ANDRITZ *Prime*LineTAD

Highest Quality at lowest possible Energy Input

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The TAD section of the ANDRITZ tissue pilot plant in Graz, Austria

ANDRITZ experts give a complete overview of its *Prime*LineTAD (Through Air Drying) technoloy for the production of premium tissue products:

Joseph Guadagno: Vice President Tissue and Air Systems, North America
Stefano Marenco: Director *Prime*LineTIAC and R&D Tissue
Paul Richards: Senior Technology Manager Tissue

Can you give an overview of the ANDRITZ TAD concept; please include anything interesting about the development timeline?

PAUL RICHARDS: ANDRITZ only entered the TAD machine market in mid-2000, following the breakdown and closure of the Beloit Corporation. While others looked to acquire the technology, ANDRITZ focused on the experience of the personnel in an effort to further grow into the TAD market in general, and specifically on the US market. Over the next two years, a concept was conceived and engineered and by early 2003 ANDRITZ had its first order for a TAD machine.

The ANDRITZ *Prime*LineTAD comprises a 2- or 3-layer headbox with dilution control that delivers the stock to a modified C-wrap twin wire former. The former is adapted to allow vacuum assisted dewatering of the base sheet before the sheet transfers to the TAD section. At the pick-up, there is the possibility of running a speed differential to tailor the quality and sheet structure according to customer needs, before the sheet passes over the "shaping" or "moulding" vacuum box to lock in the sheet structure. Next, the sheet is dried over two patented TAD drums in series, up to anything between about 75% and 90% dryness, depending on the needs of the specific customer. The complete air handling system has been developed and engineered using CFD, computational fluid dynamics analysis, by our North American colleagues in Canada.

The sheet is then transferred to the Yankee cylinder for application of dry crepe before passing over the recently developed and patented active air foils and being wound using the linear center-wind assisted reel. When we first started down this route, we typically offered a single large diameter TAD drum but have since developed our standard machine to the two drum arrangement to optimize the overall energy efficiency of the process for our customers.

Can you share details about the hood and air system and what sets the ANDRITZ *Prime*Line TAD concept apart from competitors?

JOSEPH GUADAGNO: The process air system is used to transport hot air through the paper sheet with a uniform temperature and pressure profile. There are different ways to properly mix the air and optimize the supply air temperature and pressure profile uniformity to the TAD drum. For this purpose, we developed specially designed static mixers, guide vanes and perforated screens that are incorporated into the ductwork and the TAD supply hoods.

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JOSEPH GUADAGNO
Vice President Tissue and Air Systems, North America
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"One of the main purposes of the trial is to produce paper reels that are then converted by the customer into the final products."

STEFANO MARENCO
Director *Prime*LineTIAC and R&D Tissue
ANDRITZ

The process air is transported through the large insulated ductwork by the variable speed supply fans that deliver the required air mass to the sheet. A natural gas-fired burner is installed after each TAD supply fan to heat the air supplied to the sheet and to increase its drying potential. The supply air ducts are connected to the TAD hood modules with articulating joints that permit the TAD hoods to retract, allowing access during fabric change, sheet breaks, or cleaning and inspections during maintenance shutdowns.

The wet and dry end TAD hoods are constructed of two independent, retractable halves, with perforated nozzle plates that allow proper airflow distribution into the space between the TAD hood and TAD drum. The supply air is "pulled through" the sheet by negative pressure within the TAD drum.

Moisture removed from the sheet is then partially evacuated to the atmosphere using the TAD exhaust fan. The air exhausted to the atmosphere is replaced with fresh air make-up. The TAD supply fan pushes the TAD return air back into the pre-dryer supply air duct system in this continuous drying cycle.

Thus, controlling the TAD supply air properties like mass flow, temperature, and absolute humidity, we optimize the drying capacity of the system. With the proper control of exhaust air pressure, moisture, and temperature, the optimal energy use can be achieved together with extended life of your TAD fabrics, both which represent a significant operating cost.

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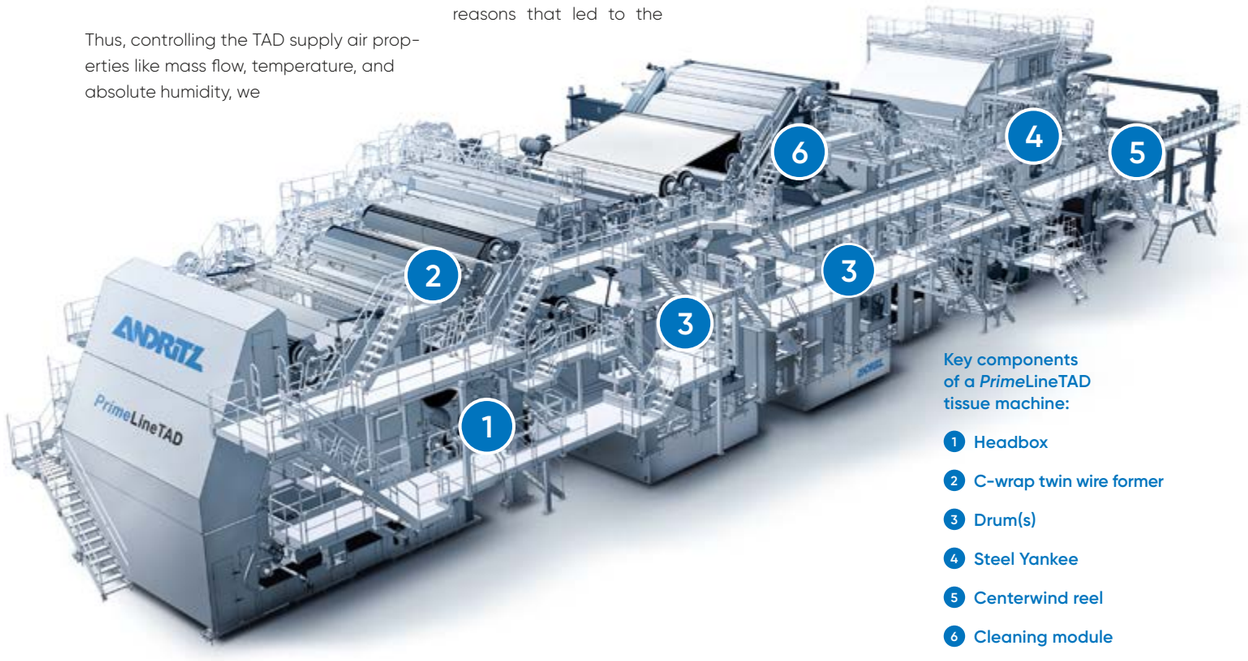
Can you talk in-depth about energy savings, and perhaps provide some numbers?

PAUL RICHARDS: TAD by its very nature is rather energy intensive, which is one of the key reasons the market has developed so much in the US, where energy is traditionally so much cheaper than in other regions. What we are seeing today, however, is an interest from regions where energy is much more expensive, but where a market can still be developed if a way can be found to reduce the energy consumption.

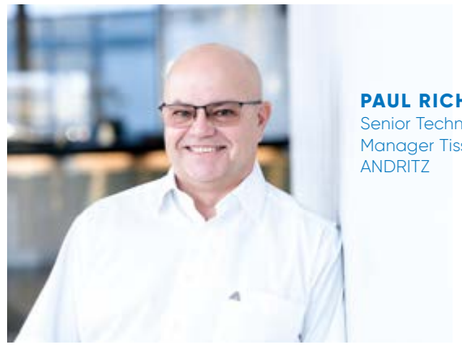
Historically, TAD was made with a dryness after the TAD of around 95% – one of the reasons that led to the development of the UCTAD, or Un-Creped TAD, process. The Yankee, a traditional part of any Tissue Machine, was only really a carrier, allowing a percentage of dry crepe to be put into the end product. Today, depending on the technology being used and the manufacturer, the dryness after the TAD can be significantly lower. In fact, ANDRITZ and its customers are constantly making efforts to push these boundaries and are evolving with the chemistry suppliers to allow higher moisture to the Yankee. This movement of the drying balance is a major step in reducing the energy demand for drying.

From the time of the development of our first TAD machine to the current offering, we have reduced the drying energy demand in the range of 15 – 20% by the simple use of a second TAD drum, albeit smaller diameter drums. This allows a more controlled and targeted use of the hot air in the drying process. We can use much hotter air for the first air system, which also has a lower permeability of the tissue sheet, where the pressure drop is considerably higher. Then in the second system, where the sheet is drier and more open, we can use lower temperatures



Key components of a *Prime*LineTAD tissue machine:

1. Headbox
2. C-wrap twin wire former
3. Drum(s)
4. Steel Yankee
5. Centerwind reel
6. Cleaning module



PAUL RICHARDS
Senior Technology Manager Tissue
ANDRITZ

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and higher volumes. All of this protects the other system components, such as the TAD fabric, while allowing smaller overall system components and commonality between the system sizes.

Taking this line a little further, our drive is now to further push the balance of the drying towards the Yankee, with a target around 65% max solids to the cylinder. This can only be achieved in conjunction with our customers and our partners in the chemical side of our industry. Financially, however, if such a movement can be realized, then the energy efficiency of the drying process could finally be at an optimal level. Once all the "free water" has been removed and only intercellular water is left, the impingement process is much more efficient from a drying perspective.

Another recent addition to energy saving opportunities comes from developments in vacuum technology. Using blowers instead of traditional liquid ring pumps provides a hot air source that can be used for preheating a portion of the incoming air as it enters the system.

Another possibility, probably more popular in places where gas supplies are more limited or infrastructure is not yet available, is the use of steam (heat exchangers) as a heating medium. The system temperatures lend themselves to consideration of such heat exchangers, especially in situations where an excess of steam is available, such as near pulp plants, etc.

Can customers see the TAD concept in action, and see some samples produced of their own products?

STEFANO MARENCO: The *Prime*LineTIAC (Tissue Innovation and Application Center) pilot machine at our facility in Graz, Austria is currently configured in TAD mode. We are running trials with our customers and one of the main purposes of the trial is to produce paper reels (small rolls of 600 mm width) that are then converted by the customer into the final products. The tissue makers can then run market analyses and product quality tests to predict the interest of the consumer or market potential for a new product.

Can you give us some insights on any ongoing R&D work on the TAD concept?

PAUL RICHARDS: One of the key areas of interest in this technology is clearly a reduction of the drying energy. Much of the current effort is directed at how we might achieve a higher reduction of the overall drying energy, without increasing the net energy input. Obviously, our goal here is to make deep cuts into the overall net energy.

STEFANO MARENCO: We are also focusing our research on technical solutions that can increase the overall efficiency of the TAD machine with a more compact design in order to reduce the building footprint and the civil construction costs for this technology.

For more information please visit www.andritz.com/tissue or contact us at tissue@andritz.com

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TAD-drum installation at the ANDRITZ tissue pilot plant