POWERING THE FUTURE OF SUSTAINABLE TISSUE

SUCCESS STORY

Sofidel Kisa, Sweden, to use syngas made of biomass for drying for the first time in the tissue industry.

ANDRITZ

A new energy source, a new challenge

ANDRITZ Novimpianti is working with the tissue industry's global player Sofidel on a ground-breaking solution to eliminate fossil-fuel from the tissue drying equation. For the first time in the tissue industry, the innovative ANDRITZ equipment will enable Sofidel to use renewable gas (bio-syngas) for the drying process.

Burning fossil fuels in industry to generate heat and electricity is one of the greatest contributors to global greenhouse gas emissions, according to the United Nations' Intergovernmental Panel on Climate Change (IPCC). Process heat used in manufacturing accounts for around 25% of the world's energy consumption.

Hence, measures to reduce this source of carbon dioxide (CO_2) are therefore one of the main targets of the European Commission's plan to achieve climate neutrality by 2050.

SYNGAS

Syngas, short for synthesis gas, is produced by the gasification of a carbon-containing fuel such as coal or biomass, when it is known as bio-syngas. One challenge when using syngas is its relatively low energy density, but it brings benefits of lower carbon emissions and the ability to generate renewable power.

ENVIRONMENTAL SOCIAL GOVERNANCE (ESG) AT SOFIDEL

Leading global tissue producer Sofidel is the second-largest tissue producer in Europe and well-known for its Regina brand, among others. The company takes its responsibility to reduce its environmental impact very seriously. One pillar of its strategy is to reduce its CO_2 emissions by 40% per tonne of paper produced by 2030 compared to the base year 2019.

SCIENCE BASED TARGET INITIATIVE SETTING A BENCHMARK IN CO_2 REDUCTION

The Science Based Target Initiative (SBTi), which promotes best practices in line with climate science, has approved this target as being consistent with limiting global warming to well below 2°C.

100%
cellulose certified with forestry certification schemes

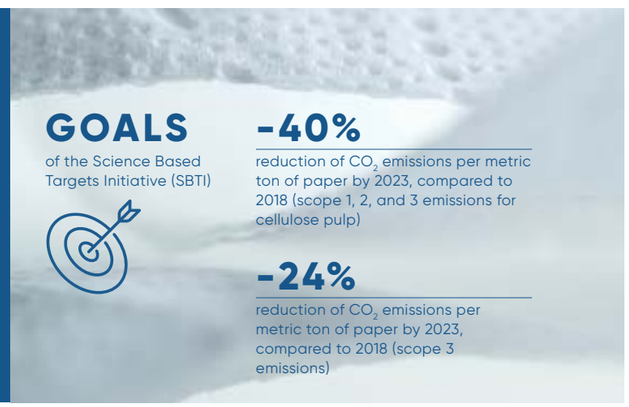
-24%
reduction in carbon intensity (compared to 2009)

-19.6%
reduction in conventional plastic packaging (compared to 2013)

7.2 l/kg
reduction in conventional plastic packaging (compared to 2013)

427 TJ
total production of energy from renewable sources

88%
use of Euro 5 and 6 trucks to deliver the products



Set in 2020: the ambitious sustainability targets of Europe's second largest tissue producer Sofidel

Being the first using bio-syngas for tissue drying

As part of its ESG program, and with the help of ANDRITZ Novimpianti, gasification technology specialists Meva Energy and the University of Pisa, Sofidel have identified an opportunity for an annual reduction in CO_2 emissions of 8,500 tons through a project at its Kisa tissue mill in the south-east of Sweden.

Like many other tissue plants, Kisa uses LPG to generate process heat for tissue drying – for now. However, through a 10-year agreement between Meva Energy and Sofidel Sweden, Meva will operate a thermochemical conversion plant with the capacity to generate at least 4.2 MW of gas on site at Kisa, based on locally sourced woodchips as biofuel. During the first half of 2023, the renewable gas produced will replace fossil-based LPG for a substantial part of Kisa's tissue drying needs.

According to Meva Energy, on-site production in combination with not having to refine the gas to pure methane is the basis for achieving high conversion efficiency along with CO_2 reductions that are more substantial than with conventional types of biofuel. The Meva Energy system also produces biochar, a stable form of renewable carbon that creates a carbon sink and can be used for soil improvement.

"It is a significant step for the whole paper industry and for sustainability but also a stimulating technical challenge."

LUCA LINARI
Managing Director, ANDRITZ Novimpianti

A PAPER-DRYING FIRST

However bio-syngas is not a direct substitute for LPG. With its lower energy density, bio-syngas requires significant downstream modifications to enable the ANDRITZ 3.4 m CrescentFormer PM3 tissue machine at Kisa to perform to its potential.

This is where ANDRITZ Novimpianti has played a vital role with its many years of experience in air and energy systems for tissue, paper and board. Managing Director Luca Linari explains: "This is the first time that syngas or bio-syngas has been used to dry paper – any type of paper.

ANDRITZ has several current CO_2-reduction initiatives in its portfolio, but this project shows particularly interesting potentials. The different characteristics of bio-syngas compared to LPG mean it is necessary to replace the burners and upgrade the combustion chamber in the hood of Kisa PM3 to ensure the uniform flow of gas and, therefore, heat that is essential for effective and consistent tissue drying. PM3 will be 100% reliant on bio-syngas for paper drying, while PM4 at the same mill will be partially fed by bio-syngas.

It is also possible to use bio-syngas to generate electrical power via a turbine, but the Kisa project is focussed on heat for now. This specific application at Kisa with burners inside within the hood for tissue drying fueled by bio-syngas is also a first for the paper industry worldwide..

Getting technical: detailed modeling is essential

The gas volume is larger with syngas than with LPG, which affects the flow, so the main challenge is to keep combustion even. In addition, the combustion chamber and fans are integrated into the hood of PM3 at Kisa, which means there is less space to work with.

"We are confident that the combination of the specially-designed burners and modifications within the hood itself will enable strong drying performance combined with the crucial environmental benefits, which are the main motivation behind this project," explains Luca Linari.

DETAILED MODELING ESSENTIAL

Before Sofidel and ANDRITZ Novimpianti could be confident that the proposed solution for Kisa would perform in practice on the scale of a commercial tissue machine, detailed modeling was required.

This is where the Department of Civil and Industrial Engineering at the University of Pisa stepped in as an essential contributor to a collaborative feasibility study with Sofidel and ANDRITZ Novimpianti. Chiara Galletti, Professor at the University of Pisa, takes up the story:

"We developed a model for operating the hood that would reflect the change in gas composition from LPG to bio-syngas. The composition of bio-syngas makes it challenging for combustion and thermal power. So by using computational fluid dynamics (CFD), we were able to verify that the new fuel would provide a stable flame and flow of heat without excessive production of CO_2 or pollutants such as carbon monoxide and nitrogen dioxide.

"This was a complex and detailed modelling scenario, involving dozens of processors and numerous simulations, each of which ran for 10 days or more. But we needed to be rigorous to be sure the combination of Meva Energy's gasification and ANDRITZ hood technology could produce a stable flame, acceptable emissions, and effective drying performance.

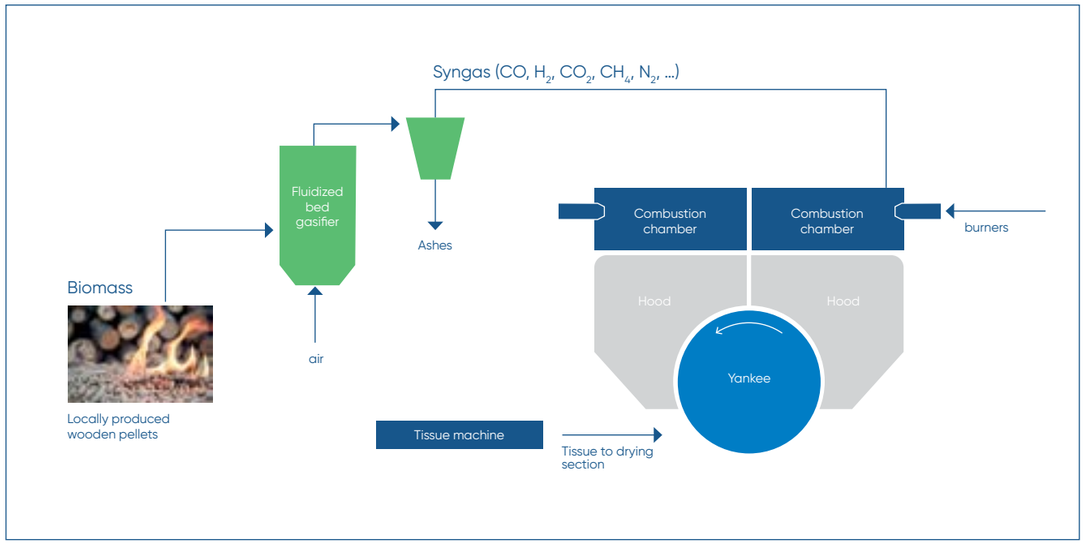
THE DIFFERENCE BETWEEN SYNGAS AND LPG

Syngas	N_2	CO	CO_2	H_2	H_2O	CH_4	C_2H_4	C_6H_6
Volume fraction [%]	46.0	17.6	10.6	9.7	12.0	2.6	1.3	0.6

	Syngas	Propane
Low heating value LHV [MJ/m³]	5	36
Adiabatic flame temperature [K]	1680	2300
LdV (volume of air needed to oxidize one volume of fuel) [m³/m³]	1	9.5

"The results were very encouraging – not only for this single project. We were able to simulate other biofuel inputs and establish the scalability of the technology as well."

CHIARA GALLETTI
Professor, Department of Civil and Industrial Engineering
University of Pisa



Integration of biomass gasification into the hood

GASIFICATION IN BRIEF

Gasification is a well-known thermochemical process for conversion of woody biomass into a mixture of gases (named producer gas or syngas), consisting of mainly of CO, H_2, CO_2, CH_4 and N_2.

Gasification is one of the most promising technologies for converting biomass into gaseous fuels thanks to its high conversion efficiency, which can exceed 75%.

UNIVERSITY OF PISA

Founded in 1343, the University of Pisa can count among its alumni numerous successful and influential technicians active in the paper and tissue industry, as well as two Nobel Prize winners in physics. It has a tradition of successful collaboration with industry and its research centers, including the Department of Energy, are recognized internationally.

Up to 8,500 t/a less CO_2 emissions

The use of fossil-free syngas from biomass gasification to feed the burners of the hoods (and boiler) in the drying section of the tissue plant allows CO_2 emissions to be reduced by 8,500 tons per year compared to the carbon footprint generated by today's consumption of fossil LPG.

"The adoption of bio-syngas at Kisa will achieve an annual reduction in CO_2 emissions of 8,500 tons."

DAVIDE MAINARDI
Chief Technical Officer, Sofidel

A LANDMARK INSTALLATION

For Sofidel, Kisa represents a milestone, according to Sofidel's Chief Technical Officer Davide Mainardi: "There are many elements involved in achieving our target of a 40 % reduction in emissions by 2030 compared to 2018.

Cumulative changes throughout our operations are important: a shoe press, for example, can reduce the energy requirement of a tissue machine, resulting in carbon-reduction benefits. But we also need to be ready to take more radical steps, and the adoption of bio-syngas at Kisa, which will achieve an annual reduction in CO_2 emissions by 8,500 tons, is a major feature on our roadmap towards 2030 and beyond.

THE ULTIMATE GOAL

"The ultimate goal of carbon neutrality can only happen with huge commitment and unprecendented levels of innovation from us and our suppliers. We are looking at many potential solutions to achieve the CO_2 reductions we need, but SBTi has helped define our goals in relation to specific climate targets. As an approach to tackling Scope 2 emissions, this initiative with ANDRITZ Novimpianti, Meva Energy and the University of Pisa provides concrete benefits that will yield results within a relatively short time frame. It will also help give us confidence that our interim goal of a 40% reduction in CO_2 emissions by 2030 is achievable with available technology."

With the help of ANDRITZ Novimpianti, Meva Energy and the University of Pisa, Sofidel's Kisa mill is set to be a reference point for best practice in tissue mills as the tissue sector strives to reduce, and ultimately eliminate, fossil-based CO_2 emissions. The project is not only a first in the tissue industry, but is also pioneering for all process industries. The Meva Energy plant is the first in the world to use bio-syngas (or any form or syngas) for industrial process heat, and ANDRITZ Novimpianti has harnessed this capability with an unprecedented solution applicable to tissue manufacturing, which is flexible according to local biofuel sources.

"Science-based targets require a scientific approach," says Linari. "It's a privilege to be involved in such a landmark project, where analysis and innovation can contribute significantly towards reducing the environmental footprint for a world-class tissue producer."

SOFIDEL

Established in 1966, Sofidel is one of the world's largest tissue producers for consumer and away-from-home use. Sofidel's headquarters is in Porcari, Italy, and its 16 affiliated companies throughout Europe and the United States produce at least 1.4 million tonnes of paper annually, with a workforce of more than 6,700.

Sustainability is a strategic value for the company, and Sofidel is committed not only to its transition to the low-carbon economy but also to maximizing the social benefits of its activities.

DISCOVER OUR FULL-RANGE PORTFOLIO FROM FIBER PROCESSING TO PAPERMAKING

An outstanding paper product requires outstanding production – matched with the particular needs of raw material and final product. Discover the full-range portfolio from ANDRITZ: Excellent stock preparation that allows best fiber development according to furnish and with economical use of resources. *Prime*Line paper machines that are a synonym for producing top-quality tissue, paper, and board grades. Complete lines or single units, upgrades, and modernizations. Contact us and benefit from your individual package in papermaking technology.

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