

Fourdrinier Wires

The mill manager is concerned with the continuous manufacture of paper of saleable quality at the minimum cost. His success is dependent on many factors, among which the performance of a paper machine is perhaps the most important. The reliability of the machine wire plays no small part in ensuring high machine efficiency. Wires must be depended upon to perform consistently one wire to the next and one maker to another. This performance can be broken down into two main features, which are — The influence on quality and the influence on economy.

Papermaking behaviour is influenced by :—

- (a) Mesh/knocking. This ratio is capable of only minor variation although there is a wide range of meshes.
- (b) Drainage characteristic — the fundamental drainage characteristic of a wire is determined by the percent open area and is substantially constant regardless of mesh. However, as mesh becomes finer the holes are much smaller and effective drainage is then influenced by such factors as the characteristics of the furnish and the basis weight of the product.
- (c) Method of manufacture of the wire — two types of cloth are known to the trade. These are slope crimp and level crimp. Slope crimp wires give better sheet support and so reduce wire mark.
- (d) Wire mark. There are two main influences; mesh/knocking and weft level.
- (e) Seam mark. It is always possible to find seam mark but for most purposes it is of little consequence unless the seam was badly made or has been affected by machine conditions.

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Economic performance — is measured by :

- (a) Quantity of paper produced, or
 - (b) Number of revolutions of the wire whilst making paper, or
 - (c) The amount of downtime needed to attend to the wire, e.g. to repair damages but should not include such items as cleaning, for which the wire cannot be fairly blamed, or
 - (d) Most popular — life in hours or days or weeks.
- and is influenced by :—
- (e) Mesh.
 - (f) State of machine and various components associated with the wire.
 - (g) Housekeeping.
 - (h) Accident frequency.
 - (j) Competence of machine operators.
 - (k) Type and range of products and furnishes.

Until quite recently all fourdrinier wires were made of metal, principally bronze in the L direction and brass in the X direction. Some experimenting has been done from time to time with different alloys, particularly stainless steel, but more than 90% of all production has been of the bronze/brass variety. In the case of wire cloth for board making there has been a minor difference, namely that bronze has been used for both L and X direction strands, since the environments in which these cloths operate are more hostile.

Today a revolution is taking place and wire products for papermaking are being made of plastic. The principal development is, as might be expected, in the fourdrinier wire field but plastics are also being used for board making and various filtering applications.

Plastic wires do not enjoy universal success and in fact are quite unsuitable for some applications. They have many virtues. They are more resistant to rough handling and damage and are more wear-resistant. In consequence they last much longer than metal wires. Economically, therefore, they are a success. On the other hand A.P. wires drain less easily and cause formation difficulties. Consequently attention is currently being given to the papermaking characteristics of plastic wires. To some extent this ball is in the papermakers' court and they will have to solve a number of problems which are beyond the scope of the wiremakers' activities.

Discussion on the following topics

Types of weave

Plain
3 shaft twill
4 shaft twill
Triple

Types of metal

P.B.
Brass
S.S.

Plastics

Polyester
Nylon — absorbs water
Monofil
Multifil

Fatigue

Particularly at damages
Main cause of failure and short life

Economics

Metal (cheap) V Plastic (expensive)

On-machine problems

Dirty stocks
Rolls which do not turn freely

(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 !!

PAULSEN

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-