

# GOING FULL CIRCLE

## Sulfuric Acid Production for Puma I and II

Brazilian pulp and paper giant Klabin is further closing the circular sustainability loop at its Puma I and Puma II projects in the south of the country. Soon it will be making its own sulfuric acid from captured non-condensable gases at its Ortigueira mill site. ANDRITZ expertise is paving the way.

"Sustainability issues and the latest innovations go hand in hand at Klabin," says Francisco Razzolini, Klabin's Director of Industrial Technology, Innovation, Sustainability and Projects. "They are part of our everyday agenda at the company."

As part of its ongoing circular sustainability strategy, Klabin recently ordered a sulfuric acid plant from ANDRITZ for its Ortigueira mill, which will be the first of its kind in the pulp industry globally. The plant has been designed to produce 150 tons of commercial grade (>98%) sulfuric acid per day from concentrated odorous gases (CNCG) and elemental sulfur. The plant will supply the company's Puma I and Puma II pulp lines and will allow the mill to be completely self-sufficient in sulfuric acid. The technology for the plant, which uses

the wet-gas sulfuric acid (WSA) process, has been developed by Danish company Haldor Topsoe, which has more than 150 references across many industries.

"We are constantly looking for ways to use by-products generated at our mills and some of the most important ones are the sulfur-containing gases," says Razzolini. "These are usually problematic, and we need to use special burners in the boilers, lime kilns, or flares to get rid of them as they are odorous and can cause unpleasant smell".

### PUMA II – THE PERFECT OPPORTUNITY

Klabin's ideal course of action was to find a way of using the sulfur-containing gases instead of burning them. "We have been

investigating ways of using these gases for some years now," continues Razzolini. "We now already have the Puma I project producing 1.6 million tonnes of pulp a year and with Puma II starting up soon we will have a mill producing a total of 2.5 million tonnes a year. That is a lot of pulp needing a lot of sulfuric acid for our production process needs.

"The coming start-up of Puma II has given us the perfect opportunity and is the perfect moment to include the sulfuric acid plant as part our project package. It means we are going even deeper into the circular aspects of our business and this adds to the wide range of chemicals we are already recovering from our production processes."

Once started up, the sulfuric acid plant will help Klabin control the sodium and

sulfur balance of the mill and will also improve the resource efficiency as less sulfate needs to be discharged due to the optimized Na/S balance. Major savings are achieved by reduced spending on chemicals, not only on sulfuric acid, but much more importantly, in reduced consumption of sodium make-up chemicals. The WSA plant also reduces the environmental footprint by reducing the need for purge streams containing sulfur and sodium.

There are also outside logistics advantages, "Sulfuric acid is used widely at the mill site to control pH in several parts of our process, and the amount we use is actually quite huge," adds Razzolini. "But this is not only about sustainability and economics; there is also a major logistics issue with transporting some five or six hazardous chemical trucks from 500 km away to the mill site, every day."

When all the sulfuric acid needed by the mill is produced internally, only elemental sulfur will need to be transported to the

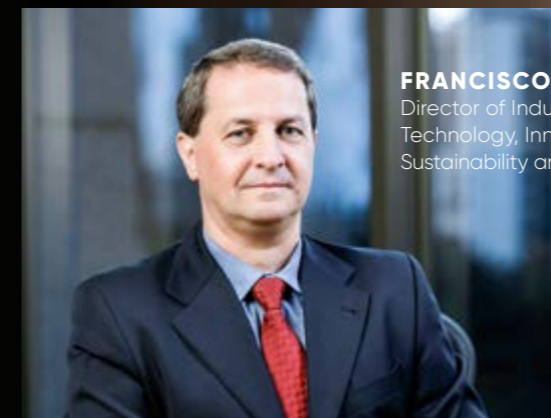
mill. The elemental sulfur volume represents one third of the sulfuric acid volume, and it is used only to supplement the sulfur flow in CNCG gases. Therefore, transport is reduced by as much as 85%, with the added advantage of the transported elemental sulfur not being a hazardous substance.

### SULFURIC ACID PRODUCTION – LEARNING CURVE?

The Ortigueira mill will soon be 100% self-sufficient in sulfuric acid, which makes the mill a major chemical producer as well as a pulp producer. What is there to learn about the new process? Razzolini says, "At the site we generate oxygen, sodium chlorate, which generates hydrogen, used in the lime kiln. Chlorate is converted to chlorine dioxide. We also handle elements inside the cooking and evaporation process, as well as separate methanol, turpentine, and tall oil. In fact, there is actually a long list of what we already do, and we are very much heading in the direction of a true biorefinery when it comes to side streams generated from the mill."



Status of the on-site construction works in May.



**FRANCISCO RAZZOLINI**  
Director of Industrial  
Technology, Innovation,  
Sustainability and Projects

"We have partnered with ANDRITZ for many years at Klabin, developing a lot of projects, initiatives, and technologies."

## ANDRITZ SCOPE OF SUPPLY FOR PUMA II

For the WSA sulfuric acid plant, ANDRITZ has supplied technologies on an EPCC basis for elemental sulfur handling, sulfur and Concentrated Non-Condensable Gases (CNCG) combustion to form sulfur dioxide (SO<sub>2</sub>), sulfur dioxide conversion into concentrated (98% by wt.) sulfuric acid, and a flue gas handling system. The sulfuric acid plant uses wet-gas sulfuric acid (WSA) technology developed by Haldor Topsoe.

As well as the WSA sulfuric acid plant, ANDRITZ has also supplied major pulp production technology and process equipment to the Puma II project, including:

- A complete Wood Processing Plant using the same and proven technology as in the existing Puma I line ANDRITZ wood-yard; including two eucalyptus debarking and chipping lines, chip storage with 360° stacker-reclaimer, chip screening, bark handling with ANDRITZ BioCrushers, bark storage, and purchased biomass receiving system for the new power boiler.
- An ANDRITZ HERB Recovery Boiler for combustion capacity of 3,300 tds/d with high steam parameters of 103 bar(a) and 502 °C for maximizing the power generation. The HERB recovery boiler features energy efficient flue gas cooling and feed water preheating technology to maximize the steam production for power generation.
- A complete White Liquor Plant, consisting of the same technology as the mill's existing Puma I line ANDRITZ white liquor plant. The new recaustizing plant has a capacity of 5,000 m<sup>3</sup>/d and includes efficient green liquor filtration with LimeGreen filters – producing clean green liquor and minimizing waste to landfill.
- A complete biomass gasification plant and a new biomass handling line. The scope of supply includes a 51 MW gasification plant, a belt dryer, a multi-fuel lime kiln burner, and biomass handling equipment with auxiliaries. By replacing 100% of the heavy fuel oil currently burned in one of the mill's lime kilns, the ANDRITZ gasification plant will significantly reduce the mill's carbon footprint.
- A Power Boiler based on ANDRITZ EcoFluid Bubbling Fluidized Bed (BFB) technology. The scope of supply includes a biomass-fired boiler with flue gas cleaning and other auxiliary equipment. The new Power Boiler is integrated together with the Recovery Boiler to a "Boiler Island" and some of the auxiliary equipment is shared between the two boilers.

## BENEFITS OF WET-GAS SULFURIC ACID (WSA) PROCESS FOR PULP MILL

- Environmental and economic savings by reducing chemical costs and amount of effluents purged
- Helps managing and controlling the mill's sodium/sulphur (Na/S) balance
- Allows pulp mills to produce commercial grade (> 98%) sulfuric acid, thus eliminating the need to invest in parallel storage and distribution systems for acid of a lower concentration
- Due to savings of expensive sodium hydroxide, investment pay-back is extremely short
- Well-proven technology in other industries, now made available by ANDRITZ for implementation at all pulp mills

The technology used for Klabin's sulfuric acid plant is based on ANDRITZ's A-Recovery+ concept that enables mills to extract side streams from the pulping process and turn them into commercial grade products and commodities.

Razzolini adds, "Obviously in the case of the sulfuric acid plant, we are talking about a very corrosive material that is difficult to handle and we have to have a very high level of safety involved in all the operations, as we already do mill-wide. This safety priority has been at the top of our agenda when it comes to the sulfuric acid plant."

### WHY ANDRITZ?

ANDRITZ was chosen as the supplier for the sulfuric acid plant for a number of reasons says Razzolini, "We have partnered with ANDRITZ for many years at Klabin, developing a lot of projects, initiatives, and technologies. Importantly, the company really knows how to operate in Brazil and has shown reliability in the

delivery of many projects, including the very latest ones.

"One key feature we recognize about ANDRITZ is the amount of effort it puts in, looking for the problems, challenges, and solutions that we have as operators at the mill sites. The sulfuric acid plant is a prime example, and the company has delivered an excellent package, with the proven technology from Haldor Topsoe, as well as a deep understanding of how we operate in our mills."

### THE SULFURIC ACID PLANT IS DUE TO START UP EARLY 2022

Razzolini concludes, "When Klabin embarks on a new, pioneering project such as this, we do a lot of thorough investigations and assessments and in this case we have had excellent support and answers from ANDRITZ and we are confident we will have yet another successful result.

"The introduction of the sulfuric acid plant at the Ortigueira mill is a perfect example of how technology is enabling us at Klabin to achieve our goals when it comes to sustainability. It is also a step closer to achieving our goals for the 21<sup>st</sup> century, which is to close loops and reduce environmental impact across all our operations, at the same time as provide valuable employment to local people. At Klabin we are firm believers that the pulp and paper industries are on the right side of the equation when it comes to solving the world's current environmental challenges and through our renewable and recyclable products we are providers of solutions to these challenges."

### CONTACT

Jaakko Martikainen  
jaakko.martikainen@andritz.com

