

Fibron TT3000™ – Innovative tail threading at Lang Papier has proven a success



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It is known that the efficiency of tail threading from the last dryer is often impaired on paper machines producing grades with a high filler content (e.g. SC, LWC) due to an overstressed doctor function in the tailing region.

High-pressure water-jet tailcutters being operated at a very high cutting pressure (more than 900-1,000 bar) produce a large quantity of cutting pulp at the take-off doctor at high speeds.

If the tailcutter is operated for a long time, this build up of pulp at the doctor results in adhesion of small paper shreds at the doctor blade in the area of the cut. These obstacles prevent the threading tail from stabilizing properly off in the pivoting tail threading element, the flip tray, fastened under the doctor blade. Tail take-off and transfer into the following part of the threading system is therefore unreliable and inaccurate. Tails with very long and uncontrolled loops, called double tail, are often produced. In a very demanding threading path such as a rope transfer system in an online Janus calender, this double tail often results in the destruction of the actual threading tail during threading due to the knocking-around, tear-off and adhesion it creates.

Alternative doctor blades, precise adjustment of the doctor combined with regular cleaning and regular blade changes only resulted in slight improvements in threading performance.

Additionally, in the event of a sheet break, such time-consuming disturbances and cleaning at the take-off doctor distinctly extend the production downtime and reduce system efficiency, which is so important, particularly with online paper machines.

To ensure constant, reliable threading and an improvement in the entire threading process, especially on high-speed machines with online Janus calenders, it was therefore necessary to develop a new method for the take-off of the threading tail. This method is based on the basic idea of taking the tail directly off the dryer surface in order to be independent of any malfunctions at the take-off doctor.

The concept of using the already known principle of the so-called "Bullhorn" take-off seemed to suggest itself as this principle had already been used successfully on other similar applications.

This principle was already tested some time ago at the last dryer of a production machine. However, for lack of testing time, sufficient flexibility of the testing equipment and of a sufficient number of tests, this test did not produce any reasonable results.

It became obvious from this experience:

- that such a development could only be implemented in the fastest and most efficient way on a pilot stand which simulates the real situation during the run-off of the paper sheet and cutting of the threading tail as precisely as possible at the last dryer of a paper machine;

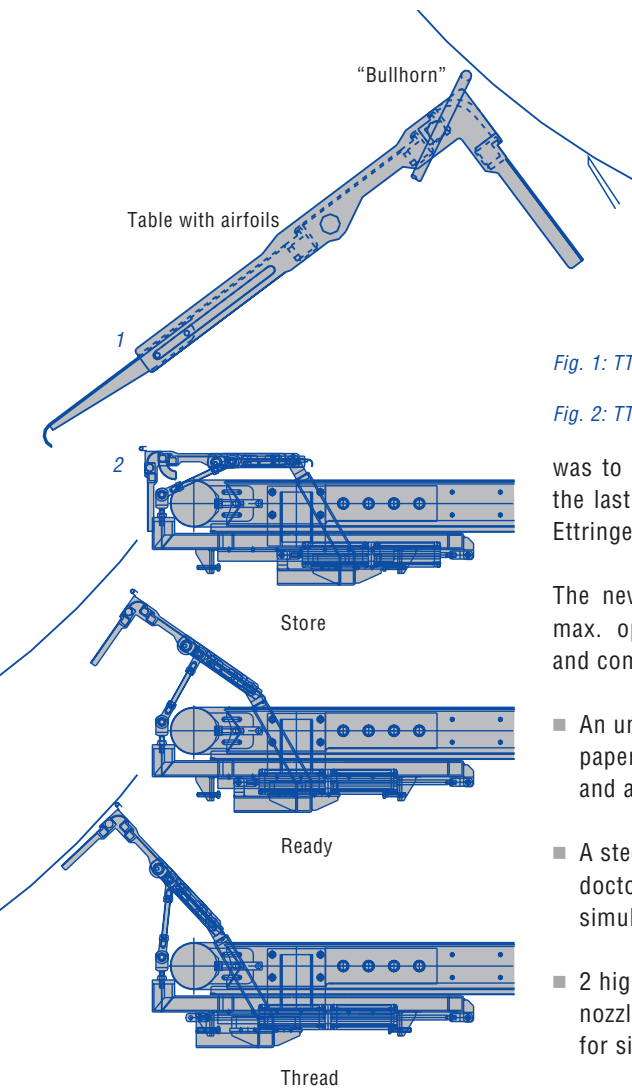


Fig. 1: TT3000™ foil configuration.

Fig. 2: TT3000™ in three positions.

was to use the new threading system on the last dryer on PM 5 at Lang Papier in Ettringen.

The new test stand was designed for a max. operating speed of 2,000 m/min. and comprised the following elements:

- An unwind device for feeding the test paper with a roll diameter of 125 cm and a roll width of 60 cm;
- A steel cylinder with pressure roll and doctor, arranged above a pulper, for simulating the last dryer;
- 2 high-pressure water-jet cutting nozzles cutting on the steel cylinder for simulating the tailcutter;
- Moisturizing nozzles for paper-sheet conditioning;
- A new, long Fibron conveyor are designed for installation at Lang Papier PM 5;
- A test "Bullhorn" take-off device.

The test was set up to simulate the actual installation situation at Lang Papier PM 5 as precisely as possible.

During the setup of the test stand, already existing components and machine parts from different Voith Paper locations could be used to a large extent. Because of this, the development time was very short.

The development of the new peeling-off and threading unit was based on the following criteria:

The concept

- Threading to be independent of the doctor function
- Threading at any machine speed
- No looping (double tail) during take-off
- Precise control of the threading tail during take-off
- Functional reliability

The device

- Operationally reliable
- Few moving parts
- Self-cleaning

Characteristics

- Immediate readiness for threading, without time-consuming doctor cleaning and other maintenance steps
- Safe initial tearing and separation of the tail
- Simple operation
- Non-contact solution
- Maintenance-free
- Retrofittable on existing systems possible

The construction of the test stand was started in the middle of December 2000.

More than 400 threading tests were carried out and documented from the end of January to the middle of March 2001 by the R&D team consisting of employees from Voith Paper Coquitlam (Fibron), Voith Paper Heidenheim and Voith Paper Krefeld.

- that a large number of tests have to be conducted using real operating parameters and taking speed, paper quality, basis weight, etc., into account;
- that a functional reliability of almost 100% must be achieved under test conditions before installation in a running paper machine can be released so that the risk of a time-consuming restoration of the old components and the production losses resulting from this are minimized in the event of insufficient function.

At the beginning of November 2000 it was decided to start a development project in the R&D center in Heidenheim. If successful, the objective of this project

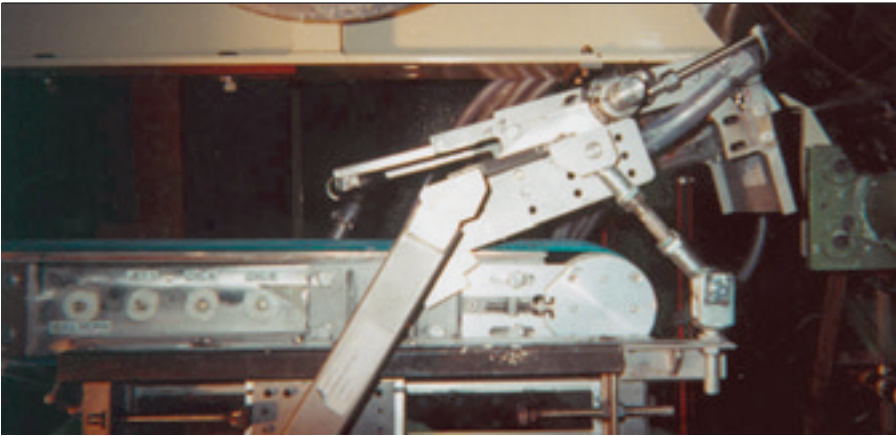


Fig. 3: Prototype TT3000™.

Fig. 4: Production unit installed at Lang Papier, Germany.

A great number of nozzle and Airfoil arrangements were tested during this period.

The use of a high-speed camera with 500 single pictures per second turned out to be invaluable for the documentation of all nozzle and Airfoil arrangements and their effects on the peeling-off and threading process.

Only the evaluation of the high-speed videos enabled us to fully understand the complex peeling-off process and thus to optimize blowing sequence and blowing time of the nozzles and Airfoils in the millisecond range.

The breakthrough with the threading tests at the R&D center in Heidenheim came at the beginning of March 2001. A functional reliability of almost 100% was reached at a test speed of 1,800 m/min with the test “Bullhorn” take-off device (Fig. 3). Shortly afterwards, the manufacture of the final design of the “Bullhorn” take-off device for installation on PM 5 at Lang Papier was started. In mid-March the device was pre-assembled in the R&D center. The installation in PM 5 took place on 26 March 2001 and the start-up from 30 March 2001.

The final design of the “Bullhorn” take-off device consists of a table with four different Airfoils (Curly Foil, Foil 0, Foil 1 and Foil 2) and two laterally attached nozzles of the “Bullhorn” type. Fig. 1 shows this arrangement.

By the explosion-like air blast from the two “Bullhorn” nozzles, the threading tail is initially torn at the side and then torn

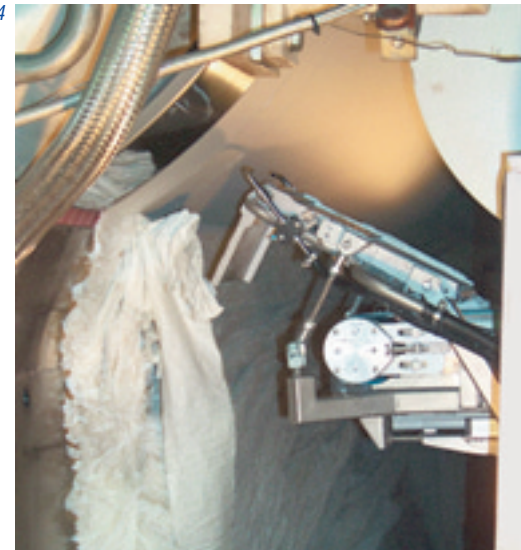
through and lifted off the dryer. The new beginning of the tail resulting from this is seized by the Airfoils in the table and guided to the subsequent Fibron conveyor. In this connection the “Bullhorn” nozzles and Airfoils are controlled according to a sequence which was optimized in the course of the tests to minimize blowing time and maximize control and guiding of the threading tail. The duration of the entire blowing sequence is far below 1 second.

The new take-off device was launched onto the market under the name **Tear and Transfer 3000™ (TT3000™)**.

Fig. 2 shows the three positions of the TT3000™: the park position, the ready position and the threading position. Fig. 4 show the device installed at Lang Papier.

When the TT3000™ was started up on PM 5, it turned out that there was an essential difference from the tests at the Research Center in that the threading tail adheres much less to the dryer during practical operation. Peeling-off of the threading tail from the dryer was much easier, but the lateral tear-in and tear-through of the tail necessary for the creation of a new tail beginning without a loop (double tail) was equally made more difficult.

One of the causes of this phenomenon was the initially extremely high cutting pressure of 1,500 bar at the tailcutter. The consequence of this was that the cutting edges of the tail no longer rested flatly on the dryer surface and that blow air could already get behind the tail and peel it off the dryer before it was initially torn. The



cutting pressure was reduced to 800-900 bar in the course of optimization.

The most important result after a total period of 6 weeks of optimization with all operating modes, paper grades, basis weights and speeds:

The production downtime after a sheet break has been significantly reduced, primarily due to the elimination of the time-consuming disturbances and cleaning requirements at the take-off doctor.

Our customer, too, who has favored and supported this new development, has confirmed the functional and operational reliability of the new device.

Congratulations to the entire project team for a job well done and completed on schedule.