Customer Case:

Why a leading board mill changed its roll packing method?

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In spring 2012 a leading board mill was rebuilt to increase its production capacity by 30.000 t/a up to 240.000 t/a production capacity. Whilst the board machine was being rebuilt, the roll finishing system (slitter winder and roll packing line) also had to moved and updated.


Figure 1. Paper roll packing methods can be divided to two main categories: stretch (on the left) and kraft wrapping (on the right).

Plan for phased line rebuild

Production capacity of this BM1 line was originally 50.000 t/a. By the time of spring 2012 rebuilt, its capacity had been quadrupled through continuous process improvements and system upgrades. Nevertheless the main machine hall building itself had stayed with its original dimensions. With this upgrade, the wrapper had to be moved backwards to make space for bigger parent reel handling and for the new slitter winder. In addition to the capacity increase, it was hoped that full automation of the finishing operations could also be achieved; this would clearly improve the operational efficiency. However, all this threatened to push the roll wrapper out through the back wall of the machine hall, thus causing a significant jump in the cost of the civil work. This would have severely limited the return on the overall investment.

The roll wrapping method used from the beginning had been kraft wrapping, and the current semi-automatic Valmet StreamPack kraft wrapper (installed in 1988) was now approaching a respectable quarter century service age (figure 2). For this machine, the wrapping was done in one station, with wrapping phases controlled by the full time operator who manually placed both inner and outer heads. The labeling, automated in an earlier rebuild, was carried out by an industrial robot at the exit station in front of the ramp to the warehouse.


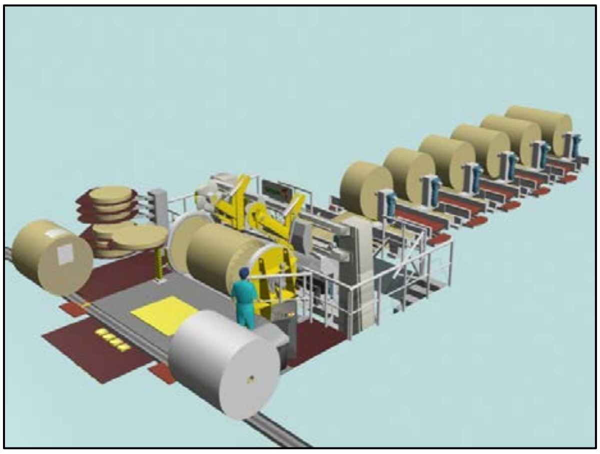

Figure 2. The starting point: The left image shows the existing semi-automatic StreamPack at the end of the board machine hall. The right hand illustration shows the "one station" structure.

The rebuild of this existing packing machine had been proved to be financially unjustified and operationally too complicated to execute. The finishing area modifications had to be done without disturbing the ongoing production. The plan, to start this line upgrade, was to install and start up the new wrapper behind the existing one, and convert the roll stream from the original winder to the new wrapper. After that, the existing wrapper could be dismantled and the new slitter winder installed in its place. In the third phase, the old winder could then be dismantled; the new parent reel handling and board machine upgrade could then be completed in the shortest possible production break.

The old Valmet StreamPack wrapper had served extremely well, so the most obvious choice for the mills project team seemed to be the new fully automated Streamline kraft wrapper. But after the first layout sketches for the new finishing area were completed (figure 3), it was noticed that the BM building needed extending by two column spaces (2 x 6 m) in order to accommodate the new fully automated kraft packing line. The main reason for this was the extension of the production line, although the new kraft wrapper also required more space. With the existing machine’s manual head insertion, both inner and outer heads are placed by the operator at the same station. Furthermore, the head stacks are continuously replenished and organized according to the needs of the station. Thanks to machine automation, the head insertion is carried out by industrial robots; these require head stack revolver platforms to feed the correctly sized heads for robot to grip during the wrapping process. At this point, the project team understood that they should investigate all of today’s available alternatives as a part of their feasibility study. This posed the question:

Are there acceptable alternatives, which both fulfill pre-terminated quality requirements and take up less floor space?

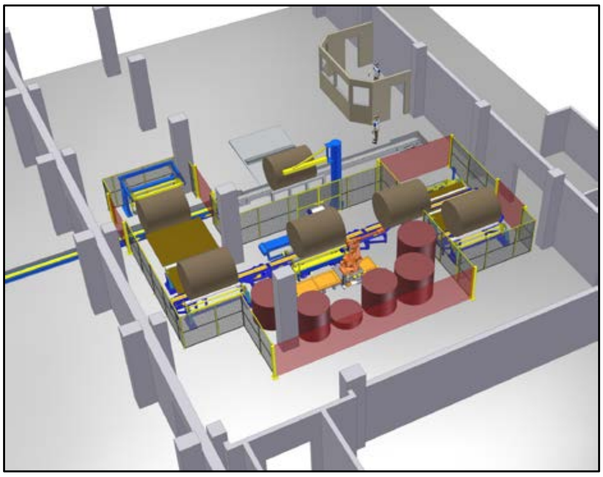

Figure 3. New slitter winder location shown with new fully automated Stremline C kraft wrapper (on the left). The Stretch film wrapper’s simplicity compared to the alternative kraft wrapping layout is striking. It fitted in the existing BM hall without building extensions (on the right).

Alternative solutions for the packing operation

Paper roll packing methods can be divided to two main categories: kraft and stretch film wrapping. With good reason, kraft wrapping has been the dominant packing method in paper mills for printing grades. And stretch film wrapping, with its all variations, has been the main method for tissue, fluff pulp, specialty papers and internal dust and moisture protection for rolls to be sheeted. Due to the improved packing materials, machines and handling systems to be found today along the entire supply chain (from mill to end user), the boundaries of stretch wrapping have expanded.

The modern business environment in which the paper industry must now operate has given extra push towards finding more cost effective operational solutions, including roll wrapping and handling.

It should also be stated that stretch wrapping tends to enable simpler space saving layouts compared to kraft wrapping.

The "for-or-against" polarising thinking that surrounds the stretch vs. kraft debate is both outdated and unnecessary nowadays. Historically, it has been fuelled partly by the suppliers, whose self-serving interest has led them to push their own respective system within their repertoire. Today most of the main suppliers have both alternatives to offer, and are able to explain in detail the relative pros and cons of each option. It seems clear that kraft wrapping offers stronger mechanical protection, especially for roll corners. Indeed, it should also be noted that insurance companies such as FM Global rate the stretch wrapped rolls to be as fire retardant as unwrapped rolls! In addition, insurers will often not differentiate between steel and plastic straps. Unsurprisingly, the proportion of business taken by plastic in preference to steel wraps is growing, due to technical and commercial reasoning. In our opinion, kraft wrapping and steel strapping are reducing exfoliation, which tends to lessen the fire hazard of the lighter-grade paper rolls. This effects both fire protection and insurance costs. But the fundamental question here is this: What is the best protection against the specific transportation chain, and what is the most economical way to achieve it?

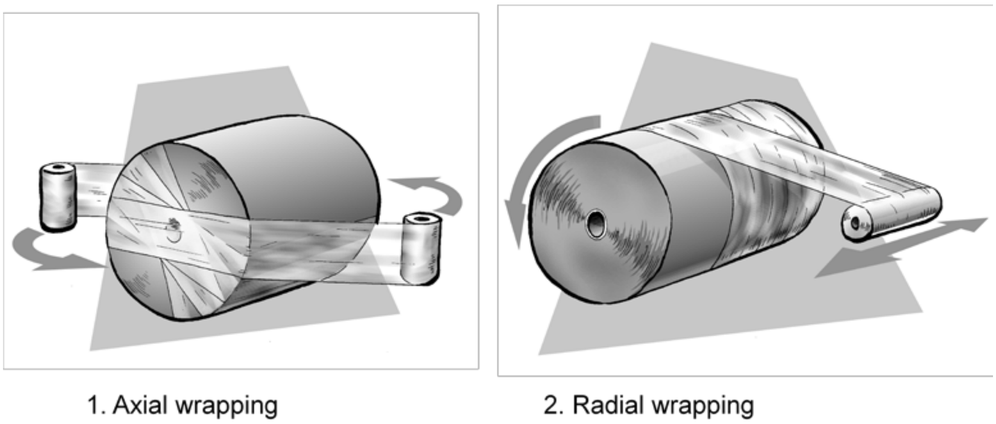

Figure 4.

The rumor that stretch wrapped rolls do not tolerate clamp truck handling like kraft wrapped rolls is not accurate. It is a myth stemming from comparison of plain axial or radial wrapped rolls (figure 4); such wrapping is commonly used as an internal moisture and dust protector for sheeter rolls on their short route to adjacent converting hall. The main benefit to axial (sometimes known as cocoon) wrapping is to seal the roll ends; radial wrapping both seals and strengthens to roll body whilst providing corner protection. Whether axial wrapped or not, stretch packing can be used in corrugated heads to give protection against roll end dents. With the various stretch wrapping alternatives that are available, combinations of stretch/kraft/foam/bubble film are possible and quite widely used in paper converting. Used stretch films can be clear, or colored if light sensitive materials are packed. It is also true to say that properly selected and adjusted hydraulic clamps can handle smooth and slippery surfaces of both stretch and kraft wrapped rolls.

In case of the mill in question, acceptance for stretch wrapped rolls was relatively simple to achieve, without any extra tests, because of previous experience at another mill; in Tampere there, board rolls had been wrapped with a radial stretch (combined with corrugated heads - see figure 5) for the past few years. In both cases, the transportation chain was relatively short. Two further points should be noted: First, the space available for the wrapper at the other mill had been limited and, secondly the stretch concept had been shown to provide sufficient protection for the rolls whilst offering considerably lower investment costs when compared to kraft wrapping alternatives.

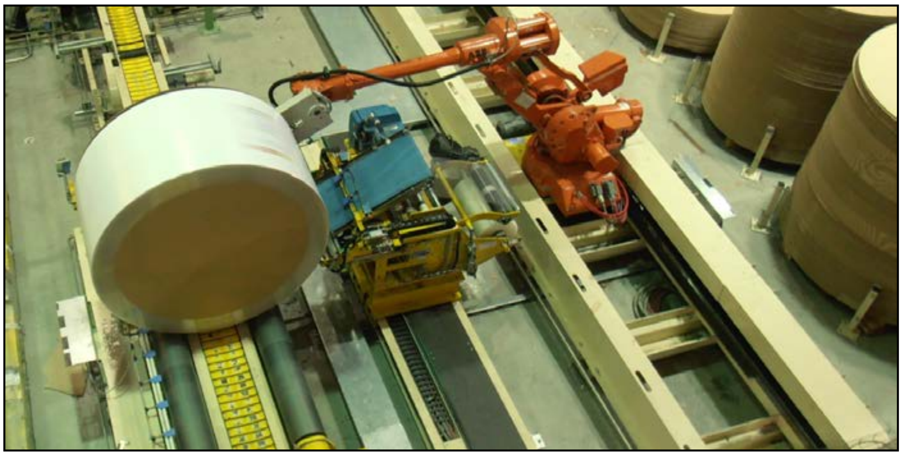

Figure 5. Selected method was radial stretch film layers to protect the roll body and corrugated head disks for the roll ends. Body labels were slipped under the film during the wrapping.

The weakest point with a stretch wrapped roll is the roll bottom corner. But this issue is, to a certain extent, overcome by the Z- folding feature, where the stretch feeder folds the stretch film layer three ways into Z-form for the roll corners. This not only saves with material costs but, in tests, has shown to be stronger when compared to the alternative method of adding a separate, thick film slip for the corner protection. This technology also helps axial - radial wrapped rolls become more stackable when compared to kraft wrapping, due to the latter’s roll end convexity that is caused by axial wrapping.

Reasons for the selection made

Figure 6**,** shows the layout installation for the mill, with the selected stretch wrapping concept (corrugated heads with radial stretch wrap). When compared to the alternative kraft wrapping layout, the simplicity is striking. The required wrapping capacity for 1.8m diameter board rolls was 60 rolls per hour.

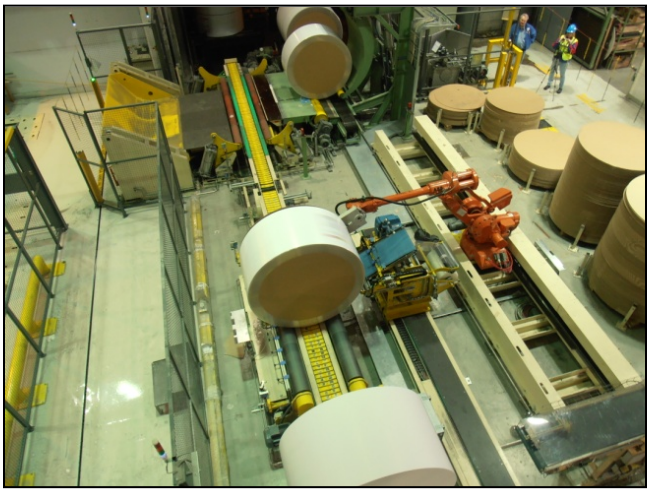

Figure 6. Fully automated stretch film packing in the mill. Corrugated heads to protect the roll ends with radial wrapping for the body and corners, and plain paper labels, without glue, slipped under the film layer.

Three points should be noted: First, the number of head stacks and head robots required can be cut in half as only corrugated heads are used with stretch film wrapping. Conversely, kraft wrapping needs to be used along the inner heads; furthermore, the outer heads are not as robust when it comes to sealing the package.

Secondly, four times as much wrap material is required to be held in stock for kraft compared to radial stretch. This gives clear savings with wrap material costs, when only one size stretch film roll needs to be stored, compared to bigger PE- laminated kraftliner rolls; these need to be stored in sizes to cover roll widths from the smallest to the biggest. Also, hot-melt glue consumption is higher with kraft wrapping - further adding to the cost per wrapped roll when compared to stretch wrapping.

Thirdly, the heavy duty head press station (with ~180 ºC heated press plates to heat seal the kraft wrapped package) is not needed for stretch concept. It should also be noted that roll labeling was the same for both alternatives.

The final stretch wrapper total investment costs (including civil works) at the mill were a third of the overall kraft wrapping alternative costs, had that been selected.

Half of the cost savings can be accounted for by stretch wrapper's much simpler structure. The other half of the savings is down to the stretch solution not requiring any building extension work - kraft wrapper would have needed two extra column bay widths. Across its whole life cycle, it is estimated that the total operational costs of the stretch wrap solution to be around half that of a comparable kraft wrapper system.

Conclusions

Any feasibility study should always be approached with an open mind in order to fully evaluate the needs of providing adequate protection against transportation and storage issues. Stretch wrapping is certainly not suitable for every application, but there are surely many more paper mills around the world that would likely benefit its installation. Vertically integrated finishing/converting operations should be able to save significant amounts of money by protecting rolls with stretch film instead of PE- laminated kraft wrapping.

Suppliers should be challenged to present alternatives that are accompanied by clearly articulated pros and cons to each system. The key to an optimally functioning finishing system is an intelligent, well-engineered layout. It is always the case: the better the information available at the investment planning stage, the better the end result.