



PRO CARTON
PACKAGING FOR
A BETTER WORLD



CARTON &
BOARD MAKING

**FOLDING
CARTONS**



PRO CARTON
PACKAGING FOR
A BETTER WORLD

THE BENEFITS OF CARTON DESIGN

WHAT IS MEANT BY “CARTON DESIGN”?

The design process is the procedure whereby the specification of a carton is developed. This involves its appearance: size, shape, printing, and function: product protection and efficient performance in manufacturing, packing and use.

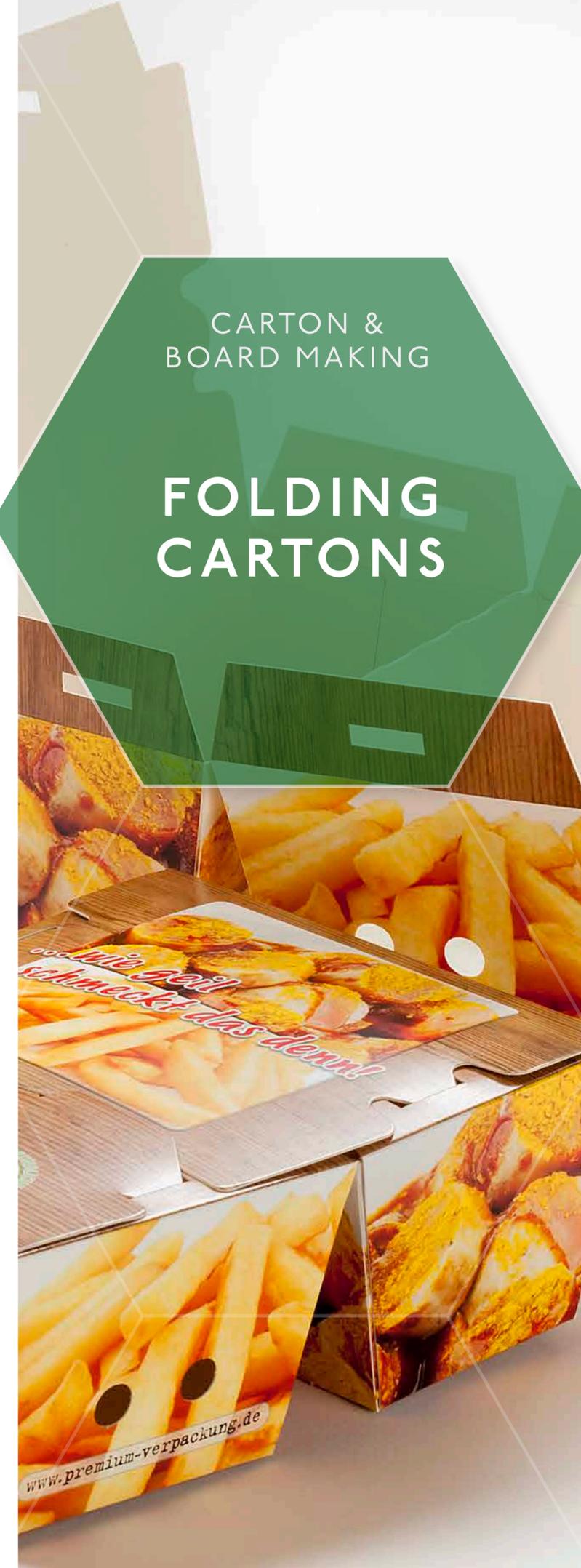
Every carton is a specially created, customised design where the needs of the product, the market and the consumer are imaginatively met. It is recommended that a checklist of the requirements for the carton be established at the start of the design process to ensure that all the requirements are evaluated during the design process.

A major benefit of the carton design process is that “tooling” for a new or modified design is relatively inexpensive. Traditional graphical and structural design techniques have been augmented with computer aided software. This means that new concepts and prototypes can be produced for evaluation cheaply and quickly.



CARTON &
BOARD MAKING

**FOLDING
CARTONS**





PRO CARTON
PACKAGING FOR
A BETTER WORLD



THE DESIGN PROCESS

HOW ARE CARTONS DESIGNED TO CREATE IMPACT AND VISUAL INTEREST?

Folding cartons create impact and visual interest through surface design and carton shape. Surface design is achieved in a number of ways:

- Use of colour, illustrations, text and by a glossy or matt surface finish by printing and varnishing.
- Choice of cartonboard surface - whiteness, smoothness and surface finish (glossy, satin or matt). A more premium effect can be created on the inside of a carton, where appropriate, by using a cartonboard with a white reverse side.
- Metallic effects by printing, lamination with aluminium foil and the application of hot or cold foil.
- Special effects by plastic film lamination with OPP (oriented polypropylene), PVC (polyvinyl chloride) or cellulose acetate.
- Surface texture by embossing the carton, either overall or to emphasise specific text or other design features.

STRUCTURAL DESIGN OF THE CARTON SHAPE CAN INCLUDE:

- Three dimensional shapes with rectangular or square panels.
- Cartons with double thickness walls, cavity walls and hinged lids.
- Hexagonal, triangular, pyramidal, circular, domed and elliptical shapes.
- Cartons incorporating special features to facilitate opening and reclosing, carrying handles, pourers, windows and internal platforms to secure and/or display the product.
- Shapes with tapered sides.
- Designs with leak-proof and sift-proof corners.
- Two dimensional wallet shapes.

CARTON &
BOARD MAKING

**FOLDING
CARTONS**





PRO CARTON
PACKAGING FOR
A BETTER WORLD

CARTON DESIGN AND CONTAINMENT

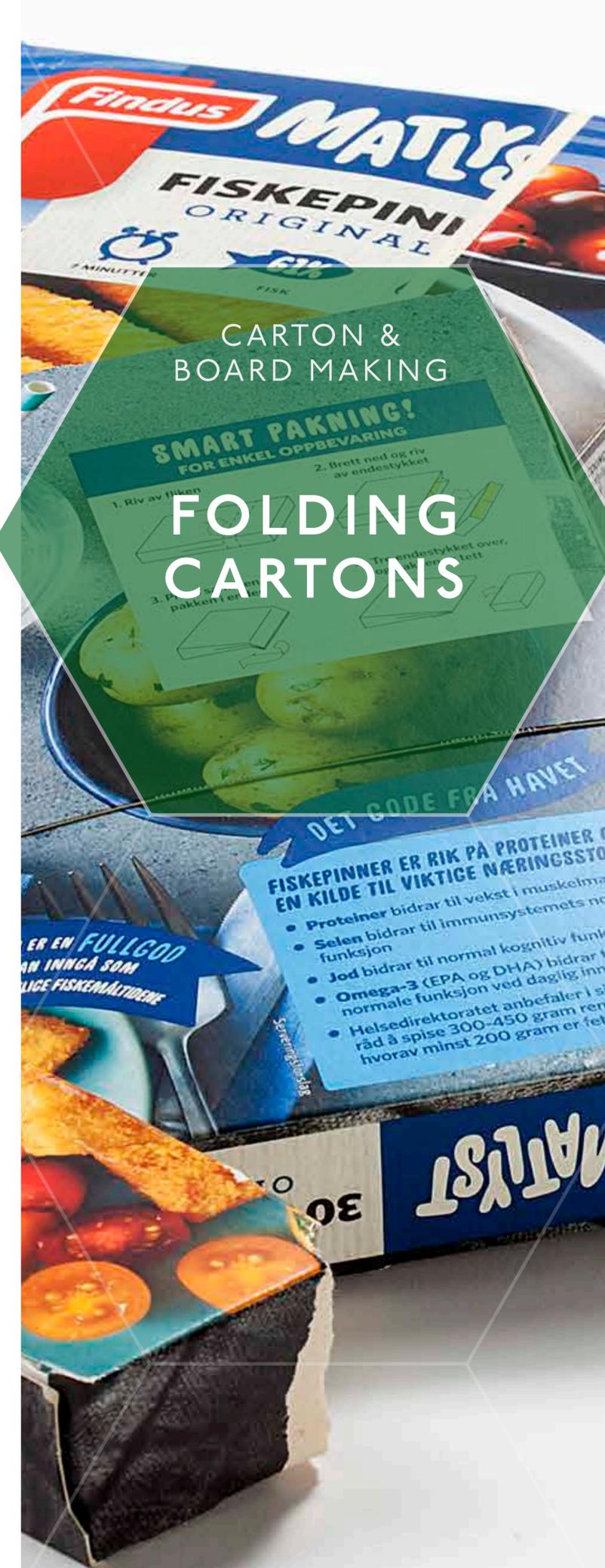
HOW ARE CARTONS DESIGNED TO PROTECT THE PRODUCT?

Product protection and preservation depends on the product as well as the methods of packing, distribution and use throughout the required life span of the product.

“Protection” is usually taken to refer to the adequate containment and protection from breakage through physical or mechanical damage. “Preservation” means the maintenance of the intrinsic integrity of the product. This mainly refers to food products and those non-food products with special features, where the product is in direct contact with, or in close proximity to the cartonboard.

The design features relating to performance include the choice of cartonboard and its strength, which in turn is determined by grade, grammage and thickness. Specific requirements may require structural features such as the need to be sift-proof or liquid tight, and provide for easy opening and reclosing. Product protection may require cartonboard with a plastic extrusion coating or lamination. In addition to the strength of cartonboard, the structural design also contributes strength through the use of features such as double or cavity walled panels and the design of closures.

Brand owners are increasing their efforts to reduce plastic materials and use mono material (cartonboard) as their preferred choice of packaging. The share of plastic materials plays an important role in the recycling process. In most countries limits are defined at a maximum between 5-10% share of the total weight.



CARTON &
BOARD MAKING

FOLDING CARTONS



PRO CARTON
PACKAGING FOR
A BETTER WORLD



CARTONBOARD AND THE PRINTING PROCESS

HOW DOES CARTONBOARD INFLUENCE DESIGN?

The important features of cartonboard are that it can be printed, cut, creased and erected into a wide range of shapes by folding, gluing and interlocking.

These features are underpinned by the properties of the material, which in turn depend on the fibres, pigmented mineral coatings and the method of cartonboard manufacture.

The strength of cartonboard is particularly important in order to protect the products through their life cycle. However, the strength of the board is also important during the process of manufacture, at the point of printing, cut and creasing, and gluing followed by distribution and storage and through to the point of sale to ensure the product presents the brand value. The choice of fibre, mineral pigment and other treatments should be considered carefully wherever consumable products are packed in direct contact or close proximity to the cartonboard, especially where the products have particular preservation needs in terms of maintenance of delicate flavours and aromas.

The properties of cartonboard can be augmented through the use of plastic laminations, surface coatings and impregnations - to give properties such as heat sealability, heat resistance, water resistance, moisture impermeability, grease resistance and product release (non-stick).

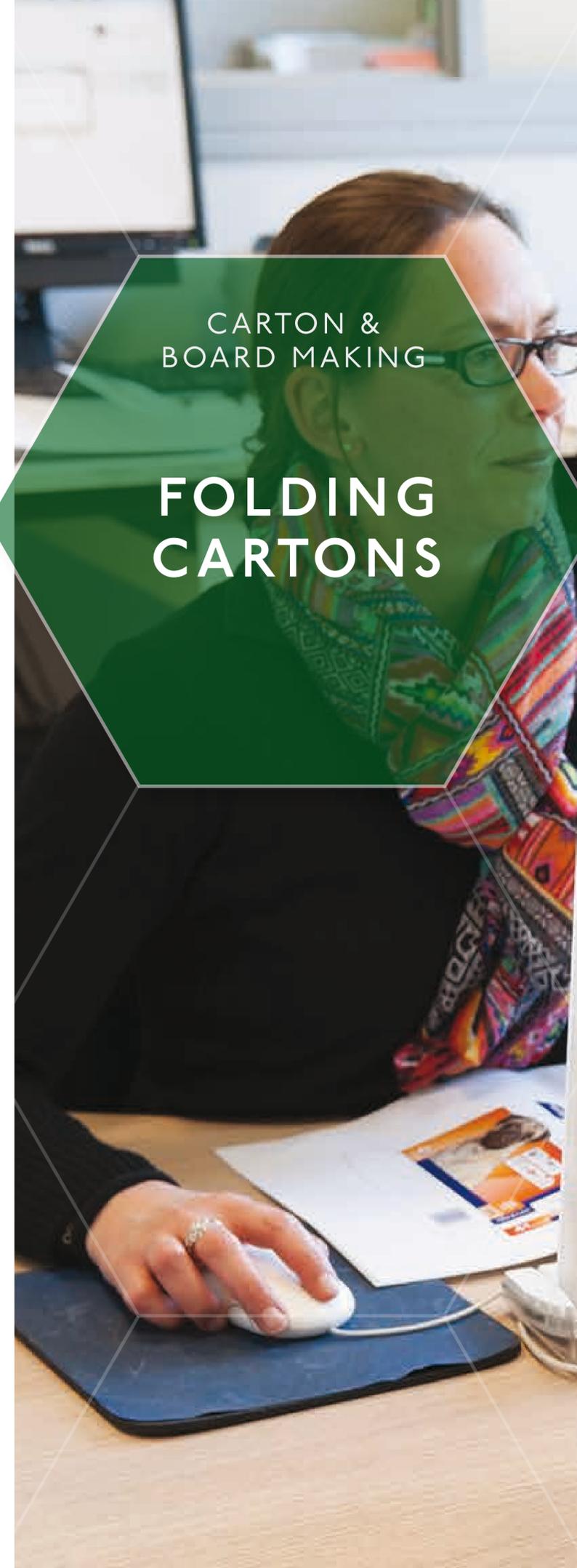
HOW ARE CARTONS PRINTED?

The most common print processes for printing folding cartons today are: offset lithography, gravure and flexography. In carton manufacture, cartonboard is usually printed in sheet form whilst gravure and flexographic printing is predominantly carried out on reel-fed presses.

All printing, except digital printing, requires a printing surface, (known as a plate or cylinder), carrying an image to which ink is applied. The ink is then transferred to the surface of the cartonboard.

CARTON &
BOARD MAKING

**FOLDING
CARTONS**





PRO CARTON
PACKAGING FOR
A BETTER WORLD

CARTONBOARD AND THE PRINTING PROCESS

In offset lithography the printing plate accepts ink for image areas whilst non-image areas reject ink. The term “offset” is used because the image is transferred to a cylinder covered with a rubber blanket and from there it is offset to the surface of the cartonboard. The inks normally used are viscous oil-based inks which dry by oxidation. Specially formulated inks are also used which dry instantly on the press using UV (ultra-violet) radiation.

With the gravure system the plate comprises of a steel cylinder with a copper shell. The image is etched chemically or by laser, with millions of tiny cells. The cylinder is then chromium plated to reduce wear and extend the life of the cylinder. The ink is carried in the cells and any excess on the surface is removed with a doctor blade. The inks are solvent based and dry by evaporation of the solvent using hot air. UV cured inks and varnishes are also used.

In flexography the image is raised above the surface of the plate or cylinder. The printing image is hardened in those parts of the surface to which ink is to be applied and the material in the non-image areas is washed away. The inks are also solvent-based and UV formulations are also used.

Letterpress, digital and silk screen printing are also used to a very limited extent.

WHICH IS THE BEST PROCESS FOR PRINTING CARTONS?

There is not a straight forward answer to this question. The best process and type of ink and varnish for any given print enquiry will depend on a number of interacting factors:

- Quality of printing required
- Run length
- Lead time
- Product to be packed
- Cost
- Complexity of artwork

The best advice is to discuss the proposed print job with printing experts at the design stage.



CARTON &
BOARD MAKING

FOLDING
CARTONS





PRO CARTON
PACKAGING FOR
A BETTER WORLD

CARTON MANUFACTURE

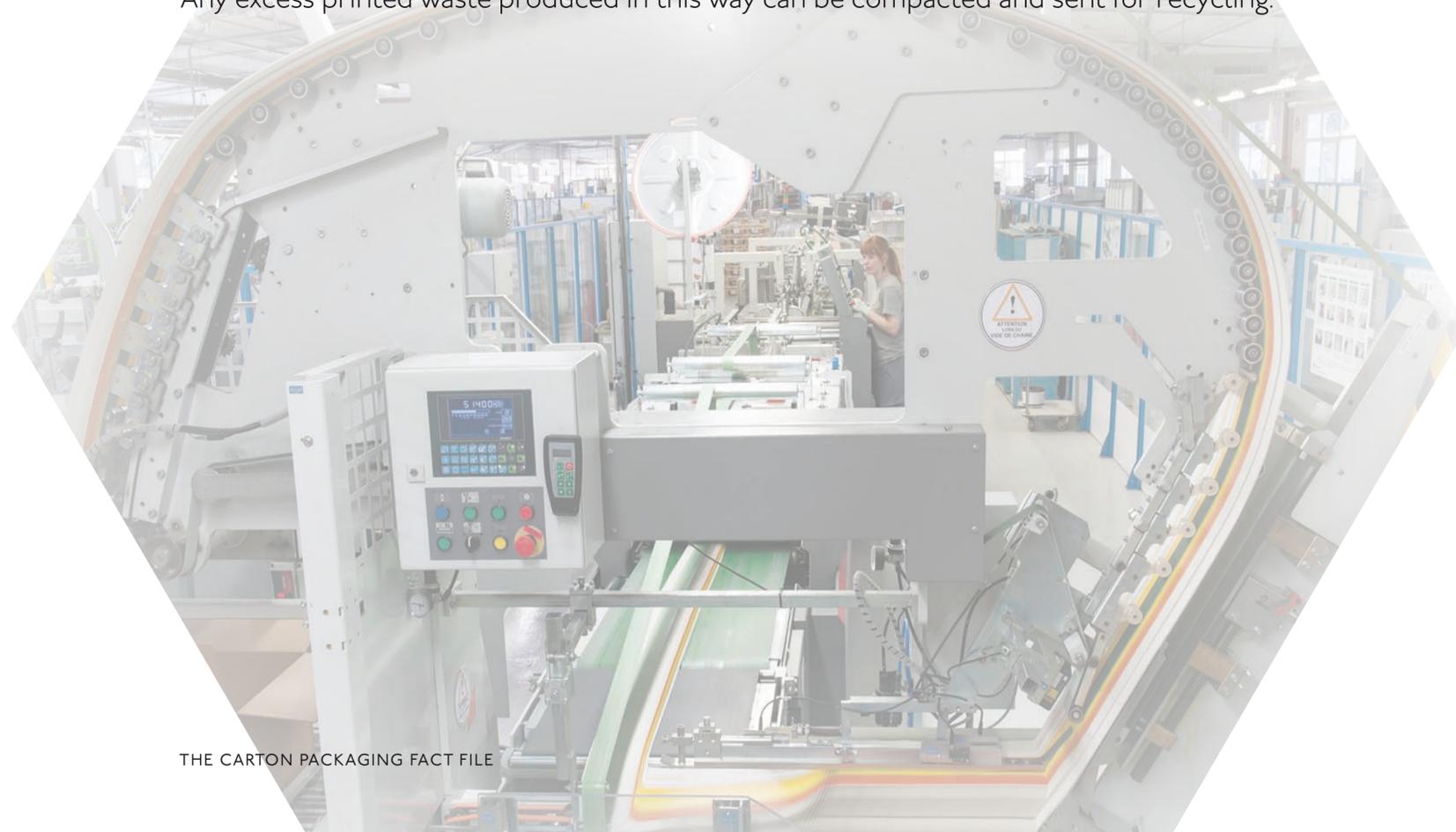
HOW IS THE CARTON PROFILE PRODUCED?

This is performed using a cutting and creasing machine and a metal die in the shape of the final profile of the carton. The die comprises sharp cutting rules to cut the carton profile, perforations and windows, together with slightly shorter creasing rules which have rounded ends to indent the board surface where the creases are required. The groove of the crease is formed by having a channel cut in a special backing material applied to the cutting plate so that the board is forced into the channel. Creases are subsequently folded.

When cutting and creasing takes place from the reel it can be carried out either with a flat forme or from a circular cylinder mounted forme. In the latter case two separate cylinders may be used, one for creasing followed by another for cutting.

Embossing and hot foil stamping features in a design may be carried out at the same time as cutting and creasing.

As a consequence of cutting and creasing a certain amount of cartonboard waste has to be removed. This is done by "stripping" and it is normally carried out automatically using a stripping unit on the cutting and creasing machine. Any excess printed waste produced in this way can be compacted and sent for recycling.



THE CARTON PACKAGING FACT FILE



CARTON & BOARD MAKING
MEMBER OF BPA

FOLDING CARTONS





PRO CARTON
PACKAGING FOR
A BETTER WORLD

CARTON MANUFACTURE

WHAT OTHER PROCESSES ARE USED IN CARTON MAKING?

Several processes can occur in carton making after cutting and creasing.

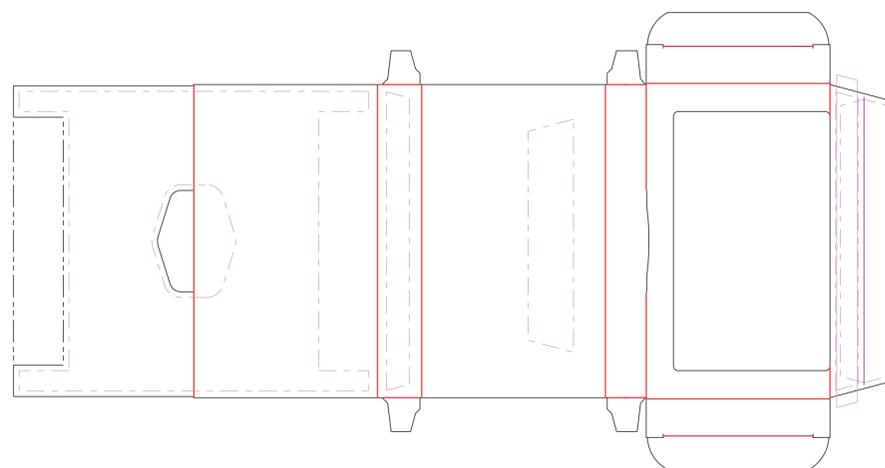
The most important of these processes is folding and gluing on a machine known as a straight line folder gluer. The most common carton design has four panels and a fifth narrow side seam. In the gluing operation the side seam is glued to the underside of the first (opposite) panel. At the same time the carton is folded flat and the other two creases are folded over (pre-broken) as far as possible. This achieves two important features of folding cartons. Firstly, the flat glued carton takes up as little space as possible for storage and transportation to the FMCG company, end-user or customer and, secondly, the pre-broken creases enable the carton to be easily erected at the packing stage.

Straight line folder gluers can also be used to glue other designs e.g. cartons which form internal fitments, double walls and cavity walls.

The carton maker can also produce a side seam glued carton with a crash lock glued end and tray designs with four or six point corner gluing - all designs which can be folded flat for storage and transportation to the FMCG company, end-user or customer.

Windowing is a design option that provides product visibility. A window is cut into the carton blank at the cutting and creasing stage and then a plastic film window is applied on a windowing machine. Windowed cartons are often designed with internal platforms to locate and display the product. These can be integrally created at the cutting and creasing stage and designed so that all the panels can be folded together and the window blank side seam glued.

There are several options whereby wax can be applied to a carton blank. It can be applied to either one or both sides. This can either be in the form of "dry" waxing which impregnates the board, though an uncoated strip can be left uncoated for subsequent gluing, or "wet" waxing where immediately after waxing the blank is plunged into very cold water thereby creating a high gloss finish. High gloss waxed cartons can be heat sealed after filling. Waxed cartons are used for frozen foods, ready meals and ice cream.



CARTON &
BOARD MAKING

**FOLDING
CARTONS**



PRO CARTON
PACKAGING FOR
A BETTER WORLD

FOLDING CARTONS - END USE

The carton designs discussed so far are sent to the end-user glued. Alternatively, some carton blanks are sent straight to the FMCG company, end-user or customer as “flats”, usually in pallet form, after cutting and creasing.

HOW ARE CARTONS PACKED?

Pre-glued cartons and carton flats are erected, filled and closed by the FMCG company, end-user or customer. Cartons can be erected, filled and closed by hand at speeds up to 20 cpm (cartons per minute).

Many operations require higher speeds and an important advantage of the folding carton is that whatever the packing speed required there is a mechanical system available. Mechanically assisted packing with some of the operations, such as product insertion carried out by hand, can be achieved at speeds of up to 40-60 cpm. Typically fully automatic carton packing speeds are in the range 60-240 cpm. The highest speed of packing is for cartons containing 20 tobacco (sticks) where there are many machines running at 400-700 cpm and some can reach speeds of 1000 cpm.

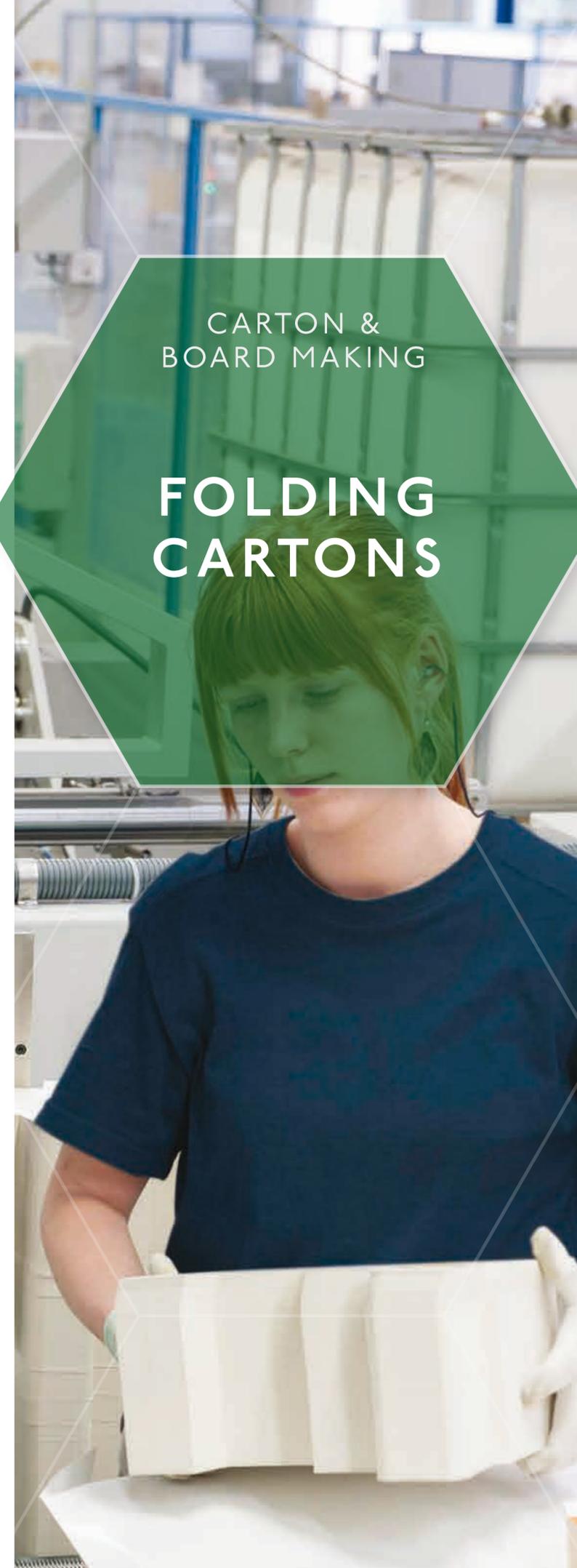
Speed alone is not the only consideration. Depending on the product mix and range of carton sizes required to be packed within a given time, it may be that carton and/or product change over time is a more critical requirement which has to be met.

Filled cartons are usually collated in groups for distribution (secondary packaging). Various styles of pack can be used, e.g. corrugated board outer cases and cartonboard trays or sleeves. Groups of individual cartons can be stretch-wrapped in plastic film. Some types of secondary packaging can be designed to be “shelf ready”, i.e. suitable for direct placement in retail display.



CARTON &
BOARD MAKING

FOLDING
CARTONS





PRO CARTON
PACKAGING FOR
A BETTER WORLD



WHAT ARE THE KEY BENEFITS OF FOLDING CARTONS?

- Cartons are considered by consumers to be a renewable and fully recyclable packaging material.
- Well established and trusted recycling infrastructure is in place: cartons are recycled to recover valuable fibre.
- Cartons create impact and visual interest through print, colour, surface design and shape.
- Promotion of the product through visual impact at the point of sale.
- Creative, innovative design potential in print, surface texture and structural shape.
- Product protection and increased shelf life.
- Prototypes can be produced quickly.
- Flexibility in the specification of cartonboard, carton making and packaging operation.
- Carton production and packing is based on well-proven technologies.
- Short production lead times enable end-users to respond to changing market conditions such as surges in volume and the need for promotions.
- Efficient use of space in palletisation, transportation and in merchandising at the point of sale.
- Carton manufacturing and packaging machinery technology is well established. Cost effective manufacturing and packaging routes can efficiently handle small, medium and high volumes.

CARTON &
BOARD MAKING

FOLDING CARTONS





PRO CARTON
PACKAGING FOR
A BETTER WORLD

ACKNOWLEDGEMENT

Pro Carton would like to thank the following companies for contributing both information and images to support the creation of these Fact Files:



CARTON &
BOARD MAKING

**FOLDING
CARTONS**