



MARK YOUR CALENDER

A Calender is a series of hard pressure rollers that are used to form a smooth sheet of fine paper, copy paper and high grade printing paperboard. This equipment is mostly online and located at the end of paper making process. They can be used offline also in form of supercalenders. The word "calender" is derived from the Greek word "kylindros", which is also the source of the word "cylinder".

The history of Calender goes back to 1836, when Edwin M. Chaffee, of Roxbury India Rubber Company, patented a four-roll calender to make rubber sheet laminated to fabric base. Calenders were further then used for the paper and fabrics industry followed by making PVC film as early as 1935.

Evolution Of Calendering For Paper :

In the past, for paper, sheets were worked on with a polished hammer or pressed between polished metal sheets in a press. With the continuously operating paper machine it became part of the process of rolling the paper (in this case also called web paper). The pressure between the rollers, the "nip pressure", can be reduced by heating the rolls and/or moistening the paper surface. This helps to keep the bulk and the stiffness of the paper web.

Modern calenders have "hard" heated rollers made from chilled cast iron or steel and "soft" rollers coated with polymeric composites. The soft roller is slightly non cylindrical, tapered in diameter towards both ends to distribute the specific pressure on the paper more smoothly.

A supercalender is a stack of calenders (usually 9 to 12 rolls) consisting of alternating steel and fibre covered rolls through which paper is passed to increase its density, smoothness and gloss. The super calenders are offline and suitable for high speed calendering. The rolls used to supercalender uncoated paper usually consists of cast iron and highly compressed paper, while the rolls used for coated paper are usually cast iron and highly compressed cotton.

The pressure applied to paper web results in delivering three types of finish -

a) Machine finish - ranging from antique to a smooth high quality finish

- b) Supercalendered finish - fine screened halftone printing
c) Plater finish - obtained through additional process of placing cut sheets of paper between zinc or copper plated stacked together and then put under pressure and heating.

How different designs meet different requirements :

Calendering equipment designs have been developed based upon the required properties and parameters of the produced paper :

For precise thickness and increased smoothness, an online calender system is used which consists of at least 2 hard rolls. The top roll is a chilled iron roll which provides uniform temperature profile and the bottom roll is a deflection compensation roll with which consistent nip is produced and cross profile maintained.

For good printability and running characteristics, the calender design has a least one hard and one plastic coated elastic roll. Such a combination allows paper web to be formed with uniform consistency and little variation in density.

For wide band operation and product flexibility, combinational machines delivering features of supercalender and soft roll calender are available. The rolls are stacked in a geometry that allows smooth production flow and controlled single or dual nip operation ensures product flexibility and long service.

For better micro roughness and product surface, soft calender designs have longer dwell time of web in the nip and this allows higher volume with similar surface quality to be achieved, under reduced pressure condition.

Identifying the challenge :

As the calender softens the surface of paper, the control factors are temperature, nip pressure and dwell time. The calender rolls is heated to make paper surface reach the glass transition point- at which the wood and cellulose fibres change from solid to malleable state (200-250 degC). At the same time only the thin layer below the surface should be heated to transition point and inner layer should remain stable and this is the key to preserving bulk. Then again the millisecond dwell time

INDUSTRY NEWS

International Paper, India, and the Indian Institute of Forest Management (IIFM), Bhopal, have signed a memorandum of understanding to engage in research and work on mutual interests in the field of forest sustainability by setting up a Centre of Excellence.

typically is a clear challenge. What researchers continuously work upon is roll material for higher temperatures and energy management. Calendering also requires high performance drives that are coordinated through process controllers and high speed data interfaces.

Recent Breakthroughs in Calendering Technology :

The key to new calendering technology developed by some vendors is use of temperature and moisture gradient calendering. The control of moisture gradient allows first to moisture the sheet to lower the glass transition point, through water misting on the surface layer of the sheet only. Then a belt presses the sheet against a heated roll in the preheating zone. By controlling the contact time between the sheet and the heated roll and also the angle and degree of wrapping, the dwell time achieved is many folds longer than a hard nip calender. The temperature for the rolls needs to be only 20-30 degC above glass transition point and lower compression would allow bulk to be preserved.



A new patented technology has also come up where the paper web is cooled down before the calendering nip. This is done by applying a small amount of water with a moisturizer and evaporating it with air dryer. It is claimed that this concept can help in substantial saving in energy and raw material and that almost half of the metal belt calendering benefits can be realized with lower investments.

Its important to efficiently monitor and maintain these hi-tech calendering systems to prevent costly repairs and machine downtime. Contamination on the surface of a soft calender roll can result in hot spots that can permanently damage the polymer coating of the calender roll. Solutions like synchronized thermal imaging systems are available which are equipped with rotational sensors and acquire real-time thermal images of calender rolls, processes the information, identifies defect size and location and activates alarm and documentation for the machine operator to take corrective action.

Calendering developments can also be applied to materials other than paper for providing smooth, flat surface like cotton, linen, silk, man made fibres, rubber and tyre manufacturing, vinyl and ABS polymer sheets, and to a lesser extent HDPE, polypropylene and polystyrene.

Conclusion :

Calendering is an integral part of Paper making. The surface properties like smoothness and gloss are imparted to the paper by Calenders. One of the challenges in paper making has been achieving smooth surface at the cost to reduction in bulk. Newer technologies address this need without too much compromise on bulk and stiffness through precise control of temperature, wrapping length and angle, pressure and moisture. Further differentiators on the solutions would be initial capital costs and bulkiness, reduction of energy and raw material usage.

QUOTABLE QUOTE	Never tell people how to do things. Tell them what to do and they will surprise you with their ingenuity - George Patton		
SCRABBLE email answers by 20 th Aug '15	Rearrange the letters for two new words relating to the paper industry. (Hint: <i>To do with foam</i>) CONN RAGE FATE FIM First correct answer will win a Parker Vector Roller Pen (Maximum two prizes for one person in a year).		
WINNER JULY'15	Mr. R. Suresh, Sr. Manager (Paper), SPB Projects and Consultancy, ESWIN HOUSE, OMR, Perugudi, Chennai. Answer : BINDER MIGRATION		
?QUIZ email answers by 20 th Aug '15	Quiz: Rank the top three 'paper' producing states in India.		
WINNER JULY'15	Mr. Babu Kambadkone, Production Manager, Gayatri Paper Mills Ltd, South Africa There are 15 elements used for bleaching and dyeing of paper including metals. Name any 5 metals that are part of these 15 elements.		
 Prizes	1. Best / first correct answer received will win one-year subscription to IPPTA Journal (Maximum one prize for one person in a year). 2. Best of the 12 monthly winners in a year will win one-year subscription to Paper 360^o Magazine, USA.		
 Interview	Employer : <i>We need a Responsible person for this job...</i> Applicant : <i>Sir, your search ends here, in my previous job, whenever anything went wrong, they said I am Responsible...</i>		
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