Handling bigger and heavier rolls – No problem with Voith Finishing logistics

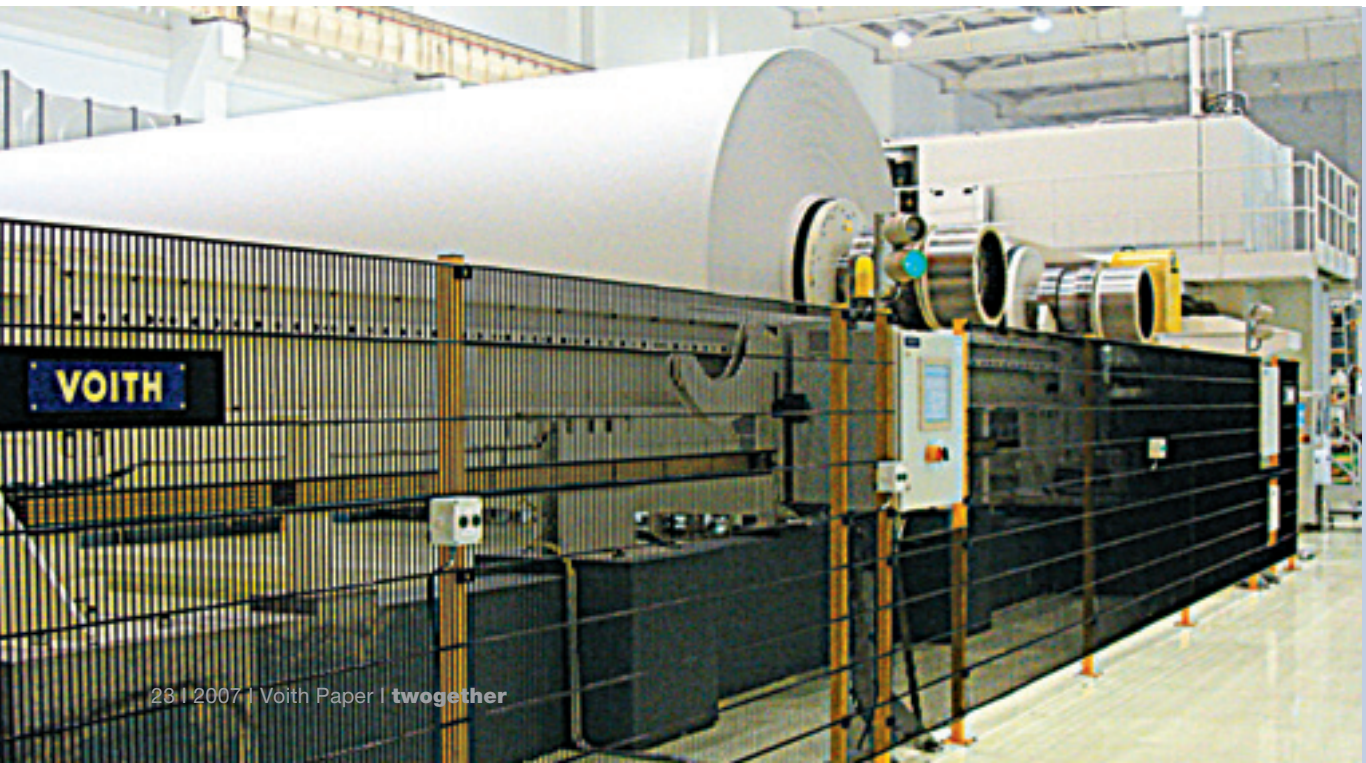
Wound paper rolls – also called parent rolls or full reel spools or just rolls – are getting much bigger and heavier these days. Weights of 125 t have already been reached (160 t will be attained in future), with web widths up to 11 m and roll diameters up to 4.5 m (or even 5 m in future). Such large rolls must be kept under precise control during handling and transport.

As explained in this article, Voith solves these problems by focusing in particular on the following:

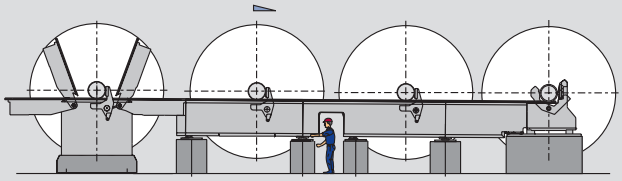
- Paper roll handling (transport tractor, rails and switches, roll magazine, roll turning)
- Paper roll trolleys.

The situation so far

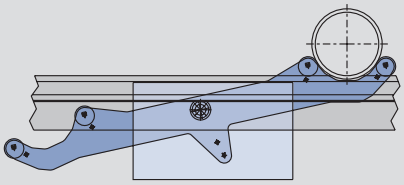
Paper roll magazines serve as a buffer between production stages. Rolls are stored there between the paper machine and offline coaters, offline calenders and winders if these



Paper roll magazine ahead of the VariFlex winder.



Line with conventional roll magazine.



Schematic view of roll tractor.

are all situated in the mill. So far the Voith paper roll storage concept has comprised two sets of rails installed in parallel, with a slight downward gradient in web run direction. The rolls travel down these rails as far as the next storage location or paper processing station. At the storage stations they are caught and held by a damping lever system until they are released afterwards for further transport.

Each magazine also has rail switches enabling rolls to be taken over from or transferred to upline or downline systems respectively. They also allow operator access to certain magazine zones.

In these present systems the paper rolls move freely from one storage point to the next, the only form of control being lateral restraint by the guide rails. Once a roll has been released by the lever system, it cannot be stopped until it reaches the next position. This freedom of motion can result in oscillations whereby the roll spindle ends impact the guide rails so heavily that the rails and spindle ends are subject to considerable wear and tear. Dependable operation of such a roll transport system depends on well-aligned guide rails, perfect condition of the roll spindles, and clean guide surfaces.

Roll trolleys transport the rolls at right angles to the web run direction, either between two lines operating in parallel, or between separate magazines. They also run on sloping rails, with a lever system to catch the rolls and rail switches for accepting or passing on rolls.

The challenge

The current state of technology had to be improved to ensure the controlled transport particularly of large heavy rolls, smoothly and well aligned to the guide rails. This requires the systematic application of controlled horizontal transport forces, precisely predictable and repeatable under all operating conditions. The principle of using a descending plane for moving the roll therefore had to be abandoned in order to eliminate uncontrolled roll motions.

Another requirement was restriction to a single form of applied energy as far as possible, but at any rate to use less maintenance-intensive systems that are also easier and faster to install.

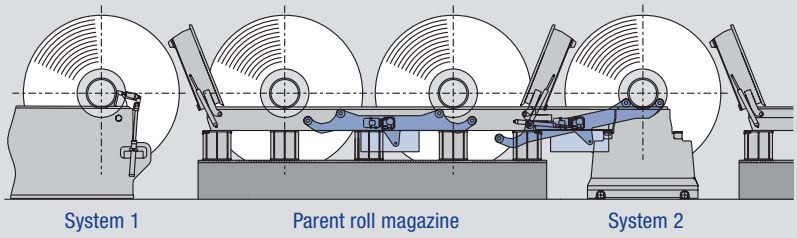
The solution

This challenge was met with a new concept. Although the paper rolls still run on rails, these are not inclined. The rolls are subjected only to precisely applied forces.

Instead of descending by gravity, the rolls are moved by a rail-mounted trolley – also known as a “roll tractor” – on each side. The guide rails for the tractor are incorporated in the roll guide-rail structure.

Each roll tractor has a centrally pivoted rocker beam, which in the horizontal position can be moved underneath a roll. The ends of this rocker beam extend out of the tractor on both sides, and can, in its tilted up position, pick up and move the parent roll. The beam projects enough for the tractor to transfer rolls to or from neighbouring systems without actually entering them. This greatly simplifies the interfaces between systems.

The tilting rail switches for roll acceptance, handing over and transfer are retained. They enable the connection of neighbouring systems to the roll magazine, and provide access



Line with new-generation roll magazine.

for maintenance and setup work prior to the further processing of paper rolls.

There are two ways of fixing rolls in the magazine. In the intermediate storage positions, a purely mechanical braking device stops even eccentrically wound rolls from moving. At other storage points where the rolls have to be rotated e.g. for winding off scrap paper, an adjustable wedge keeps them precisely positioned.

A new generation of roll turning devices has also been developed whereby the roll is rotated by a driver meshing with the teeth inside the reel spool. This ensures a fixed connection between the drive mechanism and the reel spool (instead of a frictional drive as previously). Rotation is kept under control by a disk brake, also mounted on the driver, that is much more effective than the friction brake used so far.

The trolley for transporting paper rolls between lines has been greatly simplified, and the receiving and transfer switches are now installed on the roll magazine. Rolls are fixed to the trolley by a purely mechanical device, in the same way as in the magazine, and they are received or passed on by the roll tractor. These changes eliminate many of the elements previously required on the lateral transport trolley, and no energy input is required except for actually moving the trolley. Communication with the neighbouring systems is by data interchange line.

Benefits of the new logistics system

- The fundamental advantage is precise system control, the basis for automation of the roll magazine storage system. And since rolls in the magazine can be transported in both directions if required, the storage logistics are much more flexible.
- Without the need for a hydraulics system, roll magazine installation costs are significantly reduced. This also saves planning and commissioning time, as well as maintenance costs later on (the entire hydraulics group on the roll transport trolley has been eliminated).
- Smoother motion of the rolls in the magazine saves wear and tear.
- The roll transport trolley has been greatly simplified.
- All interfaces are clearly defined.
- The dependable mechanical mechanisms used reduce system vulnerability.

Summary

By developing this new-generation roll storage magazine and transport trolley system, Voith Paper has not only met today's demands for handling bigger and heavier parent rolls, but also set another milestone toward the complete automation and optimization of finishing logistics.

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