

(Particularly wash roll) and effects of doctors
 Vacuum box tops
 Couching (Top rolls, lump breakers, etc.)
 Hanging
 Wire cleaning (with regard to filling)
 Showers
 Guiding
 Corrosive conditions — especially intermittent out-of-control incidents.
 Uneven wear of X direction machine components.

Particular features of all-plastic wires

Reduced drainage	
Reasons and effects	Solution?
More sleazy	—
Inability to transmit shake	—
More flexible	—
Tendency to pipe	
X direction instability	
Bowed rolls	
Tensions	
Stretchability	
New approach to Wet end. Provisions	

to cater for A.P. wires
 Economics

Improved life
 Difficult papermaking
 Easily damaged — fag ends
 Additional equipment
 Cleaning — high pressure showers, etc.
 Effect on regular maintenance
 O.K. on continuous operations.

N.B. :— Makers still have problems too !!

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The modern embossing calender is characterized by having the design engraved in a steel roll and not in an embossing plate. This was the condition for permitting the papers being embossed from reel to reel. Prior to engraving the steel roll a so-called "positive mill" is first made — by hand — for the desired design according to a pattern. A "negative mill" is then made from this "positive mill". This "negative" mill is then transferred on a milling bank to the steel roll to be engraved, whereby the design is "run into" the steel roll under pressure by means of an etching acid.

The rational embossing of fine designs on embossing calenders could only find general acceptance when also the knowledge of modern construction was considered. High speeds were obtained when hydraulic or pneumatic pressure application took the place of the former lever pressure system, and the steel rolls were no longer driven by open-type gears but positively and concentrically by means of precision gears of closed type. The "chatter marks" feared for decades were hereby eliminated (these are transverse stripes caused on the paper web by too high a backlash of the gears). Self-aligning roller bearings took the place of plain bearings, electro-reelers and disk brakes replaced the former frictions and brand brakes. Creasefree paper guide at controlled web tension are actually assured by

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Paper and board embossing

A great part of the paper and board production is purchased "with the eyes" and not only according to rules and test methods of the manufacturer. Therefore, the surface must be pleasing personally to the consumer, it must meet the buyers' wishes and even take a certain fashion into account. Due to the manifold variation in design embossed paper is apt to appeal to the individual taste of the consumers in a particular way. It is hereby possible to give the paper "a personal touch", to impart "characteristic features", "warmth" and "refinement". All of these properties are certainly nondimensional quantities which can hardly be considered in the recipe or expressed in formulas, nevertheless they are factors of first-order significance to the sales volume.

Just these last years there was a noticeable boom in embossed papers. Almost every day we are confronted with colour prints and illustrated brochures on embossed paper alone for advertising purposes. The concern in embossing operations has brought about in European and overseas countries that this job is not only carried out by paper converters but even by the leading paper making companies such as KNP in the Netherlands, Feldmühle in Germany, and Daishowa in Japan, etc.

The origin for paper embossing is traced back in the production of so-called "watermarks". A forerunner of the modern embossing calender is the "plate embossing unit" piling up alternatively single paper sheets and engraved embossing plates to one pack.

new systems of adjustable stretcher rolls and electrically driven or braked guide rolls. Divided and tiltable bearing boxes permit fast roll change. The roll temperature is maintained constant by means of the electrical steel roll heating with automatic control. Although the quality of the paper grades to be embossed has hardly altered it became possible to increase the embossing speed to 300 m/min. and over, from 20 m — 40 m/min. about 15 years ago, due to the aforementioned features in design and construction.

WHICH FACTORS ARE INFLUENCING THE EMBOSSING EFFECT ?

The relationship of the individual factors to each other may be represented in diagrams which, however, will only be valid for a definite design, respectively for a certain embossing procedure. We will, therefore, confine ourselves to the general inter-relations. The linear pressure i.e. the pressure in kg./cm. roll width will be defined by the paper weight and the embossing speed, but also of the geometry of the engraving. Flat and obtuse designs require a higher pressure than acute de-

signs. Between linear pressure and speed there is a common relation, the so-called interaction time which must be long enough to emboss the design in sharp and full contours. In order to get a good embossing effect, even at higher speed, pressure increase is also mostly required. It is vice versa possible to obtain a good embossing effect at reduced speed even with lower pressure. The effective interaction time is defined by the different elasticity of the fibre compound of the various paper grades. Paper grades the fibres of which have a particular elasticity should, therefore, be embossed slower and under higher pressure in order to compress the fibre compound into the position specified by the design. Coated paper may be embossed at higher speed due to its surface which can readily be shaped though it is less elastic.

Moist webs require less pressure and can thus be embossed more easily. However, if the paper web is too moist the design will later get again hazy in spite of the initially good reproduction. The optimum moisture content varies with the different paper grades and is on the average between 5 and 8 per cent.

WHICH ARE THE MOST COMMON EMBOSSING METHODS ?

The embossing method is governed by the basis weight of the material and the depth of the design.

WHICH DESIGN AND EMBOSSING METHOD IS BEST FOR THE DIFFERENT MATERIALS ?

a) **Writings, printings and coated paper grades** are mainly embossed with

the usual designs, such as "Coral-Finish" (needlepoint), "egg shell" and "linen". These designs are of course available in the most different variations. Paper grade and end-use govern the embossing method to be employed, either geared, ungeared or transparent embossing.

The "natural linen" effect plays an interesting part with writings of first-class quality. The "natural linen" effect — the characteristic structure of which reproduces only the natural woven fabric — may also be embossed in the paper by means of a calender.

Embossing of coated paper has an ever increasing importance from year to year. It is very impressive in particular for colour reproductions. The beautiful glazing effect of coated super-calendered paper can be maintained whereas the inconvenient reflection can be removed by fine screen embossing. Colour prints are getting by certain designs such plasticity that the character of the picture is reproduced in a realistic way and will resemble a genuine painting. Almanacs, illustrated leaflets and brochures, etc. are more and more embossed with such designs.

b) **Hygienic and tissue papers** are embossed with the most varying designs according to taste and end use. The "union-procedure" is the preferred embossing method assuring that the material is compressed as little as possible and, consequently, its absorbency is maintained. The soft hand is hereby also an important factor. Speeds of 300 m/min. are easily obtained in view of the low nip pressure required which is only about 60-80 kp/cm.

This embossing method is also favoured with packaging material for the protection of easily damaged goods which shall be embossed with extremely deep and large-area designs.

c) **Glassine paper, laminated and un-laminated alu-foils** are embossed — due to their minor thickness — with the most varying fancy designs in the geared embossing procedure.

Whilst the moisture content plays an important roll with glassine paper and the maximum speed is about 150 m/min., the alu-foils are embossed under low pressure and at high speed up to 500 m/min. max.

d) **Board** is mainly embossed in sheet size, using the ungeared embossing method because of the thickness of the material. Embossing calenders for trunk, car body and hard board must be largely dimensioned in design and construction to meet the great stress due to the high working pressure up to 1,000 kg/cm and shock load. A precision adjustment device permits correct spacing of the rolls and exact adaptation to the sheet thickness involved. A steel or chilled cast-iron roll in lieu of the resilient counter-bowl is employed in case of board that is embossed by means of a pre-set nip. The working speed is 20 m/min.

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