

Assignment of ABB Process Instrumentation across the Plant

Papier- und Kartonfabrik Varel GmbH und Co. KG, Varel
(Paper and board factory)



Pulp & Paper

Instrumentation Solutions



- More information due to intelligent field instruments
- Direct access to configuration and parameterization
- Extremely high plant availability
- Short commissioning period of the PM 5
- High resilience and long service life of measuring systems
- Increase of quality and productions throughput

1 Company profile

Headquartered in Northern Germany, the paper and board factory Papier- und Kartonfabrik Varel GmbH & Co. KG is a medium-sized, independent private company which has been producing paper and board for more than 50 years. Two cardboard machines (KM 2 and KM 3) are used to annually produce approx. 170000 tons of gray, brown and white quality cardboard with grammages of 300 to 1350 g/m². The paper machine PM 4 provides approx. 230000 tons of corrugated paper with grammages of 120 to 240 g/m² per year. The new PM 5 produces more than 250000 tons of testliner and corrugating medium between 70 and 150 g/m² per year. Nothing but waste paper is used as raw material so that all manufactured products are 100% recyclable. In order to meet stringent quality requirements it is, amongst others, necessary to use highly precise and reliable process control technology.



Fig. 1-1: Paper machine PM 5

2 Initial situation

ABB Automation Products GmbH is a reliable and established partner for leading companies in the pulp and paper industry. This is documented e.g. by the longtime business relationship with the paper and board factory Varel. ABB measuring instruments have been successfully used for more than 30 years with the existing board machines 2 and 3 (KM 2 and KM 3), as well as with the paper machine 4 (PM4). For the expansion of the power plant and of the process water treatment plant, the paper and board factory Varel in the early stage of planning decided to once more use ABB field instruments. Based on this successful partnership, the order was placed on ABB for delivery of the largest part of process instrumentation for the new paper machine 5 (PM5).



Fig. 2-1: Flow measurement at the KM 3

Fig. 2-2: Measurement of natural gas at a gas turbine

3 Electromagnetic flowmeters support prompt commissioning

In accordance with the goal of the paper and cardboard factory Varel to provide top-quality products with continuously increasing production throughput and an ever larger sort-variety, it was decided to use ABB FSM4000 electromagnetic flowmeters (approx. 100 devices) for the complete system of the brand-new paper machine 5 (PM 5). Based on latest technology (an advancement of the proven AC-exiting technology), this product has been especially developed by ABB for use in demanding applications. Example include liquids with a high portion of solid particles (up to 15 % otro) or with extremely low conductivity, the measurement of pulsating flows, as well as inhomogeneous fluids, as typically used in the paper industry.

The device can therefore be used for flow measurements across all substances (from dissolution to cleaning, sorting, conditioning and stuff chest), for dosing of chemicals, at the size press and in the approach-flow system part.

Nominal size can be in the range from DN 1 to DN 600. The universal applicability of the FSM4000 considerably facilitates planning and service while also minimizing spares inventory. This is complemented by simple installation and maintenance-free due to self-diagnosis.

Data can be conveniently entered via 3 keys or via magnet sensors, menu-guided and via clear text indication in a four-line display. An "Easy-Set-up" function allows for fast and easy commissioning. In addition to customer-specific menu entries for device operation, the FSM4000 offers simulation options and the setting of output signals to test downstream peripheral devices during commissioning.

Electrical connections amongst others include contact inputs/ outputs, current output and pulse output as well as communication via HART protocol and PROFIBUS PA. The system concept is complemented by downward compatibility with up to 25 year old installed field sensors from ABB/Fischer&Porter products.

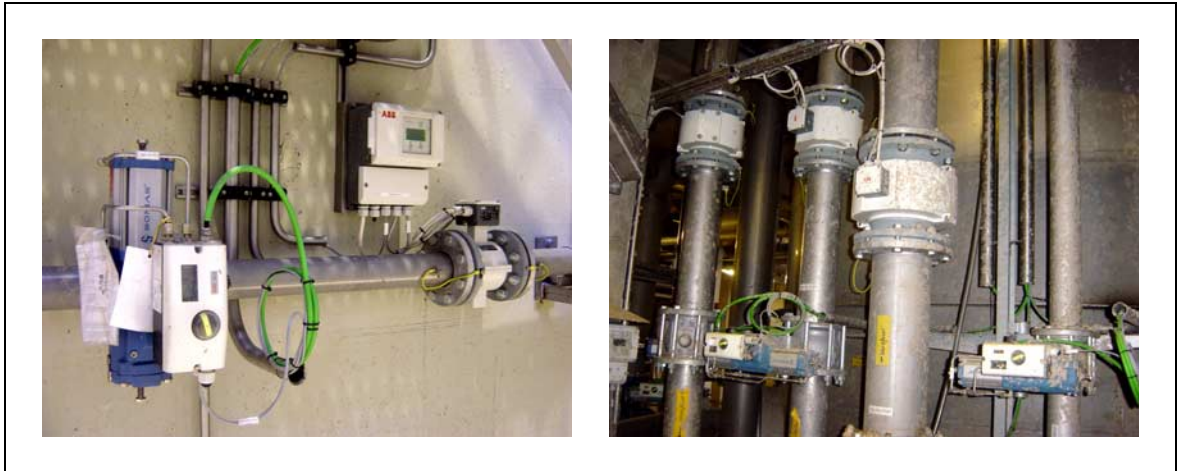


Fig. 3-1: Flow control outside the paper machine

Fig. 3-2: Flow control in waste paper conditioning

4 Cost reduction due to Coriolis mass flowmeters

The ABB portfolio includes another special solution for paper and cardboard factories such as Varel. For the headbox of a paper machine, it is extremely important to avoid air bubbles or foaming.

An ideal area of application for the Coriolis mass flowmeter FCM2000. Via the density measurement is possible to determine the free air in white water 1 and 2. The reproducible values thus gained are ideally suited as control parameter for the metered addition of defoaming agent chemicals. Using this measurement it is possible to save considerable amounts of defoaming agent each year. ABB has successfully been using this special type of air content measurement in various applications for several years.

The Coriolis mass flowmeter FCM2000 is exceptional not only in this application, but also as a high-precision measurement system in coating and color kitchens due to the simultaneous measurement of massflow and density. It allows for an online quality check in combination with process automation and drastically reduces rejects and material quantity. It is also an ideal alternative when measuring nonconductive liquids.



Fig. 4-1: Massflow measurement in white water 1

5 Quality assurance using high-quality control valves

Since both the area of material conditioning as well as the paper machine including the steam system are designed for almost uninterrupted operation, and a breakdown caused by defective control valves can hardly be compensated for, it was decided to use extremely secure Somas valves with ABB positioners. The cooperation between Somas and ABB in the area of paper industry turned out to be extremely reliable.

About 100 spherical cap valves as well as about 80 butterfly valves each with actuator and positioner TZIDC from ABB were used. The Somas valves stand out for their backlash free operation, the long life cycle at low torque, as well as for excellent control performance. They are thus particularly suited for the long, trouble-free and maintenance-free use under rough paper industry conditions. The control valves and shut-off valves are used in countless applications. Longtime experience with metal sealed butterfly valves have demonstrated in practice that due to the special geometry this concept is among the best available on the market. Due to various available options, they can be used for a multitude of applications. ABBs compact, intelligent positioner TZIDC complements the final control valves to ideally functioning control units. It convinces with its performance, its robust design, its user-friendly configuration and the low shock impact. The microprocessor-controlled positioner is ideally suited to achieve optimum results in terms of fast and precise control and also high operational safety.



Fig. 5-1: Control valves in approach-flow system

Fig. 5-2: Control valve in stock preparation

6 Temperature and pressure measurement to complete the instrumentation

In addition to flowmeters and control valves, ABB also provided temperature measurement equipment and differential pressure transmitters. Temperature sensors such as SensyTemp TSP121 with welded thermowell and TSP131 with drilled thermowell are being used which have been installed depending on mechanical or chemical stress. Different measuring inserts are in use for various process requirements in demanding applications. Analysis is provided via the head-mounted temperature transmitter TH02 which is designed in two-wire technology using the HART protocol. The measurement devices are successfully used due to their robust design and their stable operation.

The high-precision pressure and differential pressure transmitters of the 2600T series stand out for long-term stability and extremely reliable operation. They can be used for multiple measuring ranges and process connections, they are easy to operate and they have a high turndown ratio. These devices are used in two-wire technology with HART protocol and digital display.



Fig. 6-1: Temperature and pressure measurement in steam and condensate systems

7 Conclusion

Using this complete set of instrumentation, ABB Automation Products have once again been able to demonstrate their performance in the field of the pulp and paper industry. The installed instruments and control valves fully meet the technical requirements and have thus largely contributed to the successful startup of the new paper machine.

We expect the safety and flexibility of our technology to support the paper and board factory Varel in the advancement of production efficiency well beyond the current targets.

ABB has Sales & Customer Support expertise in over 100 countries worldwide.

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Printed in the Fed. Rep. of Germany (03.2008)

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3KDE010003R5501



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