

# Paper machine re-build logistics-practical factors

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To re-build a paper machine, one is often told, to increase the wire length, modify the press section, add dryers and increase horse power on the drive, with the paper maker invariably wanting more vacuum.

During the last few years (particularly after 1975) due to import of second hand machines most of them hand to be, in a sense, rebuilt. Basic drawing were not available, in many cases, and in some cases components of other machines got mixed up with several mismatched parts. This has given an opportunity for some of us to find about various factors involved in the design area and how they are practically borne out.

This effort concerns itself mostly with medium and small sized paper machines and with traditional qualities of papers and grammage ranges.

Actually more than half of India's paper output comes from such machines.

The problem has been that most of the imported machines were not making the type of papers and grammage ranges for which they have been imported.

While modernising the cost benefits in small and medium mills and the investment scarcity are factors to reckon with.

Since we in India make kraft paper and writing and printing papers interchangeably on the same machines there is an underlying belief that design differences are not significant.

## APPROACH FLOW SYSTEM

The head box dilution for kraft paper is more as the drainage is faster on the wire.

In a reverse case, we have had to re-circulate through a return line from the delivery of the fan pump to its suction, because of the high pump capacity, for improving formation.

## WIRE LENGTH

The wire length in one mill was reduced to its original design length in a bagasse based mill (without affecting production) for improving formation, disproving thereby, the traditional theory that bagasse pulp has slower drainage characteristics.

We have on several occasions lowered table rolls to accomplish a lower effective wire length.

This Suttie formula for wire length is commonly used :

$$L = C\sqrt{P}.$$

L = Wire length in ft.

C = Constant depending on the paper produced.

P = Output lb/hr/in width.

These constants vary from mill to mill and machine to machine as Suttie himself mentions in his paper.

However, the constants for some papers seem to be on higher side for normal papers and grammage ranges probably because of higher temperatures prevalent in areas where we work.

## PRESS SECTION

Except where a lick-up or a pick-up is involved, most of the time, it is the second press requiring renovation with increased pressure application.

Once there was a dispute as to whether a fabric press or a grooved press removes more moisture, (in paper machines of the same size with apparently similar furnish). It was claimed that the fabric press was taking out more moisture and was accepted as such.

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Later on, when similar papers were produced, there was no difference,—the ultimate finding being that due to more addition of talcum, the moisture removal was greater. So much for the dispute.

Modern felts with high pressure showers and flush long boxes at appropriate locations remove considerable moisture on existing press sections.

The present view is that a reverse press is not normally required and most of the time kept idle and is necessary normally in heavily dyed papers.

With high moisture removals in present day presses, the effect of the smoothing press at these lower levels of moisture does not appear to be as significant as it used to be. It might be useful thicker in boards.

### DRYER SECTION

On one occasion we had made all the changes in a paper machine and could not increase the output. Then on a war footing, the condensate system was changed resulting in more than rated output immediately thereafter.

The only place where we do not hesitate to over design is in condensate piping as it helps in condensate recovery particularly when higher grammage and output are involved and take a longer time to get corroded due to thicker walls.

The location of the size press that is the ratio of pre-dryers to after dryers varies in different machines because of grammage and extent of seizing involved.

Ofcourse, we tend to ask every time for how many days in a year the size press is proposed to be run. This is important particularly if a sophisticated stainless steel kitchen is to be provided with good size collection and return systems because the ROI depends on it.

When it comes to the dryer section one can be a little generous (as paper is drier) in splitting the section to have steadier draw control for improved strength properties.

In one rebuild, a paper machine which was installed in America with 45 dryers was installed only with 30 dryers, primarily to reduce the length of the paper machine with some changes mentioned above. This machine now produces over its rated capacity.

We know of a mill which has been ruined *partly* because of a very long paper machine resulting in a 'long paper passing time' after a paper break.

### CALENDER STACK :

Except where controlled crown rolls or soft compact stacks are involved, one calender stack is normally enough. This is also because of a crown design distribution problem over the two stacks taking into account sheet compression for the second stack.

In the case of board, if one stack is having only a single nip, it may be easy.

### DRIVE :

Tappi drive figures particularly for the recommended drive capacity (RDC) are very *safe* possibly because of difference of materials of construction, modern syphons, bearings etc. This is particularly so far a single motor drive system. This is more for RDC than NRL (Normal Running Load).

### INSTRUMENTATION :

Instrumentation as a tool for control is not yet popular atleast in the sense that *all* the basic minimal instruments are not provided for. Steam reduction has been effected in one mill to the extent of two tonnes per hour just by installing a couple of appropriate controls.

### MISCELLANEOUS :

Inspite of its being a high power consumption area, vacuum systems are normally well provided in terms of capacity but the piping is not well done.

We have had to change the vacuum piping and Broughton system to reduce power consumption on occasion.

We find that towards the end of the project, financial stringency ultimately hits instrumentation, the approach flow system and the condensate system.

The calender cooling system does not have even a starting chance inspite of all our modernism.

In the engineering effort, it is not unusual to find that the sizing of decker, saveall, white water system, etc., are some times not given necessary attention.

**GENERAL :**

Preferably, no paper machine re-build should be for more than  $\pm 50\%$  of the specified grammage (where cylinder moulds are not linked). It is not that paper cannot be made beyond this range. But either quality or output will be affected.

The second question would be as to how the proposed increase in speed will affect all the sections.

We would like to assess before a re-build :

The moisture and vacuum levels at the couch.

The press sections with 100% synthetic felts (wherever possible) with high pressure showers and flush long boxes to find out how much moisture can actually be removed without any change.

In the dryer sections with felts of latest design, appropriately located blowing systems and stream lined condensate systems—the drying capacity available.

It seems an elementary question to ask but there is no harm in asking what is the capacity, and with equal import, the *potential* of each individual section and how it fits in, in terms of increased output. We would

suggest that the length of the machine should also be a major consideration in the re-build context.

Quality of paper produced can suffer because of re-build if all the efforts are not integrated for a particular grammage-speed configuration.

It is preferable to spend more times engineering at the drafting table and listing even minor items to reduce down time which costs over Rs. 100 per minute at the very least.

The main stoppage where civil construction is also involved and many minor stoppages, the run-in after modification and consequent loss of production are all to be added to the investment in calculating the ROI.

The cost of the modification is not so cheap as it looks, as successive balance sheets of some mills indicate.

This effect is particularly marked in single machine mills.

Needless to say, while paper machines are sturdy, paper is delicate.

On one occasion, when it was suggested that such an expensive re-build may not be necessary, we found that loan sanction was already obtained, and with them laughing all the way to the Bank, we walked home.