

## Fibrous Materials used in Fibreboard Manufacture

There are four main categories into which the fibrous materials can be placed; three of these categories comprise the lining materials and the fourth is the material that forms the corrugations. These four categories are:

1. Kraft
2. Test
3. Chip
4. Fluting

Although there are variations within each group, materials will nevertheless conform to the general definitions of that group.

### 1. KRAFT

Kraft liner represents the top material grade in terms of physical properties used in the corrugated industry. In general these liners are made from softwood pulp (ISO 4046) although many sources of Kraft liner now also incorporate pulp from harder wood sources such as birch. (It should be noted that true hardwoods - such as Amazonian Teak or Mahogany are totally unsuitable for papermaking). Most sources of Kraft liner also incorporate recycled fibre in varying amounts, depending on the manufacturer.

#### Brown Kraft

This material is naturally brown in appearance and the shade varies depending on the location of the mill, the source of fibre and the pulping process.

#### White Top Kraft

White Top Krafts were developed to produce a good white appearance, with Kraft strength characteristics, but at a lower cost than traditional

#### Bleached Krafts

##### (i) White Top Kraft

A top skin of Bleached Kraft fibres on a Brown Kraft fibre base.

##### (ii) Coated White Kraft

A white coating, usually China Clay based, on a White Top Kraft or Bleached Kraft fibre base.

The whiteness and appearance of White Top liners will vary according to the thickness and profile of the outer skin. Where the shade of white liner is important for high quality print, large users may be able to agree with the manufacturer a specific quality of shade of liner.

#### White Mottled Kraft

White Mottled Krafts (sometimes known as 'Oyster') are produced by the same process as White Top liners with the skin of white being randomly distributed to give a mottled appearance.

#### Bleached Kraft

As its name implies, Bleached Kraft is produced by the same process as natural Kraft with the addition of a bleaching stage in the pulping process. This produces a material which is white in appearance but with some loss of strength against the unbleached Kraft. The stronger grades of Bleached Kraft tend to be translucent, whilst others have fillers to improve the opacity of the material. Bleached Krafts are less widely used nowadays with the development of White Top Krafts.

#### Birch Faced Kraft

The base ply is usually the same as for a White Top Kraft. The top ply is of Birch fibres which are bleached by an Oxygen based technique, which does not involve the use of chlorine compounds. This slightly lowers the overall environmental impact of the process, but the best whiteness levels that can be achieved are lower than those that can be achieved for White Top Krafts.

### 2. TEST

It is becoming common to categorise brown Test liners within three classes: (Note: The Groupement Ondule

**REVIEWED: NOVEMBER 2007**

Classification is commonly used)

- (i) TL1 - Test Liner 1
- (ii) TL2 - Test Liner 2
- (iii) TL3 - Test Liner 3

Precise and agreed definitions for the three classes are not yet available across the industry. However, the following definitions should serve as a useful guide between the three classes: (Note: All types of test liner use predominantly recycled fibre)

**(i) Test Liner 1 (TL1)**

TL1 Test liners form the rarest group of liners. They usually have a Ring Crush Test value (RCT) similar to that of Kraft at the same Grammage, with a Burst Index of over 3.0 kPa per g/m<sup>2</sup>. (Kraft is usually over 3.5 kPa per g/m<sup>2</sup>).

The top surface of a TL1 liner will be almost indistinguishable from a Kraft liner in appearance and will generally contain a high proportion of long fibres. TL1 liners should normally be suitable for use wherever Kraft liners may be used.

Sources are usually Duplex or Multi-ply\* and are sized.

\* See Working Definitions below for explanation of terms).

**(ii) Test Liner 2 (TL2)**

TL2 Test liners will usually have an RCT value that is 90% (or more) of that of Kraft at the same Grammage, with a Burst Index of over 2.5 kPa per g/m<sup>2</sup>.

The top surface of a TL2 liner will be almost indistinguishable from a Kraft liner in appearance and will contain a high proportion of long fibres. TL2 liners may be suitable for use wherever Kraft liners are used.

Sources are usually Duplex or Multi-ply\* and sized.

**(iii) Test Liner 3 (TL3)**

TL3 Test liners will usually have an RCT value that is 75% (or more) of that of Kraft at the same Grammage, with a Burst Index of over 2.0 kPa per g/m<sup>2</sup>.

TL3 liners vary more widely than TL1 or TL2 liners in colour and appearance (spots etc.) from one source to another. The final shade may be a result of dyes as well as the source of fibre being used. TL3 liners are

most often used as inner liners, or as outer liners where appearance is not critical.

Sources may be Single-ply\*, Duplex or Multi-ply\* and are available sized or unsized.

**White Top Test**

White Top Tests are usually Duplex\* materials comprising a base layer of recycled fibre on which a layer of white fibre is laid. Some sources use recycled fibre in the white layer, others use Bleached Kraft fibre.

Coated White Top Tests have a China Clay based coating, are available to give the smoothest, whitest, surface for high quality printing.

As with White Top Krafts, the whiteness and appearance of white top liners will vary according to the thickness and profile of the outer skin.

Where the shade of white liner is important for high quality print, large users may be able to agree with the manufacturer a specific quality of shade of liner.

**White Mottled Test**

White Mottled Tests are produced by the same process as White Top Test liners, with the skin of white being randomly distributed to give a mottled appearance.

**3. CHIP**

Chip liners are manufactured from recycled fibre and are usually unsized. Their use is normally restricted to applications as an inner liner and/or centre liner in double wall board, but can be used throughout in the manufacture of fittings as appropriate.

Chip liners are available in dyed (brown) or undyed (grey) versions.

In Solid Fibreboard manufacture, the Chip board used is also known as Container Middles.

**4. FLUTING**

Flutings fall into two categories:-

**(i) Recycled Fluting**

Recycled flutings are made from 100% recycled fibre, which come from selected grades of waste paper. RCT Rigidity and Concora strength properties are usually

enhanced by the addition of chemicals and starches.

### **(ii) Semi-Chemical Fluting**

Semi-Chemical fluting is manufactured from hardwood pulp. Typically, Semi-Chemical flutings will contain a proportion of recycled or softwood fibres.

Semi-Chemical fluting is commonly used for heavy duty packaging and in some instances where high humidity conditions are expected.

### **NOTE ON MATERIAL SHADES**

Many of the materials used in corrugating are variable in shade due to the inherent nature of the raw material whether the raw material is a tree, (pine trees differ depending on species and where grown) or recycled fibre. Variations will also exist from mill to mill in the degree and type of cleaning and preparation that is done on the fibres during papermaking. Even the most consistent paper manufacturers exhibit minor shade variation from batch to batch.

### **WORKING DEFINITIONS**

#### **Simplex**

Defines a paper that has only one ply and is homogenous in that it is of the same fibre mix. Dye may be added to the fibre mix to maintain colour consistency.

#### **Duplex**

Defines a two-ply paper. It is specifically a paper having two different fibre mixes for each ply and would commonly consist of a top ply of better quality selected or fractionated recycled fibre, cleaner than the backing ply and to which dye may be added to maintain colour consistency.

#### **Triplex**

Defines a three-ply paper and could have three different fibre mixes for each ply. It commonly consists of a top ply of better quality selected, or fractionated recycled fibre, cleaner than the inner and backing plies and to which dye may be added to maintain colour consistency.

#### **Multiplex**

Defines a paper consisting of more than three plies of different fibre mixes. It would commonly consist of a top ply of better quality selected, or fractionated recycled fibre, cleaner than the inner and backing plies

and to which dye may be added to maintain colour consistency.

#### **Ring Crush Test**

(RCT) Rigidity A paper test that indicates the contribution the paper will make to the compression strength of the final packaging (measured in Newtons (N)).

#### **Concora (CMT)**

A paper test for fluting materials that indicates how well the fluting will resist crushing forces in the combined board (measured in Newtons (N)).

#### **Burst (Mullen Burst)**

A paper and fibreboard test that indicates the contribution a paper will make to the ability of the final packaging to retain its contents. A low Burst paper will tear easily (measured in Kilo Pascals (kPa)).

#### **Sizing**

Sizing chemicals are added to fibres in the paper making stage to increase the resistance of the paper to the penetration and spreading of aqueous liquids such as inks.