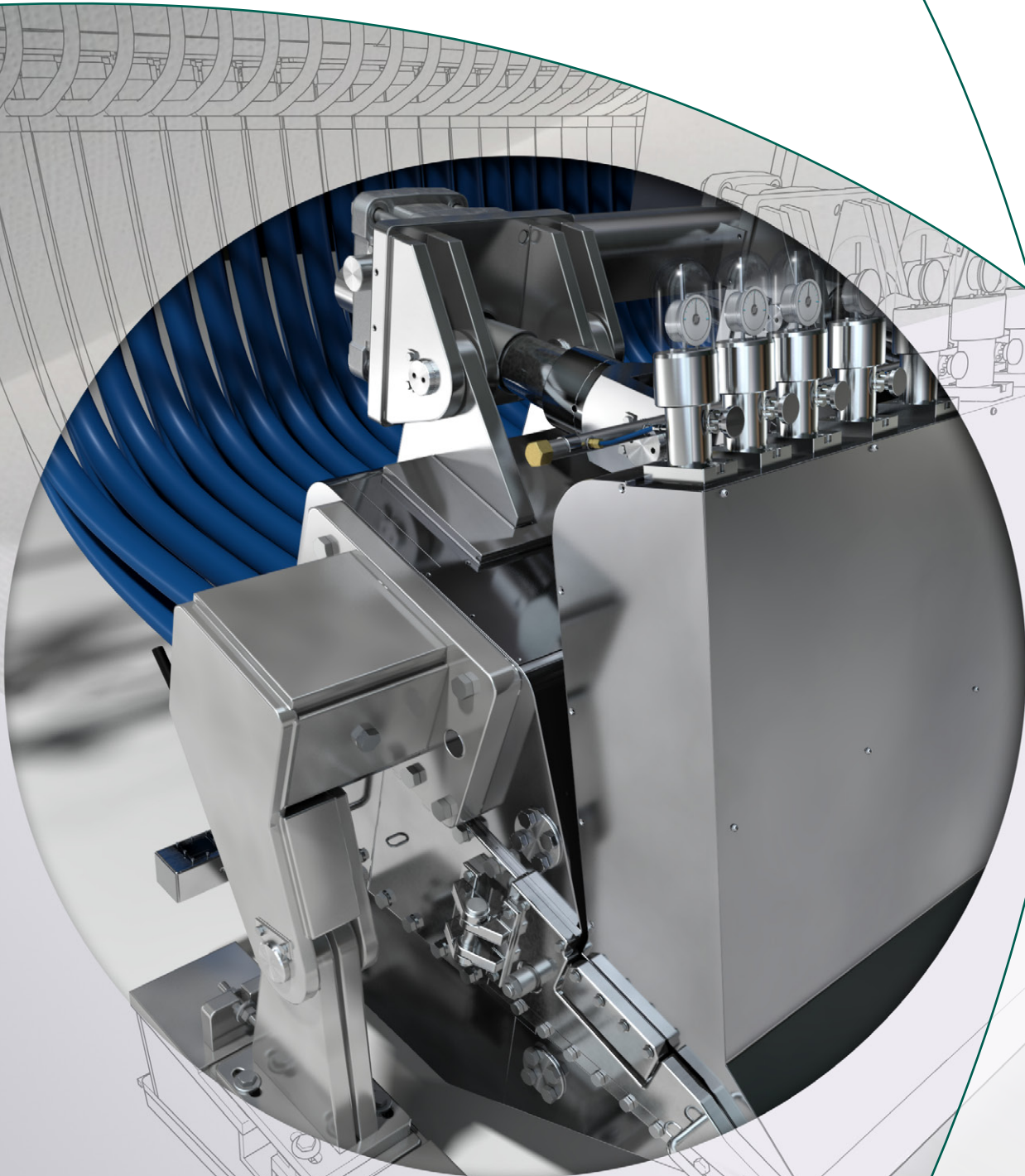


Tissue making starts in the headbox

OptiFlo II TIS



For your finest products

Tissue making starts in the headbox

Metso recognizes that one of the most critical components on a tissue machine is the headbox. A properly functioning headbox enhances tissue makers' ability to produce various tissue grades at their desired level of quality. Tissue making starts in the headbox.

And this is why applied research conducted at the Metso Tissue Technology Center over the years has continuously focused attention on improving headboxes. In the 1970s, the HTB headbox enabled layering tissue grades while running tissue machines at high speeds. In the 1990s, the solid stainless steel SymFlo TIS improved formation and introduced dilution.

In 2005, Metso launched the OptiFlo II TIS headbox. The focus this time was improved overall headbox performance with special attention paid to formation and structural design, which is the foundation of excellent basis weight profiles.



Improved formation and basis weight profiles, low energy consumption

Research leading up to excellent formation has focused on the behavior and physics of the flow of fiber in a suspension. In particular, the work centered on the de-flocculation and re-flocculation processes.

The result of these efforts is an optimized turbulence generator and improved nozzle geometry in the area before the slice, which creates a highly de-flocculated and uniform fiber suspension into the wire gap to enable the best possible formation.

Compared with a sheet from a SymFlo TIS headbox, which is considered an industry leader, the average floc size in a sheet from an OptiFlo II TIS headbox is 20 to 30% lower.

Another target of the research, no less important than improving formation and basis weight profiles, was reducing energy consumption.

The OptiFlo II TIS headbox permits running at consistency levels 10% or higher resulting in lower levels of energy consumption than the SymFlo TIS headbox, without sacrificing good formation and CD basis weight profiles. Lower energy consumption is due to less fan pumping: the pump is by far the most energy consuming item in a tissue mill.

Reduced and more uniform slice deflection, which results in excellent CD basis weight profiling on high-speed machines, is the effect of the improved structural design of the OptiFlo II TIS headbox.

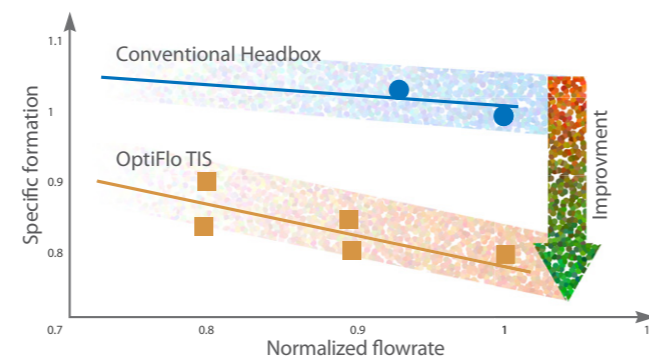
Apart from optimal formation and improved CD basis weight profiling, OptiFlo II TIS headboxes retain the excellent layering, diluting and jet setting capabilities of the SymFlo TIS headbox.

The OptiFlo II TIS headbox is standard on all Metso Advantage™ DCT®, NTT® and ThruAir® (TAD) tissue machines. The headbox operates at speeds of up to 2200 m/min or 7200 ft/min.

Optimal formation and basis weight profiling

Metso guarantees optimal formation and CD basis weight profiles in all of the OptiFlo II TIS headboxes in their product range to provide tissue makers with

- Real operational and quality improvements
- The option of low or high consistencies into the headbox, low for production of top-of-the-line grades, or high consistencies to reduce energy consumption, a choice that minimizes pumping energy
- Superior base paper properties
- Uniform fiber distribution, a necessity for gaining tensile efficiency
- Greater opportunity to satisfy consumers' esthetic requirements for tissues such as touch, softness and appearance
- The option of producing within a wide range of basis weights
- Excellent layering capability giving tissue makers the opportunity to put bulk and softness where they want it
- The option of one, two and three layer applications



Designed to boost productivity

Optimum production costs, and products and production capacities matched to current market demands are essential for tissue makers to achieve the best levels of productivity.

Minimum production costs

Uniform formation, CD basis weight and moisture profiles, in other words, optimum uniformity of the essential properties in the tissue making process, positively impact machine runnability, efficient use of fibers, water and steam consumption and maintenance requirements.

Uniformity throughout the tissue making process increases tissue makers' possibility of hitting their production and quality targets without overcompensating for variation.

Tensile efficiency saves refining energy.

OptiFlo II TIS headboxes give tissue makers the option of high or low consistencies into the headbox: high consistencies to reduce energy consumption, a result of minimized pumping, or low consistencies for production of top-of-the-line grades.

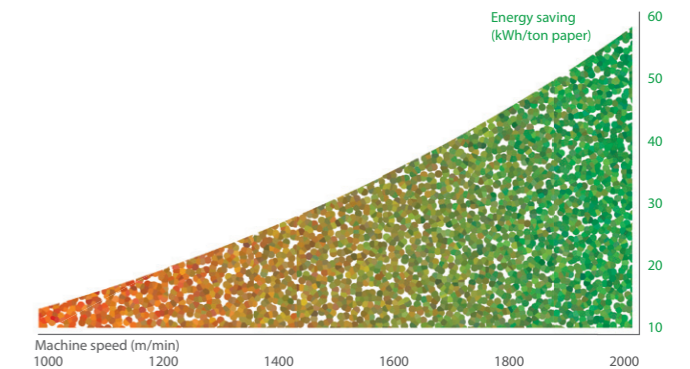
The compact and simple design of the OptiFlo II TIS headboxes simplifies maintenance, and its high turbulence factor minimizes cleaning requirements.

Products matched to market demands

The wide range of basis weights, running speeds and layer configurations that the OptiFlo II TIS headbox offers tissue makers enables them the option of developing products for a wide range of end-users. And the OptiFlo II TIS headbox has no trouble meeting the current trend calling for production at very low basis weights.

Capacities adapted to market demands

The wide range of Metso tissue machines is available in a number of widths and they run at speeds of up to 2200 m/min or 7200 ft/min to meet tissue makers' capacity specifications.



New or rebuild –it's all about efficient performance

The OptiFlo II TIS headbox is standard on all Metso Advantage DCT, NTT and ThruAir tissue machines. A number of different models are available, each corresponding to customers' requirements for machine widths and speeds.

Each model of the OptiFlo II TIS headbox provides tissue makers with the same outstanding end-product properties.

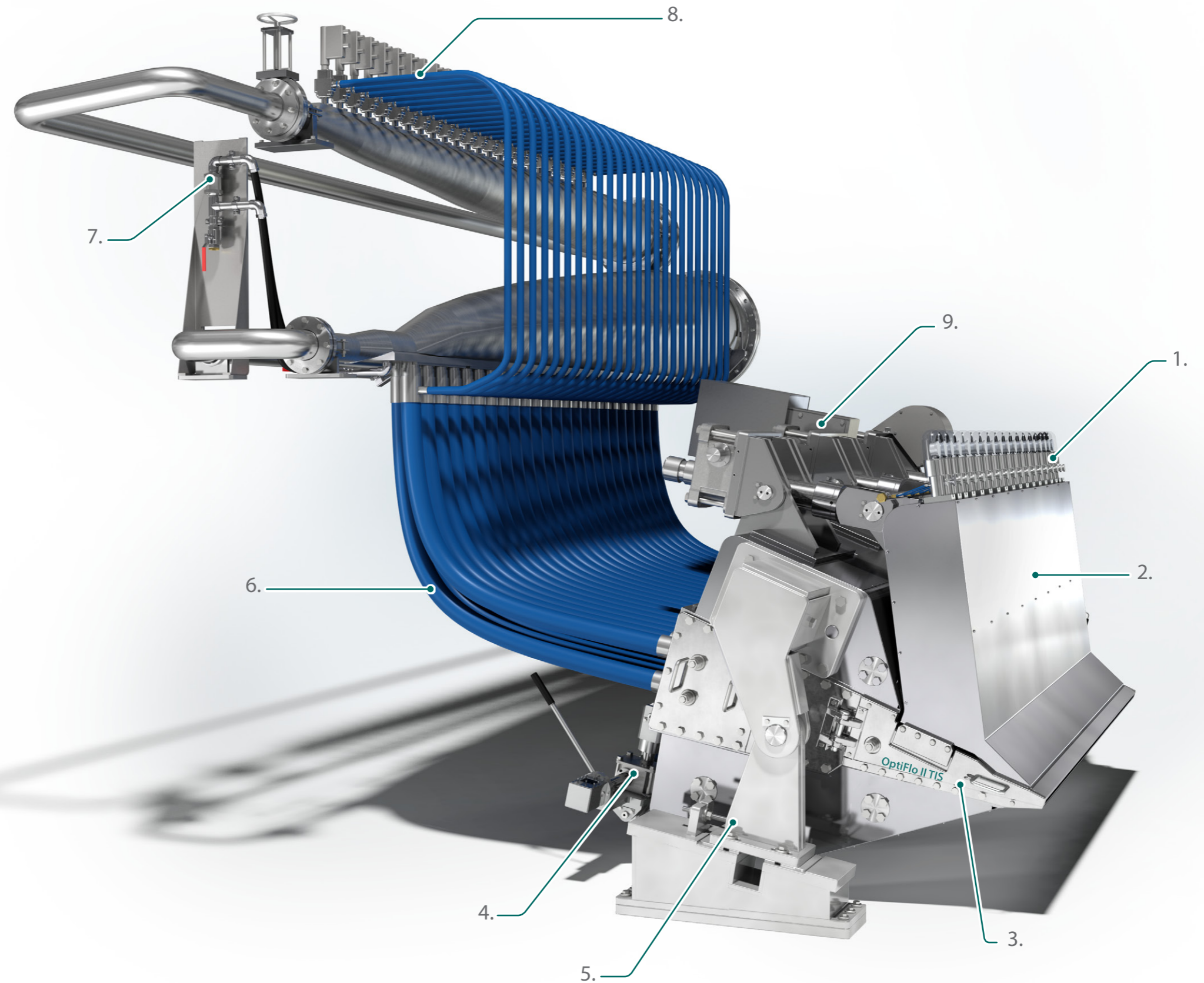
The compact and flexible design of the OptiFlo II TIS headbox makes cost-effective upgrading and rebuilding of existing tissue machines a real possibility.

The OptiFlo II TIS headbox ensures the stable tissue making performance necessary for efficient tissue production.



Features designed with productivity in mind

1. Easily accessible micro adjusters in stainless steel with easily read slice indicators add up excellent basis weight profile.
2. The clean design and smooth exterior surface means no fiber buildup.
3. The hinged pond side doors enhance easy inspection and cleaning.
4. The screw jack enables adjusting the impingement angle during operation.
5. Flexible mounting allows moving the headbox laterally and vertically to facilitate easy fine-tuning of the position of the headbox.
6. Long life flexible hoses connect the stand-alone headers to the headbox for optimum flexibility, and they simplify pipe connecting as well. Flexible hoses also ease adjustment of headbox position and increase rebuild options where space is limited.
7. The header-balancing unit fitted with an observation window enhances adjusting the pressure balance in the header.
8. The option dilution system automatically and continuously adjusts basis weight profiling.
9. The remote controlled slice opening adjustment facilitates changing of grades. An indicator provides easily read slice-opening data.



OptiFlo II TIS Improving the science of tissue making

It is often said that tissue making is both an art and a science. Aiming to put a little more scientific understanding into the art, Metso initiated an applied research program that resulted in the development of the OptiFlo II TIS headbox.

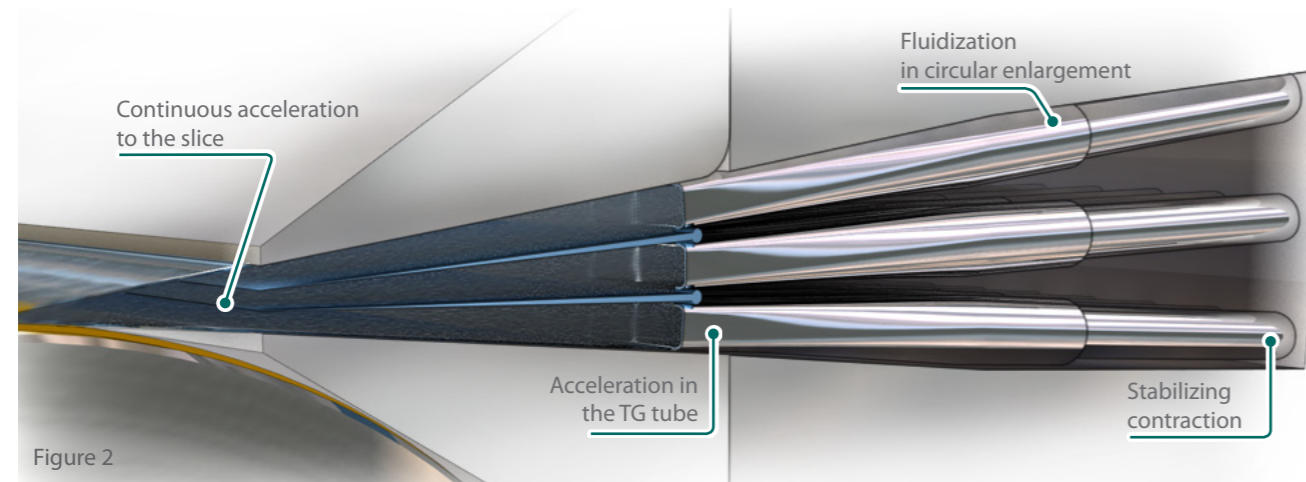


Figure 2

This headbox, based on an optimized turbulence generator and improved nozzle geometry, is designed to produce superior base paper properties as a result of the excellent formation that the new technology allows. At the same time, the design provides important energy savings as the improvements allow increased consistency to achieve the same quality, resulting in reduced flow to the headbox and decreased pumping energy.

In order to understand and improve headbox operation, the research focused on the behavior and physics of fiber suspension flow. The work centered especially on the fluidization (de-flocculation) and re-flocculation processes in fibrous suspensions.

Of course, good formation depends on the flocs in the fiber suspension being minimized when the jet is injected from the slice and trapped between the felt and wire. While headboxes typically have turbulence generators to fluidize the fiber suspension, the re-flocculation process is extremely rapid. This means that the flocs can be reformed almost as quickly as they are fluidized if the shear forces are allowed to decrease, as can occur in a traditional design. This is illustrated in **Figure 1**, showing floc size before and after the sudden expansion of a typical turbulence generator.

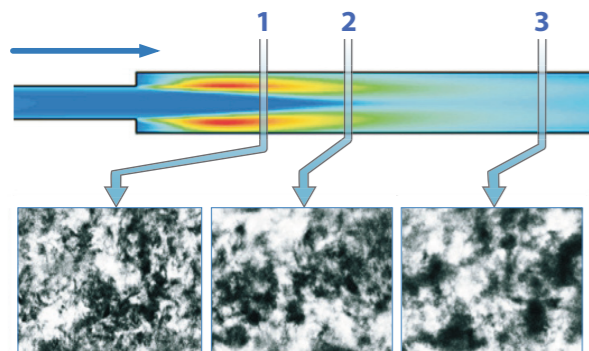


Figure 1

Experiments with various turbulence generators and nozzles led to the development of new process solutions in the area before the slice, **Figure 2**. As can be seen, the configuration features a long inlet contraction zone followed by a tapered turbulence generator tube that is characterized by continuous acceleration between the wedges and through the slice chamber, leading to the ejection of the jet to the wire gap in a more fluidized state. The result is a fiber suspension that is highly de-flocculated for the best possible formation.

Mill experience of the OptiFlo II TIS headbox suggests outstanding improvements in formation. The beta-radiographic analysis,

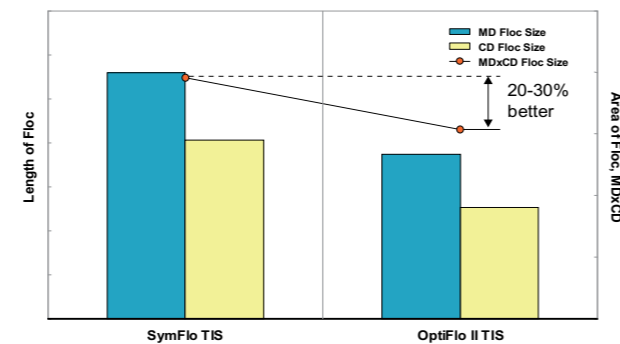


Figure 3

Figure 3, shows a 20% improvement in formation in a sheet produced in a towel producing tissue mill after installation of an OptiFlo II TIS headbox compared to a sheet produced using conventional technology. The OptiFlo II TIS headbox offers the quality and operational improvements that make it the perfect headbox for the full range of tissue machines from Metso.

Tissue Technology Center Theory verified in practice

Two full-sized, flexible pilot machines, a well equipped and organized laboratory and extensive expertise of tissue machines and manufacturing processes. That's the Metso Tissue Technology Center in a nutshell, a unique facility among suppliers to the tissue making industry.

Together with customers, the Metso Tissue Technology Center continuously develops new processes and original components. The OptiFlo II TIS headbox is one of the Center's latest creations, and an excellent example of Metso and customers working together to develop new technology.

The OptiFlo II TIS headbox project successfully targeted improved formation, CD basis weight profiling, and tensile strength development. Other concerns included a number of energy, fiber and water saving measures, while retaining the excellent layering, dilution and jet setting capabilities of its predecessor, the SymFlo TIS headbox.

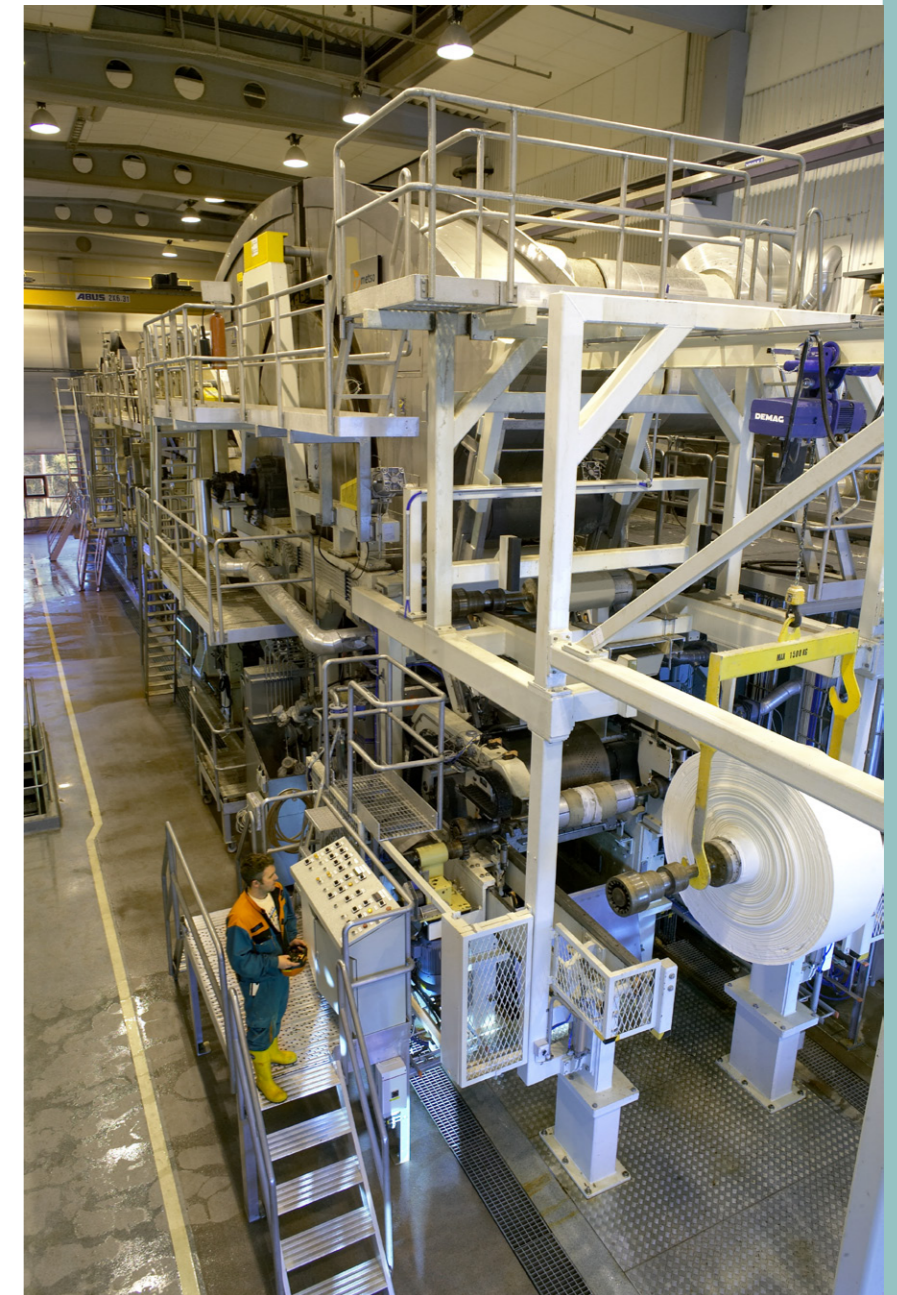
Similar collaborative efforts at the Center gave rise to pioneering innovations such as the twin-wire former, the multi-layer headbox, the SymFlo TIS headbox and the Advantage DCT, NTT and TAD tissue machines.

The Metso Tissue Technology Center is a creative environment offering tissue makers from around the world, regardless of their machine manufacturer, the opportunity of sharing their knowledge and experience with Metso resources to find answers to tissue making problems.

And that's any problem, ranging from improving productivity, to configuring machine design to meet current customer demands, to training machine operators and process technicians in realistic conditions.

Metso guarantees

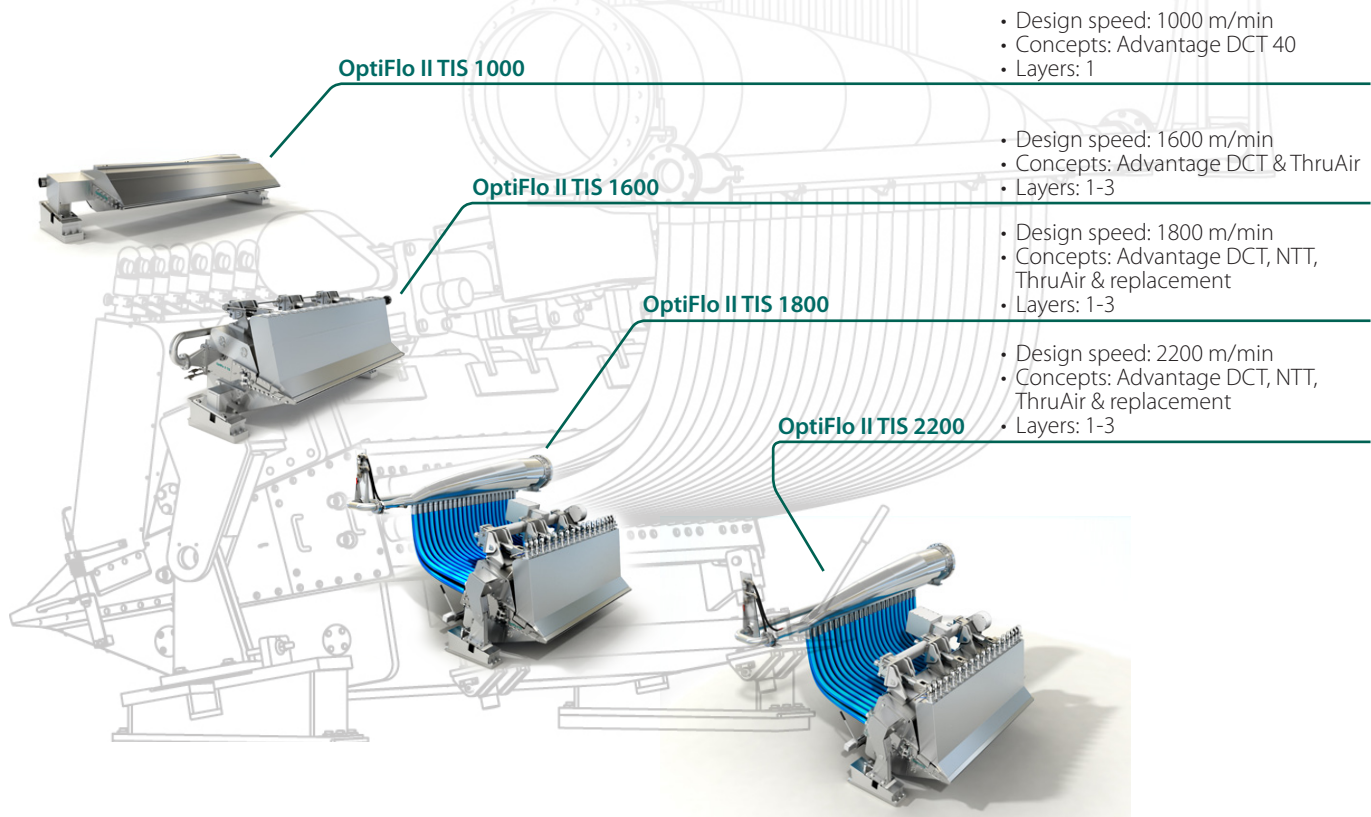
- Formation
- CD basis weight profiles
- Overall machine energy consumption.



TM1 at the Tissue Technology Center in Karlstad, Sweden

OptiFlo II TIS

One headbox for every need



- Design speed: 1000 m/min
- Concepts: Advantage DCT 40
- Layers: 1

- Design speed: 1600 m/min
- Concepts: Advantage DCT & ThruAir
- Layers: 1-3

- Design speed: 1800 m/min
- Concepts: Advantage DCT, NTT, ThruAir & replacement
- Layers: 1-3

- Design speed: 2200 m/min
- Concepts: Advantage DCT, NTT, ThruAir & replacement
- Layers: 1-3

References

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|-----------------------|--|------------------------|--------------------------|
| • HengLi, China | • Confidential, USA | • Gold Door Co., China | • San Fransisco, Mexico. |
| • Delipapier, Germany | • Georgia Pacific, USA | • Confidential | • Wausau, USA |
| • Ibertissue, Spain | • Confidential | • Century, India | • Santher, Brazil |
| • Lila Kagit, Turkey | • Syktyvkar, Russia | • Metsä Tissue, Sweden | • Heng An, China |
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