

## PAPERMAKING 4.0 BY VOITH

### “Papermaking 4.0 – the vehicle to the factory of the future”

Industry 4.0, Big Data or the Internet of Things – the networking of processes and communication between machines is what will shape the future. Digital advances are making it possible. Voith’s technology vision is to provide a virtual machine, which is a digital image of the actual machine. The machine model in the cloud reflects the real-life operation of the physical machine and can provide a constant actual-target comparison. But Voith has not only ventured a look into the future, we are already offering specific solutions that are making “Papermaking 4.0” reality today.



Voith has recently celebrated its 150th anniversary and is looking back at a history of innovation. By establishing the new division Voith Digital Ventures in 2016, Voith will actively shape the developments in the industry in respect of digitalization. The strong IT and automation background of Voith Digital Ventures paired together with the high process knowledge in paper manufacturing, affords us a significant competitive advantage over other competitors as well as over emerging competitors from the IT market. Therefore, Voith is the reliable partner to leverage today’s industrial opportunities for a smarter digital tomorrow. Despite our competences and our knowledge, the customer remains the key to the successful implementation of Industry 4.0 projects. Using agile and customer-centric development processes, we work hand-in-hand with the customer to develop new and flexible solutions that meet their requirements.

With Papermaking 4.0, Voith is making an intelligent contribution to increase the efficiency, productivity and quality of the entire paper production process, even in existing systems and equipment. The term “Papermaking 4.0” has been chosen deliberately to address Industry 4.0. While some industries are still discussing which IT measures are going to be the key to the smart factory, Voith is already offering specific technology solutions for existing plants and equipment.

### Exploiting the opportunity offered by IT

The fact is that in recent years, information technology has dominated and changed our daily lives and has consequently influenced economic processes to a much greater degree than many people would ever have imagined. Thanks to IT, communication

has become much faster in recent years and enables better data storage and analysis. This can now be used in the industrial space as well, e.g. for the optimization of machines.

We see Industry 4.0 as a sphere of activity for new business models, given that the five crucial technological areas have been mastered. These are: embedded systems (cyber physical systems, CPS), smart factory, robust data networks, data transfer in real time and absolute IT security.

The future is all about being more productive and less expensive

To sum it up, it is about visualization, stabilization and optimization. We make the processes of our customers’ paper machines transparent and the installation of actuators and controls enables our customers to stabilize these processes. As logical consequence, it is also possible to optimize the stable processes. The connection of many sub-processes among themselves to utilize quality data in stock preparation through to the finished product, for example, results in a measurable monetary benefit. In this context, reducing the excessive use of valuable resources such as energy, chemicals, fibres and time plays a crucial role.



In order to better understand the environment of the new digital opportunities, it is worth reviewing what today’s scenario involves. In the context of Voith’s paper machine technology, the numbers are as follows: A modern board machine already incorporates 20,000 I/O (input/output processes), transmits around 160,000 data signals per second and uses 7,000 actuators. To make this possible, 900 metric tons of copper cable had to be installed in this machine. Even these figures will definitely multiply with the next machine as a result of technological advances. But that is exactly what should be avoided. Today, for example, copper cable can be replaced by modern, fast networks, although the number of signals will increase substantially. The “Internet of Things” (IoT) makes this possible now.

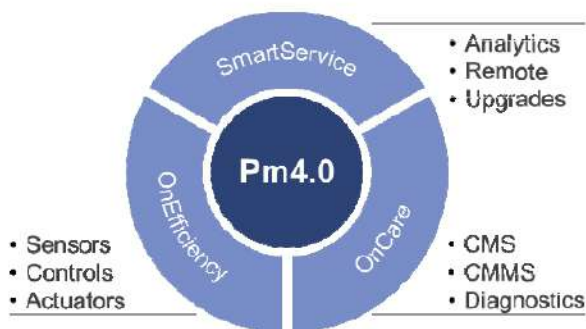
Voith has set itself the goal of helping to shape the future with technological developments, so that in the paper industry, costs are reduced while productivity and flexibility are increased. Voith has defined concrete figures for this ambitious goal:

We believe that 10 percent more productivity and a 10 percent reduction in costs are absolutely realistic.

The first steps to digitalization? OnEfficiency, OnCare and SmartServices

Voith developed OnEfficiency to better exploit the potentials in the paper machine. With this system consisting of several sub-systems, processes are stabilized and more scope is created for optimizations. For example, it is possible to improve the yield from the DIP flotation process, or achieve strength targets for board with minimal use of starch and adjust the porosity of newsprint or base papers on the running paper web towards one target variable. OnEfficiency Dewatering gets right to the process at the heart of papermaking, sheet formation, which is measured and analyzed with a package of sensors. This means that dewatering, retention and flocculation can be stabilized and at the same time coordinated. As a result of the stable process, raw materials and chemicals can be saved and energy use reduced.

It is at this point that we come back to the three aspects: visualization, stabilization and optimization. Sensors and actuators are the technical basis for visualization and for creating transparency about the individual processes in a paper machine. Regardless of which solution is used, i.e. OnEfficiency Dewatering or OnEfficiency DIP, which proactively adjusts the downstream flotation and bleaching process in the deinking process and therefore reduces the use of recovered paper, energy and chemicals: The aim is process stabilization, the outcomes of which offers the paper manufacturer a cost benefit.



**Stable processes mean fewer costs and consistent quality**

But that is not all: Every paper manufacturer wants quality that is as consistent as possible. But the reality is often very different. Although the paper quality might still be right when the machine starts up, the values can start changing after just a few weeks or months. Voith measurements on various paper machines taken over a longer period have shown that over time, the quality diverges from the defined corridors for dewatering, retention, formation or porosity. The basic conclusion is that the huge volume of data available in paper manufacturing cannot be effectively managed with manual methods over longer intervals. But that is exactly what Voith's "Papermaking 4.0", with its various systems, is able to do. OnCare is another of these systems. It identifies the smallest of malfunctions, and can diagnose initial damage to roll bearings before it becomes a problem and therefore prevent unscheduled and costly machine downtimes, for example.

OnCare monitors important areas of the paper machine online, such as pressure pulsation in the approach flow system, vibrations of presses, coating units and calenders. In case of irregularities in the paper, the cause is automatically identified via synchronous averaging. A high-frequency online analysis investigates quality data such as basis weight, thickness and moisture. With this analysis tool, Voith has created a mobile and fixed option for data collection. In the mobile version, operation and quick diagnosis can be performed using any mobile device directly at the machine.

As this is still not a 100% guarantee to prevent downtimes, Voith also offers SmartServices. Our service personnel are located all over the world to ensure that installed technology runs smoothly. In the event of technical problems, we can restore the system availability by remote support and help our customers fast around the clock via hotline and VPN connections. The online connections can be used to check the current status, rectify faults if necessary, or carry out optimizations. Additionally, we are currently in the pilot phase for connecting with our customers in a better way and to leverage the communication and problem solving by using augmented and virtual reality for example.

**Papermaking 4.0 – already proven in practice**



Regardless of whether it is based on visualization or stabilization solutions, smart preventive maintenance that virtually announces and runs itself before the papermaker at the machine is even aware of it – thanks to Voith, the world of Papermaking 4.0 already exists and has been proven in practice. Numerous Voith customers are already relying on OnEfficiency and OnCare systems. Papermaking 4.0, the use of intelligent systems that network with other systems, pays off within just a few months and brings the targeted cost and optimization benefits. A Voith customer stated: "We really appreciate OnEfficiency a lot, so much so that we don't want to tell anyone about it!" And another innovative aspect is that OnEfficiency has a modular structure. Every module as such already provides a measurable benefit. When installed consecutively, the modules network with one another and will result in a Papermaking 4.0 concept to enable our customers to reach the vision of the digital twin.