

## TYPES OF BOARD

*Although there are many special types and grades of paperboard, the following list includes those most widely used in the production of folding cartons.*

### CHIP BOARDS

These boards are produced only on combination or cylinder board machines. They are low in cost and are manufactured from primarily recycled fiber.

### BENDING CHIP

Used for the production of many types of folding cartons such as laundry boxes and other throwaway containers. It is composed of mixed fibers and by definition must be able to withstand a single fold of 180° without breakage or separation of plies. It is generally gray or tan in appearance.

### BLEACHED MANILA

Used where good bending qualities and a surface well adapted to color printing are needed. It is made with a chip board base and is lined with a white manila vat liner.

### COATED BOARDS

These multi-layer boards (six to nine plies) are manufactured on a cylinder or combination board machine. They are usually composed of primarily recycled fiber and are used for most better grades of folding cartons.

### PATENT-COATED BOARD

Patent-coated on one or both sides with white virgin pulp or white reclaimed fibers. It is produced in many combinations including patent-coated manila, newsboard and news center-manila black. Cost, quality, or appearance requirements dictate which combination works best for a particular order.

### CLAY COATED BOARD

Used in the production of folding cartons where brightness of color, excellent printing surface and permanence of color are considered essential. It is a high grade paperboard coated with a clay finish.

### CAST COATED BOARD

A high quality boxboard with a glossy finish obtained by pressing the surface against a highly polished surface during the drying process. Excellent where sparkling color is required.

### LAMINATED BOARD

This category of boxboard includes many specialty applications where foil, patterned paper, or any number of other materials are adhered to the paperboard with resin, starch, asphalt or other type of binder.

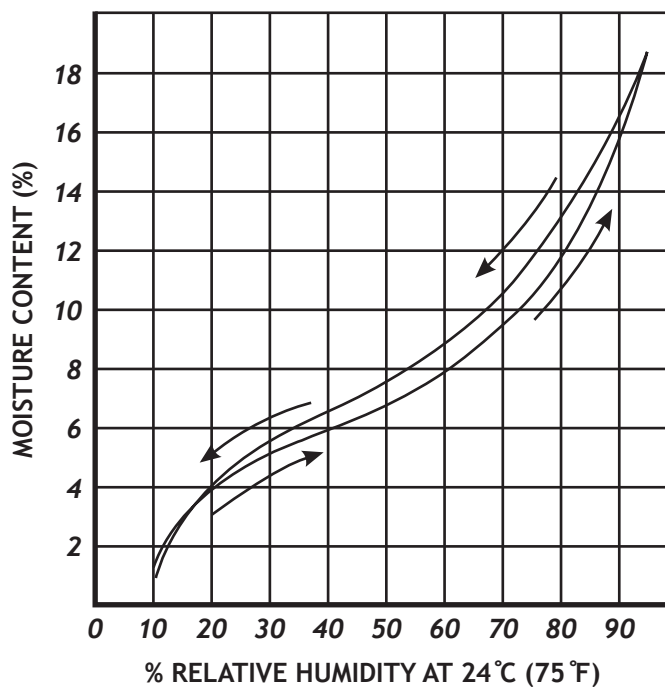
### SULFATE OR KRAFT BOARD

These boards are usually manufactured on a Fourdrinier machine in a single layer and are composed entirely of virgin Kraft (sulphate) pulp. They are produced either as bleached or unbleached board and often are clay coated to provide a white printing surface. There is also a Bogus Kraft which is an adulterated board colored brown to look like unbleached Kraft.

## PAPER - GENERAL MATERIAL SPECS

### Equilibrium moisture content for paper and paperboard.

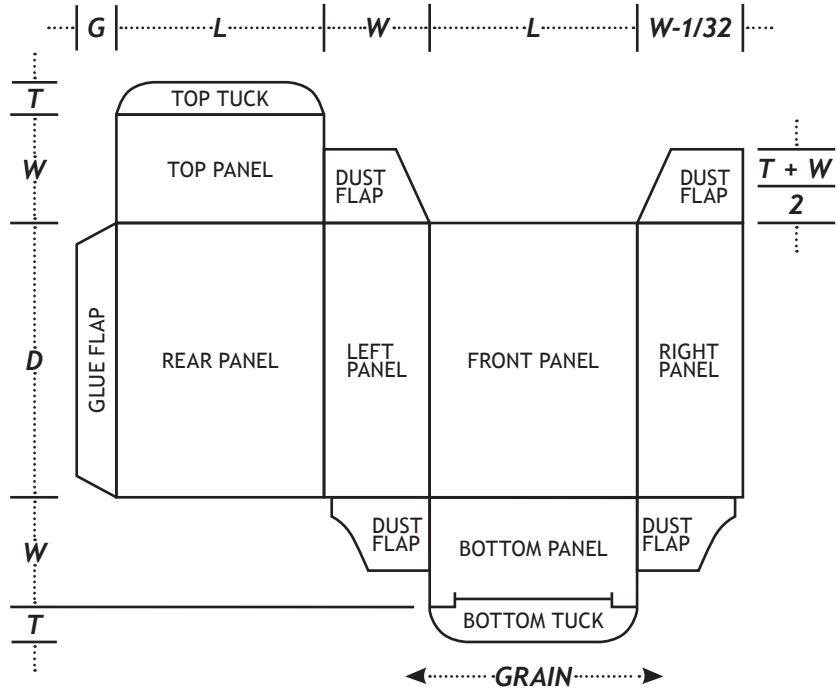
| Temperature<br>°C | Temperature<br>(°F) | Relative Humidity |     |     |     |     |     |      |      |      |
|-------------------|---------------------|-------------------|-----|-----|-----|-----|-----|------|------|------|
|                   |                     | 10%               | 20% | 30% | 40% | 50% | 60% | 70%  | 80%  | 90%  |
| -1.1              | (30)                | 2.5               | 4.3 | 6.0 | 7.3 | 8.3 | 9.6 | 12.3 | 15.5 | 22.5 |
| 4.4               | (40)                | 2.4               | 4.3 | 5.9 | 7.3 | 8.1 | 9.4 | 12.1 | 15.4 | 22.0 |
| 10.0              | (50)                | 2.4               | 4.2 | 5.8 | 7.2 | 8.0 | 9.2 | 11.9 | 15.3 | 21.5 |
| 15.6              | (60)                | 2.3               | 4.2 | 5.8 | 7.1 | 7.9 | 9.1 | 11.7 | 15.2 | 21.0 |
| 21.1              | (70)                | 2.2               | 4.0 | 5.8 | 7.0 | 7.8 | 9.0 | 11.4 | 15.0 | 20.5 |
| 26.7              | (80)                | 2.1               | 4.0 | 5.7 | 6.9 | 7.7 | 8.8 | 11.2 | 14.8 | 20.0 |
| 32.2              | (90)                | 2.0               | 4.0 | 5.5 | 6.7 | 7.5 | 8.6 | 11.0 | 14.4 | 19.8 |
| 37.8              | (100)               | 1.9               | 3.8 | 5.3 | 6.5 | 7.3 | 8.4 | 10.7 | 14.0 | 19.5 |
| 43.3              | (110)               | 1.9               | 3.7 | 5.1 | 6.2 | 7.0 | 8.2 | 10.4 | 13.7 | 19.1 |
| 48.9              | (120)               | 1.8               | 3.5 | 4.8 | 5.9 | 6.7 | 7.8 | 10.1 | 13.2 | 18.6 |
| 54.4              | (130)               | 1.8               | 3.4 | 4.6 | 5.5 | 6.4 | 7.5 | 9.7  | 12.7 | 18.0 |
| 60.0              | (140)               | 1.8               | 3.2 | 4.3 | 5.2 | 6.1 | 7.1 | 9.3  | 12.3 | 17.5 |
| 65.6              | (150)               | 1.6               | 2.9 | 4.1 | 4.9 | 5.8 | 6.7 | 8.8  | 11.9 | 16.9 |
| 71.1              | (160)               | 1.5               | 2.7 | 3.8 | 4.6 | 5.4 | 6.3 | 8.4  | 11.3 | 16.3 |



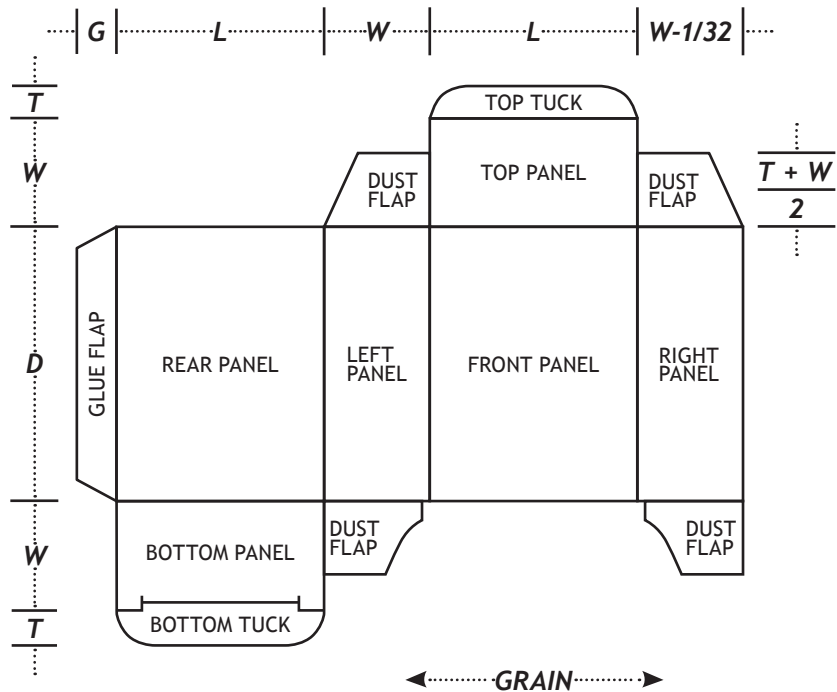
EQUILIBRIUM MOISTURE CONTENT FOR PAPER AND FIBERBOARD.

# FOLDING CARTON LAYOUT

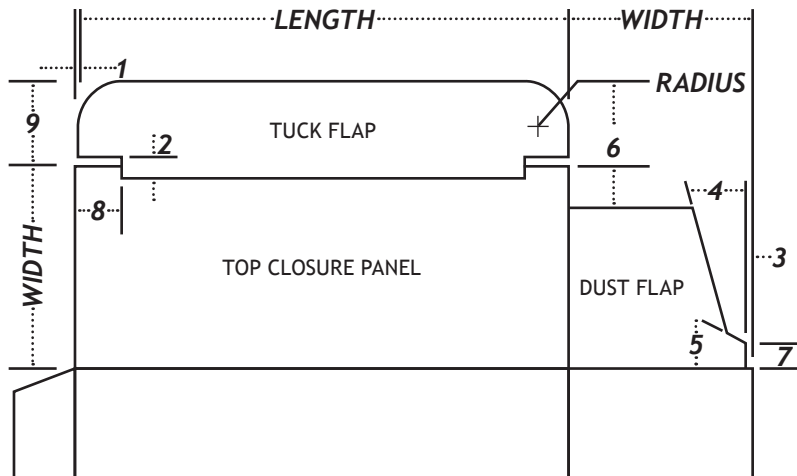
## STANDARD REVERSE TUCK FOLDING CARTON



## FRENCH REVERSE TUCK FOLDING CARTON

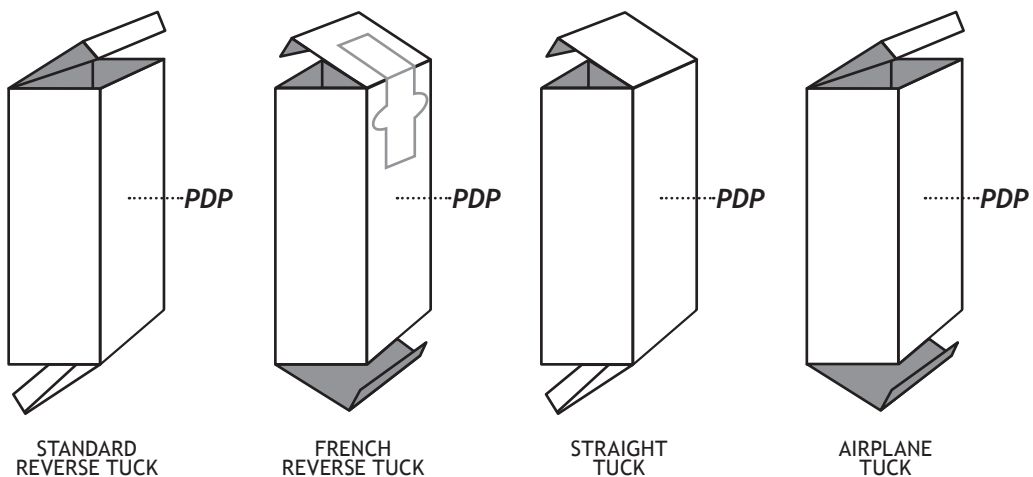


## CARTON DESIGN



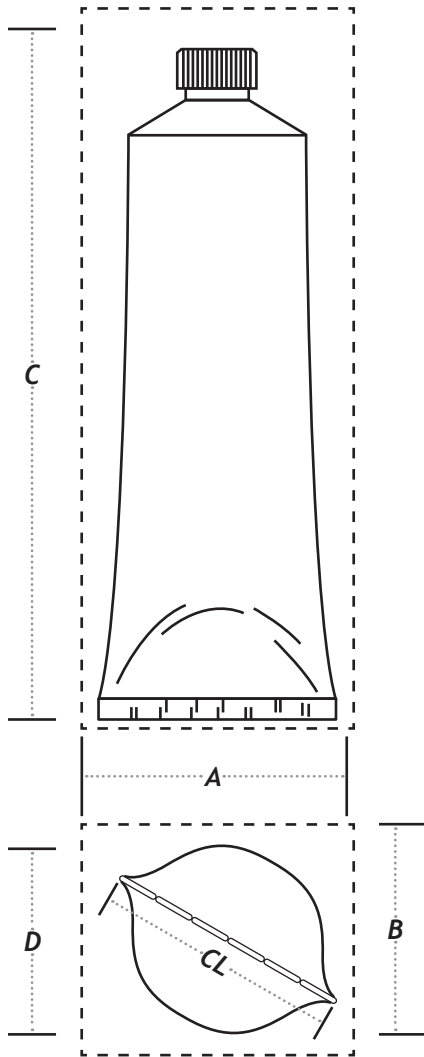
- 1) Tuck flap setback. (Setbacks are typically 0.8 millimetre (1/32 in.) or board thickness.)
- 2) Slit-lock closure panel setback.
- 3) Dust flap setback.
- 4) Dust flap secondary taper, typically 15 degrees.
- 5) Dust flap primary taper, typically 45 degrees.
- 6) Tuck flap shoulder, typically 6 millimetres (1/4 in.).  
The shoulder provides friction against the dust flaps.
- 7) Dust flap shoulder, typically 6 millimetres (1/4 in.).
- 8) Slit-lock width is typically 10 millimetres (3/8 in.) for small cartons.
- 9) Tuck flap depth varies with carton size and shape  
but is typically 20 millimetres (7/8 in.) on small cartons.

Slit-lock tuck closures have slits that engage against the dust flaps to form a more positive closure than a plain friction lock. Slit locks are sometimes called pie locks.



Tuck closures can be arranged to come off in various directions relative to the principal display panel (PDP).

# CARTON SIZING GUIDE FOR TUBES



The carton that holds individual tubes for retail sales are normally made no bigger than necessary to contain the filled tube.

The following rules-of-thumb for sizing tube cartons were developed for this premise:

**LENGTH** - no more than  $7/32''$  greater than length of tube.

**HEIGHT** - no more than  $1/8''$  greater than tube diameter.

**WIDTH** - diameter of tube x 1.57 for tubes less than  $5/8''$  in diameter.

- diameter of tube x 1.25 for tubes more than  $5/8''$  in diameter.

| TUBE DIAMETER "D" | DIMENSION "CL" | DIMENSION "A" | DIMENSION "B" |
|-------------------|----------------|---------------|---------------|
| 1/2"              | 25/32"         | 25/32"        | 5/8"          |
| 5/8"              | 63/64"         | 63/64"        | 3/4"          |
| 3/4"              | 1 11/64"       | 1 1/32"       | 7/8"          |
| 7/8"              | 1 3/8"         | 1 3/16"       | 1"            |
| 1"                | 1 37/64"       | 1 11/32"      | 1 1/8"        |
| 1 1/8"            | 1 49/64"       | 1 1/2"        | 1 1/4"        |
| 1 1/4"            | 1 31/32"       | 1 21/32"      | 1 3/8"        |
| 1 3/8"            | 2 5/32"        | 1 13/16"      | 1 1/2"        |
| 1 1/2"            | 2 23/64"       | 1 31/32"      | 1 5/8"        |
| 1 3/4"            | 2 3/4"         | 2 17/64"      | 1 7/8"        |
| 2"                | 3 7/32"        | 2 19/32"      | 2 1/8"        |

## CORRUGATED CONTAINER REQUIREMENTS

| MAXIMUM WEIGHT<br>OF BOX AND<br>CONTENTS<br>(POUNDS) | MAXIMUM SIZE<br>(O.D.)<br>L+W+D<br>(inches) | MINIMUM<br>COMBINED WEIGHT<br>OF FACINGS<br>(lbs./M sq. ft.) | MINIMUM<br>BURNING TEST<br>(lbs./sq. in.) | MINIMUM EDGE<br>CRUSH<br>TEST ECT<br>(lbs./in. width) |
|--|---|--|---|---|
|--|---|--|---|---|

### *SINGLEWALL CORRUGATED BOXES*

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| 20  | 40  | 52  | 125 | 23  |
| 35  | 50  | 66  | 150 | 126 |
| 50  | 60  | 75  | 175 | 29  |
| 65  | 75  | 84  | 200 | 32  |
| 80  | 85  | 111 | 250 | 40  |
| 95  | 95  | 138 | 275 | 44  |
| 120 | 105 | 180 | 350 | 55  |

### *DOUBLEWALL CORRUGATED BOXES*

|     |     |     |     |    |
|-----|-----|-----|-----|----|
| 80  | 85  | 92  | 200 | 42 |
| 100 | 95  | 110 | 275 | 48 |
| 120 | 105 | 126 | 350 | 51 |
| 140 | 110 | 180 | 400 | 61 |
| 160 | 115 | 222 | 500 | 71 |
| 180 | 120 | 270 | 600 | 82 |

## CORRUGATED CONTAINERS SCORING ALLOWANCES

INSIDE LOSS RESULTING FROM SCORING (CENTER PANEL OF A U SHEET).  
USED WHEN AN EXACT *INSIDE* DIMENSION IS REQUIRED.

| <i>FLUTE</i>       | A    | B    | C     | AB   | BB    | CB    | E    |
|--------------------|------|------|-------|------|-------|-------|------|
| <i>INSIDE LOSS</i> | 1/4" | 1/8" | 3/16" | 3/8" | 5/16" | 5/16" | 1/8" |

WHEN FIGURING SCORED SHEETS USING INSIDE LOSS, THE ALLOWANCES ARE TO BE ADDED.

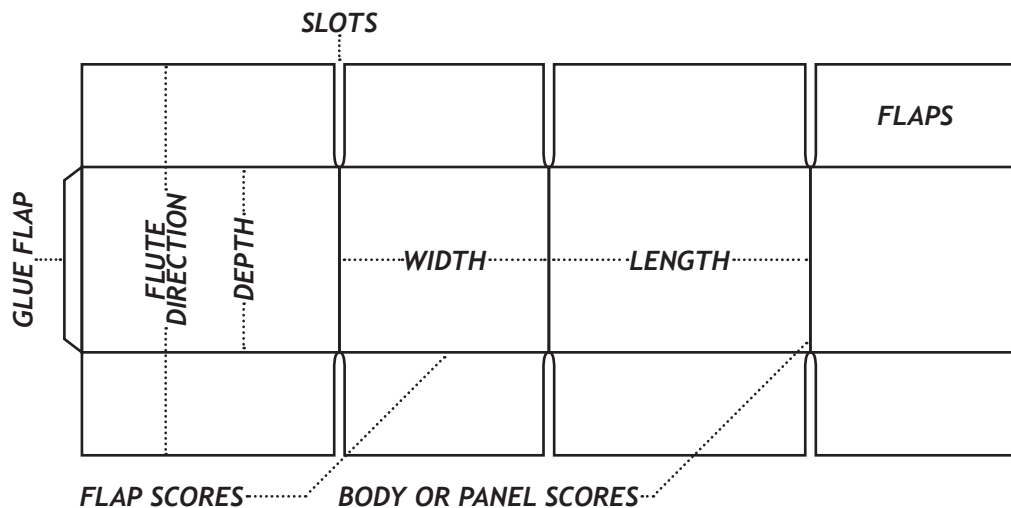
OUTSIDE GAIN RESULTING FROM SCORING (CENTER PANEL OF U SHEET).  
USED WHEN AN EXACT *OUTSIDE* DIMENSION IS REQUIRED.

| <i>FLUTE</i>        | A    | B     | C    | AB    | BB    | CB    | E     |
|---------------------|------|-------|------|-------|-------|-------|-------|
| <i>OUTSIDE GAIN</i> | 1/8" | 1/16" | 1/8" | 3/16" | 3/16" | 3/16" | 1/16" |

WHEN FIGURING SCORED SHEETS USING OUTSIDE GAIN, THE ALLOWANCES ARE TO BE SUBTRACTED.

| <i>FLUTE</i>           | A     | B    | C     | AB    | BB   | CB    | E     |
|------------------------|-------|------|-------|-------|------|-------|-------|
| <i>BOARD THICKNESS</i> | 3/16" | 1/8" | 5/32" | 5/16" | 1/4" | 9/32" | 1/16" |

**DESIGN - SHIPPERS**



**PARTS OF A REGULAR SLOTTED CONTAINER (RSC) BLANK.**

Summary of carrier rules for singlewall and doublewall boxes.

|   |   | TABLE A   |  | TABLE B  |
|---|---|---|--|--|
| Maximum Weight of Box and Contents (lbs.)     | Maximum Outside Dimensions, Length, Width, and Depth Added (inches) | Minimum Bursting Test, Singlewall, Doublewall, or Solid Fiberboard (lbs. per sq. in.) | Minimum Combined Weight of Facings, including Center Facing(s) of Doublewall | Minimum Edge Crush Test (ECT) (lbs. per in. width) |
| <b>SINGLEWALL CORRUGATED FIBERBOARD BOXES</b> |   |   |  |  |
| 20  | 40  | 125   | 52   | 23   |
| 35  | 50  | 150   | 66   | 26   |
| 50  | 60  | 175   | 75   | 29   |
| 65  | 75  | 200   | 84   | 32   |
| 80  | 85  | 250   | 111  | 40   |
| 95  | 95  | 275   | 138  | 44   |
| 120   | 105   | 350   | 180  | 55   |
| <b>DOUBLEWALL CORRUGATED FIBERBOARD BOXES</b> |   |   |  |  |
| 80  | 85  | 200   | 92   | 42   |
| 100   | 95  | 275   | 110  | 48   |
| 120   | 105   | 350   | 126  | 51   |
| 140   | 110   | 400   | 180  | 61   |
| 160   | 115   | 500   | 222  | 71   |
| 180   | 120   | 600   | 270  | 82   |

### **STRENGTHS AND LIMITATIONS OF FLEXOGRAPHIC PRINTING.**

#### ***FLEXOGRAPHY PRINTING STRENGTHS***

Prints well on rough and uneven substrates.

Able to print low-strength and lightweight substrates.

Has wide ink formulation latitude, including good water-based inks.

Prints large solids evenly and with good color consistency.

Printing plates are low in cost (in the same order of magnitude as lithographic plates and considerably less than gravure) and readily made.

Considered to be better than lithography for printing large solids, but not as good as gravure.

#### ***FLEXOGRAPHY PRINTING LIMITATIONS***

Very sensitive to changes in printing pressure.

Subject to halo effects around the edges of line copy.

Screen sizes cannot be as fine as with lithography or gravure.

Halftone dot gain is greater than in lithography and gravure.

Highlight halftone dots tend to disappear, while shadows tend to fill in.

Impractical to adjust colors on the press.

Difficult to make smooth transitions of dot size in vignettes.

Considered not as good at reproducing fine type as lithography but better than gravure.

### **STRENGTHS AND LIMITATIONS OF PRINTING BY OFFSET LITHOGRAPHY.**

#### ***LITHOGRAPHIC PRINTING STRENGTHS***

Plates economical and readily made.

Replacement or corrected plates easily made.

Economical for small runs.

Capable of producing fine reverses and fine lines, and of holding highlight halftone dots better than flexography or gravure.

Can print fairly rough substrates.

Capable of exceptionally fine halftone screens.

Prints well on metal surfaces.

Low halftone dot gain and excellent register.

#### ***LITHOGRAPHIC PRINTING LIMITATIONS***

Paper stocks need to be exceptionally clean.

Heavy paste inks make printing of lightweight substrates (thin papers or films) difficult.

Oil-based inks dry slowly.

Ink formulations are limited because the operating principle is based on the mutual repellency of oil and water.

Color can vary across a sheet or from sheet to sheet.

Oil-based inks and the requirement for dampening can make the printing of plastic substrates difficult.

Relatively complicated compared with flexography and gravure, requiring higher press crew skill levels.

Does not produce large solids as well as flexography or gravure.

Sheet-fed lithography is slower than web flexography or gravure.

## **STRENGTHS AND LIMITATIONS OF GRAVURE PRINTING.**

### ***GRAVURE PRINTING STRENGTHS***

Very high printing speeds and productivity possible.

Exceptionally fine halftone screens possible.

Excellent color consistency over long runs.

Ink cells can be engraved to different depths, allowing for the application of different ink thickness.

Heavy ink applications can be used to give exceptionally bright and glossy colors.

Can print heavily pigmented metallic inks.

Can be used to print lightweight substrates.

Considered to be superior for printing skin colors and uniform heavy solids.

Gravure cylinders are capable of printing several million repeats; flexography or lithography plates need to be replaced several times for long runs.

Press make-ready is fast, and production costs are modest.

Gravure cylinders can be easily stored and remounted for repeat runs.

Continuous repeat is readily available.

### ***GRAVURE PRINTING LIMITATIONS***

Gravure cylinder preparation requires a long lead time.

Gravure cylinders are several times the cost of flexographic or lithographic plates, making the process economical only for long runs.

Does not print well on rough substrates such as uncoated paperboard.

Does not give good resolution of small type, fine lines, and other small details.

Inventory and storage of base and engraved cylinders is costly.

Changing or correcting gravure cylinders is rarely practical.

## **STRENGTHS AND LIMITATIONS OF SCREEN PRINTING.**

### ***ADVANTAGES OF SCREEN PRINTING***

Image carrier (printing plate) is inexpensive and quickly prepared.

Able to print with the greatest variety of ink formulations.

Can print any substrate, including metal plates and some textiles.

Capable of the heaviest ink lay-down of any process and of producing brilliant colors.

Heavy ink lay-down provides high opacity on colored substrates.

Large solid areas are uniformly opaque.

Can be readily adapted to print cylindrical or tapered shapes.

Very large image carriers possible.

### ***SCREEN PRINTING LIMITATIONS***

Production speeds are very low compared to other printing processes.

Heavy ink lay-downs increase ink consumption and cost.

Not able to produce fine halftones.

## THE POWER OF DIGITAL OFFSET PRINTING

In today's retail marketplace, store shelves have many products. The package is the tiebreaker when it comes to which product the consumer picks. Digital Offset Printing can provide many benefits when it comes to package design and short-to-medium runs of multiple SKU's.

Digital Offset Printing provides the benefit of high-resolution four-color process print quality with no make-ready, no separations and no printing plates needed.

### DIGITAL OFFSET PRINTING - BENEFITS:

Digital Offset Printing eliminates the expense of films, plates, or chemistry, and generates little or none of the waste. Plus, it requires far less set-up time.

Digital files are downloaded directly into the Digital Offset Printing System.

Flexible short-to-medium runs.

Superior quality to flexography and equal to offset.

Copy changes in minutes.

Large range of films and paper stocks available.

Great for testing several different product decisions.

Unequaled production turnaround.

Can quickly and accurately review new packaging graphics prior to full-scale production press runs.

Variable information imaging and bar codes, static, random or sequential.

Better inventory management with shorter runs of multiple SKU's.

### DIGITAL OFFSET PRINTING - USES:

Prototypes

Short-to-medium runs of multiple SKU's

Proofing

Sales Samples

Target/Regional Promotions

Private Label Brands

Authentication, Tracing & Tracking

Same Day Proofs/Bids

### DIGITAL OFFSET PRINTING - BREAKEVEN POINT VS. FLEXOGRAPHY: (BASED ON FOUR-COLOR PROCESS ON WHITE PRESSURE SENSITIVE FILM STOCK)

3" x 3"            50,000 labels

5" x 5"            22,000 labels

8" x 8"            8,000 labels

***Digital offset printing is the ideal solution for cost-effective, short-to-medium runs, on demand, full color, high-quality, high-resolution, four-color process labels and promotional products.***