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Rotary Consistency Transmitters for demanding applications

Consistency measurement devices have long been in a state of "Status Quo". Sensors have remained much the same they have always been despite the development in interface systems. That's why the new KC/5, a revolutionary rotary consistency transmitter brought into the market by Kajaani Process Measurements Ltd., has been very refreshing news. The KC/5 has been positively noted e.g. in pulp and paper exhibitions and among customers worldwide based on rapid sales success.

Shear force technology is the most common method to measure fiber consistency in the world's pulp and paper mills. Shear force transmitters, rotating consistency transmitters and blade consistency transmitters have their own established applications in processes based on either experience, price/performance ratio or just the preferred technology in each mill.

Another principle to measure consistency is total consistency measurement, when all solids in the pulp are measured. In these applications microwave transmitters are commonly used. Also optical transmitters have their own applications, especially with pure pulps and low consistencies. Different measurement principles have earlier been covered comprehensively in this magazine.

Metsä-Botnia Ltd. Pulp Mill, Kemi, Finland.

Erkki Rantavuoti, Automation Supervisor, Kemiart Liners ltd. (left) and Jari Kivakka, Automation Supervisor, Botnia Mill Service Ltd.

Rotary product innovation from Kajaani

"Rotating consistency transmitter is the industry standard for shear force measurements" was the starting point for the product development of the KC/5, Kajaani Process Measurements' new rotary consistency transmitter. The KC/5 was launched in June 2004 at PulPaper05 Exhibition in Helsinki, Finland. The transmitter is based on well-established and widely applied technologies, in which Kajaani Process Measurements Ltd. added their experience of pulp and paper industry. The high expectations of the industry, especially in the areas of performance, user friendliness and maintainability, was paid special attention to during the development of the KC/5.

The response from the customers has been evident; the production volume has clearly exceeded even the most optimistic expectations.

The KC/5 is designed for important consistency measurement locations. It has rotating sensing element and excellent performance, it is compact and easy to maintain. It does not require special know-how for maintenance, which is also needed less and more seldom than with other rotary transmitters.

The KC/5 has finally overcome the weak points of the old type rotary consistency transmitters, such as high weight – the KC/5 weighs only 15 kg (30 lbs) – and high cost of maintenance. If necessary, the KC/5 can be removed from the process line without shutdown: no need to wait or arrange it and drain the line.

In the following interview, Mr. Jari Kivakka from Botnia Mill Service Ltd. reports practical user experience of KPM's rotary consistency transmitter in a pulp mill. Mr. Kivakka is in charge of the automation maintenance in Metsä-Botnia's Kemi pulp mill, jointly owned by M-real, UPM-Kymmene and Metsäliitto. Board mill experience is given by Mr. Erkki Rantavuoti, Maintenance Supervisor, Automation from Kemiart Liners Ltd., owned by M-real.

Rotating Consistency Transmitter in a pulp mill

From the process point of view, consistency measurement is one of the most important measurements in a pulp mill. Without it process control would be practically impossible. Consistency measurement is needed e.g. for production calculation and to optimize the performance of different process equipments. In practice, measurement is fiber consistency measurement. Total consistency measurement is not needed, because the pulp does not contain any fillers like in paper machines.

The first rotating consistency transmitters were installed in Kemi pulp mill in the 70's and nowadays there is 6-7 units in service. The oldest devices were very heavy and the installation required two persons at minimum.

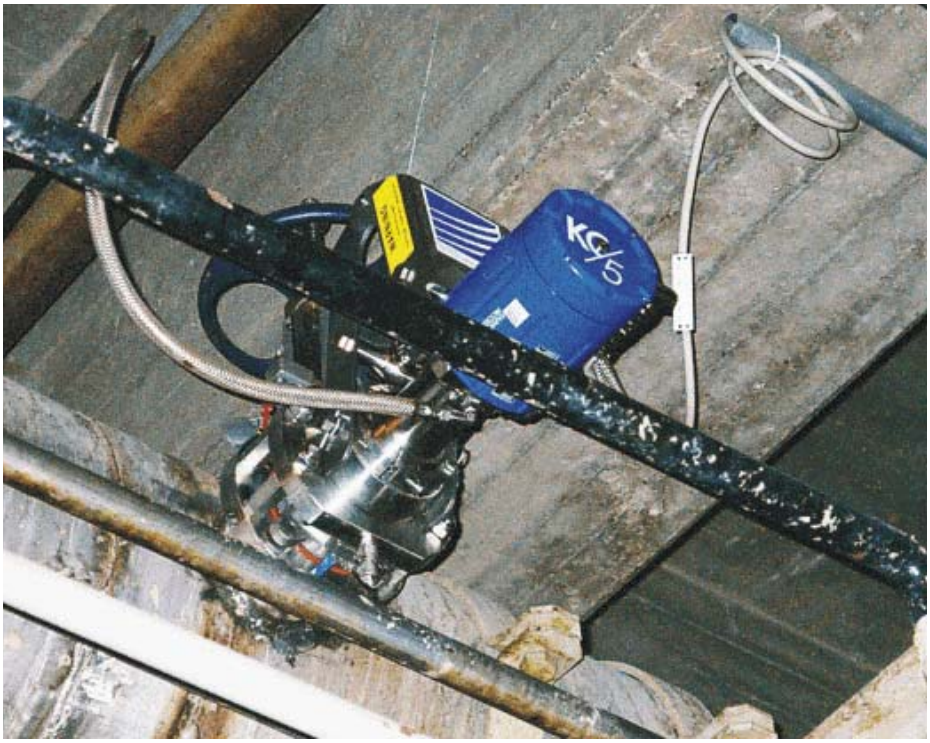
Erkki Rantavuoti has seen consistency transmitters to develop a lot over the years; especially digital signal processing has improved the performance of consistency measurement. The rotary transmitters were the first devices possible to install into pressurized process lines. Before there were different kind of "vat" installations, so called "friction vat's". Blade transmitters became more common later. In the early years with rotary transmitters, consistency was measured only in the most important applications due to the expensive price and constant need for maintenance. Nowadays consistency is under control through the whole process.

- Certainly the production optimization of the process has also developed to a completely different level, increasing the performance requirements for measurements as well, Jari Kivakka adds.

Kemi pulp mill has over two years experience of KPM's rotary transmitters. In use is the earlier production version, still the measurement principle is well comparable with the KC/5's.

The installation location is the feed of the bleach plant, after leveling chest and before washer-filter. Many different consistency transmitters have been tried in

Mr. Jari Kivakka is in charge of the maintenance of automation in Kemi pulp mill.



Due to high performance and advanced maintenance features the KC/5 has fulfilled the demanding requirements in Kemiart Liners Board Mill.

this location and the final choice was KPM's rotary transmitter.

The key criteria to select KPM's product was the possibility to remove the transmitter from the process and clean the sensing element without shutdown, extracts in the birch pulp buildup on the sensing element causing offset to the measurement.

Contamination problem by birch extracts is continuously studied and process is under development. In the future the process may change, but now the consistency is measured this way and is well under control, Jari Kivakka states.

Rotating Consistency Transmitter at a board mill

Erkki Rantavuoti looks after consistency measurements at the board machine making high quality white top coated board. The performance of the sensor is the top criteria; secondly important is the maintainability of the sensor.

At board machines consistency measurement and control have generally a major role in achieving and maintaining required end product quality e.g. through refining and chemical dosaging. The absolute accuracy of the measurement would be ideal, but the most important issues for control are repeatability of the measurement and immunity against changes in process conditions. In paper and board manufacturing fillers are commonly used and total consistency measurement is also needed.

The board machine was built in 1971 and since there have been many rotating consistency transmitters in use. In 1990's blade transmitters were systematically used to replace the old rotaries. When the process conditions are stable, the performance of the measurement is quite the same regardless of the measuring technology. Because both, blade and rotary, use the same shear force measurement principle.

- One limitation of blade transmitters is sensibility to flow velocity, which does not affect to the performance of rotary transmitters is the same extent. E.g. in Kemi board machine the middle layer flow changes in ratio of 1:6, causing blade transmitter having troubles in measuring. The middle layer stock also contains some air and has no pressure, so the microwave transmitter does not work either. The best choice is rotating consistency transmitter.

The KC/5 application is after the machine chest of the previously mentioned middle layer stock, which is the last consistency measurement before the wet end measurements. KC/5 measurement is used for calculating middle layer production and for predictive process control during grade changes. In this location absolute accuracy and repeatability of the measurement are essential. Measurement is also used for feed forward basis weight control, one of the most important control loops in paper and board machines. Both are crucial for the quality of production and end product. Rotating transmitter was originally used in this location and after blade and microwave transmitters were unsuccessfully tried, the circle has now closed: measurement is done with KPM's KC/5 rotary technology.

Based on his experience of the KC/5, Erkki Rantavuoti stated that the light weight of the sensor represents major development. Measurement principle is the same proven method commonly used in rotary transmitters; the basic principle has not changed in such. However, the

Mr. Erkki Rantavuoti has extensive experience in board manufacturing.

technical solutions of the KC/5 are successful, especially in self diagnostics and maintainability, which have positive impact to the total lifetime costs of the transmitter.

Board machines have much more shutdowns than pulp mills - in Kemi typically after every three weeks. However, the requirements for maintenance are very high: the transmitter has to perform well at minimum two production cycles, that is six weeks after the first indication of maintenance need. To achieve that requirement first class self diagnostics is essential

Both Erkki Rantavuoti and Jari Kivakka are very pleased with the cooperation with Kajaani Process Measurements, which has quickly become the third biggest consistency supplier worldwide. The close location of KPM is only a benefit for them.

KPM's rotary consistency transmitter at bleach plant of the Kemi pulp mill.

KPM has a comprehensive product range for consistency management.

Facts about KPM

Kajaani Process Measurements Ltd. is a global high tech company specialized in the development of advanced measurement solutions for the pulp and paper industry worldwide. KPM combines extensive knowledge of and experience in the pulp and paper industry measurements.

The basic principle is to develop innovative measurement solutions without prejudice so that genuinely the most suitable technology can be chosen in order to achieve the best cost efficiency and value for the customer.

KPM has worldwide distribution and service network, which is implemented with own strategically located sales and service offices working together with local distributors and representatives. Head office, product development and production of the company are located to Kajaani, Finland.

KPM's consistency transmitters are the most advanced units in the market and have well established successful references around the world. Well known Japanese manufacturer Toshiba has appointed KPM as exclusive distributor of microwave consistency transmitter for pulp and paper industry.

KPM's sampling device family is the widest on the market. Product range includes also a sheet break detector for paper and board machines.

All the biggest pulp and paper manufacturers in the world are KPM customers.