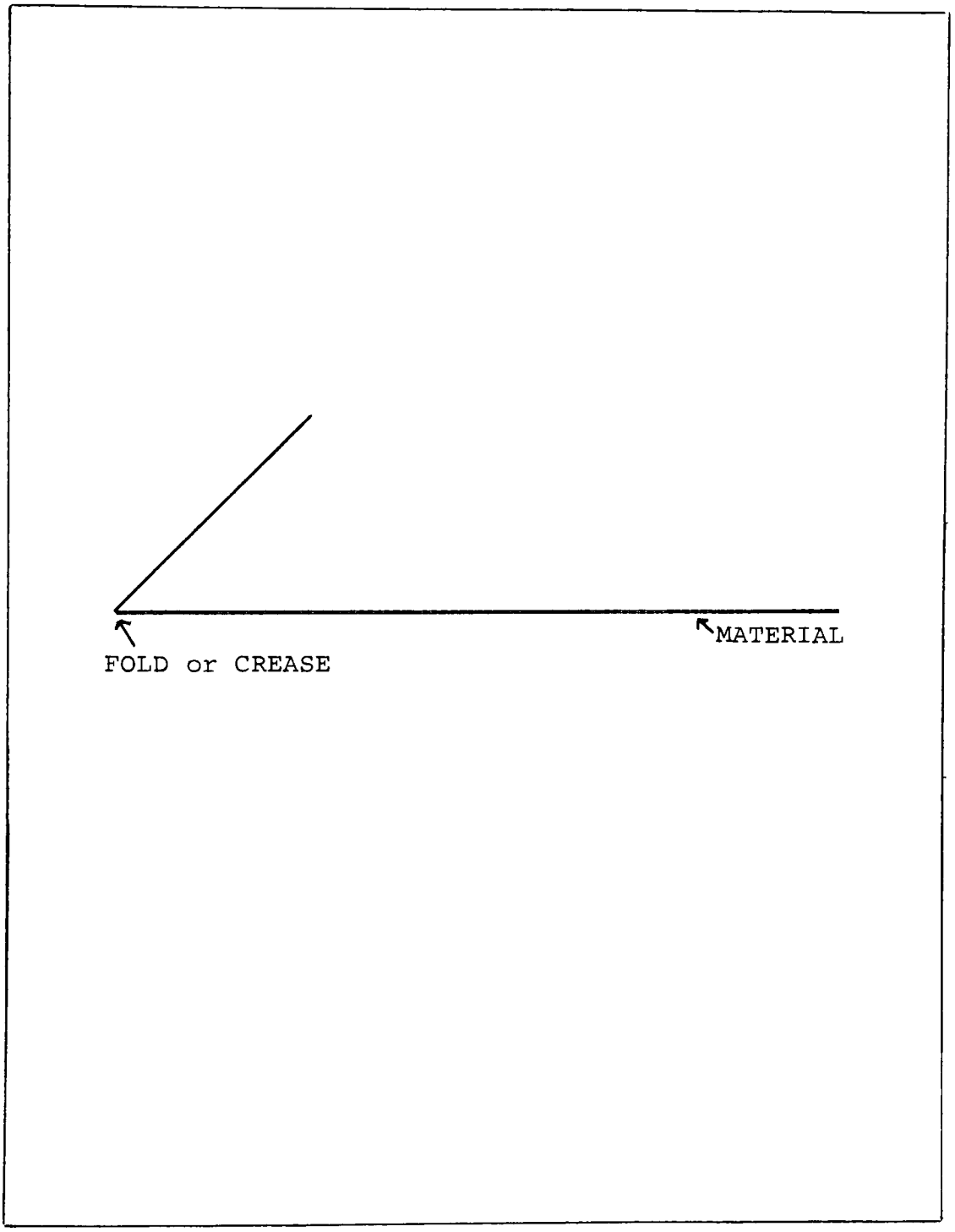


Figure II.14. FLEX RESISTANCE - Ability to withstand recurring folding

2. What are the barrier requirements of a packaging material?

* A barrier is a protective material that serves two functions: 1) it prevents outside environment influences from reaching the internal atmosphere surrounding the packaged product, and 2) it maintains the internal atmosphere. The appropriate barrier ensures the end use of the product.

* Barriers are mostly used for their resistance to vapors, gases and odors.

  The main group of potentially damaging environmental influences is vapors usually water or moisture. The most common potentially gases are oxygen, carbon dioxide, nitrogen and sulphur dioxide. The odor field's constituents are flavor aromas, essential oils and perfumes.

* Other barriers protect against liquids, such as water, chemicals, oils and greases. Barriers can provide protection against particle contamination, mold, bacteria, insects and rodents.

* Specially designed barriers provide protection against static electricity, electro magnetic interference, and wavelengths of light.

  An effective light barrier can extend a sensitive product's shelf life. Some light barrier materials contain carbon (2 - 6%) for light opacity. Some contain stabilizers, such as ultra-violet absorbers if the material is intended for applications involving continued use in the sunlight. Light transmission is the ratio of the light intensity measured with the film to that obtained without it, and is expressed as a percentage. A 5 percent transmission is frequently accepted as a threshold of high barrier and 1 percent as very high barrier (Allison 26).

  EXAMPLE: A customer requires bags to hold X-ray film. The PSP realizes the film is sensitive to light. This product will have to be packaged with barrier material to prevent early light exposure. Early light exposure will cause the product to fail and prohibit the end use. The barrier material has to protect against wavelengths of light.

* A barrier bag contains seals and closures which are equally important in providing the appropriate barrier. Seals will be covered in greater detail under Heat Sealing.

3. How is the effectiveness of a barrier material measured?

* Permeability is the term used to define the barrier qualities of a material.

* Permeability is the process by which a vapor, gas or liguid passes through barrier material. Solubility, diffusion, and desorption are examples of permeability processes.

* Permeability increases until a steady state of diffusion has been reached. Steady state of diffusion is defined as both sides of the material being at the same level of environmental influence.

* Permeability generally decreases as the material thickness increases (Cairns et al. 9).

* Permeability is affected by the temperature. Edward and Pickering were the first to show that the relation between the rate of permeation and the temperature was not linear (Cairns et al. 22).

* Permeability is directly proportional to the time of exposure.

* Permeability generally increases as the pressure of the interior and exterior vapor, gas, or liquid increases.

* The nature of the material surface determines permeability.

* Permeability is influenced by: properties of the barrier material, properties of the environmental influences (i.e. vapor, gas, or liquid), and the interaction between the barrier and the environmental influences.

* Permeability is proportional to the area of the material exposed, as predicted by Fick's law (Cairns et al. 9).

* Permeability is dependent on the arrangement of molecules.

* The physics of permeability is best explained by Cairns, Oswin and Pain in Packaging for Climatic Protection .

> "All matter consists of discrete molecules packed together in various ways. If these molecules are arranged in an ordered fashion, the resultant solid is crystalline in nature, but if they are arranged at random, then the solid is said to be amorphous or to exist in a disordered state. Whether the material exists in a crystalline or in an amorphous, form it is obvious that, with this original premise, no solid can form a completely continuous arrangement of matter but will consist of a network containing 'pores', the size of which will depend on the nature of the molecules forming the material itself. Such a network of pores will be more or less rigid, depending upon the rigidity of the molecules which form it. This, in its turn, will depend on the degree of vibration of the atoms contained within the molecules. Hence, the number of pores of any given size will obviously also be dependent on the degree of vibration. Thus, the more rigid networks can give rise to selective permeation, allowing only small molecules to pass, See Figure II.15., while more elastic networks will permit larger molecules to diffuse, since at the maximum vibration there will be a greater displacement of the atoms surrounding a hole from their mean position" (4).

EXAMPLE: Another way of looking at permeability is to picture a strange golf course. The goal is to putt the ball into the cup. The size of the cup varies from hole to hole; cups range in size from 1 inch to 4.25 inches. Players are given different size balls, ranging from 1.5 inches to 4.5 inches in diameter. Obviously, some balls will go into some cups; some will not. Like the golf course, barrier material has little "cups" called pores, which vary in size from one material to another. The vapor molecules are like the different sized golf balls. When the vapor molecules can pass through the pores, the barrier is said to be permeable. When the pores are too small or molecules too big, the material is said to be impermeable.

* For more information on the "Theory of Permeation", refer to Cairns et al.

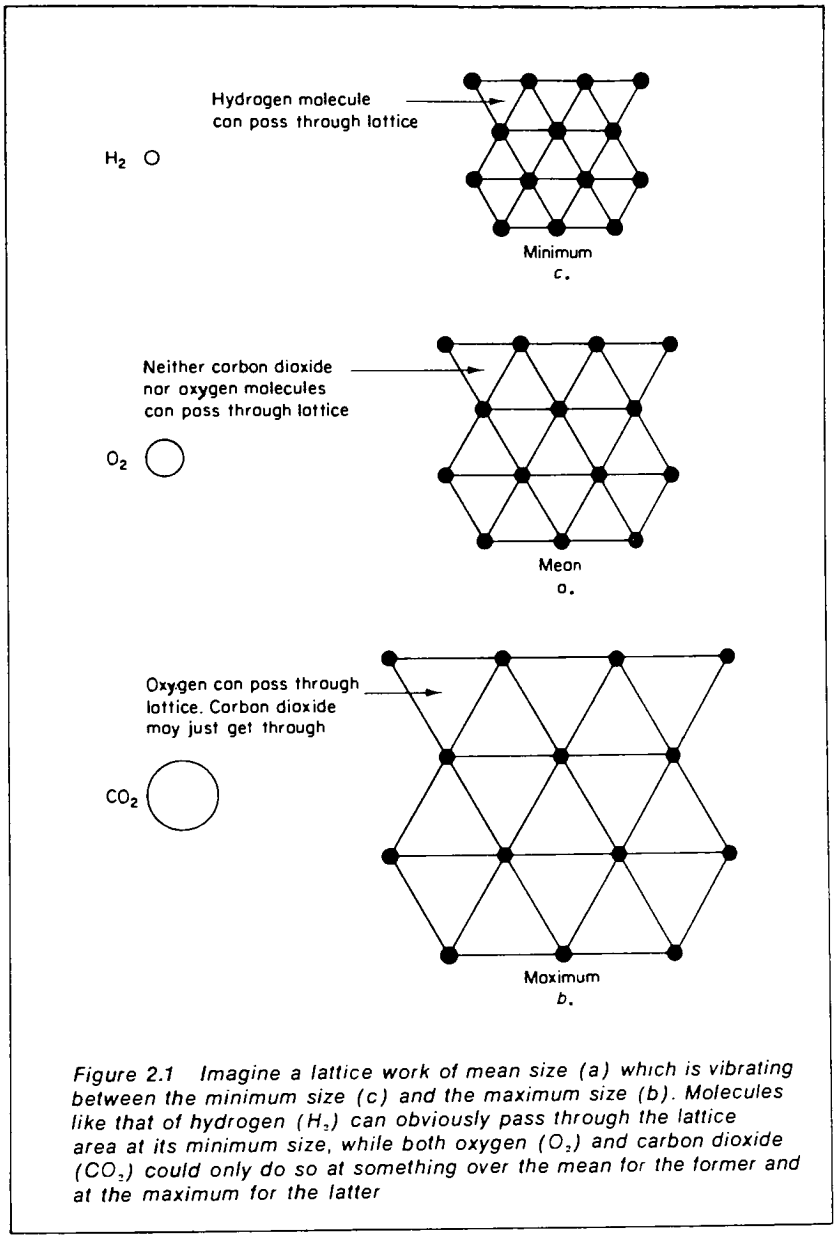


Figure 2.1 Imagine a lattice work of mean size (a) which is vibrating between the minimum size (c) and the maximum size (b). Molecules like that of hydrogen (H_2) can obviously pass through the lattice area at its minimum size, while both oxygen (O_2) and carbon dioxide (CO_2) could only do so at something over the mean for the former and at the maximum for the latter

Figure II.15. SELECTIVE PERMEATION

Source: Cairns et al. 5

4. How is permeability measured?

* Permeability is measured in terms of Transmission Rate.

* Transmission rate is the total permeation through the barrier material of stated dimensions within a stated time at a fixed driving force.

Common units of transmission rate are stated in terms of cubic centimeters or grams of substance transmitted in one day of 24 hours at the test pressure at a specific temperature and relative humidity. A transmission rate provides a quantitative measure for choosing the appropriate barrier material for a particular application. The lower the transmision rate, the better the barrier material performs.

EXAMPLE: A customer requires bags to hold pharmaceutical powder, a highly moisture sensitive product. The customer has not determined the amount of moisture that can damage his product. The PSP provides the customer with two material specification sheets containing information on the Water Vapor Transmission Rate(WVTR). One spec sheet includes a high density polyethylene material with a WVTR of .1gms/100 sq.in./24hrs; the other spec sheet includes a foil laminate material with a WVTR of .02gms/100 sq.in./24hrs. The PSP advises the customer that the laminate material's transmission rate is lower; therefore, the material provides a better moisture barrier.

5. What are the types of transmission rates?

* In general, there are three commonly used transmission rates.

* WATER VAPOR TRANSMISSION RATE

* OXYGEN TRANSMISSION RATE

* ODOR TRANSMISSION RATE

WATER VAPOR TRANSMISSION RATE
Water vapor transmission rate is the measurement of moisture or water vapor content that passes through a sheet material. Moisture damage can cause a product to malfunction due to rust or cause it to lose its aesthetic appearance. Products like semiconductors, pharmaceuticals, and photographic films are sensitive to moisture.

* The standard test for determining water vapor transmission rate is described in the American Society for Testing and Materials journal. The test is known as ASTM E 96.

Under the ASTM E 96, the material to be tested is fastened over the mouth of a dish, which contains either a desiccant or water. The method selected approaches the conditions of use. The assembly is placed in an atmosphere of constant temperature and humidity, and the weight gain or loss of the assembly is used to calculate the rate of water vapor movement through the sheet material under prescribed conditions (ASTM 15.09). The resulting WVTR is expressed as grams passing through 100 inches squared per 24 hours at 100 degrees Fahrenheit and 90% relative humidity and is stated as .03gms/100"squared/24hrs. Generally, a WVTR of .5 grams is the threshold of high barrier and .03 grams is a very high barrier (Allison 25). When comparing the WVTR's for materials the test methods must be the same, for the results may vary due to the different test methods. See TABLE II.1 for comparing the WVTR for six specific materials.

OXYGEN TRANSMISSION RATE
Oxygen transmission rate is the measurement of oxygen gas that passes through a sheet material. One of the most prominent causes of food spoilage is oxidation. Limiting exposure of foods to oxygen can assure the longest possible shelf life and the highest retention of quality and nutrient content in most foods. A material cannot totally eliminate the passage of oxygen. The challenge is to limit oxygen availability to some level below the damaging level.

TABLE II.1

Water Vapor Transmission Rate (WVTR)
and
Oxygen Transmission Rate (OTR)

Film/Manufacturer/ Product Name	WVTR gms/100 sq.in/24 hrs ASTM E96	OTR cc/100 sq.in/24 hrs ASTM D3985
1. LDPE/Eastman Kodak Tenite	1.2*	420*
2. LLDPE/Dow/2045	.8	525
3. EVA/Dupont/3120	1.8	300
4. Biaxially Polypropylene/ Hercules/BX-310	.3	85
5. Nylon 6 /Allied/2500	11-13	1.3- 2.3
6. Polyester/Dupont/Mylar	1.8	6

Source: Manufacturer's Brochures

Notes: The above data is based on 1 mil of material.

* These figures are only estimates from a representative from Eastman Kodak.

* The standard test for determining the oxygen transmission rate(OTR) is ASTM D 3985.

  Under the ASTM D 3985, the specimen is mounted as a sealed semi-barrier between two chambers at ambient atmospheric pressure. One chamber is slowly purged by a stream of nitrogen, and the other chamber contains oxygen. As oxygen gas permeates through the film into the nitrogen carrier gas, it is transported to the coulometric detector, where it produces an electrical current, which is then converted into a signal on a recorder. One millivolt on the recorder equals one/cc/day. Oxygen transmission rate (OTR) is expressed as cubic centimeters (cc) per 100 square inches per 24 hours at 73 degrees F. and at a defined relative humidity. A high barrier is 1 cc or less, and very high barrier is 0.5 cc or less (Allison 26). See TABLE II.1 for comparing the OTR for six specific materials.

ODOR TRANSMISSION RATE

Relatively little is known in the industry about odor transmission. However, in general, a good oxygen barrier provides a good odor barrier, but some materials have a better odor barrier than an oxygen barrier. Food service coffee is packaged in an odor barrier material to preserve the aroma of the coffee bean.

* A new quantitative evaluation of an odor barrier is becoming more widely used.

  Developed by Rutger's University, the technique utilizes a permeation cell with solvent passing through the sample and being picked up by a nitrogen stream, which is analyzed in a gas chromatograph. A key consideration in this method is conditioning the film sample for 10 days at 70 degrees F and 100 percent relative humidity; the sample is also Glebo flexed 20 times to simulate the shipping and distribution environment. (23)

* Several materials are currently in use as odor barriers.

  Metallized Nylon
  Metallized Polyester
  Biaxially-Oriented Nylon with a Low Density-EVA heat sealing coating
  Aluminum foil laminates
  PVDC-coated materials
  Wax coated materials
  EVOH containing materials.

* For more information regarding transmission rates refer to Bakker 650-654.

6. What is unique about a chemical barrier material?

* A chemical barrier is a barrier that provides a resistance to a chemical reagent.

  A chemical reagent can attack and destroy the molecule chain forming the barrier material. If the molecules are disturbed along the chain, the result is chain scission. Chain scission leads to ultimate destruction of the barrier material.

* The rate of reaction depends on the barrier material and the reagent, reagent's concentration, and temperature. Raising the temperature raises the reaction rates rapidly.

* The effects of the interaction between the chemical and the barrier material may be evident immediately OR may not be evident until much later.

  If the reaction is rapid, change in molecular weight and appearance will be apparent after relatively short exposure, causing immediate destruction of the material. If the rate of reaction is slow, long exposure may be required before the molecular weight and appearance are significantly affected causing slow degradation of the material.

* Slow degradation affects mechanical properties, such as tensile strength and elongation, even though evidence of deterioration may not be immediately apparent.

* Environmental Stress-Cracking(ESC) failures occur as a result of the interaction between a chemical reagent and mechanical stress(i.e. bending) placed on a material.

  Environmental Stress-Cracking begins with a reagent that does not appreciably attack or dissolve an unstressed material. However, when the material is later stressed, the reagent will cause catastrophic failure. Bending or stretching a material initiates cracks or crazes which allow new opportunities for the chemical to attack the barrier (Agranoff 420).

  EXAMPLE: A customer requires vacuum sealed bags to hold photographic film for archival storage. The photographic film has an emulsion coating that omits a chemical reagent strong enough to breakdown the barrier material after long term storage. After loading the film, the vacuum operation will cause bending and creasing to the material. The PSP recommends a material that is chemically resistent and can be utilized in a vacuum seal operation.

* The standard test for determining the chemical resistance is ASTM D 1239.

* See TABLE II.2 for comparing the chemical resistance of six specific materials.

* For more information regarding chemical resistance refer to Agranoff 419 -424.

TABLE II.2

CHEMICAL RESISTANCE PROPERTIES

	Manufacturers						
	Eastman	Dow	Dupont	Hercules	Allied	Dupont	
	LDPE Tenite	LLDPE Dowlex 2045	EVA 3120	BIAX POLY-PROPYLENE B-503	BIAX NYLON 6	BIAX PET (mylar)	
Chemicals							ASTM METHOD
Strong Acids	G	G	F	G	P	G	ASTM D543
Strong Alkalies	G	G	F	G	F	P	ASTM D543
Grease & Oils	P	G	P	G	E	G	ASTM D722
Organic Solvents	F	F	F	G	G	G	ASTM D543

E = Excellent

G = Good

F = Fair

P = Poor

Source: Manufacturer's Brochures

7. What are the types of barrier materials?

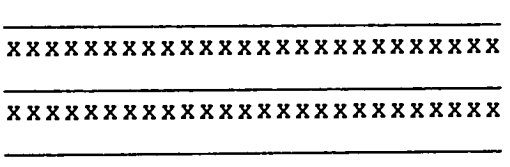
* Barrier materials consist of a wide range of materials.

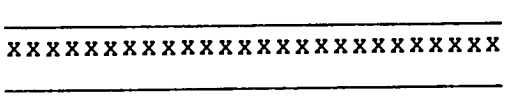
Some of the barriers include glass, aluminum foil, plastic films and multilayer flexible laminates. Historically, glass, steel, and metal containers were used to protect products from environmental influences. These materials are still used today; however, there is a growing use of plastic films and multilayer flexible laminates.

* Many plastic films are defined as monolayer films. Some of the commonly used films: low density polyethylene(LDPE), linear low density polyethylene(LLDPE), ethylene-vinyl acetate(EVA), polypropylene, polyester(PET) and nylon.

* Multilayer flexible laminates are layers of materials bonded together.

The lamination process consists of bonding materials together by heat or with an adhesive (Bakker 430). The lamination formed is a multilayer flexible structure that optimizes the barrier and physical properties of each layer. A multilayer structure can be illustrated by two example:

1.


2.


INNER LAYER
The inner layer generally consists of a plastic film. that can be heat sealed at low temperatures, 180 - 250 degrees Fahrenheit. Some of the materials used in this layer are LDPE, LLDPE, and EVA.

MEDIUM LAYER
The medium layer generally consists of aluminum foil or a metallized aluminum for optimum barrier properties.

OUTSIDE LAYER
The outside layer generally consists of a plastic film that provides resistance to the environmental influences and distribution hazards. Some of the materials used in this layer are polypropylenes, nylons, and polyesters.

* The barrier properties are combined by laminating materials.

  For laminated materials consisting of two barriers, the impedances of the materials may be added together, provided both films show no interaction with the diffusing vapor, gas or liquid.

  EXAMPLE: A candy bar manufacturer requires bags to hold a moisture and oxygen sensitive product. The PSP inquires about the acceptable level of permeability allowed. The PSP checks the material specification sheets for the corresponding Water Vapor Transmission Rate(WVTR) and Oxygen Transmission Rate(OTR) that will provide these barrier qualities. The PSP recommends a polyester/foil/poly laminate material. The polyester offers the oxygen barrier, and the polyester/foil gives the moisture barrier.

* Increasing demands are placed on the expertise of the PSP due to the growing use of flexible barrier packaging to replace existing metal and glass containers.

* Knowledge of the following basic types of barrier materials will give the PSP the understanding needed to discuss the client's demands.

A. GLASS
B. LOW DENSITY POLYETHYLENE (LDPE)
C. LINEAR LOW DENSITY POLYETHYLENE (LLDPE)
D. ETHYLENE-VINYL ACETATE (EVA)
E. ALUMINUM FOIL
F. POLYPROPYLENE
G. POLYESTER (PET)
H. NYLON

* An overview of each of these common barrier materials appears on pages 104 to 121 .

* See TABLE II.3 for comparing properties of LDPE, LLDPE, and EVA materials. See TABLE II.4 for comparing properties of polypropylene, PET, and nylon materials.

* For more information regarding types of barrier materials refer to the resources listed in the works cited.

A. GLASS

* Glass has traditionally been a reliable packaging material, preferred especially for its effectiveness as a barrier to a broad spectrum of environmental influences.

* Glass is virtually impermeable to all environmental influences.

* Glass is hard, brittle and usually transparent.

* Transparency is a major attribute of glass.

  Transparent glass transmits almost all visible wavelengths of light and some ultraviolet(UV) light, an obvious asset for many packaged products. However, transparency does cause a problem for many products, such as beer and edible oils. These products can be protected from light by adding color, or impurities into the glass.

* Glass is inert.

  Glass does not interact with the interior product or with the exterior environment. Glass does not corrode, oxidize or deteriorate. Only hydrofluoric acid appreciably attacks this material.

* The strength of glass is dependent on its surface condition.

  The surface condition of the glass influences the tensile strength and theoretical breaking strength. When the surface becomes scratched or bruised, as much as half of the original strength of the glass is lost. The surface may be damaged in filling, handling, packaging, shipping or use (Bakker 387)

* Glass is a thermal insulator and is very sensitive to thermal differentials.

  Thermal differentials is not a problem for glass containers when the temperature rises and falls very slowly. Since glass is formed at temperatures above 2600 degrees Fahrenheit, it will not flow, melt or distort as a consequence of exposure to high environmental temperature. However, if the temperature varies quickly, this thermal shock can result in breakage.

* Glass has excellent mechanical strength; mechanical strength increases with weight.

* Various tests are performed on the completed glass container to measure size, thickness, weight, capacity, impact resistance, internal pressure resistance, and thermal shock resistance.

* Many products are now made in dry form, which has allowed packagers to search for plastic alternatives to glass.

  Plastic barrier films such as polypropylenes, polyesters, nylons, and multilayer flexible laminates are utilized as packaging alternatives. Plastic alternatives provide shatter resistance, transparency and design options, while eliminating the weight and abrasion disadvantages of glass.

  EXAMPLE: A customer requires bags to hold pharmaceuticals. In the past, the customer has been using glass bottles for moisture and oxygen protection. The PSP recommends a plastic alternative, possibly a Ethylene Vinyl Alcohol(EVOH) multilayer plastic laminate. This layer alone provides an OTR of .07cc.mil/100sq.in/24hrs and WVTR of 1.4gms/100sq.in./24hrs.

* For more information regarding glass refer to Bakker 376-388.

B. LOW DENSITY POLYETHYLENE (LDPE)

* LDPE works well as the flexible laminate inner sealing layer.
[1]
* LDPE has the lowest density of the polyethylenes.

Polyethylenes all have densities less than 1, which means that the polymer can float on water. ASTM defines low density polyethylene as

[3]
0.910 - 0.939 g/cm (Bakker 523)

The lower the density of the material, the more limp and flexible it is.

[2]
* LDPE contain crystalline and amorphous areas. The crystallinity of low density polyethylene varies between 30 -40% (Juran 68).

* LDPE is a short term moisture barrier film.

* LDPE has a good balance of properties such as tensile strength, puncture resistance, impact resistance and tear strength.

* LDPE retains its strength down to low temperatures (-60 degrees to -70 degrees C).

* LDPE is a versatile film due to the combination of balanced properties.

* LDPE is easily heat sealed and gives good tough welds.

* The softening point of LDPE is slightly below the boiling point of water so that the material cannot be used where boiling water or steam sterilization are involved.

* LDPE is one of the lowest cost polyethylenes.

* LDPE is used in the following flexible products:

1. zip-lock bags
2. pallet covers
3. drum liners
4. bulk container liners
5. plain or printed bags

EXAMPLE: A dry cleaning customer requires bags to cover the freshly dry cleaned clothes. The clothes will only be covered for a short period of time. The material does not need to possess any outstanding barrier or mechanical properties. The PSP recommends a .0001 mil low density polyethylene for this application.

* For more information regarding LDPE refer to Briston 9.

FOOTNOTES

1. DENSITY
Density is a measure of crystallinity. The higher the measured density, the more crystalline regions in the polymer. As density increases, barrier properties, hardness, abrasion resistance, tensile strength, rigidity, heat resistance, chemical resistance, and surface gloss also increase. Decreasing density leads to increased toughness, stress cracking resistance, clarity, flexibility, and elongation. The standard test for determining density is in accordance with ASTM D 1505.

2. CRYSTALLINITY
Crystallinity is the process of crystallation of the polymeric chains. As the polymeric chains cool from the molten state or coalesce from solution, they begin to pack, and the degree of packing depends on the backbone of the structure. If they pack perfectly, they can form crystallites which are impervious to permeability (Bakker 49). Thus, the greater the crystallinity, the better the barrier. If the chains do not pack tightly, they remain disordered, and are known as amorphous. Amorphous areas reduce the barrier qualities of the polymer. Polymers that contain amorphous and crystalline areas may not be good barriers because the amorphous regions.

C. LINEAR LOW DENSITY POLYETHYLENE (LLDPE)

* LLDPE works well as the flexible laminate inner layer.

* The properties of LLDPE will vary according to the particular process employed.

* LLDPE has a density of .910 - .925.

* LLDPE is a more crystalline film than LDPE.

  Linear low density molecule chains have light branching characteristics. Light branching allows the chains to pack tighter, thus increasing the crystallinity of the film. See Figure II.16. for a comparison between LDPE and LLDPE chain branching.

* LLDPE has better barrier properties than LDPE because of higher crystallinity.

* The best way to describe LLDPE is to compare it to LDPE.

  LLDPE has improved mechanical performance characteristics. The advantages of LLDPE over LDPE are improved chemical resistance, improved performance at both low and high temperatures, higher impact strength at a given density and greater resistance to environmental stress cracking. It also shows improved puncture resistance and tear strength.

* LLDPE has higher heat sealing point, approximately 230 - 250 degress.

* LLDPE provides comparable properties to LDPE, but uses thinner gauge material. As a result, LLDPE has replaced LDPE in many applications.

* As a stand alone product, LLDPE is used in the following flexible products:

  1. ice bags
  2. retail merchant bags
  3. produce bags
  4. trash bags
  5. industrial liners

  EXAMPLE: A customer requires plastic bags with die cut handles to hold a fairly heavy training manuals. The manual will be carried through the plant on a daily basis. The PSP recommends a linear low density polyethylene bag because the material must be able to withstand the constant stress exerted by the weight of the manual without stretching or puncturing the material.

* For more information regarding LLDPE refer to Juran 56.

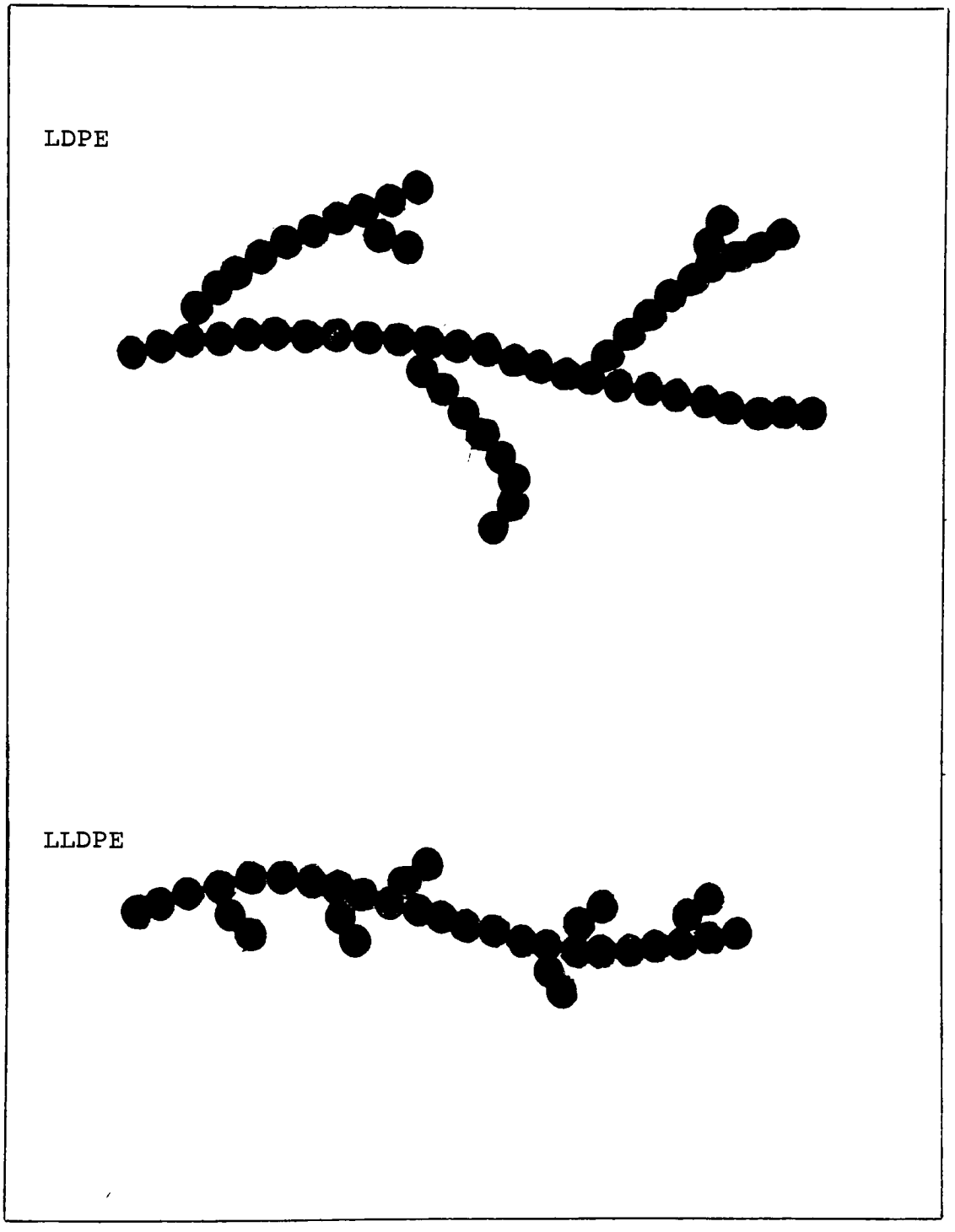


Figure II.16. CHAIN BRANCHING - LLDPE's light chain branching allows chains to be packed tighter

Source: Juran 56

D. ETHYLENE-VINYL ACETATE (EVA)

* EVA works well as the flexible laminate inner layer.

* EVA is a copolymer consisting of ethylene and vinyl acetate.

* EVA copolymers properties will vary according to the percentage of vinyl acetate in the molecule chain.

  Copolymers containing less than 5% vinyl acetate are defined as PE or modified PE; above 50% vinyl acetate they are considered vinyl acetate-ethylene copolymers (Agranoff 64). This high percentage reduces polymer crystallinity and hardness, but increases flexibility.

* In comparison to LDPE, EVA copolymers are more permeable to gases and water vapor.

* EVA copolymers have reduced chemical resistance and are less heat stable.

* EVA copolymers have greater elongation, greater elasticity, and higher impact strength.

* EVA copolymers provide strong heat seals at lower temperatures.

* EVA has a higher resistance to environmental stress cracking.

* EVA provides strong seals through particle contamination.

  Cereals, crackers, and powders, are packaged in bags. The particles broken away from these products can interfere with heat seal integrity of the bag. EVA can be heat sealed even through these particles.

* EVA produces seals for water containment applications.

* The following are examples of typical applications for EVA copolymer films:

Application	%of EVA	Property in use
1. Bulk Liquid Bags	7.5	* Excellent stress cracking resistance * Pinhole resistance * High impact toughness * Excellent seal integrity
2. Poultry/Meat Bags	12	* Low temperature heat seals * Appropriate barrier * High clarity and gloss
3. Snack/Cereal Bags	18	* Sealing thru product contamination * High flow in seal areas

* For more information regarding EVA refer to Agranoff 64.

TABLE II.3

MATERIAL PROPERTIES

Manu.	EASTMAN LDPE TENITE	DOW LLDPE DOWLEX 2045	DUPONT EVA 3120
THICKNESS OF SAMPLE (MIL)	1	1	1
TENSILE STRENGTH (PSI) ASTM D 882	1770	1500	2900
YIELD STRENGTH (PSI) MD ASTM D 882	2200	1800	2500
ELONGATION PERCENTAGE (%) MD ASTM D 882	250	600	410
IMPACT STRENGTH (FT.LBS/MIL) ASTM D 3420	2.5	10	3.5
TEAR STRENGTH (GMS/MIL) MD ASTM D 1922	360	375	65
DENSITY resin form (GMS/CC) ASTM D 1505	.923	.920	.93
HEAT SEAL TEMPERATURE (FAHRENHEIT)	250	270	212

Source: Manufacturer's Brochures

Note: the above information was obtained from the manufacturer's specification sheets. Data marked with * are estimated values because the manufacturer does not perform this test to determine the value. NA = Data not available

E. ALUMINUM FOIL

* Aluminum foil is an excellent vapor, gas, and odor barrier.

  In flexible packaging, aluminum foil is usually considered when water vapor or gas barrier are critical to the success of a packaging material.

* Aluminum foil is defined as a solid sheet section rolled to a thickness less than .006 in.

  The thickness of aluminum foil is between .00017 and .006, .00035 in. being the most common, in flexible packaging. However, flexible packaging converters are moving towards utilizing even thinner material(.00028-.00030) for laminating purposes.

* Aluminum foil is the lightest weight packaging metal per unit area. The known yield for .00035 in. gauge is 29,300 sq.in. per pound.

* Aluminum foil has good chemical resistance properties.

  Resistance of aluminum foil to chemical attack depends on the specific compound or agent. Aluminum foil has a high resistance to most fats, petroleum greases and organic solvents. It resists mildly acidic products better than mildly alkaline compounds, such as soaps and detergents. Standing water in the presence of certain salts and caustics can be corrosive (Bakker 347).

* Aluminum foil is unaffected by heat and moisture.

* Aluminum foil must be laminated to other materials in order to improve the permeability rates.

  Unsupported light gauge aluminum foil is considered a high barrier material. However, aluminum foil will crease and crack very easily in use, creating pinholes and breaks. The pinholes and breaks increase the permeability rate of this material. Damage to the foil can be minimized by laminating the foil to a paper or plastic film, or both, one on each side of the foil. Generally, a polyethylene or low melting film layer is used as the heat sealing layer of the laminate. Chart II.1 illustrates how the moisture vapor transmission rate improves with lamination.

Plain Aluminum Foil and Aluminum Foil Laminates
Moisture Vapor Transmission Rates
GM PER 100 SQ. IN. PER 24 HR

.00035 in. Foil	0.37
.00035 in. Foil(paper backed)	0.14
.0005 in. Polyethylene/.00035 in. Foil/(paper backed)	.05
.001 in. Polyethylene/.001 in. Foil	.03
.00048 in. Polyester/.00035 in. Foil	.03

Chart II.1

* Aluminum foil is used in the following packaging applications:

1. military bags
2. resin liners
3. shipping sacks
4. Alka-selzer bags
5. photographic bags

EXAMPLE: A customer requires heat sealed bags for nylon resin for overseas shipment. The bags will be subjected to shock and vibration. The nylon resin has a hard surface and is extremely moisture senstive. The PSP recommends a barrier material that is abrasion, puncture, and moisture resistant. The laminate material selected is .00048 in. polyester/.00035 foil/.0003 in linear low density polyethylene. The polyester layer provides the abrasion resistance and the strength to the foil; the foil provides a moisture protection; the linear low density polyethylene provides puncture resistance and heat sealing capability.

* For more information regarding Aluminum foil refer to Bakker 346-351.

F. POLYPROPYLENE

* Polypropylene is attractive for many uses because of its unique combination of properties and low cost.

* Polypropylene is a stiff film due to high crystallinity.

* Polypropylene film can be manufactured in unoriented or biaxially oriented directions.

Unoriented film, sometimes referred to as cast film, is a thermoplastic film that is extruded through a slit die onto a chill roll, where it is quenched and resolidified (Juran 269). This manufacturing process produces a good transparent film that has strength in the machine direction only. When a film is biaxially oriented, it is mechanically stretched in directions which are at right angles to each other. The film's molecules are aligned in the cross (transverse) machine direction (XD) as well as in the machine direction (MD) (Bakker 320). Biaxially oriented films exhibit improvements in optics, strength, and low temperature durability over unoriented film. Biaxial orientation also improves moisture and gas barrier properties (Smith 200).

	Unoriented Polypropylene 1 mil	Biaxially Oriented Polypropylene 1 mil
Yield, sq in./lb	31000	31000
Tensile strength(psi)	4600-7600	18000-26000
WVTR, gms/100sq.in/24hr	.7	.4

* Polypropylene film has high gloss and clarity, but as thickness increases the clarity diminishes.

* The tear initiation of polypropylene is difficult, but tear resistance after initiation is low.

* Polypropylene has excellent resistance to environmental stress cracking.

* Polypropylene's chemical resistance is good, and, in particular, is more resistant to oil and grease than the polyethylenes.

* In comparison to LDPE, Polypropylene:
  - has a lower density 0.90g/cm^3
  - has a higher softening point
  - has a two times the tensile strength
  - has about half the tear strength

* Polypropylene film is used in following packaging applications:

  1. cigarette pack outer skin
  2. M & M candy wrappers
  3. crackers wrappers
  4. tamper evident closures
  5. packing list envelopes

  EXAMPLE: A hosiery manufacturer requires bags to hold stockings that must be seen through the package without opening. The package must be opened easily at the time of use. The PSP recommends a unoriented polypropylene film, and with an additional tear strip, to initiate the tear.

* For more information regarding polypropylene refer to Briston 19.

G. POLYESTER (PET)

* PET is a tough and strong film, with excellent transparency.

* PET has a density of 1.38 - 1.41.

* PET has excellent oxgyen barrier properties.[3]

* Water vapor permeability is comparable to LDPE.

* PET is available in biaxially oriented or unoriented films.

* PET has excellent thermal properties. It can be processed and used in applications covering a wide temperature range (-70 to 150 degrees C).

* PET's impact strength is retained at temperatures of about -70 celcius.

* PET has a high tear, fold and abrasion resistance.

* PET is chemically resistant to dilute acids and alkalis but is attacked by concentrated ones.

* PET is available in grades that comply with FDA and USDA requirements (Bakker 318)

* Heat sealing of polyester is difficult because of crystallization, which occurs at heat sealing. Laminating polyethylene to PET is recommended for heat sealing because of the lower heat requirements of polyethylenes.

* PET film is used in the following packaging applications:

  1. frozen poultry bags
  2. boil-n-bags
  3. dorito bags
  4. cracker bags
  5. vacuum sealed cooked meat bags

  EXAMPLE: A customer requires bags to contain processed cheese. Cheese is sensitive to oxgyen, and will spoil if exposed to this environmental influence. The cheese will also be vacuum sealed, so strong seals will be necessary. The PSP recommends saran coated PET laminated to a heat sealing layer. Saran coating the PET will improve the barrier properties, and the heat sealing layer allows the bag to be sealed easily.

* For more information regarding PET refer to Juran 45.

FOOTNOTES

3. The water vapor and gas permeability can be greatly increased by metallization. Metallized polyesters are treated in a special way to enhance metal adhesion and then plated with a thin coating of metal(generally aluminum). The metal provides an excellent moisture barrier (.05 or less) and keeps out light that would cause oxidative rancidity of fatty and fried foods, such as snacks, nuts, and candies (Bakker 443). As a result, metallized polyester is becoming a strong competitor to many foil laminates while a substantial savings can be realized.

H. NYLON

* Nylon has good abrasion resistance.

* Nylon is a tough material with high tensile strength.

* Nylon films have a fairly high MVTR.

* Nylons are good gas and odor barriers.

* Biaxial orientation improves certain properties such as tensile strength and oxygen permeability.

	Nylon 6	
	Unoriented	Biax-oriented
Tensile strength		
psi MD	12,000	32,000
XD	10,000	32,000
Oxygen permeability		
cc/100sq.in/24hrs	2.6	1.2

Note: Comparative properties based on 1 mil thickness (Bakker 420)

* Nylon retains its flexibility and strength over a wide temperature range.

  Nylon film is useful at 400 degrees F for short exposures because the melting point is 350 - 400 degrees F. Nylons are tough at low temperatures, but depends on type of nylon.

* Nylons are hygroscopic, absorbs water.

  Nylons have a high water absorption rate but the absorption rate depends on the type of nylon. The most common type of Nylons are 6, 6.6, 11, and 12. Nylons 11 and 12 have a lower absorption rate than nylons 6 and 6.6.

* Nylons mechanical properties can be affected by water absorption. The effect is not permanent and full properties are restored to their full value when the material is dried (Briston 52).

* Nylons are chemically resistent to weak acids, alkalis, and organic solvents, but are attacked by concentrated mineral acids.

* Nylon is heat sealed for applications that require heat seal integrity under high temperature exposure.

* Nylons are typically laminated to or coated with a heat seal layer to take advantage of nylon's mechanical properties with lower heat seal requirements.

* Nylon is used in the following packaging applications:

1. oven cooking bags
2. meat bags
3. vacuum cheese bags
4. battery acid bags
5. Hot fill liners

EXAMPLE: A desiccant manufacturer requires bags to ship oxygen absorbing desiccant to a food packager. The desiccant is used to absorb any oxygen that enters the food package. Since oxygen causes rancidity, the desiccant will prolong the life of the food. The PSP realizes that the desiccant must arrive at the food packager without absorbing any damaging oxygen. For if it does, the desiccant's shelf life will be shortened before its actual use. The PSP recommends two alternatives, a nylon/ LDPE bag or a saran coated nylon/LLDPE bag, depending on the oxygen transmission rate and puncture resistance needed by the desiccant manufacturer.

* For more information regarding nylon refer to Bakker 477-482.

TABLE II.4

MATERIAL PROPERTIES

Manu.	HERCULES BIAX POLYPROPYLENE BX-310	ALLIED BIAX NYLON 6 2500	DUPONT BIAX POLYESTER (MYLAR)
THICKNESS OF SAMPLE (MIL)	1	1	1
TENSILE STRENGTH (PSI) ASTM D 882	30000	33000	25000
YIELD STRENGTH (PSI) MD ASTM D 882	NA	NA	NA
ELONGATION PERCENTAGE (%) MD ASTM D 882	60	110	130
IMPACT STRENGTH (FT.LBS/MIL) ASTM D 3420	3	NA	NA
TEAR STRENGTH (GMS/MIL) MD ASTM D 1922	4-6	15	16
DENSITY resin form (GMS/CC) ASTM D 1505	.93	1.13	1.39
HEAT SEAL TEMPERATURE (FAHRENHEIT)	300	419	430

Source: Manufacturer's Brochures

Note: the above information was obtained from the manufacturer's specification sheets. NA = Data is not available

PART II - PRODUCT KNOWLEDGE

C. PACKAGING MANUFACTURING

1. What are the parameters and capabilities of the machines used in manufacturing?

2. What is heat sealing?

3. What are some factors to consider when evaluating bag manufacturing machines?

1. What are the parameters and capabilities of the machines used in manufacturing?

* A PSP learns about the machines in order to coordinate the customer's requests with the manufacturing company's parameters and capabilities.

* Machine parameters are the specifics that determine its limitations.

  EXAMPLE: A machine is 8 feet wide and 30 feet long by 4 feet high.

* A machine capability is its function, the job it was designed to perform.

  EXAMPLE: A machine is capable of fabricating 4 feet wide by 8 feet long bags.

* Knowledge of the following basic packaging machine capabilities and parameters will give the PSP the understanding he needs to discuss his client's demands.

  A. MACHINE DESCRIPTION
  B. MACHINE'S MAXIMUM AND MINIMUM WEB WIDTH DIMENSIONS
  C. MAXIMUM AND MINIMUM FINISHED PRODUCT DIMENSIONS
  D. MACHINE TOLERANCE LIMITS
  E. SPECIFIC MATERIALS ARE FABRICATED ON SPECIFIC MACHINES
  F. MACHINE RUNNING SPEEDS
  G. PRINTING CAPABILITIES
  H. SPECIAL FEATURES
  I. MACHINE SEALING METHOD

A. MACHINE DESCRIPTION
Machine description consists of an introduction to the machine and a general overview of the fabrication process. See Figure II.17. for pictorial of a machine.

EXAMPLE: An acrylic manufacturer was searching for a new source of bags to hold an expensive moisture sensitive powder. The packaging specification called for a back seam bag, which could only be fabricated on a special machine. The customer was experienced with bag fabricating machines and had been promised by several salespeople that the back seam specification could be met. However, not one salesperson was able to keep the promise. The PSP, on the other hand, was able to describe the fabrication process of the back seam bag and confidently stated that the bag could be fabricated by the company. Satisfied with the explanation and convinced of the PSP's expertise, the customer issued the packaging specification.

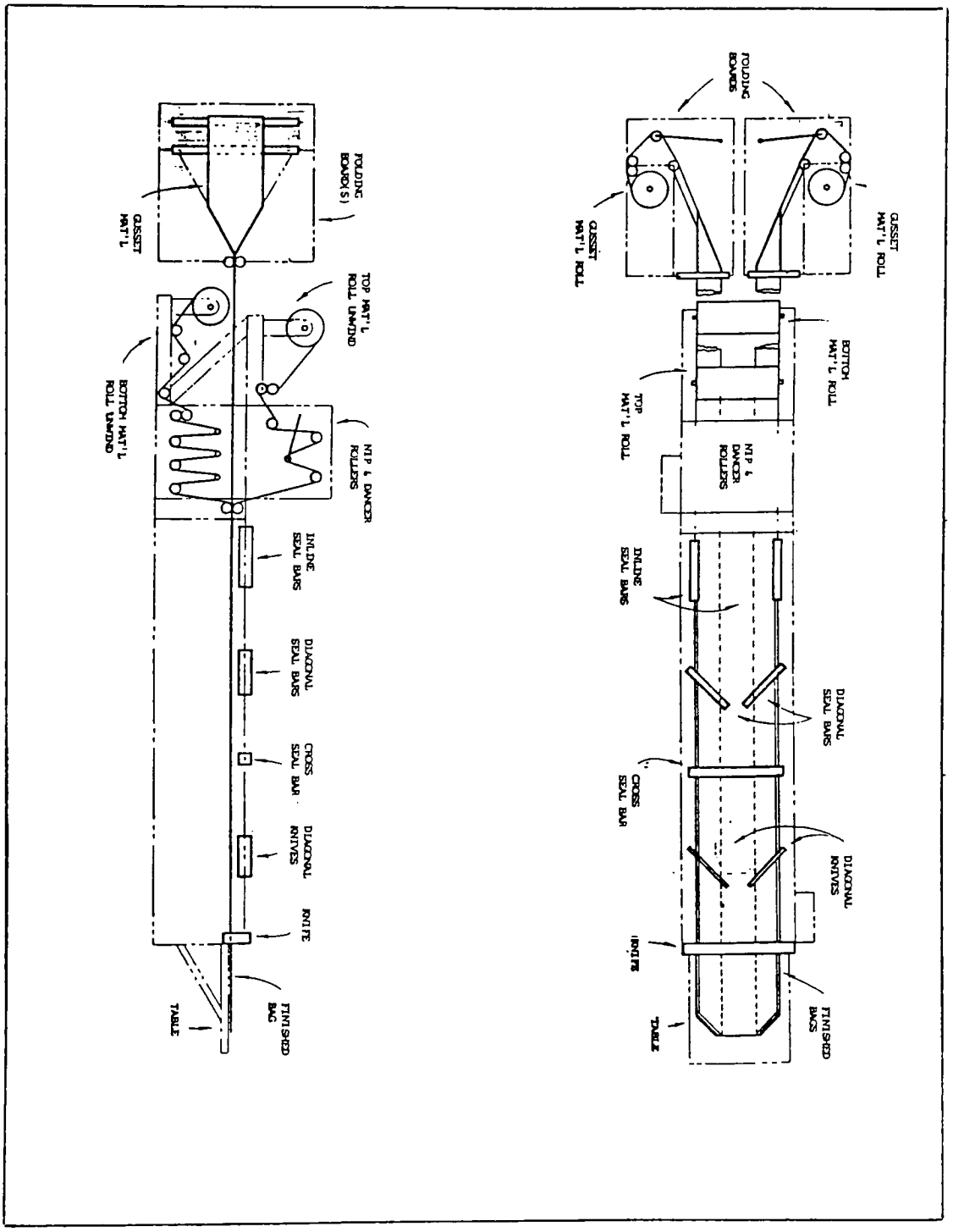


Figure II.17. MACHINE DESCRIPTION

B. MACHINE'S MAXIMUM AND MINIMUM WEB WIDTH DIMENSIONS
A machine is capable of running web widths between its maximum and minimum dimensions. A machine described as having a Max: 24" and Min: 15", can run material any web width between 24 and 15 inches.

EXAMPLE: A camouflage suit customer requires bags that are 25" wide. The PSP realizes the company's bag machine is capable of handling up to 24" wide. The PSP states the maximum width is 24". The PSP has several options. The PSP can work with the customer to change the specification to 24", persuade the company's management to buy a machine to handle the customer's wider size bags, or refuse the order.

C. MAXIMUM AND MINIMUM FINISHED PRODUCT DIMENSIONS
The machine is capable of fabricating a finished product within stated dimensions of width and length. A machine described as having a Max: 12" x 18", Min: 1" x 2", can run bags between 12' x 18" and 1" x 2".

EXAMPLE: The baseball card customer requires bags to a size of 3" x 5". The PSP knows that the bag machine is capable of running this size bag. Immediately, the PSP advises the customer that the size specification can be met.

D. MACHINE TOLERANCE LIMITS
Machines fabricate product by a measurable criteria, known as tolerance limits. The machine tolerance limit must be equal to or less than the product tolerance level to meet the customer's specification. Product tolerance levels are set because product size can vary due to movement of material through the machine. A machine described as having a tolerance limit of + or - 1/8" can run bags that may vary up to 1/8" from the specified size.

EXAMPLE: The medical customer requires bags to be a size of 12" x 18" with a dimension tolerance of + or - 1/16". The PSP knows the machine tolerance level is + or - 1/32". This tighter machine tolerance insures the customer that the bags will meet specification.

E. SPECIFIC MATERIALS ARE FABRICATED ON SPECIFIC MACHINES
Material characteristics are matched with machine capabilities in order to fabricate a product. For example, LDPE is fabricated on a polyethylene bag machine.

EXAMPLE: A grocery bag distributor requires bags fabricated with LLDPE film. The PSP knows that the company's polyethylene bag machine can heat seal LLDPE film. The PSP is able to meet the customer's bag specifications.

F. MACHINE RUNNING SPEEDS
Machines fabricate a specific amount of material in a specified time period, often referred to as machine running speeds. The company that fabricates a quality product in the shortest time period will be competitive. A machine capability described as 3500 bags per hour, means that the machine completely fabricates 3500 bags per hour.

EXAMPLE: A polyethylene bag distributor needs a competitive quote from two suppliers for the same bag. The PSP knows that the company's machine running speeds are at a rate of 5000 bags per hour and that the competition fabricates at a rate of 3500 bags per hour. The PSP has a better chance of receiving the order because the machine is running at 5000 bags per hour.

G. PRINTING CAPABILITIES
Products are printed with identification marks, advertising logos and explicit instructions. This type of value added manufacturing allows the PSP to increase prices where competition is limited.

EXAMPLE: A customer needs bags with two-color printing, "Please recycle", on one side of the bag. The PSP knows that manufacturing has two-color printing capabilities. The PSP is able to meet the specification.

H. SPECIAL FEATURES
Some machines are equipped to add special features, such as notching, die cutting, zippering and hot stamping.

EXAMPLE: A customer requires bags that can be opened quickly and easily. The specification calls for a tear notch, 1" from the top of the bag with the printed instructions, "Tear here to open". The PSP's company must be able to print the message and add a tear notch to the bags in order to quote on this piece of business. These value added special features allow the PSP to charge a higher price.

I. MACHINE SEALING METHOD
All machines have a method of joining materials together to form the finished product. The method employed will vary with the type of material that runs through the machine. Heat, glue and sewing are common methods of sealing.

EXAMPLE: A rubber resin manufacturer requires bags made from a multi-layer flexible structure with an inner layer of LDPE film. To seal this material, the heat must pass through the layers to the inner layer. A thermo bar sealing unit is used to heat seal this layer. The PSP armed with this information affirms that the customer's requirements can be met.

* For more information regarding parameters and capabilities refer to Armine et al.

2. What is heat sealing?

* Most plastic film materials can be bonded together by heat. When heat is applied at the proper melting temperature, the material melts forming a glue-like structure. The appropriate pressure and acceptable dwell time are then added to affect the strength of the seal.

* The choice of heat sealing method depends on many factors including the seal characteristics required, production speed required, the nature of the material to be sealed, and the cost/effectiveness of the energy source or sealant.

* The most common methods of heat sealing multi-layer laminate structures, unsupported films and monolayer films include:

A. THERMO BAR SEALING
B. BAND SEALING
C. IMPULSE SEALING
D. HOT-WIRE OR HOT KNIFE

A. THERMO BAR SEALING
In thermo bar sealing, the material passes through heated sealing bars. As the bars close , the heat melts the material and bonds the layers together. The heat is generated from the top, bottom or both bars and stays at the same heat throughout the fabrication process. Thermo bar is the most widely used method in making and sealing multi-layer bags. See Figure II.18. The most common seal widths are 1/4", 3/8", 1/2", 5/8" and 1".

Applications: laminated pouches, potato chip bags, form fill seal, liquid resistant and/or hermetic seal bags

B. BAND SEALING
In band sealing, the bag opening passes through two moving bands, which are pressed together by heated bars. See Figure II.19. The heat is transferred through the bands into the material, softening it for sealing. The bag then travels along between these bands through two chilled rollers, where the heat is withdrawn and the forming process is completed. The most common seal widths are 3/8" and 1/2".

Applications: multi-layer or unsupported film-filled bags, repair of defective sealed bags, bags with product inside

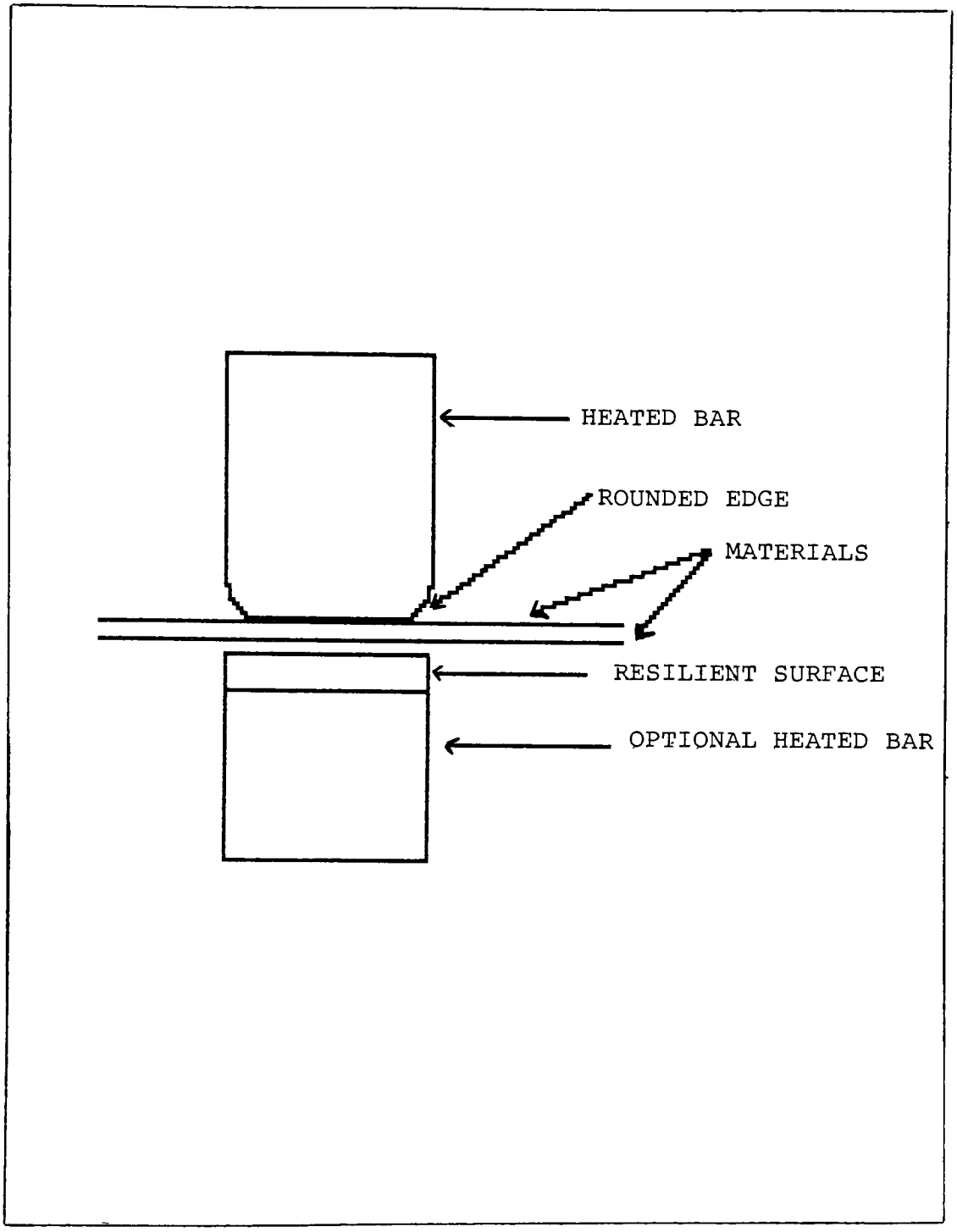


Figure II.18. THERMO BAR SEALING

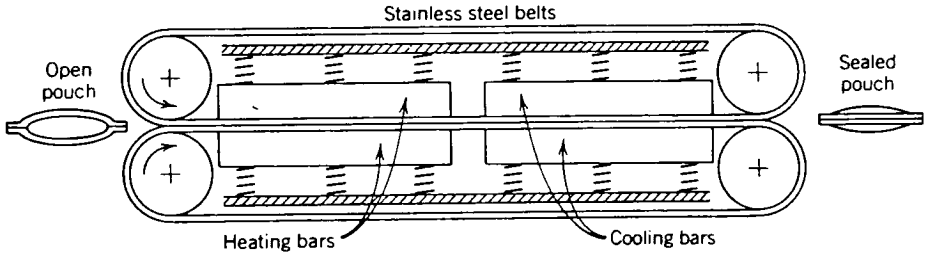


Figure II.19. BAND SEALING Source: Bakker 575

C. IMPULSE SEALING
In impulse sealing, the heat transfer works much like thermo bar except the heat in the bar is withdrawn before the bars are opened. The seal is cooled to achieve adequate strength before the bars are opened. This method permits the sealing of unsupported films, which would stick to the heated bars and fall apart if the heated bars were opened. See Figure II.20. The seal formed is 1/8" wide.

Applications: tacky materials, unsupported or monlayer films, frozen food bags

D. HOT-WIRE OR HOT-KNIFE SEALING
In hot-wire or hot-knife sealing, the heat is transferred through a hot wire or knife, which cut and seal the materials simultaneously. This method is mainly used in sealing unsupported or monolayer films. A strong bead is formed where the materials have been bonded together. See Figures II.21. and II.22., respectively. The seal formed is a bead.

Applications: record bags, grocery bags, overwrap bags, vegetable bags and polyethylene films

* The ASTM method for testing the seal strength of flexible barrier materials is ASTM F 88-68.

* Some seals may test well in the laboratory, but fail in actual use due to Environmental Stress Cracking(ESC) or chemical interaction.

* The barrier properties of a material are only as good as the seals that form the bag.

The seals may contain wrinkles or channels. If wrinkles or channels do appear in the seal area, there is a possibility that a true bond has not been achieved. If a true bond has not been achieved, environmental influences may permeate through these areas. In fact, if product damage does occur due to permeation of environmental influences, the seal areas are checked first.

EXAMPLE: A customer required heat sealed multi-layer foil laminated liners for packaging extremely moisture absorbent ionomer resin pellets. The PSP wanted to get liners approved for this application. The PSP had to prove that liners could protect the pellets against moisture damage. In evaluating these liners, the customer weighed a small sample of ionomer pellets before filling the liner. At a later date, another sample of pellets was weighed from the filled liner. The second weighing was identical to the first, indicating that no moisture had been absorbed by the pellets. A heavier second weighing would have indicated that the liners were suspect. Since the liners provided the appropriate protection for the ionomer pellets, the PSP's liners were approved.

* For a more information regarding heat sealing methods refer to Bakker 574-578.

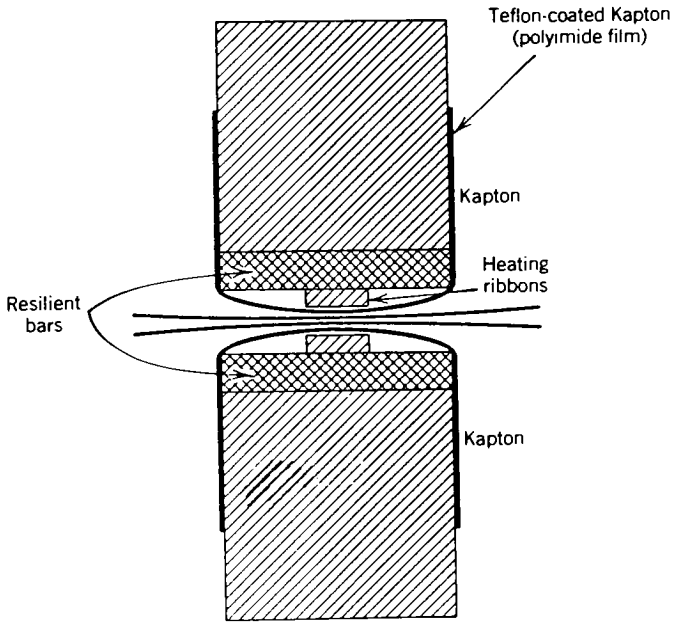


Figure II.20. IMPULSE SEALING Source: Bakker 576

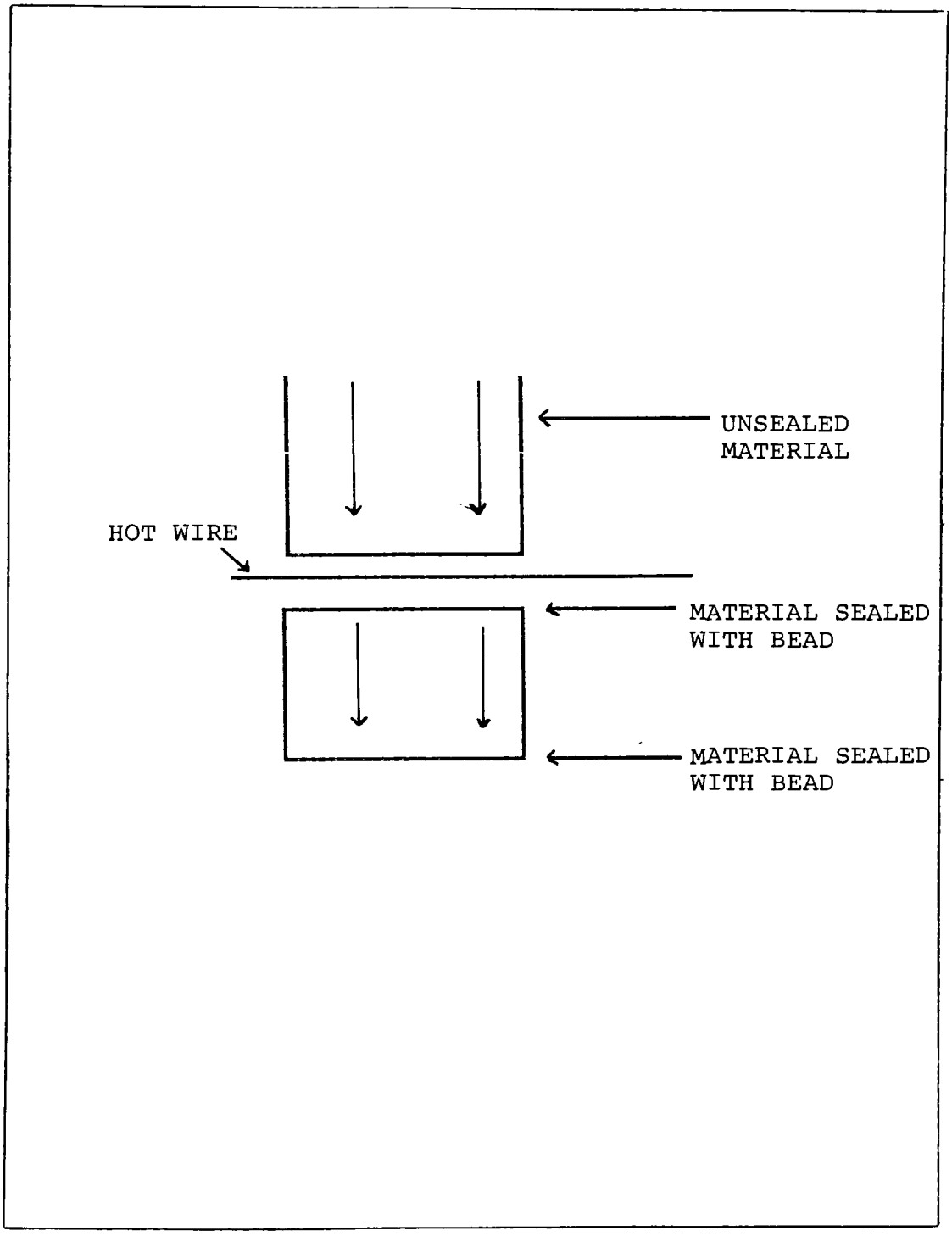


Figure II.21. HOT WIRE SEALING - Top view Picture shows material traveling under hot wire to form bag

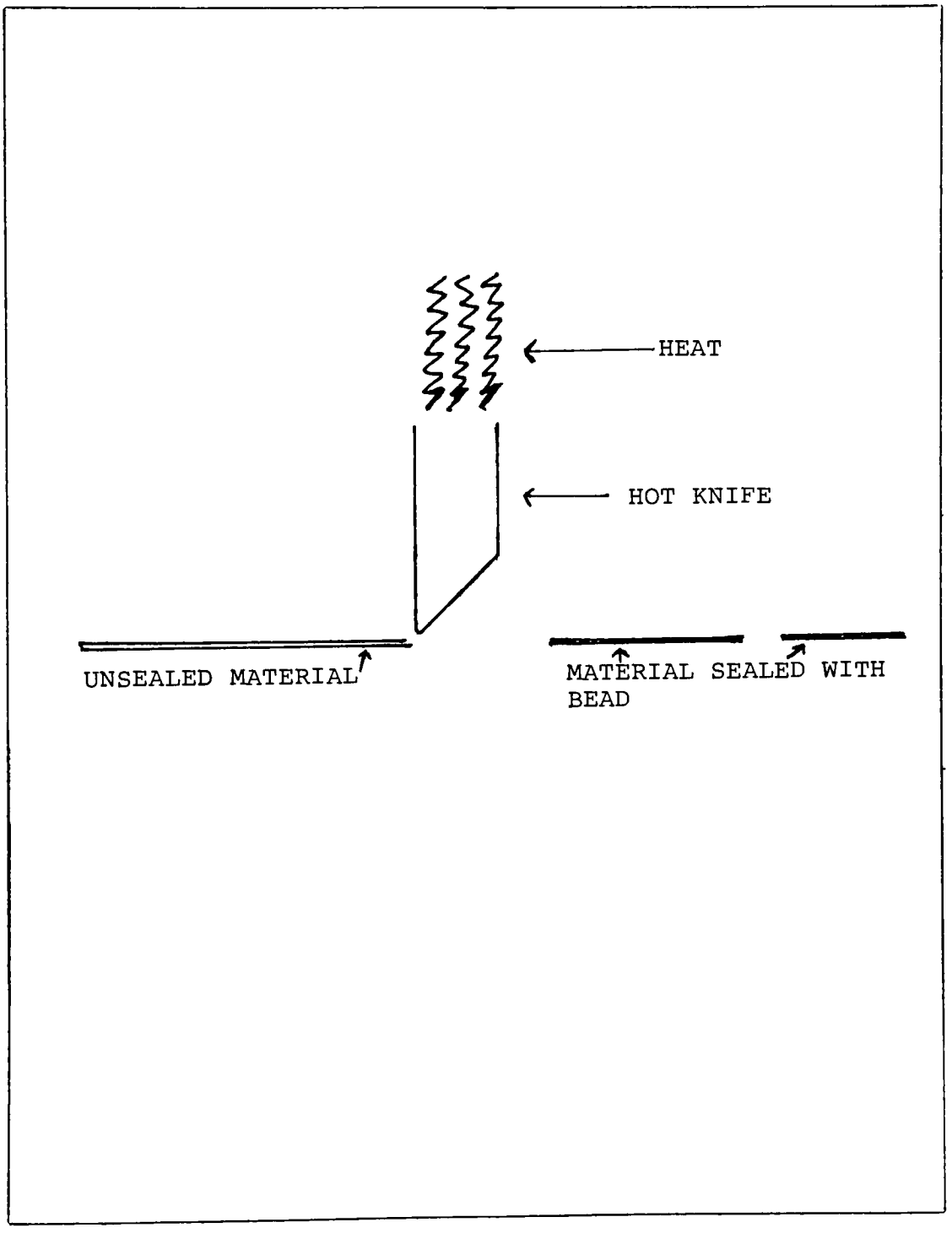


Figure II.22. HOT KNIFE SEALING - Side view

3. What are some factors to consider when evaluating bag manufacturing machines?

* When selling bag machinery, the PSP uses machine product knowledge acquired through a cross training program with manufacturing to gain credibility and the competitive edge. The customer quickly learns about the PSP's and machine's dependability and reliability .

* Knowledge of the following basic bag machine characteristics provides the PSP with valuable selling tools.

A. MACHINE INSTALLATION
B. ENERGY CONSUMPTION
C. NOISE LEVEL
D. PROTECTIVE GUARDS
E. OPERATOR SKILL
F. MACHINE PARTS AND WORKMANSHIP

A. MACHINE INSTALLATION
Machine installation is the positioning of the machine, getting it ready for everyday manufacturing use.

Machine installation consists of five phases.

Phase 1: Positioning the machine.
Phase 2: Connecting the machine.
Phase 3: Setting up the machine.
Phase 4: Making sure machine is manufacturing product to customer specifications.
Phase 5: Training operators in basic in routine functions.

EXAMPLE: W.L. Corporation, a pharmaceutical powder manufacturer, needed a machine to fabricate bags to hold powder. In the purchase negotiation stage, the customer became concerned because they had never installed fabricating machines and their workers were not experienced in operating them. In order to put the customer at ease, the PSP described in detail the five phase installation process, assuring the customer that the machines would be properly placed and calibrated and that the operators would be properly trained by the PSP.

B. ENERGY CONSUMPTION
Energy consumption is the amount of energy a machine will use while in operation.

The initial cost of a machine is only a part of the cost of the machine purchase. The continuous energy or power to support this equipment is an on going cost. Some machines have low initial purchase price, but consume high levels of energy to support the on going manufacturing capabilities. Energy consumption is extremely crucial for long range cost planning.

EXAMPLE: The PSP was competing against another machine manufacturer. The customer had to make a choice between the two competing companies. The PSP was selling a machine with a price tag of 10% more than the competing company. However, the PSP's machine needed 110 volt power supply versus the competitor's needing 220. In order to choose which manufacturer, the customer performed a three year machine energy consumption cost analysis. The energy to operate the PSP's machine for the first three years was 25% less than the competing company, even though the initial cost of the machine was higher. The machine's energy consumption secured this order.

C. NOISE LEVEL
Noise level is the decibel level of the sound of the machine in operation.

Noise level is governed by the plant safety committee or by OSHA standards. Typically, if the plant safety committee sets the decibel level it will be be lower than OSHA standards. This is to insure the decibel level passes OSHA standards. Noise level has an effect on the operators of the machine. The machine noise can cause nerve damage to the operator's hearing.

EXAMPLE: A medical bag customer required a machine to fabricate bags for holding surgical equipment. The PSP explained how noise can affect the operator and the quality of the bag. Low noise allows the operator to work in a healthier environment. A healthier environment directly relates to the higher quality product. The PSP also pointed out that when potential customers of the medical bag company tour the plant, manufacturing operations can be explained on the factory floor next to the machines without noise interference.

D. PROTECTIVE GUARDS
Protective guards are safety features which are placed on the machines to prevent operator injury.

Machines equipped with protective guards will disengage or shut down the equipment if any foreign object, such as a hand or tool, gets in the path of converting. Protective guards also protect companies against insurance claims caused by accidental injury.

EXAMPLE: G.S. Corporation requires a machine to fabricate bags for a government contract. G.S.'s company policy assures all personnel a safe work environment. G.S. has requested a machine that will provide safety devices to prevent accidental injury for the operators. The PSP recommends a light alarm protective guard system. The machine will automatically shut down if an operator breaks the light beam surrounding the machine. An automatic shut down could occur, for example, if a bag gets caught in the machine, and the operator attempts to pull the bag out without shutting off the machine.

E. OPERATOR SKILL
Operator skill is the level of experience needed by the operator to run the machine.

Some machines require an operator with years of experience to run the machine. The cost of the operator is figured into the cost of manufacturing the product. If the machine is user friendly, the cost of hiring experienced operators is reduced, therefore reducing the cost of the product.

EXAMPLE: A.P. Inc., a small polyethylene bag manufacturer, needs a machine to fabricate plain polyethylene bags to compete against a larger competitor. In order to be competitive, A.P. needs to keep the direct labor costs low and the machine running speeds high. The PSP recommends a state of the art machine that doubles normal bag output. The machine is equipped with a user friendly computer system that tells the operator if all systems are ready, monitors machine settings, and performs process control. The machine requires an operator with very little experience. As a result the direct labor costs can be kept to a minimum.

F. MACHINE PARTS AND WORKMANSHIP

Machine parts are the individual components that are assembled to form the machine. Workmanship is the skill required to engineer the machine and to assemble the parts.

A quality machine is only as good as the quality of parts and workmanship used in building the machine. Machine parts and workmanship have a direct effect on the maintenance costs, the machine's life expectancy and product quality. As a result of quality parts and workmanship, a machine will run efficiently, producing a quality product.

EXAMPLE: J.G. Corporation needs a machine to fabricate bags on a twenty-four hour basis with minimum down time for roll changes. The PSP recommends a DD-1000 machine which is built with only heavy duty parts, and is engineered for quick roll changes. Roll change occurs in minutes by positioning the mandrel in the unwind holder, locking the holder clamp and attaching the new roll of material to the end of the previous roll. Maintenance costs are kept to a minimum because the parts are extremely durable. When parts do need replacement or repair, the job can be done quickly and easily.

* For more information regarding machine evaluation contact Proven Designs Inc.

PART III

THE PACKAGING SALES PROFESSIONAL(PSP) CLOSES THE GAP

This new knowledge closes the gap that has existed since packaging has become a profession. As the PSP applies this new knowledge to applications, and becomes a problem solving expert. The goal is to open new doors, increase the close ratio on sales, generate higher profits, and increase sales revenue. The sales manager and the TQM company both benefit from this specialized trained professional because of his committment to excellence.

A. IMPACT OF PRODUCT KNOWLEDGE ON SALES

1. How does specialized training affect the sales income of the PSP?
2. How will learning about specifications increase sales?
3. How will learning about drawings increase sales?
4. How will learning about materials increase sales?
5. How will learning about manufacturing increase sales?

1. How does specialized training affect the sales income of the PSP?

* The PSP spends more time making sales calls on a daily basis.

The number of sales calls increases on a daily basis when productive time is spent with production and each customer. The specialized trained PSP relays specification details to the appropriate person, quickly and accurately, thus preventing wasted time in a sales call.

EXAMPLE: At 8:00 the PSP picks up the specifications from the customer and by 9:00 a.m. meets with production to discuss the specifications. By 9:30 the concerns around fabrication are answered. At 9:45 a.m. the PSP receives the order. By 10:00 a.m. the PSP returns to selling, leaving the rest of the day to make more calls. Without the ability to read the specifications, the PSP would have spent unnecessary time translating the customer needs to production and potentially leaving out important details, thus reducing the number of sales calls on that day.

* The PSP spends productive time with the purchasing agent.

During any given day a purchasing agent buys a large number of materials. As a result, the time spent buying each material is limited. The purchasing agent relies on the specialized trained PSP, who quickly and accurately relays the factual information, thus reducing the time spent buying each item.

EXAMPLE: A purchasing agent has to buy 40 different materials for the one application. Each material purchased is crucial to the application. The PSP is selling one of the 40 materials necessary for this application. The PSP, by looking at the specifications, quickly confirms that fabrication is possible. The time spent on this one material is productive, thus allowing the purchasing agent more time to spend on the other commodities. The PSP builds customer's allegiance as a result of the PSP's quick and accurate responsiveness.

* The PSP maximizes profits.

The specialized trained PSP sells packaging materials based on the needs of the application. If the need calls for a low price packaging material, the profits directly correlate to price of the material. If the need calls for a critical application, the profits will be higher because the need is answered and price becomes secondary. Maximium profits are generated by accurately assessing the application and answering the needs of the application.

* The PSP gains a competitive advantage.

  The PSP who has specialized training stands out among the competitors. The PSP will be seen by the customer as a partner, not as a supplier. As a solid relationship grows between the PSP and customer, competition will have the challenge of breaking the bond between these two parties.

* The PSP reduces the customer's opposition to specify the product after the presentation.

  The customer's opposition to specify the PSP's product is based on the amount of negatives or concerns that have not been answered by the presentation. A specialized trained PSP reduces these negatives and answers the needs of the customer. Once the needs have been answered and the specifiction issued, the PSP can ask for the order.

* The PSP receives the order on the first call to the customer.

  Some customers are ready to purchase when the PSP walks in the door for the first time. Specialized training gives the PSP the information needed to counsel with this type of customer and to solve the problem so that the decision to purchase can be made on the first call.

* The PSP closes the sale.

  The key to closing a sale is the ability to satisfy the customer's needs with the PSP's product. The specialized trained PSP who has thorough product knowledge can satisfy these needs. If the PSP does not have a thorough product knowledge, the needs will not be satisfied. If the needs are not satisfied, a sale will not occur.

* The PSP increases the close ratio of sales.

  The specialized trained PSP delivers a positive sales presentation. The close ratio of sales increases as a result of positive sales presentations.

* The PSP raises sales volume and consequently increases income.

  A PSP's income tends to fluctuate in the same direction as sales volume. The more specialized training the PSP has, the more products he should be able to sell. The more products that are sold, the more income the PSP receives.

2. How will learning about specifications increase sales?

* More time is spent on selling, and less time on researching.

The PSP who researches material and manufacturing specifications in the initial training process can answer the customer quickly and accurately, thus leaving more time daily to make calls.

EXAMPLE: A flowerseed manufacturer needs 10" x 2" x 34" 30# Bleached Kraft/Foil/Polyethylene gusseted bags. The PSP knows immediately the material type and knows that the bag can be manufactured. The manufacturer returns the quick response by giving the PSP a request for quotation. The PSP can then go on to make another call. If the PSP has to return the response at a later date, the opportunity to satisfy the customer's requirement may have been lost. In addition, the PSP would have lost precious selling time investigating the company's capabilities.

* Higher prices are justified.

The PSP who exhibits technical expertise can quote a higher price to the customer. The customer is willing to pay for extra quality service.

EXAMPLE: An expensive electronic part is to be packaged. The PSP explains how the bag is fabricated based on the specification and how the bag will protect this part. The bag will act as shield preventing static electricity damage to the static sensitive part. The PSP can then quote a price. In the customer's mind, the PSP has exhibited technical expertise. This type of value added selling allows the PSP to quote a higher price.

* A counselor image is created by examining the details.

A typical salesperson is a generalist. A professional engineer is a specialist, who performs duties by examining details. The PSP who understands the details of a specification acts as a counselor earning the trust and confidence of the engineer.

EXAMPLE: A product worth $100,000 is to be packaged. The PSP calls on the engineer to review the specifications. The PSP interprets the specifications with ease and makes immediate recommendations regarding fabrication. As the PSP examines the details with the engineer, a counselor image is created.

3. How will learning about drawings increase sales?

* The language of drawings creates a common ground for both the engineer and the salesperson.

  Engineers speak a language that is unique to their profession. Salespeople speak their own lanaguage. Drawings precisely, accurately, and concisely define a material object that is common to both professionals.

  EXAMPLE: A PSP with a BA in Marketing may be calling on a packaging engineer. It is safe to assume they are going to speak different languages. The drawing is presented to the PSP for fabrication. If the drawing is understood by the PSP, the difference in educational background will not interfer with this business transaction.

* Communication to manufacturing is quick and accurate.

  The PSP is the key link between the customer and the company's manufacturing team. The PSP equiped with a drawing quickly and accurately communicates the requirements of any object-- its shape, size, dimensions, tolerances, special features.

  EXAMPLE: The PSP presents a drawing to manufacturing containing the accurate details for fabrication. Quickly manufacturing knows whether it is possible to fabricate this product. Without a drawing, the PSP has to interpret the customer's needs, leaving room for error. This error is eliminated by presenting the drawing.

* The drawing creates a clear and consistent communication to all departments.

  There can be different interpretations when describing a material or product verbally or in writing, which often results in confusion and misunderstanding. A drawing can be used to clear up confusion or prevent miscommunication.

  EXAMPLE: A PSP receives a request for a quotation for a printed bag with tape on the top edge. The quotation is received complete with a drawing. The drawing contains the dimensions, tolerances, color of print, a unique logo, custom tape and special packaging instructions. The departments involved in estimating production costs are manufacturing, engineering, design, press room, purchasing and shipping. The PSP gives a copy of the drawing to each department for feedback. The PSP does not have to interpret the drawing for each department because the picture makes explanation unnecessary. The message is clear and consistent to anyone who reads the drawing.

4. How will learning about materials increase sales?

* Competition is minimized by getting in on the ground floor of a new packaging program.

  The PSP gains the competitive edge if the packaging engineer calls him first to work on new packaging programs. The company receives the order when the name is referenced in the material specification.

  EXAMPLE: A customer's specification calls for large bags to cover a new static sensitive satellite. The packaging material is extremely crucial in this application; one static spark could cause an explosion. The company that provided the initial R & D material is referenced in the spec. Purchasing buys the material according to the specification.

* The customer's product arrives undamaged at destination.

  The shipping team utilizes the material specification for determining the appropriate packaging material based on destination.

  EXAMPLE: The customer ships moisture absorbing resin to Malaysia by ship. The shipper's concerns are the salty seas and Malaysia's humid environment. The material in the specification must provide a very high moisture barrier an MVTR (.02gms/100"squared/24hrs). If the product absorbs moisture by the time it arrives in Malaysia, the customer will not accept the product. If the requirements of the spec have not been met, the PSP is held liable for the damage.

* The approval process starts with quality control.

  Quality control approves the PSP's company based on meeting material specifications. Quality control verifies that the material does or does not conform to the specification on an incoming shipment. The first order does not get processed without their approval.

  EXAMPLE: A government depot placed an order for 50,000 machine gun bags. The PSP must submit 50 bags to the government's quality control department for approval before 50,000 bags will be accepted. If the bags meet the appropriate material and fabrication specifications, the order is processed. If the bags do not conform to specification, the order may be cancelled, causing financial hardship to the PSP and the company, creating a dissappointed customer. Getting the first 50 bags approved by the government is crucial to getting the order.

5. How will learning about manufacturing increase sales?

* Accurate assessment of production capabilities builds credibility with the customer.

The PSP must be able to tell if the company can meet the expectations of the customer. Comparing the product specs with the company's manufacturing capabilities will indicate quickly if the product can be made according to specifications.

EXAMPLE: A customer places an order for roll stock material with a tolerance level of + or - 1/16". However, the PSP realizes that the company's machine has a tolerance of + or - 1/8". Therefore, specifications cannot be met and the order cannot be accepted in its present form. One alternative is to negotiate a revision of the spec. Other options are to buy a new slitting machine, subcontract the work, refer the customer or lastly, reject the order. In any case, the customer is being dealt with in an honest well informed manner. As a result, the customer comes to trust the PSP and the company.

* Commissions are paid quickly.

Purchase orders with referenced manufacturing specifications process easier, ship sooner, and are paid faster. If the order is not fabricated according to spec, there are costs incurred and time delays. As a result, commissions are not paid on time.

EXAMPLE: A bag purchase order is received referencing a fabrication spec Mil-B-117 1 E 1. Customer service enters the order, manufacturing fabricates it, the customer pays the bill and the PSP receives the commission. Without the reference, there are some possible negative occurrences. The PSP may have to go back to the customer, or, worse yet, manufacturing fabricates the bag inaccurately, both causing commission delays not to mention, a dissatisfied customer.

* Machine setup time is reduced.

Machine runability is based on accurately fabricating material to spec. After incoming inspection is complete, manufacturing loads the material in the machine, sets up the proper controls, and runs the material into final product.

EXAMPLE: A customer orders roll stock for use in a form and fill machine. The roll stock has temperature, pressure and dwell settings specifications. The temperature of 350 degrees, 95 pounds of pressure, and 3 seconds dwell are all set in the machine. Manufacturing gives positive feedback back to purchasing that the material performed according to specification. If the material was not fabricated to specification, the feedback to purchasing would not result in a future order.

PART III - THE PACKAGING SALES PROFESSIONAL(PSP) CLOSES THE GAP

B. LEARNING TO SELL AS A PSP

1. How does the PSP evaluate the current packaging material system?

2. How does the PSP use STEP ONE, PRODUCT CHARACTERISTICS to solve a packaging application?

3. How does the PSP use STEP TWO, PRODUCT'S LIFE CYCLE to solve a packaging application?

4. How does the PSP use STEP THREE, PRIMARY PACKAGING to solve a packaging application?

5. How does the PSP use STEP FOUR, PACKAGING PROPOSAL to solve a packaging application?

6. How does product knowledge aid the PSP in the long term sell cycle?

7. What role does the PSP play in key account management?

1. How does the PSP evaluate the current packaging material system of the customer?

* The PSP performs a simple evaluation of the customer's packaging material system, if the PSP is provided with the customer's product characteristics information, the product's life cycle and a packaging material specification. From this information, the PSP can determine if the appropriate packaging material is used to provide the appropriate protection needed in the application.

* If the customer cannot readily provide the PSP the details needed to make the proper evaluation, the PSP performs the research. The PSP's methodology includes four basic steps.

STEP ONE: PRODUCT CHARACTERISTICS
The PSP starts by looking at all the details concerning the product to be packaged. The PSP evaluates the characteristics of the product, including product nature, product form, and product vulnerabilities. The PSP summarizes this information, highlighting ways the customer can benefit from using the appropriate packaging.

STEP TWO: PRODUCT'S LIFE CYCLE
The PSP researches on the life of the product from manufacturing to disposal. A statistical process control technique, such as process flowcharting, is a valuable tool in understand a product's life cycle.

STEP THREE: PRIMARY PACKAGING
The PSP investigates the primary, secondary and tertiary levels of packaging used in the application. The primary packaging material contains the product, i.e bags; the secondary packaging material holds a group of primary packages, i.e corrugated carton; the tertiary packaging material is the shipping unit, i.e. unitized pallet load. Some products do not require all three levels of packaging material protection (Bakker 594). The appropriate protection for safe transportation will depend on the product to be packaged. It is important to note that all three levels should be included in the customer's packaging material specification. Since the focus of this study has been on flexible materials, discussion of the application will be restricted to the primary packaging level. A simple flowchart illustrates all three levels in the packaging material system. See Figure III.1.

STEP FOUR: PACKAGING PROPOSAL
After retrieving all the facts concerning the application, the PSP submits a packaging proposal for the appropriate packaging material based on the research and PSP's expertise in packaging material product knowledge.

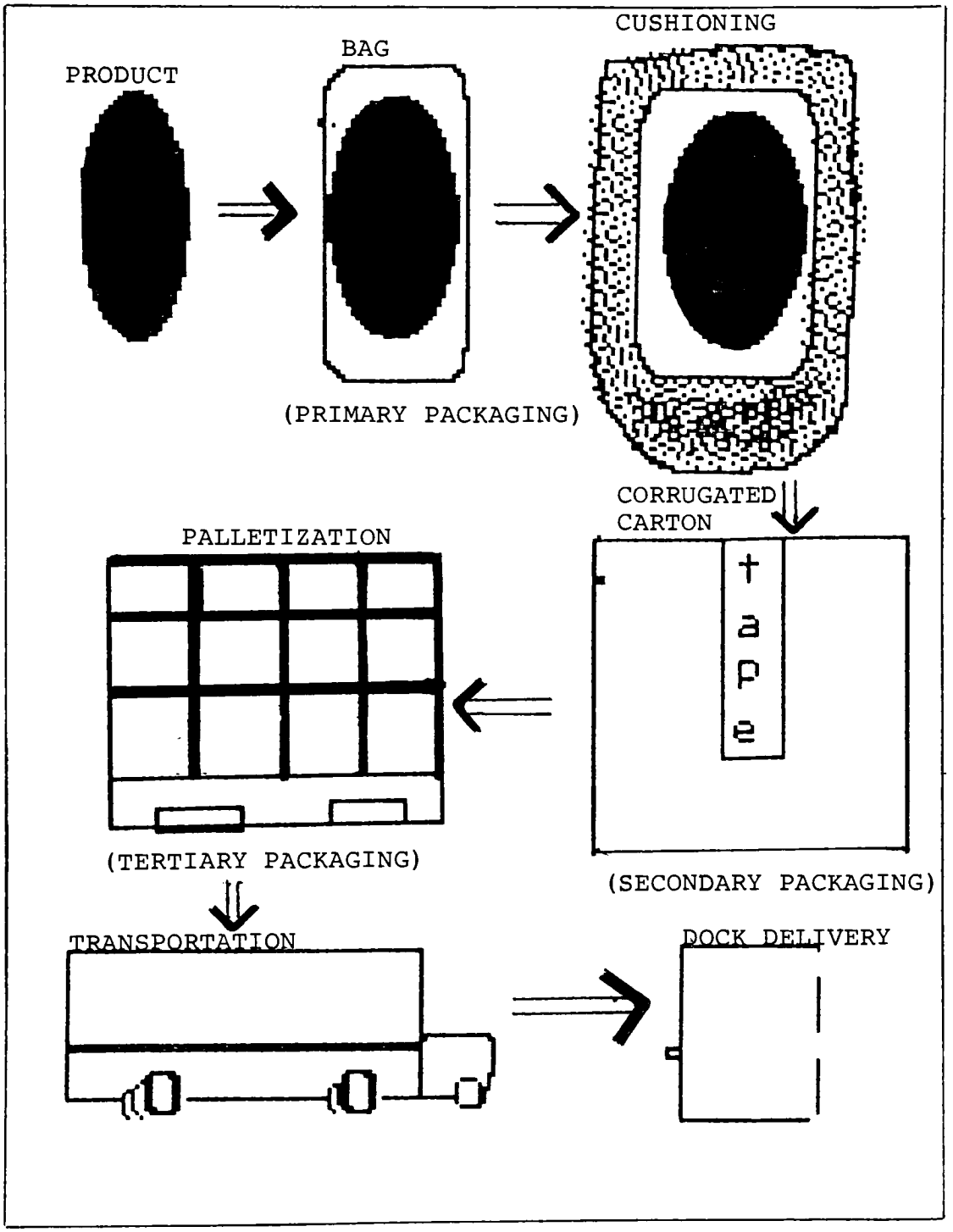


Figure III.1. PACKAGING MATERIAL SYSTEM

2. How does the PSP use STEP ONE, PRODUCT CHARACTERISTICS to solve a packaging application?

* The PSP relies on a four step process to structure his investigation and analysis of a packaging application. The first step is to identify product characteristics. The following is a checklist that includes the questions a PSP needs to ask in order to fully understand the product to be packaged.

A. PRODUCT NATURE
   a. What is the product?
   b. How is the product used?
   c. What materials make up the product?
   d. How is it made?
   e. How long does it last?
   f. What industry classification(s) applies to this product?
      ___ Food ___ Pharmaceutical ___ Military ___ Electronic
      ___ Medical ___ Aerospace ___ Chemical ___ Plastic
      ___ Metal ___ Agriculture ___ Waste ___ Photographic

   g. Are there any laws or regulations applicable to the the packaging of the product?
      ___ Food and Drug Administration
      ___ United States Department of Agriculture
      ___ Consumer Products Safety Commission
      ___ Department of Commerce
      ___ Department of Transportation
      ___ Federal Aviation Administration
      ___ Environmental Protection Agency
      ___ Department of Defense
      ___ National Aeronautics and Space Administration
      ___ Electronic Industries Association

B. PRODUCT FORM
   a. What are the dimensions? ___ " L x ___ " W x ___ H"
   b. What is the shape of this product?
   c. Are there any protruding objects on the product?
   d. What is the material surface of the product?
   d. What is the weight of the product? _____
   e. Is it in liquid or dry form?

C. PRODUCT VULNERABILITIES

a. What is the product sensitive to?

___ Moisture absorption or loss ___ Corrosion ___ Fire
___ Explosion ___ Temperature ___ Air ___ Humidity
___ Carbon dioxide ___ Nitrogen ___ Flammability
___ Sulpher Dioxide ____ Aromas ___ Oils ___ Greases
___ Oxygen ___ Contamination ___ Wavelengths of Light
___ Chemicals ___ Chemical Offgasing
___ Static Electricity
___ Electromagnetic Interference
___ Radio Frequency Interference
___ Other _____

b. What are the physical and mechanical properties of the product?

___ Fragile ___ Puncture Resistant___ Abrasion Resistant
___ Tear Resistant ___ Compression Resistant
___ Impact Resistant ___ Stretchable ____ Flexable
___ Stiff ___ Durable ___Soft ___ Hard

3. How does the PSP use STEP TWO, PRODUCT'S LIFE CYCLE, to solve a packaging application?

* Product's life cycle is defined as the life of the product. The product's life when raw materials are combined in a manufacturing process, continues through customer use and disposal, and ends at disposal considerations.

* The PSP's knowledge regarding the life of the product is crucial to choosing the appropriate primary packaging material. In fact, the PSP can only specify the appropriate packaging material if he knows details of the product's life. Process flow charting, a statistical process control technique, is used in discovering the product's life details. According to Dr. John T. Burr, this technique is a valuable tool in understanding any process. "... [B]efore you can take any action on a process, you must understand exactly how the process works"(64). The PSP uses process flowcharting to help himself and his customers understand the processes from manufacturing, through distribution, to actual customer use. It also allows the PSP to uncover potential hazards and highlight areas of improvement. In applying Dr. Burr's methodology, the PSP uses process flowcharting to solve packaging problems and make recommendations for packaging materials to ensure the customer will receive the quality product.

* The PSP has to understand the significant parts of the product's life. Process flowcharting creates a visual picture of the product's life. See Figure III.2. for an illustration of the major steps in a product's life cycle.

* The list that follows gives further details of the significant part of the product's life including the considerations for each part.

A. MANUFACTURING PROCESS
 1. Product Nature
 2. Product Form
 3. Product Vulnerabilities

B. PACKAGING METHODS
 1. Primary Packaging Methods
 2. Physical, Mechanical, Pilerage Protection Methods
 2. Secondary Packaging Methods
 3. Closure Methods of Secondary Packaging
 4. Identification Method
 5. Tertiary Packaging Methods

C. WAREHOUSING CONDITIONS
 1. Handling Methods
  a. Hand Carry
  b. Conveyor System
  c. Two Wheeler
  d. Pallet Truck
  e. Towmotor
 2. Storage Rack Location
 3. Storage Temperature Conditions
 4. Storage Temperature Variations
 5. Length of Time in Storage before Shipment
 6. Dock Access

D. TRANSPORTATION SYSTEM
 1. Method of transportation
  a. Automobile
  b. Step Van
  c. Company Truck
  d. Common Carrier
  e. Airplane
  f. Ship
  g. Railcar
 2. Transportation Distance
 3. Storage Conditions
 4. Environmental Conditions
 5. Temperature Conditions
 6. Storage conditions
 7. Length of Time in Storage during Shipment

E. CUSTOMER'S WAREHOUSING CONDITIONS
 1. Dock Access
 2. Handling Methods (same as above)
 3. Storage Rack Location
 4. Storage Temperature Conditions
 5. Storage Temperature Variations
 6. Length of Time in Storage before Use.

F. CUSTOMER USE
 1. Ease of Identification
 2. Handling Methods
 3. Shelf Space Requirement
 4. Ease of Opening
 5. Ease of product use
 6. Shelf Life
 7. Promotional uses

G. DISPOSAL CONSIDERATIONS
 1. Reuse
 2. Recyclable
 3. Biodegradiable
 4. Source Reduction
 5. Incineration
 6. Landfill

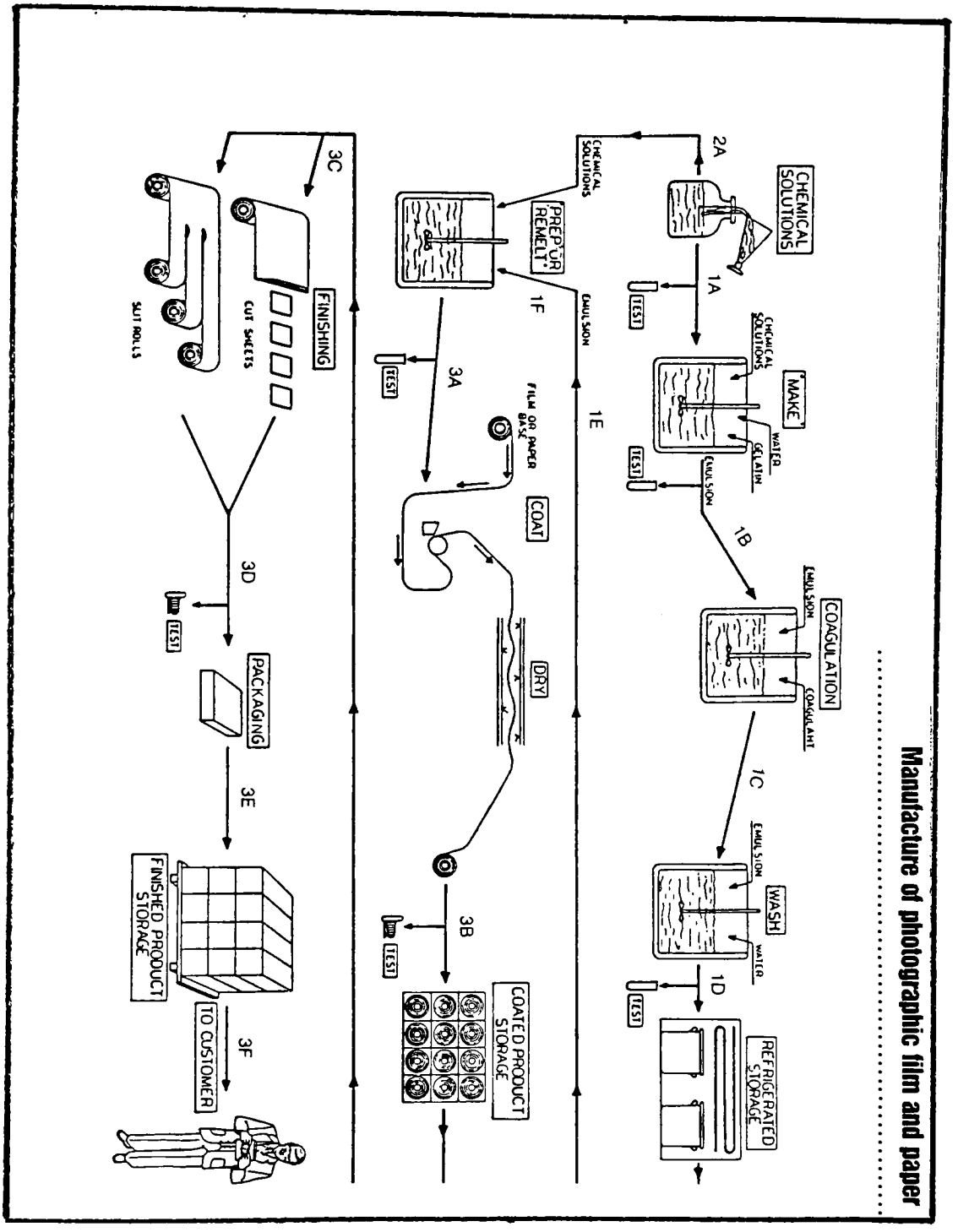


Figure III.2. PRODUCT'S LIFE CYCLE Source: Burr 65

* In applying Dr. Burr's process flow charting rules, the PSP can make process flowcharting simple, easy, and fun.

RULE 1. The PSP assembles the right people in making the chart.

The PSP involves the following people to participate in the process: raw material supplier, machine operator, shift supervisor, engineer, quality control person, packager, warehouseperson, shipping clerk, shipper and customer. It is important to assemble the right people in one meeting. However, in reality it may be difficult to gather all the key people at one time, so the PSP may have to form smaller groups to uncover all the details of a process.

RULE 2. The PSP gets all the members of the group to participate in the group discussion.

The PSP, as a result of packaging expertise, acts as a facilitator of the group(s). The PSP creates an atmosphere of trust and respect within the group. The PSP's functions are to ask the right questions, seek input from everyone, resolve any conflicting statements, right down the details, and keep any one member from having undue influence on the outcome. The PSP knows each person adds a detail that is crucial to understanding the entire process.

RULE 3. The PSP makes all the details visible to all the people all the time.

The PSP writes the details on blank newsprint. As the details are written down, the PSP tapes the sheets side by side on the wall, so that all the people in the group can see the process. This method also helps the group think about areas that may have been overlooked.

RULE 4. The PSP schedules enough time for the meeting.

The PSP needs to uncover the details of the process. Uncovering details is time consuming because people have to remember what happens in the process. It is very easy to overlook a particular step. More than one meeting may be necessary to give the participants more time to think about the process.

RULE 5. The PSP gets everyone in the group to ask more questions.

There are many questions that can be asked by the PSP as well as each group member. What is the first step in the process? What is the next thing that happens? Questions like these should continue throughout the meeting. The PSP is aware that getting answers to questions is the key to flowcharting. The complete picture of the process can be drawn if all the questions are answered.

* According to Dr. Burr, the use of process flowcharting allows the PSP and the group to reap many benefits, including the following:

  PROCESS UNDERSTANDING
  "The people who work in the process understand the process."

  IMPROVEMENTS
  "Once the process can be seen objectively in the flowchart, improvements can be easily identified."

  FITNESS
  The people who are involved in the process realize how they fit in the overall process.

  ENTHUSIASM
  "The people who participate in flowcharting sessions become enthusiastic supporters of the entire quality effort."

  CONFIDENCE
  The people who particpate in flowcharting become confident in their own competence.

* For more information regarding process flowcharting refer to Burr 64 - 67.

* For more statistical process control techniques that can be used for any quality improvement process refer to Burr, Dr. John T. SPC Tools For Operators . Milwaukee: Quality Press ASQC, 1989.

4. How does the PSP use STEP THREE, PRIMARY PACKAGING, to solve a packaging application?

* After completely understanding the product characteristics and the product's life cycle, the PSP researches the customer's use of primary packaging material, i.e bags. Bags contain the product, but more importantly, they provide the appropriate barrier protection for the product's characteristics.

* The PSP starts the investigation of the primary packaging system by asking the customer if there are any packaging specifications already established for the product. One example of a complete packaging specification would be included under the Military Material and Bag Specifications. See TABLE III.1. If there are preexisting specifications, the PSP compares the packaging specification with the product characteristics and life cycle to make sure the packaging material meets the needs of the application. If the customer does not already have established packaging specifications, the PSP needs to investigate the customer's current packaging material system. This situation is an opportunity for the PSP to write the packaging specification for the customer and provide packaging engineering support, as a result, the PSP builds a long term relationship with the customer.

* The PSP first needs to determine the material type of the current primary packaging material. The PSP uses product knowledge to identify completely the customer's current primary packaging material. The PSP relies on a comprehensive list of material and bag fabrication questions to identify the customer's current primary packaging material. With each answer, the PSP asks, "Is the material characteristic appropriate for the application?" Although this process may seem lengthy and detailed, it reveals valuable information pertinent to the PSP's analysis of the current situation.

EXAMPLE: A corrugated box manufacturer loads square boxes on a pallet and places a shrink bag over the pallet load of boxes. As the bag is heated, it shrinks over the pallet load. The customer is experiencing two problems: (1) periodically, the corners of the boxes puncture the bag, and (2) the corners of the boxes get crushed. The customer has made several attempts to correct the problem, but without success. The customer needs to have the PSP evaluate the current primary bag material and make the appropriate recommendation for a more consistently performing shrink bag. Based on product knowledge, the PSP identifies the current shrink bag material used in the application as a 4 mil. Low Density Polyethylene (LDPE). The PSP asks the question, "Are Low Density Polyethylene's puncture resistance and elongation properties appropriate for this application?" The answer is no. The puncture resistance and elongation properties of the 4 mil. LDPE are too low for this application. Instead the PSP recommends a 2 mil. Linear Low Density Polyethylene (LLDPE). The LLDPE puncture resistance is higher than the LDPE's. Also the LLDPE has a higher elongation property, 600% stretch versus 250% stretch for LDPE. These two properties allow the shrink bags to stretch over the corners of the boxes without damaging either the boxes or the film.

TABLE III.1

MILITARY MATERIAL AND BAG SPECIFICATIONS

MIL-B-117 BAG SPECIFICATION			MATERIAL SPECIFICATION			
Type	Class	Style	Document	Type	Grade	Class
I	A	2	MIL-B-81705	II	-	1
I	B	1	MIL-B-121	I	A	1
II	B	1	MIL-B-121	II	A	1
III	B	1	MIL-B-121	II	A	1
I	B	2	MIL-B-22191	III	-	-
			L-P-378 1/	I or II	A	1 2/
I	B	3	MIL-B-121	I	A	1
			MIL-B-22191	III	-	-
I	C	1	MIL-B-121	I	A	1
II	C	1	MIL-B-121	II	A	1
I	C	2	MIL-B-22191	II	-	-
I	C	3	MIL-B-121	I	A	1
			MIL-B-22191	II	-	-
I	E	1	MIL-B-131	I	-	1
I	E	2	MIL-B-22191	I	-	-
II	E	1	MIL-B-131	I	-	3
III	E	1	MIL-B-131	I	-	2
I	E	3	MIL-B-131	I	-	1
			MIL-B-22191	I	-	-
II	E	3	MIL-B-131	I	-	3
			MIL-B-22191	I	-	-
I	F	1	MIL-B-81705	I	-	1
I	G	1	MIL-B-81916	-	-	-

Source: Department of Defense

* The following list of material questions is a guideline for a PSP's thorough diagnosis.

MATERIAL TYPE

1. What material is used to fabricate the bag?
___ LDPE ___ LLDPE ___ High Density Polyethylene ___ Blend
___ Unoriented Polypropylene ___Biax Oriented Polypropylene
___ Unoriented PET ___Biax oriented PET
___ Unoriented Nylon ___ Biax Oriented Nylon
___ Coextrusion ___ Laminate ____ Foil Laminate
___ Metalized Polypropylene ___ Metalized PET
___ Metalized Nylon ___ Other_____

2. What is the total material thickness?

3. If the material is constructed of different layers, what is the thickness of each layer in the material?

4. Does the material have a product name or number?

NOTE: A product name or number is useful in cross referencing to find the material specifications.

5. What is the texture of the material?

6. Does the material tear easily?

7. Does the material puncture easily?

8. Is the material flexible or stiff?

9. Is the material abrasive?

10. What is the color of the material?

11. Is the material clear or tinted?

12. Is the material opaque?

13. Is there a static control material requirement?
___ Antistatic ___ Static dissipative ___ Static Shielding
___ Electromagnetic Interference(EMI)
___ Radio Frequency Interference(RFI)

14. Is there a corrision inhibitor in the material?

15. Is there a cleanliness material requirement?
(Material is classified by classes; the lower the class, the cleaner the material.)
___ Visiably Clean ____ Class 100,000 ___ Class 10,000
___ Class 1,000 ___ Class 500 ___ Class 300 ___ Class 100
___ Class 50 ___ Class 25 ___ Class 10 ___ Class 1

* The PSP continues the investigation of primary packaging process by examining the bag characteristics to make sure fabrication is possible, to see if any cost savings can be passed on to the customer due to his company's fabrication methods, and to see where improvements can be made to the bag.

BAG CHARACTERISTICS

1. What are the dimensions of the bag?
Inside dimensions(I.D.) ___"w x ___"g x ___"l
Outside dimensions(O.D.) ___"w x ___"g x ___" l

NOTE: a. The first dimension is the opening of the bag.
b. A two dimension bag will only contain width(w) x length(l)
c. A three dimension bag will contain
width x gusset(g) x length(l)

2. Does the bag dimensions have a tolerance level?

3. Does the bag conatin a lip on the opening of the bag?
a. What is the width of the lip?

NOTE: A lip is an extension of one side of the material at the bag opening.

4. What type of seals form the bag?
___ Heat ___ Sewn ___ Glue ___ Other

5. How many seals make up the bag?

6. Where are the seals on the bag?
___ Two side seals and one bottom seal
___ Two side seals and a bottom fold
___ One back seal and one bottom seal
___ One side seal and one bottom seal
___ One bottom seal only

7. What are the widths of the seals?
(i.e. 1/8", 1/4", 1/2", 5/8", 3/4", 1")
___ Two side seals and ___ one bottom seal
___ Two side seals and a bottom fold
___ One back seal and ___ one bottom seal
___ One side seal and ___ one bottom seal
___ One bottom seal
___ Sealed areas are in a bead form?

8. Does the bag contain any printing?
   If no, skip to Question 21.
   If yes, please continue with the following questions.

9. Can the printing be scraped off with a penny?
   If no, printing is on the reverse side of material.
   If yes, printing is on the surface?

10. What is the location of the printed area(s)?

11. Is the bag have random or registered print?

NOTE: a. Random printing is scattered or repeated with no exact location.
b. Registered printing has an exact location on the bag.

12. What is the total square area of coverage?

NOTE: To calculate total square area, add the printed square areas together.

13. How many sides are printed?

14. Do both sides have the same printing?

15. How many colors are printed on the bag?

16. Is there a product ink color number? (i.e. PMS color)

17. Does the printing contain line type only?

18. Does the printing contain loco's or special artwork?

19. Is the printing embossed or raised?

20. Is the bag printed with a bar code?

21. Does the bag a have printed label or bar code label attached to its surface?
    a. What is the dimension of the label ___"w x ___"l
    b. What is the color of the label?
    c. What is material type? (refer to material types section)
    d. What is printed on the label?

22. Does the bag have any unusual characteristics?
___ Pocket on material surface
a. What is the dimension of pocket ___"w x ___"l?
b. What is the location of pocket?
c. What is material type? (refer to material types section)
___ Punched hole(s)
a. What is the dimension of hole(s)? ____" diameter(d)
b. What is the location of hole(s)?
___ Notch(es)
a. What is the dimension of the notch(es)?
b. What is type of notch(es)?
___ slit notch ___ C notch ___ V notch
c. What is the location of the notch(es)?

NOTE: The purpose of the notch is provide easy opening once the bag has been sealed.

NOTE: The measurement is to be made from one end of the bag to the center of the notch.

23. Is there a closure on the bag?
___ Zipper
___ Tape
a. What is the width of the tape?
b. What is the type of tape?
c. Does the tape have a liner protecting the adhesive?

24. How is the bag closed?
___ Heat sealed ___ Sewn ____ Glued ___ Twist Tied ___ Folded over
___ Taped ___ Stapled ___ Left open

5. How does the PSP use STEP FOUR, PACKAGING PROPOSAL, to solve a packaging application?

* The PSP presents the solution by means of a written packaging proposal.

  The PSP offers the appropriate primary packaging material only after the PSP performs the analysis work on product characteristics, the process flow charting of the product's life cycle and the research of the current primary packaging material. The packaging proposal finalizes all the work that has been put into the evaluation process and provides the customer all the information, including minute details, needed to make the final purchasing decision.

* A packaging proposal is a powerful sales tool for the PSP.

  After the PSP leaves the customer; the customer goes on with his other daily duties and responsibilities. Sales are lost as a result of the "out of sight out of mind" cliche. A well constructed packaging proposal keeps the details in the sight of the customer so that the customer can make the final purchasing decision without having the PSP present.

* A packaging proposal has a crucial importance to a company's success.

  "A poorly conceived and ineptly presented proposal has an immediate and brutal effect because it fails to get a contract thus results in less income for the company"(Mills et al. 275).

* Packaging proposals' formats vary, but all formats must be technically sound, and logically and clearly stated. One possible format includes the following elements:

I. LETTER OF INTRODUCTION

A. Proposal Introduction

B. Capabilities

C. TQM Philosophy

D. TQM Program Implementation

E. TQM Goals

II. PROPOSAL OBJECTIVE

A. Statement of packaging need or problem

B. Statement of packaging objective

C. Statement of packaging solution

III. ENGINEERING EVALUATION

A. Step One - Product characteristics

1. Product Nature Summary
2. Product Form Summary
3. Product Vulnerabilities Summary

B. Step Two - Flowchart of Product life cycle

C. Step Three - Current Packaging Material System Component List

1. Tertiary Level of Packaging
2. Secondary Level of Packaging
3. Primary Level of Packaging

D. Drawing of Current Packaging Material System

E. Performance Evaluation of Current Packaging Material System

1. System Description
2. System Evaluation

IV. PROPOSED PACKAGING MATERIAL SOLUTION

A. Proposed Packaging Material

B. Proposed Packaging Material Component List

1. Tertiary Level of Packaging
2. Secondary Level of Packaging
3. Primary Level of Packaging

C. Drawing of Proposed Packaging Material System

D. Performance Evaluation of Proposed Packaging Material System

1. System Description
2. System Evaluation

V. Packaging Solution Cost Justification

A. Current Packaging Costs

1. Material Costs
2. Labor Costs

B. Proposed Packaging Costs

1. Material Costs
2. Labor Costs

C. Cost Evaluation

VI. Summary of Proposed Packaging Material Benefits

VII. Formal Packaging Proposal Quotation

* An example of Barrier Pak's Packaging Proposal submitted to Cobelco Metal Powder of America, Inc. appears on pages 167 to 180 .

* For more information regarding proposal writing refer to Mills et al.

LETTER OF INTRODUCTION

January 22, 1992

Joanne Nice
Corporate Purchasing Department
Cobelco Metal Powder of America, Inc.
P.O. Box 1313
384 Pack Road
Newark, N.Y. 14513

Dear Joanne:

We are pleased to submit for your review a packaging proposal which results from the collaborative efforts of the COBELCO and BARRIER PAK team. The proposal summarizes a viable solution to improving moisture barrier protection for your hygroscopic iron powder.

BARRIER PAK INCORPORATED specializes in high barrier and custom flexible liners and bags for bulk containerization of powders, solids and liquids. Our innovative approach and reliable service are quickly establishing our reputation as the leader in specialized flexible barrier packaging.

BARRIER PAK'S offers fresh ideas and technical innovations in materials, equipment and manufacturing, resulting in significant improvements in production efficiencies and quality consistency. This means substantial cost benefit to you.

Total Quality Management is the basis of BARRIER PAK'S philosophy and methodology. Statistical Process Control (SPC) is our standard, Certicate of Compliance is our guarantee, and 100% customer satisfaction is our goal.

BARRIER PAK looks forward to the opportunity to work with you and to demonstrate our capabilities, service and commitment. I will be contacting you in one week to discuss the proposal. We look forward to a continuing partnership between COBELCO and BARRIER PAK.

Sincerely yours,

PROPOSAL OBJECTIVE

A. Packaging Problem - According to Joanne Nice, Cobelco has been notified by their Malaysian customer that the hygroscopic iron powder, which is packaged in an export sandwich pack, is periodically out of spec by the time it reaches a warehouse in Malaysia. When the powder is out of spec, the customer has three alternatives depending on the severity of the problem: (1) redry the powder, (2) ship the powder back to Cobelco for reprocessing or (3) cancel order completely. Cobelco experiences unnecessary costs no matter which alternative the customer selects.

B. Packaging Objective - Barrier Pak's objective is to provide appropriate moisture barrier protection for overseas shipments and long term storage for Cobelco's hygroscopic iron powder.

C. Proposed Packaging Solution - Barrier Pak recommends using one BP-2175 Foil Laminate Liner to replace the three level flexible packaging materials in the current Export Sandwich Pack, which is comprised of one 2 mil. Low Density Polyethylene (LDPE) cover, one 4 mil. LDPE liner and one 4 mil. Green VCI LDPE liner.

ENGINEERING EVALUATION

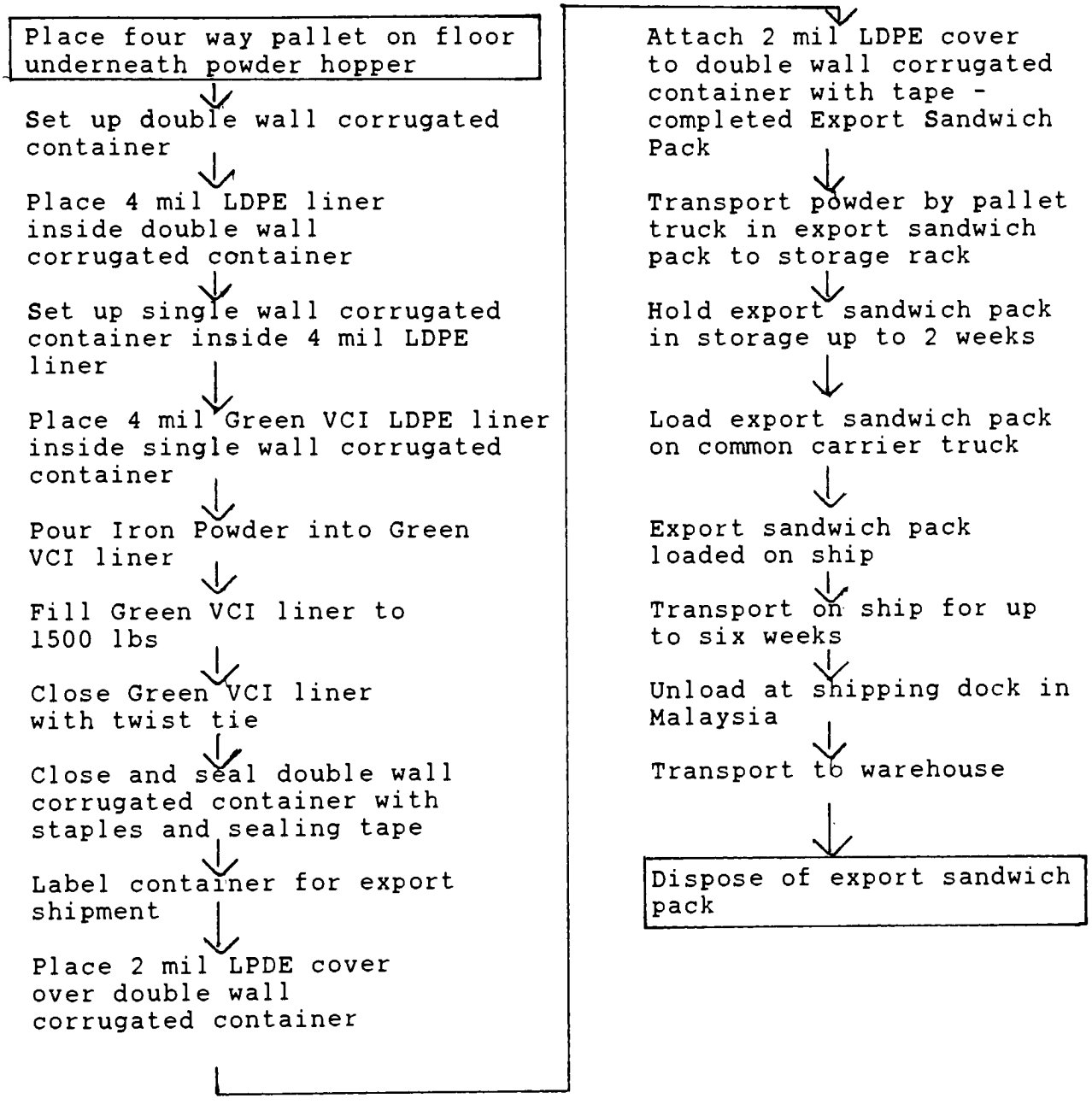
A. STEP ONE - Iron Powder Characteristics

1. PRODUCT NATURE SUMMARY
   The iron is in powdered form. The powder may be compounded or molded alone in manufacturing connecting rods and gears for the automotive industry.

2. PRODUCT FORM SUMMARY
   The powder is in dry form.

3. PRODUCT VULNERABILITIES SUMMARY
   The powder is hygroscopic and sensitive to many environmental factors, including: Corrosion, Temperature, Humidity, Air and Oxygen.

B. STEP TWO - Flow chart of Iron Powder Life Cycle



C. STEP THREE - Current Packaging Material System Component List
* From outside cover to inside liner

1. Tertiary Flexible Packaging Component 1:
   Quantity: 1
   Dimensions: 62" x 110" I.D.
   Material Description: 2 mil. Low Density Polyethylene (LDPE)
   Fabrication Style: Cover

2. Secondary Flexible Packaging Component 2
   Quantity: 1
   Dimensions: 62" x 110" I.D.
   Material Description: 4 mil LDPE
   Fabrication Style: Liner

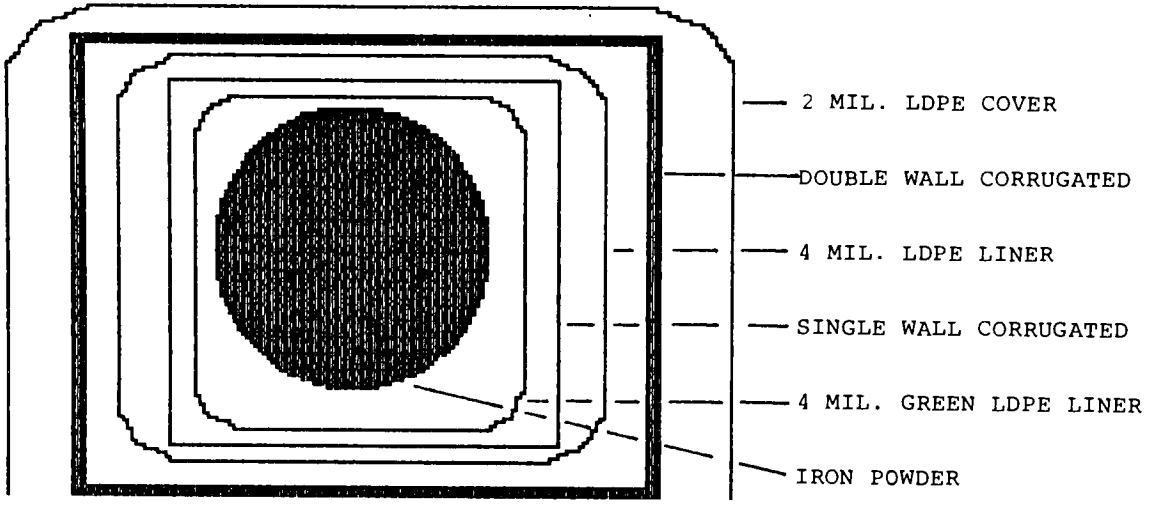
3. Primary Flexible Packaging Component 3:
   Quantity: 1
   Dimensions: 62" x 110" - I.D.
   Material Description: 4 mil Green VCI LDPE
   Fabrication Style: Liner

D. Drawing of current packaging material system - See attached drawing # CP-12292

E. Performance Evaluation of Current Packaging Material System

1. System Description:

   a. Water or moisture comes in contact with the 2 mil LDPE cover.
   b. Moisture permeates through the cover over time.
   c. The double wall corrugated absorbs the moisture which has permeated through the cover.
   d. Moisture permeates through the 4 mil liner over time.
   e. The single wall corrugated absorbs the moisture which has permeated through the 4 mil liner.
   f. Moisture permeates through the 4 mil green VCI liner over time but the effects are counteracted by the corrosion inhibitor impregnated in the liner.



CURRENT PACKAGING SYSTEM		
MAT'L:	SCALE: NONE	DRAWN BY: DPB REVISED:
DATE: 1/22/92	APPROVED BY: Duane P. Beck	DRAWING NUMBER: CP-12292

2. System Evaluation:

* Due to material inconsistencies, your current packaging system provides short term moisture barrier protection leading to periodic moisture damage. Several factors contribute to the periodic moisture damage:

(1) Variation in the amount of moisture which has permeated the 2 mil LDPE cover, 4 mil LDPE liner and 4 mil green VCI LDPE liner.

LDPE is defined as a short term moisture barrier material, due to the inconsistency of the molecule chain structure. LDPE has a Water Vapor Transmission Rate of 1.5 gms/100 sq.in./24hrs. Water Vapor Transmission Rate (WVTR) is a rate which provides a quantitative measure for specifying the appropriate barrier for the application. The lower the transmission rate, the better the barrier material performs.

(2) Variation in the length of time the powder remains in the export sandwich pack.

The longer the time, the more moisture permeates.

(3) Variation in the amount of moisture in the outside environment.

Increased moisture results in more pressure to permeate the export sandwich pack

(4) Variation of the absorption rate or hygroscopic properties of the enclosed powder.

The higher the powder's absorption rate, the quicker the powder will absorb moisture from the outside environment.

PACKAGING MATERIAL SOLUTION

A. Proposed Packaging Material:

Barrier Pak recommends a moisture barrier liner which provides consistent protection against the variability of time, powder characteristics, and the outside environment.

Barrier Pak recommends one BP-2175 Foil Laminate Liner instead of the current three level flexible packaging materials.

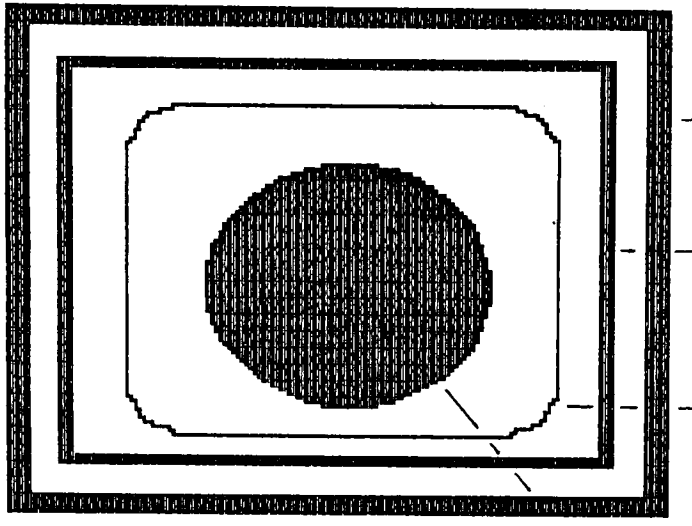
B. Proposed Packaging Material Component List

1. Primary packaging component 1:
   Quantity: 1
   Dimensions: 62" x 110" I.D.
   Material Description: BP-2175 Foil Laminate
   Outer layer - 48 gauge Polyester
   Medium layer - .00035 aluminum foil
   Inner layer - 2.5 LLDPE
   Fabrication Style: Liner

C. Drawing of Proposed Packaging Material System - See attached drawing #CP-12292A

D. Performance Evaluation of Proposed Packaging Material System

1. System Description:
   a. Water or moisture comes in contact with double wall corrugated container.
   b. The double wall corrugated absorbs the moisture over a period of time.
   c. The single wall corrugated absorbs the moisture over a period of time.
   d. The BP-2175 liner positioned inside the single wall corrugated container protects the hygroscopic iron powder, allowing it to remain within specifications.



PROPOSED PACKAGING SYSTEM		
MAT'L:	SCALE: NONE	DRAWN BY: DPB REVISED:
DATE: 1/22/92	APPROVED BY: Duane P. Beck	DRAWING NUMBER: CP-12292A

2. System Evaluation:

* The proposed packaging system provides consistent long term moisture barrier protection. Several factors support the support the moisture barrier consistency:

(1) The BP-2175 liner protects the iron powder by not allowing the moisture to permeate the liner for up to a two year period. Since the length of time for the powder to remain in the export sandwich pack is up to one year, BP-2175 satisfies this need.

(2) The BP-2175's foil medium layer laminated between the polyester and LLDPE provides a high barrier protection against the moisture permeation from the outside environment.

(3) The BP-2175 liner provides a high barrier against the hygroscopic iron powder absorbing moisture from the outside environment.

(4) By comparing the WVTR's of the BP-2175 and LDPE material, 1.5 gms versus .02 gms, it can be seen BP-2175 represents superior moisture barrier performance characteristics.

PACKAGING SOLUTION COST JUSTIFICATION

A. Current Packaging Costs

1. Material costs: cover, liners and tape:

Quantity	Size	Description	Cost
1 ea.	- 62" x 110" I.D.	- 2 mil. LDPE cover	$ .75 ea.
1 ea.	- 62" x 110" I.D.	- 4 mil. LDPE liner	$1.65 ea.
1 ea.	- 62" x 110" I.D.	- 4 mil Green VCI LDPE liner	$10.00 ea.
1 strip	2" x 14'	- Carton sealing tape (to seal 2 mil cover to double wall corrugated container) @ $.012/ft	$.17 ea.
		Subtotal packaging material cost for cover, liners and tape	$12.57 ea.

2. Labor costs for appling the cover, inserting liners and sealing with tape:

12 min. @ 35.00/hr* $7.00 ea.

* Represents Cobelco's labor rate for packaging personnel

Total current packaging material and labor costs for cover, liners and 2" tape $19.57 ea.

B. Proposed Packaging Costs

1. Material costs

Quantity	Size	Description	Cost
1 ea.	62" x 110" I.D.	- BP-2175 liner	$10.00 ea.

2. Labor costs for inserting BP-2175 liner

3 mins. @ 35.00 $1.75 ea.

Total material and labor costs for proposed primary packaging material $11.75 ea.

C. Cost Evaluation:

Total current packaging costs	$19.57 ea.
Total proposed packaging costs	- $11.75 ea.
Cost savings	$7.82 ea.
Percentage savings	40%

SUMMARY OF PROPOSED PACKAGING MATERIAL BENEFITS

(1) Iron powder will be in specification, ready for use upon arrival at Malaysia warehouse.

(2) The BP-2175 liners provide consistent moisture barrier protection regardless of variability of length of time in storage, powder characteristics, and outside environment.

(3) The BP-2175 liners eliminate customer returns or cancelled orders due to powder out of spec.

(4) The BP-2175 reduces packaging material and labor costs.

(5) A reduction in purchasing costs results from buying one packaging material instead of three materials.

(6) Cobelco realizes an immediate 40% savings or $7.82 for each export sandwich pack.

(7) Both Cobelco and the Malaysia customer receive 100% satisfaction.

FORMAL PACKAGING PROPOSAL QUOTATION

DATE: January 22, 1992

TO: Corporate Purchasing Department
Cobelco Metal Powder of America, Inc.
P.O. Box 1313
384 Pack Road
Newark, N.Y. 14513

ATTENTION: Joanne Nice

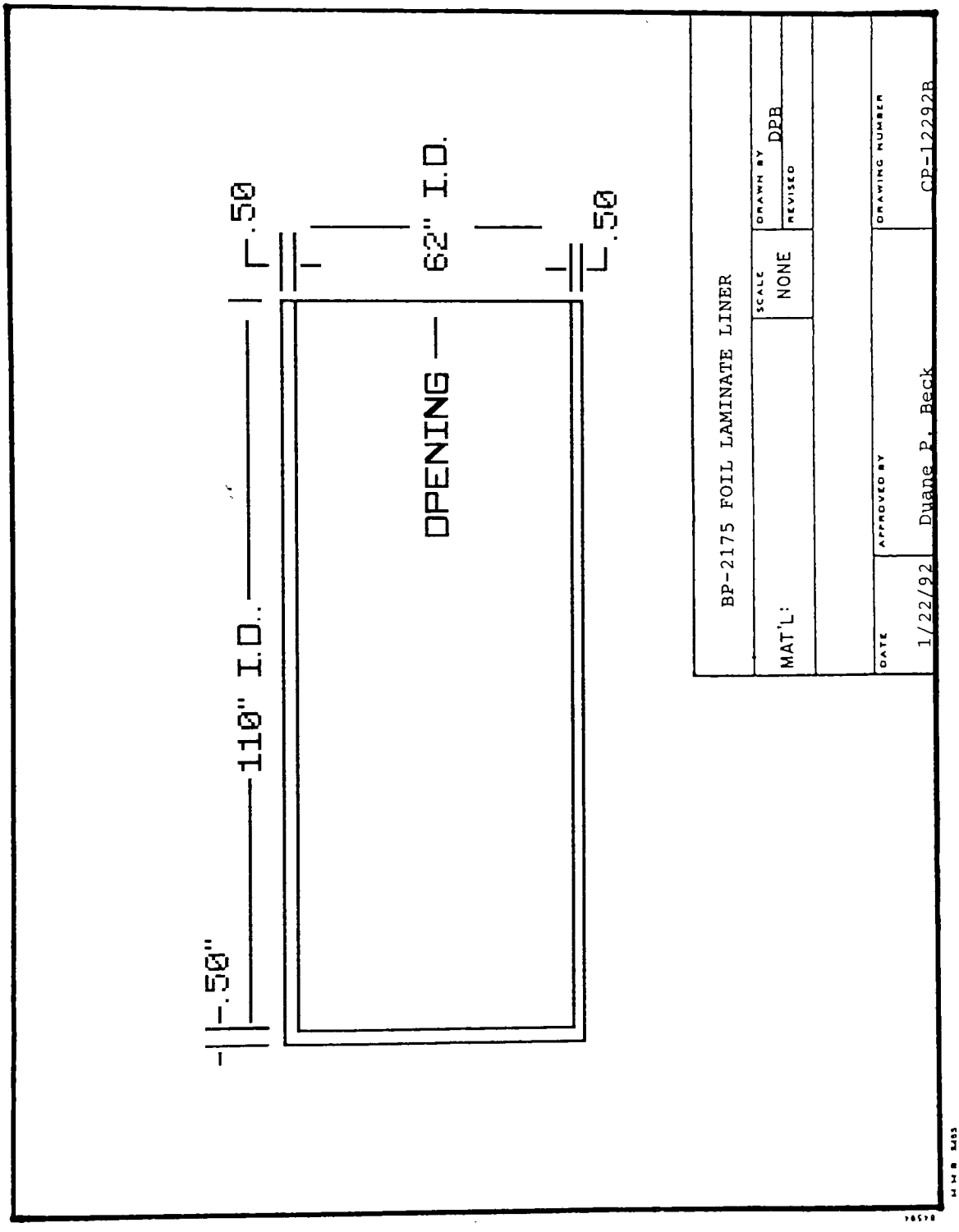
We are pleased to submit our quotation as follows. Please check specifications, drawing dimensions, printing and other requirements carefully.

QUANTITY	SIZE	DESCRIPTION	PRICE
1,000 ea.	62" x 110" I.D.	- BP-2175 Foil Laminated Liners as per drawing # CP-12292B	$10.00 ea.

LEAD TIME: 2 weeks
F.O.B. POINT: Newark, N.Y.
TERMS: 1%/10 - Net 30

APPROVED BY: _____

Quotations subject to acceptance within 30 days from date of quotation. Prices subject to change without notice.


.50
110" I.D.
.50
OPENING
62" I.D.
.50
BP-2175 FOIL LAMINATE LINER
MAT'L:
SCALE
NONE
DRAWN BY
DPB
REVISED
DATE
1/22/92
APPROVED BY
Duane P. Beck
DRAWING NUMBER
CP-12292B

6. How does product knowledge aid the PSP in the long term sell cycle?

* In order to build long term relationships with customers, the PSP has to have a solid foundation. A solid foundation starts with product knowledge. A product knowledgeable PSP can meet the customer's needs at every step of the long term sell cycle methodology.

* If the long term sell cycle is properly performed, the PSP will build solid long term relationships with customers, solve current problems, uncover new packaging needs, develop new sales opportunities, open new markets, make efficient use of selling time, build personal relationships, and promote professionalism.

* Most books written about salesmanship are consistent in identifying techniques for developing a long term selling relationship. This thesis focuses on product knowledge as it applies to the following long term sell cycle techniques.

A. PROSPECTING
B. RESEARCHING
C. MAKING APPOINTMENTS
D. QUALIFYING
E. OPENING
F. PROBLEM SOLVING
G. HANDLING OBJECTION
H. QUICK ACCURATE RESPONSE
I. PRESENTING THE SOLUTION
J. CLOSING
K. SERVICING THE CUSTOMER
L. MAINTAINING

A. PROSPECTING

Prospecting is the process of finding new potential customers or prospects who can use packaging materials. Product knowledge strengthens the PSP's ability to uncover potential new customers. The prospecting step often separates the successful from the unsuccessful PSP. A PSP uses a variety of ways to find new customers: S.I.C. codes, trade associations and journals, magazine and newspaper articles, and leads from customers and the sales manager.

EXAMPLE: A PSP enjoyed a large percentage of the territorial business for moisture barrier liners for hygroscopic food additive powders. The PSP realized the liners could be used for other hygroscopic products, such as agricultural fertilizers. The PSP went to the local library and looked under the S.I.C. codes for fertilizers, which lead to a list of several new potential prospects. The next step was to perform research on the different fertilizers.

B. RESEARCHING
Researching is the process by which the PSP examines prospective customers' literature to find out the initial packaging potential at the prospect's company. The PSP learns about the prospect's product uses, manufacturing and shipping locations, sales figures, future company expansions and new product developments. The information can be retrieved through trade journals, corporate brochures, sales literature, technical and annual reports. The PSP builds credibility with a prospect, by performing preliminary research.

EXAMPLE: Before approaching to the agricultural industry, the PSP needed to find out more about agricultural companies. From the S.I.C. codes, the PSP made preliminary research telephone calls to selected agricultural companies' customer service departments, asking for literature pertaining to the products they manufactured. After receiving literature from Agrichem Fertilizer Corporation, the PSP closely examined the literature and found a picture of fertilizer bags. By using product knowledge, the PSP noticed the bags were made of polythylene material. Even though the PSP did not know the specifications, the bags could be manufactured by the PSP's company. The next step was to qualify the prospect.

C.QUALIFYING
Qualifying is a concentrated effort to segregate the prospects. The PSP with product knowledge can spend the maximum amount of time making sales presentations to "live" prospects who are likely to specify or purchase the product. When attempting to qualify prospects, the PSP needs answers to the following probing questions: (1) Does a packaging need or want exist at this prospect? (2) What type of packaging does this prospect use? (3) Is the prospect open to new ideas? (4) Does the prospect have the authority to specify or buy packaging?

EXAMPLE: The PSP made a phone call to the purchasing department of an agricultural fertilizer company to qualify the prospect. By performing preliminary research, the PSP learned that the fertilizer was shipped in bags, but needed to find out more regarding the chances of selling to this prospect. The PSP asked probing questions and discovered the company's interest in finding an alternative supplier. The PSP proceeded to set up an appointment.

D. APPOINTMENT MAKING

Appointment making is essential in building a long term relationship because appointments tend to dignify the PSP and add prestige to the PSP's product. The product knowledgeable PSP saves valuable time by seeing the right person at the appropriate time. The prospect is more likely to be open-minded towards the PSP's ideas and products if an appointment is set-up. Typically, a PSP uses telephone calling as a method for setting up appointments with "live" prospects.

EXAMPLE: After qualifying the prospect, the PSP set up an appointment for Wednesday at 9 A.M., a convenient time for both the purchasing agent and PSP. The PSP explained that 30 minutes was needed for the initial sales presentation.

E. OPENING

A quality opening is essential for relaxing the prospect enough to be open to new ideas and products. After the initial warm introductory greeting, the product knowledgeable PSP arouses the prospect's interest by stating how packaging material features will provide packaging protection for the prospect's product. The PSP continues to qualify the prospect by thinking about the following questions: (1) Will the packaging sale be profitable to my company? (2) How long will it take to close the sale? (3) Will the sale be profitable? (4) Does the prospect have the ability to pay? The PSP tries to identify and seek appointments with other influencers and decision makers in the various functional departments so that the problem solving can begin.

EXAMPLE: Once at the customer's location, the PSP continued to qualify the prospect. The PSP used product knowledge to build confidence with the prospect. The fertilizer bags holding the Agrichem fertilizer in the company brochure appeared to be a type of a polyethylene material. Through a series of questions, the PSP learned that the bags represented a large portion of packaging costs. The PSP offered cost-cutting suggestions with current bag manufacturing practices. In addition,the PSP explained the opportunity for further reduction by investigating new materials. The PSP explained that depending on the thickness and type of polyethylene, a cost savings could be realized with a new high density polyethylene material just introduced to the market. In addition, the prospect would be able to reduce the material thickness with the high density material but increase the strength characteristics as well as provide improved moisture barrier properties. In order to recommend this new material, the PSP needed to complete an engineering study which included analysis of the Agrichem product and product life cycle, and an evaluation of the current packaging material system.

F. PROBLEM SOLVING

Before any sale can be made, the prospect must be aware of, or be shown that a product will solve a problem or satisfy a need. If the prospect recognizes a need, the PSP starts by collecting the detailed information concerning the prospect's product characteristics, product life cycle and current packaging material system. In order to make any changes, the PSP needs to determine what has to be changed and the impact of each change. The problem areas will stand out once the details have been uncovered. If the prospect does not recognize a need, it is the PSP's duty to show the prospect that a problem or need does exist.

EXAMPLE: The PSP worked along with various departments at Agrichem. By the use of process flowcharting, the PSP uncovered the necessary information for a complete understanding of the bags and their use for the Agrichem fertilizer. The bags of fertilizer weighed 50 lbs and were stacked and shipped on pallets.The current bags were made of 4 mil. low density polyethylene material. At destination, the bags were unloaded by hand and there were some reports of the bags breaking open due to weak seals. This was the kind of information the PSP was looking for. By identifying the prospect's problem, weak seals, the PSP opened the opportunity for working toward solutions. One viable option was switching from the 4 mil. low density polyethylene bags to 2 mil. high density bags. Based on product knowledge, the PSP realized that although the high density bags would cost more money for the same thickness as the low density. By switching to a 2 mil. high density polyethylene material, the bags would be competitively priced with the low density. However, the 2 mil. high density polyethylene bags offers increased seal strength and increased puncture resistance.

G. HANDLING OBJECTIONS

Handling objections is a difficult area for any sales representative. "Salesmen who succeed, however, prove their merit and their abilities under actual test of meeting and overcoming a good percentage of the objections they encounter" (Pederson and Wright 401). The PSP overcomes many objections by using product knowledge to evaluate the objection and by inserting the packaging material feature. Researching can aid the PSP in anticipating many of the prospect's objections. No matter what the reason, the PSP must be ready to handle the objection when it occurs during a sales presentation. The PSP handles objections in the opening, problem solving and closing phases of the sales presentation. Some reasons for common objections include the following:

a. Opening reasons - (1) No need for Product (2) Unrecognized need (3) Salesman resistance (4) Salesman dismissal.

b. Problem solving reasons - (1) Lack of money (2) More information desired (3) Fear of change.

c. Closing reasons (1) Budget constraints (2) Poor product features (3) Nonacceptable lead time

EXAMPLE: The PSP set up another appointment with the purchasing agent. The PSP explained the findings and a possible solution to the previous unseen problem. The purchasing agent hadn't heard about the new material. The purchasing agent was afraid of the possible loss of product if the new material did not perform as well as the PSP's claim. The PSP acknowledged the purchasing agent's concern but demonstrated how the 2 mil. high density bags would provide stronger seals. The purchasing agent then inquired about any difference in price. The PSP responded immediately.

H. QUICK ACCURATE RESPONSE

Quick accurate response to a customer's objection or question is the only way of building a long-term relationship. Quick accurate responses demonstrate professionalism and keep the presentation flowing in a positive direction towards solving the packaging problem. The PSP, as a counselor of packaging, draws from a comprehensive data bank of product knowledge to provide the prospect with quick accurate responses.

EXAMPLE: The PSP had anticipated the purchasing agent's price resistance and had the cost comparison data available. The pricing between the 2 mil. high density and 4 mil. low density was comparable. However, the purchasing agent became concerned that the high density material was half of the low density material. The PSP understood the legitimate concern. The PSP used product specifications to prove that the high density strength characteristics out-weighed those of the low density material.

I. PRESENTING THE SOLUTION

Presenting the solution is the PSP's opportunity to present the collected information and to persuade the prospect to become a customer. The prospect has to see clearly that the need or problem will be solved by using the product. The method used to present the solution is just as important as the solution itself. When presenting a solution, the PSP assembles the involved prospects, restates the problem, performs a demonstration to prove the solution, and submits a written proposal.

EXAMPLE: The PSP arranged a meeting with the purchasing agent and representatives from the various departments to present the solution. The meeting started with a restatement all of the findings. By means of process flow charting, the PSP showed the group, the possible problem areas, such as the broken bags at destination. The PSP stated the benefits of the high density material: increased strength, increased puncture resistance and improved moisture barrier properties.
A written proposal laying out the entire evaluation, including cost comparison, was then submitted for their final review. The PSP wanted to give the purchasing agent a week to review the proposal.

J. CLOSING
Closing refers to obtaining a final agreement from the prospect to purchase the product. All the PSP's efforts are wasted unless the prospect "signs on the dotted line." As the time it takes the PSP to close the sale increases, the profit from the sales goes down, and the risk of losing the sale entirely increases (Churchill et al. 89). The following methods and techniques are used frequently to close sales sucessfully: (1) Summarize the selling points, (2) Implement the contingent method, (3) Build a series of acceptances, (4) Try a trial order (Pederson and Wright 447 - 449).

EXAMPLE: One week later, the PSP met with the purchasing agent and received a trial order to test the bags.

K. SERVICING THE CUSTOMER
Servicing the customer happens after the sale is made. The PSP who promises service prior to the sale and follows that promise after the sale will receive repeat business. The PSP follows up after the sale to insure 100% customer satisfaction in the following areas:(1) Appropriate solution, (2) Quality of product, (3) Accurate billing, (4) Immediate responses, (5) On time delivery performance.

EXAMPLE: The trial order was delivered within one week. After the PSP received notification of the delivery by the shipping department, the PSP made a follow up phone call to the purchasing agent to make sure the customer was satisfied with the delivery of the product and to thank the customer for the order. The trial was going to take approximately four weeks and feed back from their customer would be a deciding factor in switching to the high density polyethylene bags.

L. MAINTAINING

Maintaining is the process of staying on top of the new customer's needs. The PSP maintains customers by staying in touch on a regular basis. Frequency of contact depends on the customer's contribution to sales revenue growth. The PSP provides expert advice to the customer and counsels with potential new prospects at the customer's location, approaching engineering, design, shipping, production, and quality control. The PSP keeps the customer informed in the following areas: (1) New product developments (2) Improvements in the PSP's company (3) Changes in the industry (4) Changes in the current product.

EXAMPLE: Four weeks later, the bags performed as the PSP claimed. The PSP set up a plan to maintain a long term relationship with this potential large customer. The PSP will call on the Agrichem on weekly basis because it can generate a large percentage of sales revenue and has many more packaging opportunities for increased sales. The PSP increases its potential by promoting new products, performing more engineering studies and providing quick responses to customer requests.

7. What role does the PSP play in key account management?

* In the previous section, a PSP builds long term relationships with customers. In order to service properly these customers and perform a long term sell cycle, the PSP focuses on a select number of customers, known as key accounts. The 80/20 rule applies to key account management. The rule says 80% of sales come from 20% of the customers.

* The PSP uses product knowledge to provide key customers with sales support, technical expertise, innovation, reliability, accurate communication, coordination efforts, and quick responsiveness.

  By concentrating on only one or a few major customers, the PSP becomes very familiar with each customer's problems and needs. The PSP devotes the time necessary to provide a high level of service to each customer (Churchill et al. 119).

* As a result of the PSP is concentrated service to each customer, the PSP and the PSP's management can expect the following: (1) Increased sales from each key account, (2) Increased profits from each account, (3) Increased market share, (4) Improved product acceptance, (5) Improved forecasting (Churchill et al. 117).

* Different variations of key accounts programs are established by companies depending on the size of the company or organizational structure. However, no matter which program, the product knowledgeable PSP provides benefits to the PSP's company and key customers.

  Programs could be modeled after the following programs:

  Program 1: The smaller company's PSP executive, who has sales and management responsiblities, finds time for both management responsibilies and customer service. Because of the PSP's product knowledge, authoritative decisions regarding the company's production capacity and pricing can be made accurately and quickly. Customers will be provided with quick responses to questions because the PSP has not only the authority, but also the indepth knowledge of the operation as base to the response.

  Program 2: The PSP of a separate corporate division provides the corporation with the financial and operational insight of a major customer's potential downfall. The PSP has the preliminary instinct to assess a customer's product, manufacturing and position in the marketplace. The PSP's corporation can protect itself against a possible catastrophic event.

Program 3: The most common way for many packaging companies to handle key accounts is the use of separate PSP account managers. The PSP account manager focuses on each key account based on the packaging needs of the customer. The PSP account manager may report to a field sales manager. Some PSPs perform all necessary selling activities, and some have an entire selling team of assistants who work on the account (Churchill et al 119). In either case, product knowledge is essential to the PSP account manager because sales managers, assistants and customers depend on the PSP's expertise and customer's needs.

* Traditionally, PSP account managers separate accounts by size, sales potential, profitability and effort needed to establish a long term relationship. According to Crissy, Cunningham, and Cunningham, key accounts can be classified as A, B, C, or D accounts. The PSP establishes a schedule for servicing the key accounts with personal visits or telephone calls (194-196).

Account Classification	Personal Visit	Telephone Calls
A	3 times/month	3 times/month
B	1 time/month	3 times/month
C	4 times/month	1 time/month
D	1 time/year	2 time/year

* Key account management is essential in achieving and maintaining long term relationships with Total Quality Management customers. The TQM philosophy is based on service, service and service.

* For more information regarding key account management refer to Churchill et al. 117-121.

PART III - THE PACKAGING SALES PROFESSIONAL(PSP) CLOSES THE GAP

C. IMPACT ON MANAGEMENT

1. How can a team of PSPs benefit the Sales Manager?

2. How does the PSP's sales call communicate the company's Total Quality Management (TQM) philosophy?

3. How would a PSP's sales call reflect a company's implementation of a TQM program?

1. How can a team of PSPs benefit the Sales Manager?

* The PSPs' autonomy allows the sales manager to focus on methods of increasing sales revenue instead of focusing on the management of sales personnel.

* The sales manager becomes part of a topnotched problem solving "team", a focused group working together toward a common goal. The sales manager's team is responsible for selling to and servicing the customers. Team selling is an important trend in today's business environment.

* The sales manager gains more market share as a result of his PSP team's ability to close more sales.

* The sales manager is credited with generating higher profitable sales as a result of the PSPs' ability to perform value-added selling.

* The sales manager is knowledgeable about the direction of the packaging industry because the PSP team is well-informed on current laws, future market trends, and new regulations.

* The sales manager opens new markets as a result of the PSPs' use of product knowledge in uncovering new opportunities.

* The sales manager is confident about staying ahead of the competition because the manager can rely on the PSP team to come up with a way of meeting challenges from other companies.

* The sales manager has a professional image if his PSPs have a professional image. A professional image carries with it confidence, respect and admiration.

* The sales manager's trust increases as a result of the PSPs' ability to perform the specified duties and responsibilities without supervision.

* The sales manager can easily delegate because of the PSPs' ability to accept responsibilities.

* The sales manager can develop performance incentive programs and advanced training programs because the PSP team is capable of using the programs in a constructive manner.

* The sales manager's dream of having a team of specialized trained sales professionals can come true.

* The sales manager becomes enthusiastic and reduces stress as a result of the comraderie and trust between the PSP team members.

* The sales manager has fun managing.

2. How does the PSP's sales call communicate the company's Total Quality Management (TQM) philosophy?

* The PSP plays an important role in communicating the company's customer-first mindset.

  The PSP is the communication link between the company and the customer. In a sales call, the PSP says, "We want to know what you need." and "Here's what we have done to meet those needs." The PSP clearly states that the purpose of the sales call is to uncover the customer's needs and to communicate these needs back to the company. The PSP assures the customer that through the use of product knowledge the customer's needs will be translated into the appropriate specifications for the production of a quality product.

* The following hypothetical quotations are samples of what the PSP would say to the customer during a sales call to explain the foundation of his company's TQM philosophy.

  . . . about why we adopted a TQM philosophy . . .

  "Our company has recognized several problems with the American business culture today. Some businesses appear not to care about meeting the customer's needs. They come across as impersonal and cold, interested only in volume of sales. They manufacture products which must be returned due to poor quality workmanship. 'It's not my job' or 'Who cares' are two attitudes that have destroyed many businesses. Overseas companies' concern for customer needs has allowed them to take customers away from American businesses. Our company's TQM philosophy is addressing these problems. TQM is a committment to meet the customer's needs. If your needs are met, then you will be 100% satified with the results."

  . . . about serving the customer . . .

  "Many people are unclear about what it means to meet customer needs. Schonberger, an expert in the field, says it best, 'I don't mean tender loving care, service with a smile, all returns accepted-no questions asked, ten year warranties, consumer telephone hotlines, and customer satisfaction polls' (1). Total Quality Management means, DOING IT RIGHT and DOING IT RIGHT THE FIRST TIME." TQM means taking care of the customer by producing a quality product to meet the customer's needs.

. . . about meeting the employees' needs . . .

"It is not just the final customer's needs that must be met, it is also the employees' needs, for in a sense they are customers too. Each employee is a customer of the person preceding him in the line of producing and processing an order. Every employee is affected by every other worker in the chain. We encourage our employees to consider the needs of the other people in the organization. As a result we are noticing that each person's job is handled efficiently and our people have a sense of value and cooperation. Our employees are committed to doing quality work and producing a quality product. So, you see, our company is people oriented internally, as well as externally."

3. How would a PSP's sales call reflect a company's implementation of a TQM program?

* The PSP wants to show the customer how the needs are going to be met. In a sales presentation, the power of the sale comes from specifics and details rather than general statements. As a result of knowing in depth how a process will be carried out, the customer begins to feel confident, assured, and relieved that his needs are going to be met.

* The following hypothetical quotations are samples of what the PSP would say to the customer during a sales call to show how the company implements its TQM program.

. . . about dedication . . .

"Our entire company, from the executives to the operators, are dedicated to serving our customers. Every employee decision to change a process or product is made for the purpose of providing better customer service. We are constantly looking for better ways of serving the customer. Programs like employee involvement, cross training or job rotation allow our employees to gain an appreciation for the other workers' job responsiblities."

. . . about continuous improvements . . .

"We make continuous improvements. In order to serve our customer properly we put our entire operation under a microscope, searching for unnecessary steps in the process. We try to uncover and eliminate the negatives of a process. The negatives are time wasters which produce unnecessary costs which in turn are passed along to the customer. In addition to reducing costs, fine tuning the process quickens the response time."

. . . about a quality product . . .

"Every person in our organization wants to ship a quality product. Many companies believe that producing a quality product costs more. Producing a quality product doesn't cost more. In fact, it costs less. According to one expert, 'Many prominent companies have estimated their cost of bad quality. Typically, it turns out to be 15 to 30 percent of sales' (Schonberger 77). We utilize statistical process control techniques, such as process flow charting and fish bone plotting in order to uncover the causes for the negative effects and ensure the production of a cost effective quality product."

. . . about certification . . .

"We know that customers are 100% satisfied when the product meets the appropriate specifications. Certification is a method of written communication stating the product specifications have been met. It generally takes the form of a certificate of compliance. This certificate eliminates the customer's need to perform incoming inspection, thus reducing your time and costs when products arrive."

. . . about on specifications . . .

"'Before a product can be certified, it has to be specified.' (Schonberger 73). Customers order product to specifications. They expect to receive the product according to those specifications. As a result of not meeting specifications, our company would incur a number of unnecessary costs including rework, scrap, warranty claims, and lost customers."

. . . about competitive price . . .

"In order for you to be satisfied with the price, you do not have to pay the lowest price. However, we must make sure that the product meets the need of the application and the price is competitive. We believe our price will be competitive if we have successfully implemented a TQM philosophy. According to a leading TQM authority, if the machines run right, problems with materials are ironed out, and rework and returns are eliminated, the cost of the product will be the lowest (Schonberger 20)."

. . . about reliable on time delivery . . .

"Reliable on time delivery is a result of the dedicated mindset and successful implementation of our TQM philosophy. Reliable on time delivery means when you are given a delivery date, the date is based on facts. Especially, in the case of JIT, your production hinges on us meeting the delivery schedule. If for some reason the date promised cannot be met, we consider it inappropriate to wait until the eleventh hour to notify the customer. Changes do occur, and it would be important to notify you as soon as the change occurs."

. . . about on 100% customer satisfaction . . .

"Our company's goal is to have 100% customer satisfaction. We believe that if we follow a complete TQM philosophy you will be satisfied and we will be the your first choice. Our company's approach is to put ourselves in the customer's shoes. 'Provide to the customer as you would have the customer provide to you' (Schonberger 26)."

* For more information regarding a Total Quality Management philosophy refer to Schonberger.

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