



Sappi Kirkniemi

EMAS Environmental Review

2023

Foreword

In line with the 2025 strategy of the Sappi Kirkniemi Mill, our goal is to continuously improve environmental efficiency throughout our value chain. Our main goal is to reduce the mill's carbon dioxide emissions. Our vision is to be the world's best printing paper producer for our customers. We are committed to developing innovative products and service concepts to meet our customers' needs while respecting the environment. Our operations are built on a committed staff who take pride in our excellent safety record.

Climate action proceeded as planned

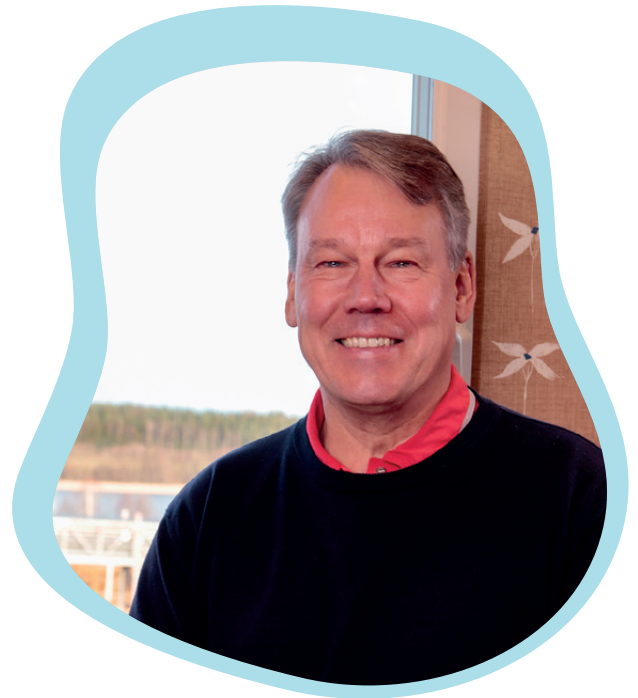
In 2020, Sappi Europe set its sustainable development goals for 2025. These climate goals include reducing carbon dioxide emissions and increasing the proportion of renewable energy in total energy consumption. To achieve these goals, we invested €16.5 million in Kirkniemi's energy production, and the mill switched to using biofuels in the spring of 2023. The project was completed on schedule, although there were delays along the way due to global events. The coronavirus pandemic, the war in Ukraine, logistical bottlenecks and material availability challenges were global concerns, but project suppliers were still able to stay on track.

The Minister of Climate and the Environment, **Kai Mykkänen**, officially inaugurated the installation in August. After the project phase, further work has been done to optimise operations and biofuel deliveries. We are proud of this transition to bioenergy, which makes us part of the solution for combatting climate change. For us, a circular economy means that all parts of the wood and other raw materials we use are carefully recycled. We can recycle wood fibre-based products and finally utilise them in bioenergy production. Paper is already an important product in the circular bioeconomy.

A competent and safety-conscious staff

After record turnover in the 2022 financial year, paper demand remained low in 2023. At the end of the year, we had to layoff staff for the second time in the mill's history. The first time was due to the coronavirus pandemic.

We aim to provide our staff with a safe workplace and opportunities to develop their competence. Our active safety efforts have paid off. In 2023, we set an all-time record in the low lost time injury frequency rate.



In the first company-specific collective agreement with the Finnish Paperworkers' Union, which came into force in 2022, we reserved the right to include three training days annually in employees' shift schedules. In 2023, we continued to utilise these days and fine-tuned the training content even further. The number of training days per person was 6.3. We want Kirkniemi to become an increasingly diverse, interesting and competitive place to work as our expertise grows.

This review complements the broader 2021 EMAS statement. I hope this review provides an up-to-date picture of our mill's operations and impacts.

28 March 2024

Martti Savelainen
Mill Director

Sustainability work in 2023

Renewable fuel to be used at power plant

The investment aimed at reducing the mill's direct carbon dioxide emissions was completed on schedule in early 2023. We invested in biofuel reception, storage and processing equipment at the mill's power plant. This investment will reduce the Kirkniemi Mill's direct carbon dioxide emissions by up to 90%, i.e. around 230,000 tonnes of carbon dioxide per year.

The equipment was commissioned in January, after which coal was gradually replaced by biofuels in the multi-fuel boiler completed in 2015. Since the completion of the bio-project, the majority of the power plant's fuels have been domestic biofuel: wood chips and bark. The mill's power plant also incinerates the bark from its debarking plant and the sludge from its effluent treatment plant. The mill's power plant produces the steam and part of the electricity needed by the mill. District heating is produced to heat the mill buildings and a nearby residential area.

Investments in the effluent treatment plant

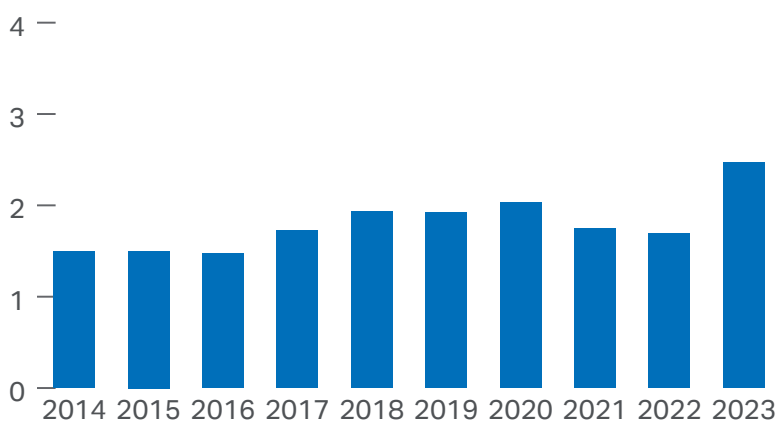
The work on reducing water pollution is carried out under the principle of continuous improvement. Compared to 2022, emissions to waters decreased, except for nitrogen. To optimize nutrient dosing and reduce emissions, we installed an online COD meter at the inflow to the wastewater treatment station. We also replaced the phosphorus dosing equipment at the same time. A Six Sigma Green Belt project was commissioned to optimise nutrient dosages.

At the effluent treatment plant, we invested in increasing the biosludge removal capacity by remodelling the centrifuged sludge transfer line. This reduces the risk of the biosludge escaping from the process and, in the worst case, entering the lake. An optical sludge bed measurement system was purchased for the primary clarifier.

Reducing material loss to the target level of 1.4% of paper production has proven challenging. In 2023, this loss was

2.47%. The most significant reason for the high level of material loss was the low operating rate and the consequent ramping-up and ramping-down of the paper machines. To facilitate the monitoring of material loss, we installed online solids meters in both main flows into the treatment plant. These meters indicate the direction from which the solid matter is coming and how its volume varies. To reduce loss, we built a new pipeline at the end of the year from one coating kitchen to the other. This allows us to ultrafiltrate all the water from the mill that contains coating colour and maximise the use of the pigments in the water as a raw material for paper. We have also optimised machine shutdown procedures and improved monitoring to reduce losses. The work on reducing material loss will continue in 2024.

Material losses to the effluent treatment plant %

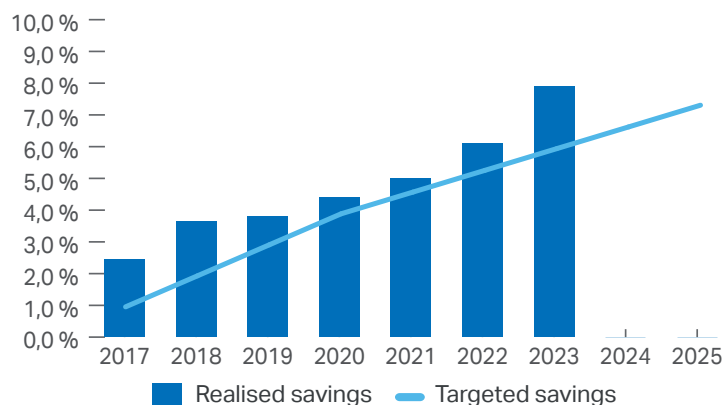


The biofuel investment will allow the Kirkniemi Mill to reduce its fossil carbon dioxide emissions by up to 90%.





Actual energy-efficiency savings as % of total energy consumption, cumulative



Waste as part of the circular economy

In 2023, the mill generated approximately 43,000 tonnes of waste and side streams. This is significantly less than in 2022. The largest abnormal waste streams came from the construction site for the biofuel project, railway repairs, dredging of the mill's reservoir and waste kaolin generated in storage at the port. With the exception of the waste kaolin, all of the waste was recovered as either material or energy. Approximately 8,200 tonnes of sludge was generated at the effluent treatment plant, and approximately 18,700 tonnes of bark classified as a side stream was produced at the debarking plant.

Waste heat recovery through energy investment

The Kirkniemi Mill is included in a national energy-efficiency agreement. The

overall energy savings target for 2017–2025 is 7.5%. The energy savings have realised well, and we already reached our target ahead of time in 2023. In 2023, our energy-saving projects amounted to approximately 33 GWh. The biggest savings resulted from using the pulp department's waste heat to heat the water for the mill's district heating network.

Managing energy efficiency is part of all our development projects, and improving it is part of our daily work. In addition to equipment purchases and investments, we take energy efficiency into account in how we run and develop our processes and products.

Proactive safety efforts set new record

Safety is a shared concern for all Kirkniemi employees. The mill's safety

slogan, 'Safety starts with me', was brainstormed together with the staff. Continuously developing a safety culture where everyone is primarily responsible for their own safety has brought successes. In 2023, the mill achieved an all-time record in the low lost time injury frequency rate (LTIFR): 1.76 accidents per million working hours.

Safety is strongly linked to the mill's strategy. Regular occupational safety training and safety workshops ensure that personnel have the skills and knowledge needed to continuously develop the safety culture. A safe workday is based on proactive safety efforts, which all staff are encouraged to take part in. In 2023, the mill's personnel made 2,635 hazard notifications and 438 behaviour-based safety assessments (BBS assessment).

Personnel at the mill were trained for emergencies in accordance with the



rescue plan. We reviewed an extensive training package on the power plant's newly built biofuel silo with the mill's fire brigade. The mill's fire brigade conducted smoke exercises with the Länsi-Uusimaa Rescue Department which also carried out its own risk assessment in the mill area. The subject of the annual Tukes exercise related to chemical accidents was safety measures for ammonia water tanks. The exercise was carried out with the mill's fire brigade. Fire inspections to map fire risks were carried out with the fire inspector of the rescue department four times throughout the factory area.

Environmental communication to stakeholders

Communication of environmental issues to the different departments continued with the pulp department, the product development team and the purchasing department. During the summer, we held an environmental briefing for the entire mill staff, reviewing the practices and latest guidelines related to waste sorting.

We held our neighbourhood meeting in February. There were about 50 people in attendance from the area near the mill. At this event, we discussed the impacts of the biofuel investment, including increased transport and other topical environmental issues.

We received six stakeholder feedback responses throughout the year. The feedback was related to, among other things, the amount of light emitted from the factory, noise, traffic behaviour and the presence of solids in Lake Lohjanjärvi.

We worked with local educational institutions, offering students introductory visits and internships. Institutional cooperation was also carried out by offering project work opportunities to students at applied sciences universities.

Certified systems as a sign of systematic operations

The Kirkniemi Mill has valid certificates for the quality management system (ISO 9001), the environmental management system (ISO 14001), the occupational health and safety system (ISO 45001) and the energy efficiency system (ISO 50001). We arranged two training sessions for mill employees, where we reviewed the content and structure of the management system standards, as well as their requirements, interpretation and application. This allowed us to focus specifically on the issues at our own mill.

Decision of the Vaasa Administrative Court in the environmental permit case

The Regional State Administrative Agency for Southern Finland issued an environmental permit decision for the Kirkniemi paper mill in October 2022. The decision was appealed to the Vaasa Administrative Court, which rejected the appeals. On 29 December 2023, the decision of the Vaasa Administrative Court was appealed to the Supreme Administrative Court, where the matter is now being heard.

Hazard notifications

2 635
notifications



Lost time incident frequency

1.76
/million
working hours



The Kirkniemi Mill employed

582 people
110 summer
employees



Fulfilment of permit conditions in 2023

In 2023, the mill's emissions to water bodies was in accordance with the environmental permit's regulations. Compared to 2022, total emissions into waters decreased

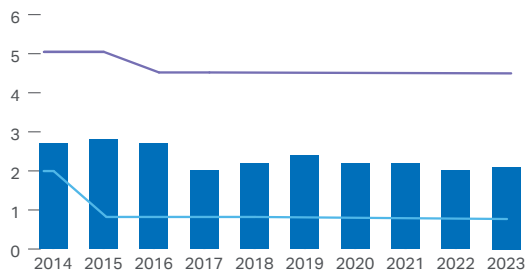
in terms of COD, phosphorus and solids loads, but nitrogen emissions were slightly higher than in the previous year. Relative to paper production, nitrogen and COD

emissions increased. The emissions were in line with the BAT-AELs for the pulp and paper industry, except for the solids content of wastewater.

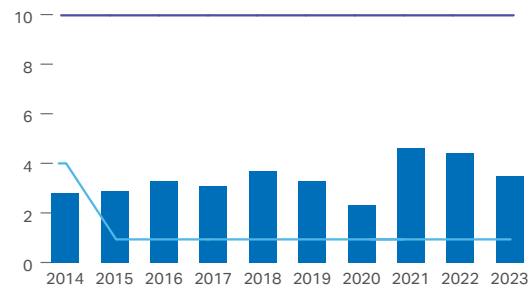
Water emissions vs. permit limits in 2023

Emission parameter	Unit	Permit limit, monthly average	Permit limit, annual average	Actual yearly average 2023
COD _{Cr}	kg/day	7,000	5,400	2,173
Total phosphorus	kg/day	9	7	3.6
Total nitrogen	kg/day	130	100	52
Solids	kg/t	–	0.8	0.50

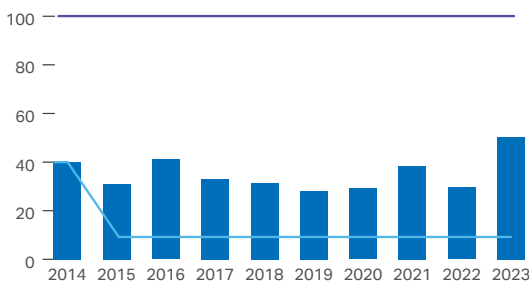
Specific load of COD_{Cr} kg/t paper



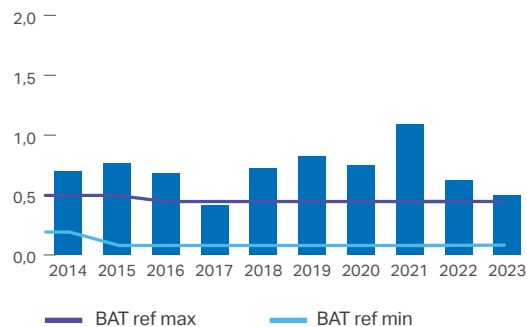
Specific load of phosphorus g/t paper



Specific load of nitrogen g/t paper



Specific load of solids kg/t paper



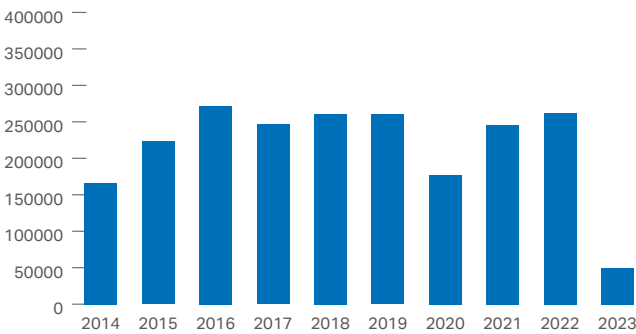


While the weather is freezing outside, microbes enjoy a warm bath in the biological phase of the mill's effluent treatment plant. Living microbes remove organic matter from effluent.

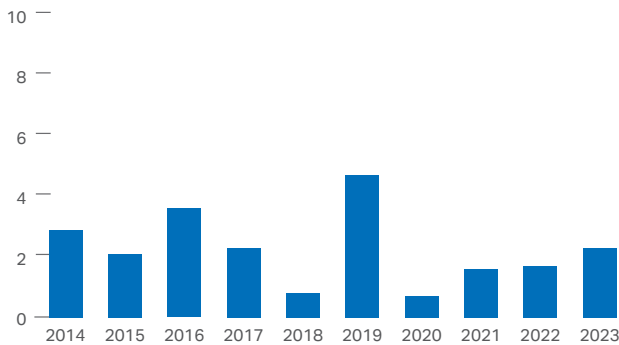
Emissions to air decreased, except for particulate matter. Particulate matter emissions amounted to 2.3 tonnes, compared to 1.7 tonnes in 2022. Nitrogen emissions were reduced by about 17%,

sulphur dioxide emissions by about 80% and fossil carbon dioxide emissions by about 81%. The emissions were in line with the permit requirements.

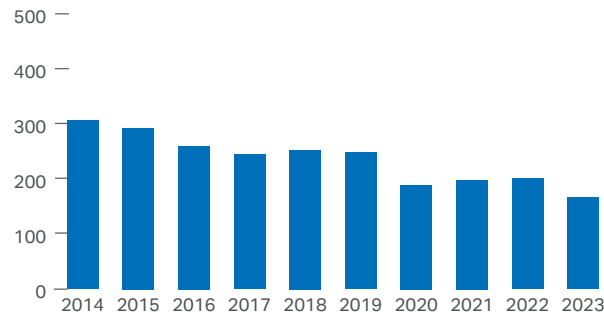
Fossil CO2 emissions t/y
Power plant and mill, Scope 1



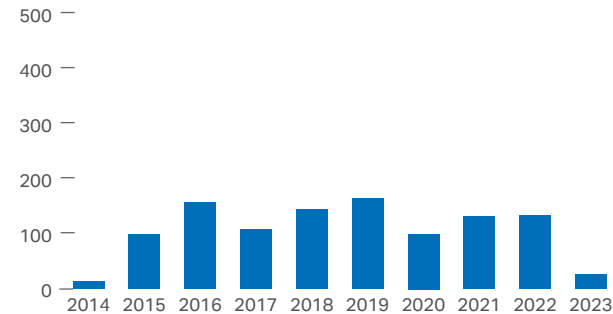
Particulate emissions t/y



Nitrogen emissions (NO_x) t/y



Sulphur dioxide emissions (SO₂) t/y



Meeting environmental goals in 2023

The mill's environmental targets were met for water emissions, environmental risk management, energy savings, the amount of certified fibre, and air emissions. The

specific values for material loss and effluent flow were greater than the target, which is largely explained by the low paper production volume. The waste

recovery rate exceeded the target, but there was slightly more mixed waste than what our goal had been. The biofuel investment was completed on schedule.

Target	Metric	Unit	Target value	Outcome
Managing the chain of origin for wood	Percentage of certified fibre	%	> 85	88
Improving material efficiency and water management	Loss of solids to the treatment plant	kg/t	< 14	24.7
	Effluent flow	m ³ /t	< 9.4	12.6
Improving energy efficiency: Savings targets for 2017–2025 in accordance with the target programme	Energy saving: electricity, heat, fuel	GWh	≥ 12.8	33.1
Efficient waste sorting and recovery	Recovery rate	%	> 99	99.7
	Mixed waste from sorting	t/y	< 10	14
Good environmental risk management: Identification of risks, investigation of deviations and preventive measures No serious accidental emissions	Number of unexplained incidents that disrupted the treatment plant's operations	No. (count)	0	0
	Number of accidental emissions	No. (count)	0	0
Compliance with environmental permit limits: Remaining below the annual and monthly averages (in parentheses) of the permit limits for discharges into water bodies	COD _{Cr}	kg/day	≤ 5,400 (7,000)	2,173
	Phosphorus	kg/ day	≤ 7 (9)	3,6
	Nitrogen	kg/ day	≤ 100 (130)	52
	Solids	kg/t	≤ 0.8	0.50
Keeping air emissions from the power plant in accordance with the permit limits	Emissions < permit limit	Y/N	Yes	Yes
Reducing carbon dioxide emissions	Biofuel project on schedule	Y/N	Yes	Yes



Environmental targets for 2024

The mill's environmental targets have been set for a three-year period, 2022–2024. The targets will be reviewed annually and, if necessary, revised in line with the principle of continuous improvement. Our goal is to continuously

improve environmental performance throughout the value chain.

One of the key goals of the mill's strategy for 2025, drawn up in 2019, is to reduce the mill's carbon dioxide emissions. At the end of 2021, we initiated

investment work, which, once completed, would allow the mill to transition to using biofuels in the K5 boiler of its power plant. The transition to biofuels took place gradually in 2023.

Target	Metric	Unit	Target value	Action
Managing the chain of origin for wood	Percentage of certified fibre	%	> 85	Monthly verification of raw material sources
Improving material efficiency and water management	Solids loss from the mill to the effluent treatment plant	kg/t	< 14	Reducing material waste according to the project plan
	Effluent flow	m ³ /t	< 9.4	Reducing the use of fresh and hot water at potential sites
Improving energy efficiency: Savings targets for 2017–2025 in accordance with the target programme	Energy savings: electricity, heat, fuel	GWh	12.8	Pre-planning and implementation of energy-efficiency investments Energy efficiency meetings Continuous improvement projects
Efficient waste sorting and recovery	Recovery rate	%	> 99	Quarterly waste management rounds
	Mixed waste from sorting	t/a	< 10	
Good environmental risk management: Identification of risks, investigation of deviations and preventive measures No serious accidental emissions	Number of unexplained incidents that disrupted the effluent treatment plant's operations	No. (count)	0	Operation and maintenance of the SARA system, carrying out measures
	Number of accidental emissions	No. (count)	0	
Compliance with environmental permit limits: Remaining below the annual and monthly averages (in parentheses) of the permit limits for discharges into water bodies	COD _{Cr}	kg/d	≤ 5,400 (7,000)	Daily monitoring and rapid response to anomalies
	Phosphorus	kg/d	≤ 7 (9)	
	Nitrogen	kg/d	≤ 100 (130)	
	Solids	kg/t	≤ 0.8	
Air emissions from the power plant comply with permit limits	Emissions vs. permit requirements	Y/N	Yes	Daily monitoring and rapid response to anomalies



Environmental indicators 2021–2023

		2021 Total	2022 Total	2023 Total
Production	Paper, t	583,179	581,971	376,303
Raw materials*	Chemical pulp, t	102,000	98,000	67,000
	Mechanical pulp, t	220,000	216,000	136,000
	Pigments, t	236,000	232,000	150,000
	Binders, t	24,000	23,000	15,000
	Additives, t	12,000	11,000	7,700
Power plant fuels	Fossil fuels, GWh	718	772	137
	Biofuels, GWh	201	206	581
Energy use in production	Electricity, GWh	863	828	585
	Renewable electricity, GWh	85	96	109
	Heat, GWh	539	543	400
	Renewable heat, GWh	134	118	304
	Natural gas for the coating process, GWh	83	70	45
Heating of buildings, GWh	Mill and residential area	74	58	44
Emissions to air, power plant and mill	Sulphur dioxide, SO ₂ , t	132	133	26
	Nitrogen oxides NO _x , t	199	202	167
	Particles, t	1.6	1.7	2.3
	Fossil CO ₂ , Scope 1, t**	245,889	262,051	49,474
	Fossil CO ₂ , Scope 2, t***	179,474	343,295	0
Water use	Raw water for the entire plant, m ³	25,886,000	28,015,000	22,837,000
Emissions to water bodies	Clean cooling water, m ³	20,050,000	22,598,000	17,937,000
	Process wastewater, m ³	5,629,000	5,204,000	4,751,000
	Biological Oxygen Demand, BOD ₇ , t	58	53	43
	Chemical Oxygen Demand, COD _{Cr} , t	1,287	1,174	793
	Phosphorus, t	2.68	2.56	1.33
	Nitrogen, t	22.3	17.2	18.9
	Solids, t	634	362	189
Waste and side streams*	Recovery rate, %	98.3	99.4	99.7
	Ash, t	23,980	25,700	11,957
	Effluent treatment sludge, t	10,350	7,930	8,206
	Bark, t	19,130	21,500	18,766
	Soil, t	495	2,120	2,923
	Other wastes, t	935	1,580	940
	Hazardous wastes, t	170	220	127
	Landfill waste, t	880	230	90
Land use	Area of the mill site, ha	112	112	112
	Impermeable area, ha	42	42	42
	Size of the area oriented towards nature conservation, ha	70	70	70

* reported as dry weight

** fossil emissions from the power plant and mill

*** fossil emissions from purchased energy

Specific consumption per tonne of paper produced

		2021	2022	2023
Raw materials*	Chemical pulp, kg/t	175	168	178
	Mechanical pulp, kg/t	377	371	361
	Pigments, kg/t	405	399	399
	Binders, kg/t	41	40	40
	Additives, kg/t	21	19	20
Energy use in production	Electricity, MWh/t	1.48	1.42	1.55
	Heat, MWh/t	0.93	0.93	1.06
	Natural gas for the coating process, MWh/t	0.14	0.12	0.12
Emissions to air, power plant and mill	Sulphur dioxide, SO ₂ , kg/t	0.23	0.23	0.07
	Nitrogen oxides NO _x , kg/t	0.34	0.35	0.44
	Particulates, kg/t	0.003	0.003	0.006
	Fossil CO ₂ , Scope 1, kg/t	422	450	131
	Fossil CO ₂ , Scope 2, kg/t	308	590	0
Water use	Raw water for the entire mill, m ³ /t	44.4	48.1	61
Emissions to water bodies	Clean cooling water, m ³ /t	34.4	38.8	47
	Process waste water, m ³ /t	9.7	8.9	12.6
	Biological Oxygen Demand, BOD ₇ , kg/t	0.10	0.09	0.11
	Chemical Oxygen Demand, COD _{Cr} , kg/t	2.2	2.02	2.1
	Phosphorus, g/t	4.6	4.4	3.5
	Nitrogen, g/t	38	30	50
	Solids, kg/t	1.09	0.62	0.50
Waste and side streams*	Ash, kg/t	41	41	32
	Effluent treatment sludge, kg/t	18	14	22
	Bark, kg/t	33	37	50
	Soil, kg/t	0.8	4	8
	Other waste, kg/t	1.6	2.7	2.5
	Hazardous wastes, kg/t	0.29	0.38	0.34
	Landfill waste, kg/t	1.5	0.40	0.24

* reported as dry weight

** fossil emissions from the power plant and mill

*** fossil emissions from purchased energy



Sappi is a leading global provider of everyday materials made from woodfibre-based renewable resources. As a diversified, innovative and trusted leader focused on sustainable processes and products, Sappi is building a more circular economy by making what it should, not just what it can. Its raw materials offerings (including dissolving pulp, wood pulp and biomaterials) and end-use products (packaging papers, specialty papers, graphic papers, casting and release papers, forestry products) are manufactured from woodfibre sourced from sustainably managed forests and plantations. Many of Sappi's production facilities use internally generated bioenergy, enabling many of its operations to be energy self-sufficient.



Sappi produces 5.5 million tons of paper, 2.6 million tons of paper pulp, 1.5 million tons of dissolving pulp per year. Globally, it has over 12,000 employees, 400,000 ha of owned and leased sustainably managed forests in South Africa. Sappi Limited (JSE) is headquartered in Johannesburg, South Africa with manufacturing operations across three continents and sells its products in more than 150 countries.

Sappi Europe is a division of Sappi Limited where its European mills hold chain of custody certifications under the Forest Stewardship Council™ (FSC™ C015022) and the Programme for the Endorsement of Forest Certification (PEFC/07-32-76) systems. Our papers are produced in mills accredited with ISO 9001, ISO 14001, ISO 50 001 and ISO45 001 certification. We have EMAS registration at 5 of our 8 mills in Europe.

An accredited verifier, Inspecta Sertifiointi Oy (FI-V-0001), has reviewed the data in the environmental management system of Sappi Finland Operations Oy Kirkniemi Mill and the 2023 EMAS environmental review. Based on that review, it has been established on 28 March 2024 that the environmental management system and the EMAS review meet the requirements of the EU EMAS Regulation (EC) No 1221/2009.

The Kirkniemi paper mill's EMAS environmental statement is published in Finnish and English. The EMAS environmental statement and its annual reports are available in PDF format on Sappi's website at www.sappi.com. Please send any feedback or questions you may have to the Environmental Manager at Kirsi.Tuominen@sappi.com or call her at +358 10 464 2116.

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