RISI’s Asian CEO of the Year
Chen Hongguo of Shandong Chenming
PM 5 at Mondi’s Neusiedler mill in Austria has been the subject of intense activity on monitoring quality.

IF YOU CAN MEASURE – YOU CAN MANAGE

Part of the Mondi Group, the Neusiedler mill was originally founded in 1793 and right from the start concentrated on the specialist side of papermaking, achieving something of a name for itself in watermarked papers. Over the course of the last centuries it moved variously into the production of bank note paper, specialist safety papers and security documents for passports. But it was in the 60s, with the advent of the photocopier that the mill really found a high capacity niche to exploit. In fact as the photocopier became all the rage, the Neusiedler mill began working closely with Xerox – one of the first developers of dry toner technology in photocopying - in an R&D capacity.

Mondi Neusiedler is actually comprised of two mills, the Theresienthal mill, which was the focus of PPT’s visit, and the Kematen mill, which is around 9 km away. Together the two mills employ 680 people and have a combined output of 380,000 tonnes/yr.

The Theresienthal mill has two paper machines, PM 5 and PM 6, which predominantly make high quality copy paper and the Kematen mill, which also has two paper machines that concentrate on speciality papers, for example tints and special color laser papers.

PM 5: A VERY SPECIAL MACHINE

Theresienthal’s PM 5 has been singled out as the main focus of activity in the area of quality in recent years. The machine has a trim width of 4.4 m and a maximum speed of 800 m/min per minute with a basis weight range from 60 to 160 g/m². It also has an option to go to 200 g/m² after adjustments on the head-box.

The machine is somewhat special as Erwin Sversepa, head of production at the mill explains: “PM 5 is a Fourdriner machine with a dandy roll and we haven’t touched the wire section since 1971, for good reasons. We have thought about rebuilding it and installing a top wire, but formation and surface properties might be sacrificed, so we have kept it as it is. It works, so why fix it? The quality of output on this machine is excellent, and to survive in this market we have to maintain top quality.

In order to improve surface properties Mondi installed a new Module Jet lamella head box with dilution, water control in 2007.

The main grades produced on the machine are office communication paper, but there is a large concentration on high quality color laser papers. The main brands produced on the machine are Color Copy, a high quality laser grade, and BioTop, a special TCF grade containing no added optical brighteners and with an environmental focus.

“Color laser is something very special,” Sversepa explains. “One of our major strengths is the flexibility of basis weights. In our experience 90 and 100 g/m² are the most popular weights. These are generally used are used for high quality presentations in corporate or office environments, and basically anything that needs excellent print quality and color density. The paper we produce has parameters that are very important to the end user, for example excellent formation and smoothness with a homogenous surface needed for print demand.”

Sversepa continues: “If we take a look back at the history of the machine over the last ten years these two grades, Color Copy and Bio Top, have been the two production runs that have helped PM 5 become really successful – and certainly from an economic point of view - so it makes sense for us focus on this machine when it comes to even further improvements on quality.”
When it comes to drying, there is nothing special added to PM 5, it has three nips and is more or less as it was in the 1970s and has not been rebuilt. It has a Multi HV Küsters calender with a heated roll installed in 2000 for a high level of smoothness, but other than that it is a standard size press drying section.

**QUALITY CONTROL – OUT WITH THE OLD, IN WITH THE NEW**

One of the most impressive elements at Mondi Neusiedler's Theresenthal mill is the attention to detail when it comes to surface quality and runnability. It is absolutely centric to all the operations in the mill, and for good reason; in the "on demand" world in which we all live, the very last problem busy offices need is paper that will not run through copiers or printers. Sversepa continues: "Copy machines change all the time, and there are differing demands of paper quality. As the machines become less expensive and the landscape of different qualities gets broader and broader, it means the paper has to be as versatile and trouble free as possible. What is a must, and something we have to face year by year, is that functionality is something the customer expects 100%. They don't want paper that curls, and they certainly don't want paper that won't run, the very best runnability is of utmost importance."

At the end of 2007 the management at Mondi Neusiedler decided that PM 5 was due for some investment, and after a lot of deliberation, the conclusion was that it was already an excellent machine producing top quality product. It was agreed that a new quality control system (QCS) would ensure continued good quality, and perhaps even give the opportunity to enhance quality even further. Intense analyzing of what was on the QCS market began, and complicated decisions had to be made, for instance; does the mill stick with the same technology from the same supplier, or does it break new ground?

Sversepa explains: "It was clear that our old QCS system was outdated for our needs. We started looking for a new technology and the replacement was installed in 2008.

In the end the decision was made to break with tradition, and to strike out in a completely new area and in August 2008 the mill invested and installed ABB's QCS800xA system, crucially because it had a unique and revolutionary technology on board, fiber orientation sensors (FO), as well as the other usual sensors for caliper and color.

Sversepa continues: "As a major supplier of copy paper, reducing curl is a major issue to us, as it is the main cause when it comes to rejections of products, so understanding fiber orientation effects paper behavior would put us in a good position in the race to be ahead of our competitors. An online measurement tool to see what is really going on in the papermaking process would be a perfect start."

The FO sensor measures about 20 g/m² in thickness on each side of the sheet, top and bottom - and these are the most important parts of the sheet when it comes to surface quality and runnability. Installing this type of equipment allowed the production team to really get to grips and understand the basics of why paper curls on a photo copying machine or printer. Sversepa explains further: "Before we installed the FO system, we knew that curl was a problem and we knew how to react to it, but the crucial part was that we did not understand why it was happening, and what orientation the fibers were in when curling occurred on certain segments of a production run. We only knew that we had curl when we carried out our quality control checks when we would adjust the machine accordingly, but we did not know what was causing the problem in the paper making process that leads to the curl!"

**A DIFFERENCE BETWEEN KNOWLEDGE AND UNDERSTANDING**

"We needed to go back to basics to see what was causing the problems," continues Sversepa. "In the course of the project we studied this basic cause, and this is where ABB played a crucial role, the technicians' expertise in this area was vital in understanding, identifying and analyzing the fiber orientation. So we not only got a system that helped us to analyze our fiber orientation online, we also gained a much better understanding of the papermaking process and why problems were occurring and what happens in the single layers that causes paper curl in the final product."

Were there any specific problems? "There are a few parameters on the machine where you can influence fiber orientation," explains Sversepa. "You can adjust the
position of the forming table, or the top or bottom lip depending on how your headbox is built. But before the installation of the FO, it was very much trial and error; we would have to try something, then we would have to take a sample from the machine then have to go to the lab and test how copy and curl behaves. But we still did not know why, we could only view the result. But there is a difference between knowledge and understanding. With the new online system, we can see our adjustments online immediately, and we can adjust our fiber orientation accordingly. We can now see what our fiber orientation looks like and now we know exactly what difference our adjustments make as the paper is being made.”

Sversepa continues: “We are still not at the final step, but that is something we have to do at the mill. The most important thing is we have the basic understanding of what happens, we know how to influence fiber orientation on the machine, and the final step will be some kind of closed loop system where the fiber orientation is automatically adjusted to obtain optimum results in the final product, for example no curling and good surface quality. So we still have some ongoing work to do.”

**ABB’s QCS800xA**

Installed on ABB’s Smart Platform, Mondi Neusiedler’s QCS800xA consists of two frames which have sensors linked to a server containing client based architecture and two operator stations. Both operator stations have full control of the process, and all parameters can be viewed or changed at the stations. There is an additional archiving system which helps analyze historical data for long term viewing and indentifying problem batches of paper.

For the FO system, there are six lasers, three from each side that beam through the paper and the reflected beam is then evaluated. The fiber FO is then displayed on a graph, allowing the operator to view an adjustment to fiber orientation almost instantaneously via the sensor lasers that fire at 36,000 times per second.

As well as the FO, there was other sensors integrated in the system for measurement of color, caliper and moisture.

**THE BOTTOM LINE?**

The production team on PM 5 is already very proud of its quality ratio. Complaints in 2008 were 0.1 per 1000 tonnes, which says Sversepa added up just one complaint in every 200 million sheets of A4 produced from the machine.

Results started coming quickly after installation of the new QCS, but understanding and using them to benefit production took around three months. So has the FO made a visible difference? “Absolutely”, says Sversepa. “PM 5 and its technical constellation with Fourdrinier dandy roll, and breast roll shaker means that the fiber orientation shifts from one point to another. This affects the fiber orientation, and causes what we call ‘single sheet twisted curl’ which means that the trend is not stable, and stability is needed in achieving a good copy paper result. Secondly, since you have an impingement angle, the initial forming point is very open. Small variations in stock properties have an influence in copy paper results. The sensor helps us understand what happens, allowing us to reject paper before it goes out, therefore leading to fewer complaints.”

And this is why the mill has such a good record on complaints, there is a very strict quality assurance system, which means that any substandard paper is rejected before it gets to the customer. But has there been a noticeable drop in the rejection rate at PM5 since the installation of the ABB QCS system? “We have noticed a major difference in our own production figures which have improved by +3% overall efficiency and a perfect quality. A big step and I believe driven mainly by the FO project and how we have used the information. It helped us, crucially, to take the information, understand it, and act upon it. If you can measure problems, you can manage them.”

And would Mondi Neusiedler install another FO sensor? “Tomorrow!” concludes Sversepa. PPP

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