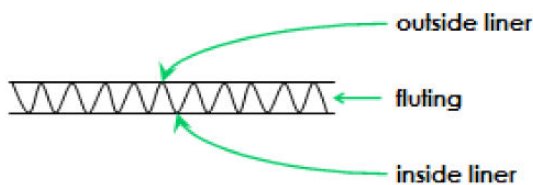


Production of corrugated board

The corrugator

Corrugated board is produced by a machine comprising several units, with a total length of approximately 120 metres. The corrugators are available in machine widths from 1.7 to 3.3 metres. The highest production speed is around 400 metres per minute.

The functions of a corrugator



Paperboard for the production of the fluting is unwound from a roll stand, then transported over the conditioner and the pre-heater to the spray damper, where it is heated and humidified to achieve elasticity. The paper is then run between two corrugating rolls and formed into fluting, through the application of high pressure. Glue is then applied mechanically to the tips of the flutes. The fluting is then glued to the liner paper by a pressure roll, to form single face corrugated board. A second piece of liner paper can be applied to the other side of the fluting, to produce standard "single wall" corrugated card (see picture above).

Each step of this process is detailed below.

The corrugator in detail

Unwinding

The paper rolls are picked up in the first stage. These paper rolls are up to 1.5 metres in diameter and up to 3.3 metres wide. They can weigh up to several tons. The paper rolls are taken up by pick-up arms that are adjustable at the sides to fit various roll sizes. Braking systems ensure that the paper webs can be slowed to conform to production.

Splicer

This makes the uniform running of the plant possible and ensures an instant roll change. Splicing takes place when a new web is glued to the web currently being processed by means of a splicer band. The storage container is simultaneously disconnected and the

web in the storage container is released and accelerated to the appropriate production speed.

Preheating cylinder and conditioner

The paper coming from the supply roll must be pre-heated before it can be used as corrugating medium or facing. That is essential in order to make the following gluing process possible. The temperature in the preheating cylinder is about 180°C and the steam pressure approximately 15 bar.

Spray damper unit

At this stage the preheated corrugating medium is damp sprayed at 2 bar pressure to make it soft and formable.

Corrugating rolls

The profile of the corrugating rolls, over which the pre-heated paper is drawn, defines the type and height of the flutes. The corrugating rolls are made of chrome-molybdenum steel and are coated to withstand a pressure of 15 bar. In normal circumstances the rolls have a life-span equal to the running of about 20 to 45 million metres of paper. Multifunctional corrugated board machines have been developed to facilitate production of as many different flute profiles as possible. The most common flute profiles are C,B and E.

Pressure roll

The next step is the gluing together of the facings/liners and the fluted medium. To ensure that both papers can be glued together well, a high temperature and great pressure is necessary, for which reason the pressure roll is heated internally with steam. The gluing together of the fluted medium and the facings takes place under pressure against the smooth steel roller. Modern machines have pressure belts instead of pressure rollers to minimize the ribbing and to allow a printing on both sides.

Transporting bridge

Single face corrugated board must, when not rolled up in a separate roll cutter and coiling stand, be transported further for gluing to the liner paper. The transporting bridge, a metal stand with transport rollers and belts, is used for this purpose.

Laminating unit

Glue is applied to the tips of the flute of the single face corrugated and then the pre-heated liner paper is glued to the single face corrugated at the beginning of the drying unit.

Drying unit

The liners and corrugating medium are brought together between hot plates and an overhead transport belt. The temperature of the plates, the speed, the belt-load and the

composition of the glue are all vital factors for perfect adhesion. Weighted rolls bring the corrugated board into uniform contact with the hot plates, which ensures uniform heat distribution and guaranteed adhesion.

Short cross-cutter

The short cross-cutter is the next stage after gluing. It separates the corrugated board web in case of format changes and also cuts off the waste. In more modern plants the short cross-cutter is usually computer-controlled for automatic size change.

Slitting and scoring unit

In this stage the corrugated board is prepared for further processing. According to what is necessary for the desired packaging, the web of corrugated board is cut into strips lengthwise, into two or more narrower ribbons, and scored. Exact scoring is extremely important for the further processing of the sheets, and there are accordingly many different scoring profiles. Scoring is always carried out across the direction of the flutes.

Cross cutter

This element of the corrugator cuts the endless web into sheets of the desired lengths by means of revolving upper and lower knife blades that must be well adjusted. Moreover, they must have the same speed as the corrugated board at the moment of cutting. Duplex cross cutters are generally used, which are capable of cutting two different lengths at the same time.

Stacker

This unit collects a specific number of sheets on conveyer belts. The stacker is fitted with counting devices. The sheets are automatically stacked for later processing or conveyed directly to the next machine.

Monitoring and control system

The corrugator is monitored and controlled by a high-tech computer system to ensure a constantly high standard of production.

From corrugated to board to packaging

The classic corrugated transport packaging is produced on an “inline” machine which was developed by arranging the individual production units in line: printing, slitting, scoring unit, rotating die-cutter, and closing unit.

The cut-to-size corrugated sheets are printed, scored, slotted, die-cut and closed to the desired box size in one working process.

Due to state-of-the art electronics, it is possible to change the dimensions on the inline machine within shortest possible time (only few minutes). The slitting unit with the knives, the scoring and the folding unit are adjusted to the new dimensions at the same

time. The ready blanks are then folded by the folder (upwards or downwards depending on the design) and then glued or stitched in a special unit (gluing, stitching or taping).

Die-cut and printed packaging

There is an increasing demand for die-cut packaging. They can be printed with up to six colours which is of great importance for a catchy advertising presentation and perfect appearance in the stores. The most common printing techniques are flexo and offline printing (both multicoloured). These high-quality boxes are produced on a flat bed die-cutter or - in case of very high quantities – on a rotating die-cutter.

Die-cutting means the production of one-piece geometric units such as circles, multisided figures etc. Perfectly exact cutting tools, precise to the millimetre, produce special corrugated packaging such as fruit and vegetable trays, point-of-sales packaging and displays meeting the demands of the products to be packed. The cutting-dies are made by specialised companies, very often by laser technology.

The most common printing processes are flexo-printing or offline-printing. The inks are environmentally friendly, food-proof and water soluble and correspond to the highest standards.

"Made-to-measure suits" for big and heavy goods

Corrugated board guarantees also the safe transport of voluminous and heavy goods such as TV-sets, computers, washing machines, furniture, and motors.

For this purpose double or triple wall transport packaging, stitched or taped, to guarantee the stacking and bursting strength, are necessary. Taping with adhesive and glass-fibre reinforced tapes of 40 - 70 mm width, activated by means of heat or water, is effected on special gluing units.

Steel wire is used for the stitching. We distinguish between cross stitching (the staples run at right angle to the height of the box) and diagonal stitching (at an angle of 45 degrees).

Transport to the shipping department and delivery to the customer

If the corrugated packaging has passed all inspection criteria, it is sent to the shipping department. The pallet robot does the hard work.

According to the box size and the wishes of the customer, the corresponding pallets are supplied automatically. The whole stock management is effected on a very high level.

Finally the boxes are loaded and transported to the industry by rail or road. The demand for corrugated packaging is increasing as they allow simple erecting on automatic packing lines.