



SulfoLoop™ SULFURIC ACID PLANT

Closing loops equals huge savings on
chemicals and enables self-sufficiency
in sulfuric acid at pulp mills

ANDRITZ

ANDRITZ SulfoLoop – CLOSING LOOPS EQUALS HUGE SAVINGS ON CHEMICALS AND ENABLES SELF-SUFFICIENCY IN SULFURIC ACID AT PULP MILLS

INTRODUCTION

ANDRITZ leaves no stone unturned when it comes to providing technology for increasing circularity at pulp mills. One of its latest solutions, SulfoLoop sulfuric acid plant, allows pulp mills to make their own sulfuric acid from sulfur-containing side streams, at the same time as eliminating the purging of waste streams to the environment.

"SulfoLoop solution is a win-win for the environment and mill revenues."

MINNA LAITINEN
Product Manager, SulfoLoop at ANDRITZ



"With very high conversion rate, the Topsoe WSA system can convert over 99% of the sulfur from the CNCGs."

SAMUEL SCHERMAN JOHANSSON
Technology Manager – Concepts and Studies Clean Air Technologies
Topsoe A/S



ANDRITZ SulfoLoop sulfuric acid plant

The pulp industry has made great progress on the environmental front over the last decades. The most modern pulp mills have now become showcases for other industries when it comes to sustainability and circularity in industrial processes. There are now prime examples of completely fossil-free mills, generating a surplus of energy and with very low carbon footprint as pulp mill operators ceaselessly look for ways to become carbon neutral.

There is also a focus on the use of side streams at pulp mills to make other value added products, for example biomethanol and bioproducts from extracted lignin. In fact, we have now entered the era where pulp mills are being described as “bioproduct mills”, and even “biorefineries” as they add innovative products made from renewable sources to their portfolio of offerings.

However, there is still work to be done to ensure environmental and financially beneficial closed loops in pulp production processes. One area that is particularly in focus is the removal of excess sulfur from the pulp mill chemical cycle to limit the dumping of sulfate-containing streams, which is already under the watchful eyes of regulators.

ANDRITZ SulfoLoop not only addresses the issue of sulfate dumping and other environmental issues, it also enables a mill to be self-sufficient in sulfuric acid, thereby making significant savings when it comes to the use of chemicals.

MAJOR ENVIRONMENTAL AND FINANCIAL BENEFITS

The SulfoLoop process involves the recovery of sulfur from concentrated non-condensable gases (CNCGs) from the pulping process, converting them into sulfuric acid to be used in the mill. One of the major benefits of the SulfoLoop solution is it allows the mill to control its sodium and sulfur balance at the same time as enabling the mill to be self-sufficient in sulfuric acid.

Over the last decades pulp mills have been striving for environmental performance which has resulted in the closure of chemical cycles, including emissions and effluent reduction and control. In turn, these improvements have led to increased sulfur in a mill's Na/S balance. This increased sulfur needs to be removed to keep the mill balance. However, taking out sulfur in conventional ways ultimately means purging to the environment coupled with the loss of other chemicals, for example sodium.

In some mills fly ash is purged from the recovery boiler which is then dumped to the waste waters. Another way sulfur is lost is via the chlorine dioxide process at mills which produces sodium sulfate as a byproduct. The sulfate is then purged to the effluent treatment. Neither of these solutions are ideal from an environmental nor economical point of view.

“When it comes to sulfate dumping, there can be environmental issues such as the harming of aquatic ecosystems,” explains Minna Laitinen, Product Manager, SulfoLoop at ANDRITZ. “There are already cases where environmental permits have been refused for new pulp mills due to sulfate dumping and there is no doubt that these disposal methods will come under much more scrutiny by environmental regulators in the future.”

There is also an economical cost to removing sulfur from the pulp mill recovery cycle. Whenever sodium sulfate is purged, sodium is lost which needs to be replaced in the mill recovery cycle by introducing make-up chemicals, for instance sodium hydroxide, which is highly expensive.

“In a nutshell, the SulfoLoop solution recovers the sulfur coming from the pulp mill processes, thereby eliminating the environmental and financial implications of purging and dumping sodium sulfate,” says Laitinen. “Furthermore, and even more beneficial, the recovered sulfur streams are then transformed into concentrated sulfuric acid for all the mill's needs. The SulfoLoop solution is a win-win for the environment and mill revenues.”

SulfoLoop: TOPSOE WSA TECHNOLOGY

As part of its CircleToZero initiative, ANDRITZ has already successfully introduced SulfoLoop sulfuric acid plants into the pulp industry, with installations at two mills in Brazil – Klabin Puma Ortigueira and Suzano Ribas do Rio Pardo – with further orders already in place in Sweden at Södra Cell Mönsterås. The solution utilizes WSA (Wet Gas Sulfuric Acid) technology developed by the Danish company Topsoe. The technology is well-proven, having already been licensed to operate at nearly 200 locations worldwide.

Samuel Scherman Johansson, Technology Manager at Topsoe, says, “The foundation of our company revolves around how we can help the world through chemistry, something we have been doing for around 80 years now. The ANDRITZ SulfoLoop sulfuric acid solution, which utilizes Topsoe WSA technology, is a prime example of the type of technology we provide. In fact, Topsoe is the market leader in this area, and is spearheading the development of sulfuric acid catalysts across industries.”

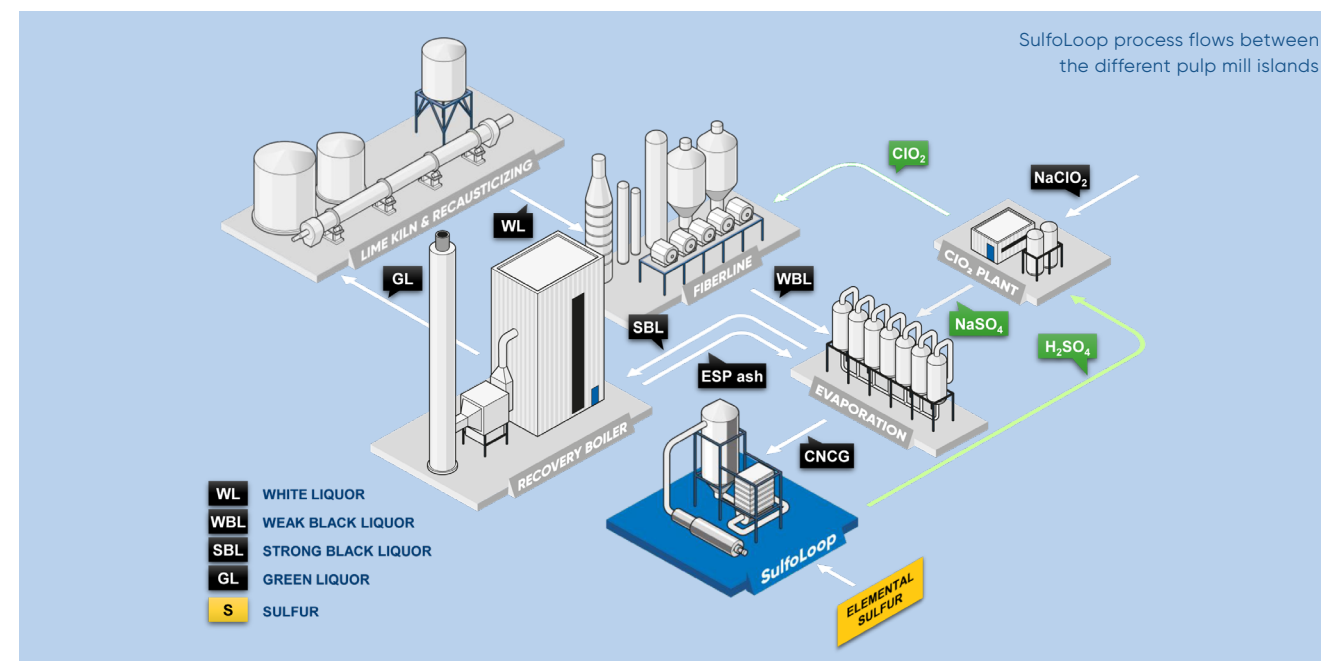
The company has successful plants all over the world in various industries including metals, crude oil, natural gas and viscose plants – basically any industries looking to convert their sulfur containing off-gases or acid gases to sulfuric acid.

The Topsoe WSA technology is well suited to the pulp industry due to its ability to handle gases that contain water, eliminating the need for drying as in the dry sulfuric acid process. The system can also take elemental sulfur to the same combustor for processing.

With the Topsoe WSA-based SulfoLoop solution, the CNCGs from the pulping process that contain sulfur and hydrocarbons are collected and burnt in a combustor to obtain the gases of SO₂ (sulfur dioxide) water, air and CO₂. This is then cooled and passed over a selected number of catalyst beds where SO₂ is converted to SO₃ (sulfur trioxide).

The resulting stream of SO₃, water and air are cooled with the process gas cooler. In this phase, SO₃ and water are forming sulfuric acid in the gas phase. When this is cooled further in the WSA condenser, sulfuric acid is condensing and reaching high concentration. The concentrated sulfuric acid is collected at the bottom of the Topsoe WSA condenser. The sulfuric acid is then ready to be stored or used at the mill. The small amount of SO₂ remaining in the gas is washed with sodium hydroxide solution, and the formed salt solution can be either returned to the cycle, or used as sodium bisulfite in pulp bleaching. The clean gas is then sent to the stack.

Central to the Topsoe WSA technology is the WSA condenser, which is capable of producing concentrated sulfuric acid above 95%, typically up to 98%, regardless of the initial amount of water in the feedstock gas. The process does not require additional steps such as concentration of the product acid. Another key benefit of the WSA is that everything upstream of the condenser is kept above acid dew point, thereby avoiding corrosion. The process gas only reaches the acid dew point when it is condensed inside the glass tubes of the WSA condenser, instead of high corrosion risk quench cooling, used in other technologies.





CONTACT US

To find out more about how your mill can become self-sufficient in sulfuric acid, please contact us at: CircleToZero@andritz.com

SulfoLoop sulfuric acid plants are part of ANDRITZ's CircleToZero initiative which includes new technologies aimed at optimizing pulp mill side streams. The initiative aims to eliminate all unused side streams, create new added-value products and lay the foundation for zero emissions and zero waste production.

FINLAND

ANDRITZ Oy
p: +358 204 50 555

JAPAN

ANDRITZ K.K.
p: +81 3 3536 9700

INDIA

ANDRITZ TECHNOLOGIES Pvt. Ltd.
p: +91 44 4293 9393

BRAZIL

ANDRITZ Brazil Ltda.
p: +55 41 2103 7601

AUSTRIA

ANDRITZ AG
p: +43 316 6902 0

USA

ANDRITZ Inc.
p: +1 770 640 2500

CHINA

ANDRITZ (China) Ltd.
p: +86 757 8202 9222

ANDRITZ.COM

JOIN US ON SOCIAL MEDIA



All data, information, statements, photographs and graphic illustrations in this brochure are without any obligation and raise no liabilities to or form part of any sales contracts of ANDRITZ AG or any affiliates for equipment and/or systems referred to herein. © ANDRITZ Group 2026. All rights reserved. No part of this copyrighted work may be reproduced, modified or distributed in any form or by any means, or stored in any database or retrieval system, without the prior written permission of ANDRITZ AG or its affiliates. Any such unauthorized use for any purpose is a violation of the relevant copyright laws. ANDRITZ AG, Stattegger Strasse 18, 8045 Graz, Austria. SulfoLoop White Paper 1.0/1.2026 EN

