Achieving a lot with a little energy

First IEM starts up at Perlen Papier AG

Economical, environmentally friendly, regionally adapted – these are the essential criteria that distinguish a Voith Paper Integrated EcoMill (IEM). The IEM concept was implemented with the PM 7 at Perlen Papier AG, with the resulting resource consumption there for newsprint being well below the average. From the beginning, 5% less electrical energy per metric ton of paper has been consumed than with the PM 5, which was repeatedly optimized and is now shut down. This not only protects the environment but also pays off economically for the Swiss paper manufacturer.

Fig. 1: Perlen PM 7, Switzerland.

Perlen PM 7 – an Integrated EcoMill in numbers

360,000 t/year
Production capacity

40-52 g/m^2
Basis weight

10.45 m
Wire width

2,000 m/min
Design speed

1,900 m/min
Maximum production speed

1,662 m/min
Start-up speed (world record)

30%
Lower fresh water consumption across the entire paper mill

Compared with the PM 5, optimized to its maximum and now shut down:

5%
Lower electrical energy use*

10%
Lower thermal energy use*

50%
Fewer additive costs*

* All results per metric ton.

From the very beginning, the PM 7 looked set to be a record breaker. The production line clearly demonstrates the benefits of the IEM concept in real life. As a complete system provider, Voith delivered wastewater treatment, stock preparation, the paper machine, winder, roll transport and roll packing systems, as well as the entire automation. In terms of the process line package, Voith Paper was also responsible for delivery, overall assembly, startup and optimization of the entire production line. Resource preservation was at the heart of the overall concept developed in close collaboration with Perlen Papier AG, Switzerland, in which all processes are holistically coordinated with one another.

The PM 7 already consumes 5% less electrical energy

As Jörg Michel of Perlen Papier AG's management observes (see interview p. 11), "Almost from the very start, we took a big leap forward with the PM 7's running time efficiency. And even more important: From the beginning, we produced good to very good marketable quality."

According to Michel, this is due to optimally integrated processes from dewatering (DuoFormer) and the press section (DuoCentri NipcoFlex with three nips and a fourth press) to the dryer section (in which 31 dryer cylinders are used in six dryer groups). In direct comparison to the shut-down PM 5, which was technically updated through continuous further development, even right after startup the new PM 7 was consuming 5% less electrical energy per metric ton of paper produced. Even in terms of thermal energy, PM 7 is better compared to PM 5. The goal is to achieve an energy requirement that is lower by about 10%. In addition, the additive costs for binding agents, starch, talcum and dyes on the PM 7 have been nearly cut in half, particularly due to the modern press section.

TwinDrum and LowEnergy-Flotation ideally prepare stock

Recycling of recovered paper is an important topic at Perlen Papier AG.

Voith expanded the existing ALPA 1 recovered paper recycling plant by adding the ALPA 2 to its overall concept. Due to the integrated processes in the recovered paper preparation system, not only is the yield in stock preparation increased, but Perlen Papier AG also saves 7 GWh of energy annually. The latest flotation technology, LowEnergyFlotation (LEF), plays a significant role in this. For the first time, Voith equipped a new system with this technology yielding a sensational result: Inks are efficiently removed and the energy used for this at Perlen is reduced by more than 30%.

Fig. 3

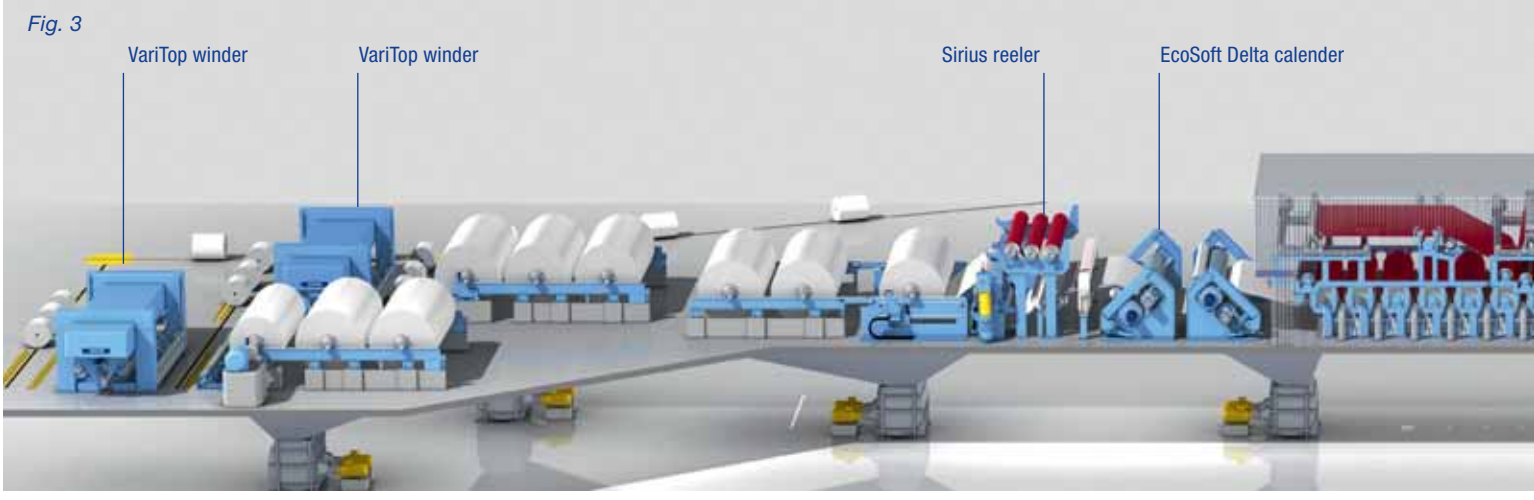

Fig. 2: The TwinDrum lowers additive consumption at Perlen.

The recovered paper used comes mainly from household material collected in Germany and Switzerland. The bundles of recovered paper from Switzerland are typically packed with various cords. The ALPA 2 not only removes the cords from the recovered paper but also de-wires bales weighing several tons, in fully automated fashion, and feeds the loose recovered paper into the TwinDrum. This TwinDrum with a capacity of about 1,500 t/day continuously supplies both stock preparation lines. Its innovative pulping concept combines the gentle slushing of fibers with a reduced requirement for additives. With a pulping consistency of 25 to 28%, outstanding ink removal is achieved, among other benefits, due to the integrated displacer located in the pulping section of the TwinDrum.

30% less fresh water is needed

Consumption of fresh water across the entire paper mill was lowered by one-third. This is a result of water management in all areas, from recovered paper preparation to the two paper machines (the existing PM 4 and the new PM 7) and the wastewater treatment system.

The latter includes purification of the water circulation system and reject treatment, for which Voith has developed and implemented a new concept for machine and process technology. During ongoing operation of the paper mill, the capacity of the clarification facility was doubled to 1,000 m^3/h of wastewater and 50 t/day of COD load. Two moving bed biological reactors (MBBR) are used as high-load biological stages followed by two low-load biological stages and three secondary clarification tanks. They ensure that biologically purified water can be discharged into the fish-abundant Reuss River, which has its source in the Saint-Gotthard Massif in the Swiss Alps. Therefore, the company meets the highest ecological requirements of the Swiss environmental authorities.

Perlen Papier AG gets its fresh water from its own well, where the village of Perlen also gets its drinking water. Thus, in further processing of the water, there is a strict separation of drinking water and industrial water. Perlen Papier AG uses around 50% of the fresh water as cooling water and discharges it back into natural circulation uncontaminated.

IEM adapted to location and customer requirements

Starting from the initial requirements, the Perlen PM 7 was designed so that it would not only meet the customer's quality expectations but also make use of existing conditions and be capable of being embedded in the existing infrastructure. In addition,

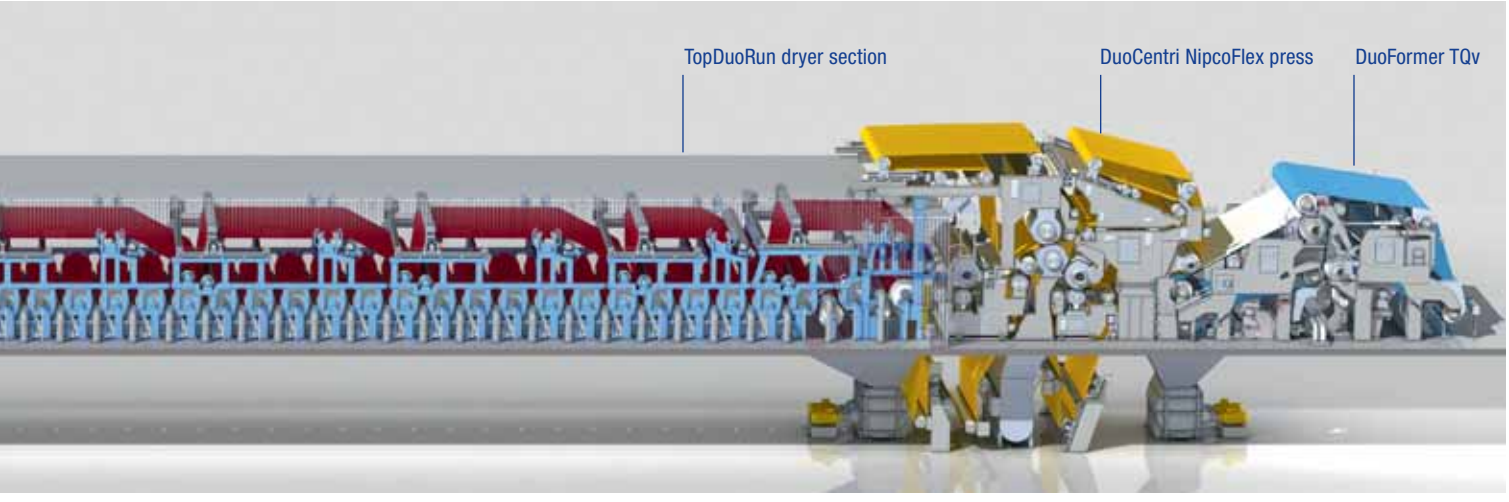

Fig. 4: The center winding principle of the two VariTop winders ensures good core-winding tightness, an important quality parameter for processing in fast-running printing machines.

through integration of all essential processes, consumption of resources was reduced to a minimum.

Important parameters were defined and established in the preliminary project phase. Printing tests and surveys of Perlen Papier AG's customers gave an exact overview of the quality requirements the new paper machine had to meet. High consistency, the best running characteristics and printability of the paper were the main concerns.

Before drawing up the first layout for the new PM 7, the project team determined its optimal location, on the company's premises. Advantage was gained from the hillside location, and the machine hall was built so that one side now has ground-level access to the PM floor and the other side has access to the machine pit. Even the dimensions of the building where the PM 7 is housed were reworked. Thus 35,000 m^3 of gross floor area were saved. Since the building was kept as small as possible, costs could be reduced.

In addition, the machine width and speed were adapted to the customer requirements, and the anticipated need for electricity, steam, water and chemicals was determined. Subsequently, the project team optimally assembled the corresponding system components and carried out the first calculations of efficiency.

Quality improvement using the center winding principle

According to Jörg Michel, the configuration of the press section and the winder with the center winding principle significantly contributed to improving the paper's quality. "Our customers made several test runs and always judged the paper quality positively," says Michel, who is responsible for the areas of production and technology. In addition, Voith integrated a special solution into its concept in the packing system area. Rolls that are delivered to Swiss customers no longer have extra packing at the front in a separate process step. This saves packing material, time and is in equal measure an ecological and economic advantage.

After an exemplary startup, the Perlen PM 7 began production in September 2010 and since then has been running to everyone's complete satisfaction. In close collaboration, Perlen Papier AG and Voith Paper implemented a system that adheres to the strictest environmental criteria, works efficiently and – with Swiss perfection – produces paper at the highest quality level.