



◀ The distinctive orange color of polysulfide liquor. Conventional cooking liquor is white.

Joutseno sees benefits of polysulfide cooking

Metsä Fibre's Joutseno mill in Finland started up the world's largest single polysulfide cooking line. The technology for the preparation of polysulfide cooking liquor, and the digester modifications to take advantage of it, were delivered by ANDRITZ.

According to Metsä Fibre's Vice President and Joutseno Mill Manager Risto Joronen, who was also the Project Director for this development with ANDRITZ, the use of polysulfide cooking liquor enables his mill to improve pulp qualities that offer a real benefit to papermakers.

"Since we started polysulfide cooking, our customers are noticing a reduction in specific energy required to refine our pulp and they are seeing some enhancements in fiber bonding," Joronen says. "The bonding improvement is due to the retention of certain hemicellulose materials in the pulp."

For its own part, Joutseno has increased fiber yield, which reduced the solids in the black liquor, which in turn reduced the load on the recovery boiler. Like many mills, Joutseno is recovery-limited. So, this is a big benefit. "The increase in yield and overall pulp production makes the investment in polysulfide economically beneficial," Joronen says.



◀ The polysulfide cooking plant delivered by ANDRITZ is the largest in the world. It is a relatively compact layout. Shown here are the polishing filter, MOXY reactor, and storage tanks.

From white to orange

Polysulfide cooking stabilizes and preserves the carbohydrates (hemicelluloses) in wood. This improves yield. The most obvious difference in polysulfide cooking liquor is its unique orange color.

"Polysulfide cooking has been around for many years," says Mika Mäkelä, ANDRITZ Project Manager. "The first patent for polysulfide pulp cooking was granted in 1943,

so the idea is not new." In 1973, Mead Corporation introduced a white liquor oxidation process (MOXY process) in which sodium sulfide was converted into polysulfide with the help of an active catalyst (coal) and air.

Mäkelä explains that while the process is proven, it has not been used that often. "We delivered plants in past years to Canada, Japan, and other countries," he says. "A



◀ Markku Lankinen, ANDRITZ Sales Manager for white liquor plant (left), with Risto Joronen, Joutseno Mill Manager, in front of the MOXY reactor in the polysulfide cooking preparation plant.

Johan Engström, ANDRITZ R&D Manager for cooking technology, oversaw the modifications to Joutseno's digester to take full advantage of the polysulfide cooking liquor. ▼



“Polysulfide cooking helps us deliver a pulp that has real benefits for papermakers.”

Risto Joronen
Vice President and Mill Manager
Metsä Fibre

new focus on increasing fiber yield of softwoods, and overcoming bottlenecks in the recovery cycle without major capital investments, is causing mills to take a new look."

Not traditional

"This was not a traditional mill-supplier project," Joronen says. "It is a high-profile project for us because it impacts pulp quality. Our people have been studying this for several years. About one year ago, we decided to implement it at Joutseno. We collaborated on process development and have been full partners with ANDRITZ. This kind of collaboration is very important to us."

Mäkelä can cite several examples of how this type of relationship is beneficial to both partners. "In almost any project, we face challenges that are best resolved with close

collaboration and a shared target," he says. "But in development work, where we are trying something unique, it is absolutely critical. We benefit from the give-and-take and sharing of knowledge."

More than a simple scale-up

The Joutseno mill, capable of producing about 2,000 t/d, is the largest single softwood line in the world. By volume, the poly plant at Joutseno is almost three times bigger than any other plant ANDRITZ has delivered. "Scaling up presented us with some challenges," says Johan Engström, R&D Manager for cooking technology at ANDRITZ. "It wasn't just a factor of making the physical size of the vessels and piping bigger. There is considerable science and process expertise involved."

The effectiveness of polysulfide liquor is dependent on the concentration, temperature, retention time, and where it is introduced into the cooking process, Engström explains. "Since polysulfide cooking can be performed at lower impregnation temperatures, we modified the Joutseno digester by adding heat exchangers and altering the cooking liquor circulations. The modifica-

tions are not expensive to implement, but are critical."

The poly process

Markku Lankinen, ANDRITZ Sales Manager for white liquor plant, explains that the MOXY process converts the sodium sulfide in conventional white liquor into sodium polysulfide with some sodium thiosulfate – forming the characteristic orange liquor. "But before this step," he says, "the white liquor is filtered to the highest possible degree by a polishing filter to prevent premature fouling of the catalyst."

The polished white liquor is pumped to the top of the MOXY reactor, where compressed air is also introduced. The mixture of air and white liquor is blown through activated carbon catalyst. The catalyst is arranged in layers, designed to prevent formation of channels. The catalyst is also surface-treated with Teflon to make it water repellent and to lengthen its life. "Joutseno can control its process to obtain just the right level of polysulfide," Lankinen says.

As orange liquor is pumped from the reactor, it passes through an air separator before arriving at a storage tank. The polysulfide reacts with carbohydrates in the wood at the beginning of the cooking process to stabilize them against alkaline decomposition.

Running well

"The project implementation was quite good," Joronen says. "We kept the time schedule, starting up in May of this year. The MOXY process started up perfectly. We produce 9,000 m³/d with an excellent level of polysulfide. There were a few small adjustments on the digester after start-up, but nothing significant. We can report that we lost almost zero pulp during the start-up. The digester is running very well now at full speed."

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