Latest Developments in **Forming Technology**

Improving the productivity and profitability of hybrid formers.

By Timo Valkama

The ability of a paper machine to provide value for its owners depends, to a large extent, on the technical concepts chosen. The main components of a machine are developed in phases over the years. These phases do not, unfortunately, coincide chronologically.

As a consequence, the key sections of a paper machine may have different operating ranges. Each new section can be utilized only partially if other sections do not fully support the operating range of the new section. Major changes can be expected in the productivity and utilization of the entire production line when all key sections can be operated at optimal speed.

At present, concepts are chosen on the basis of paper grades and speed. The dominating paper machine sections have been the forming, press and drying sections. Papermakers have time after time requested an economical solution for the intermediate speed range of 1,000 to 1,400 m/min. The fine paper former concept of choice for speeds up to 1,250 m/min is an MB hybrid former with loadable blades. Higher speeds have required a gap former technology.

The press concept for 1,250 m/min is SymPress B. However, SymPress B can manage speeds in excess of 1,400 m/min. This difference in threshold speeds has been the major obstacle to building new paper machines in the 1,200 - 1,400 m/min speed range. This difference has an even greater impact on rebuild projects for paper machines with an original design speed ranging from 900 to 1,200 m/min. To upgrade these lines to speeds as high as 1,400 m/min, both a shoe press and a gap former have been required. This is often not viable in economic terms.
The problem has not only been speed, but also the rate of production. A shoe press can manage production up to 200 tons per meter per day, but a hybrid former has a capacity limit of about 160 tons per meter per day.

INCREASING THE CAPACITY OF HYBRID FORMERS

Metso Paper has been working on a new technical concept over the past 5 years to increase the capacity of hybrid formers. The main challenge has been to increase dewatering through the top fabric without destroying the weak fiber net. Metso's latest hybrid former, ValFormer is equipped with the VacuShoe technology. ValFormer has capacity up to 1,350 m/min on an 80 g/m^2 sheet. For light grades below 40 g/m^2, capacity is 1,400 m/min. ValFormer technology has been tested and proven at two paper mills.

ValFormer is based on MB former technology. The main difference is in the topside dewatering arrangement. The first dewatering element in the former—the deflector—is replaced with a VacuShoe unit. VacuShoe is a perforated, curved dewatering element operated under a low vacuum. The perforations and geometric dimensions employed are based on extensive pilot trials at Metso Paper Anjalankoski and Rautpohja pilot plants. The drainage capacity of the shoe can be quite high depending on the vacuum level. Up to 40 % of the headbox flow can be drained out through VacuShoe *(Fig. 1)*. VacuShoe produces low pulsation designed to improve drainage and sheet structure. The top surface of the wet sheet is consolidated to the same degree as the bottom layer. The sheet is strong and symmetrical after VacuShoe, and able to withstand the shear forces created by the loadable blades.

The improvement in formation is quite distinct compared to a standard hybrid former. The effect of vacuum on sheet structure is demonstrated by the change in filler distribution as a function of vacuum level *(Fig. 2)*. ValFormer has 10% higher speed capacity and 15% higher productivity capacity than a standard hybrid former. ValFormer provides the highest productivity of all former designs for heavy basis weights.

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In a rebuild project at Stora Enso Suzhou PM 1, a SymFormer was rebuilt into a ValFormer and SymPress II was rebuilt into a SymPress B shoe press. A new production record was set only two weeks after startup. A production record of 200 metric tons per day has been reached in normal production.

The combination of a firm sheet structure from forming section with a long press impulse from the shoe press produced a sheet with 15% greater internal strength than before the rebuild. MD and CD tensile strength improved by 5% and 20%, respectively, and the MD/CD ratio was reduced by 10%. Formation was improved by 15%.

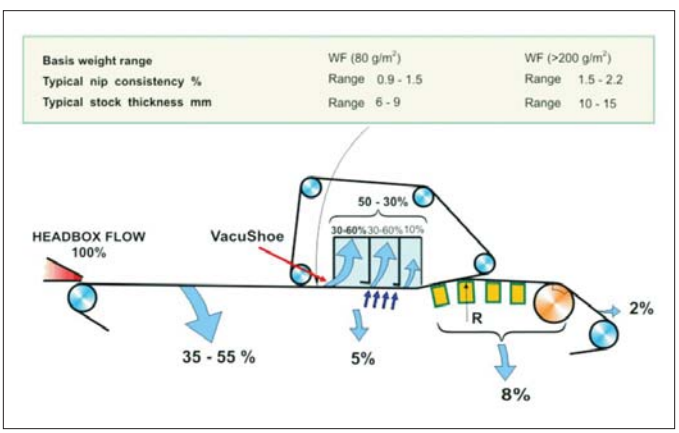

Figure 1

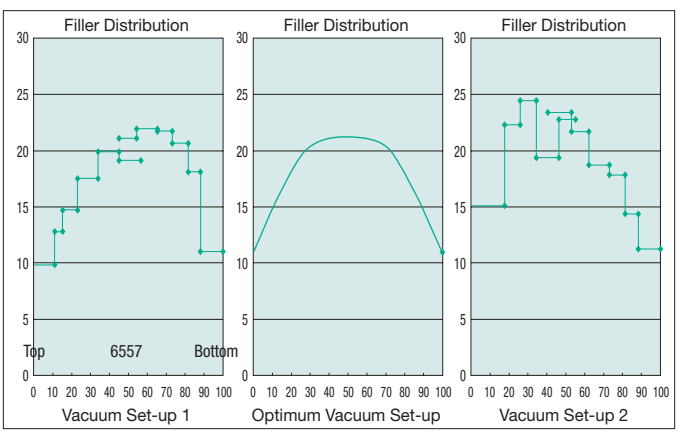

Figure 2

	Effect of Rebuild 113 g/m²
Formation Improvement	15%
Internal strength	+15%
MD tensile	+5%
CD tensile	+20%
Roughness improvement	5%

Figure 3

Improved strength properties can, in the long run, be exploited by reducing furnish costs or increasing speed. Increasing the short fiber content of furnish will further improve formation and print quality *(Fig. 3)*. In another rebuild case to be completed during autumn 2006, the Fourdrinier bottom ply forming section of the BM 1 linerboard line of M-real Kemi line will be rebuilt into a ValFormer. In pilot trials the formation of the liner base ply was improved by 45%.

In summary, ValFormer technology has clearly lifted hybrid technology to a new speed and productivity range. High productivity, wide basis weight range, easy operation and, improved sheet strength and formation are the key words for the new coming of hybrid formers.

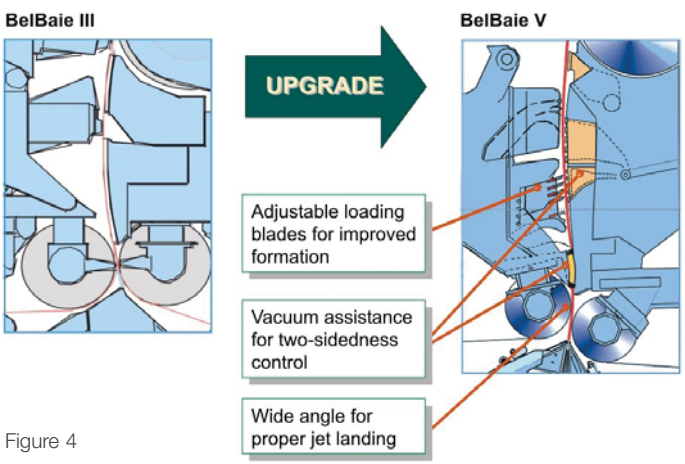

Figure 4

BELBAIE V

It is commonly known that BelBaie formers have relatively limited drainage capacity, a small operating window, low first pass retention and persistent curling and two-sidedness problems. The rebuilding of a BalBaie blade former into a roll and blade former is not cost-effective with traditional technology. Metso's solution for rebuilding the old BelBaie formers is BelBaie V, which utilizes vacuum shoe technology, called the BelShoe. The BelShoe is placed right after the forming roll. Increased drainage capacity combined with loadable blades improves the speed, operating efficiency and output quality of the papermaking line.

In the rebuild, the dewatering elements of BelBaie III are replaced with BelShoe, loadable blades and a stationary foil table *(Fig. 4)*. Other improvements related to the solids content of the sheet, impingement angle of the jet and general cleanliness are also made.

The first BelBaie was started up at Daehan Paper PM 3 in Korea. The existing BelBaie III former was replaced with BelBaie V at this newsprint line to improve speed and paper quality. The original headbox remained in use.

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After the rebuild speed was increased by 50 m/min, formation was improved by 20% and oil absorbency two-sidedness was reduced by 50%. Retention was improved at the same time by 8 percentage points, while retention aid chemicals were reduced by 20%.

The latest startup has been M-real Alizay PM 1. BelBaie III was rebuilt into BelBaie V to improve formation and retention, and to increase the speed. As in Korea, the headbox was not upgraded.

CONCLUSIONS

The new VacuShoe and BelShoe technology developed by Metso Paper will improve the productivity and profitability of hybrid formers and bring older generation BelBaie formers to a competitive level with gap former technology. The new technology is cost-effective and competitive with any other technical solution available today. Considering the existing limitation and unutilized capacity of current production lines, ValFormer and BelBaie V technologies open up new opportunities for increasing the lifetime of the entire production line. ■

Timo Valkama is Paper Tehnology Manager, Paper and Board Business Line at Metso Paper.