

Environmental performance in 2016



UPM Jämsä River Mills



UPM in the Jämsä River Valley

UPM's Jämsä River Mills – Jämsänköski and Kaipola – are located in the Jämsä River Valley in Central Finland. The Jämsänköski mill is on the banks of the Jämsänjoki River, and the Kaipola mill on the edge of Lake Päijänne. Since the mills are located in the immediate vicinity of residential areas and watercourses, special attention is paid to environmental aspects in all of the mills' operations.

UPM Paper ENA Oy and UPM Specialty Papers Oy, which are both included in this report, operate in the mill area. UPM Paper ENA's News & Retail unit produces uncoated magazine paper in Jämsänköski and directory and newsprint paper in Kaipola; and the Magazines, Merchants & Office unit produces coated magazine paper in Kaipola.

The UPM Specialty Papers SBU produces label and packaging papers in Jämsänköski.

The main raw materials used in paper production at Jämsänköski are mechanical pulp made of spruce pulpwood for the magazine papers, and chemical pulp sourced from UPM's own mills and markets for label and packaging paper. In Kaipola, the main raw materials are spruce pulpwood, recovered household paper and spruce sawmill chips.

There are a total of six paper machines at the Jämsä River Mills: three in Jämsänköski and three in Kaipola.

Both mill sites include a debarking plant, a TMP plant, a water station and a biological effluent treatment plant. In addition to these, Kaipola also includes a deinking plant for recovered papers from households. At both mill sites, the heat required for the process and a small portion of the electricity are produced by the mill's own power plant. In addition, heat is recovered from the TMP plants.

Production capacity	1,345,000 tonnes of paper
Employees	848
Products	<p>Paper ENA: UPM Cat, UPM Impresse, UPM Impresse Plus, UPM Max, UPM Max S, UPM Smart, UPM Cote, UPM Ultra, UPM Ultra Silk, UPM Valor, UPM News, UPM Brite, UPM Book, UPM Color, UPM EcoBasic, UPM EcoLite, UPM EcoPrime, UPM Opalite, UPM Opalite Plus</p> <p>Specialty Papers: UPM Label Papers, UPM Packaging Papers</p>
Certificates	<p>EMAS – EU Eco-Management and Audit Scheme ISO 14001 – Environmental Management System Standard EES+ – Energy Efficiency System ISO 9001 – Quality Management System Standard ISO 22000 – Food Safety Management System Standard PEFC™ Chain of Custody – Programme for the Endorsement of Forest Certification FSC® Chain of Custody – Forest Stewardship Council®</p> <p><i>All certificates can be found from UPM's Certificate Finder (available at www.upm.com/responsibility)</i></p>
Environmental labels	EU Ecolabel



The mark of responsible forestry

For FSC products, visit www.fsc.org



For PEFC products, visit www.pefc.org



EU Ecolabel : FI/011/001

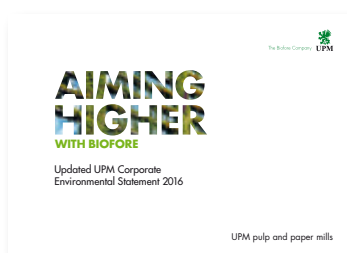


EU Ecolabel : FI/037/001

Through the renewing of the bio and forest industries, UPM is building a sustainable future across six business areas: UPM Biorefining, UPM Energy, UPM Raflatac, UPM Specialty Papers, UPM Paper ENA and UPM Plywood. Our products are made of renewable raw materials and are recyclable. We serve our customers worldwide. The group employs around 19,300 people and its annual sales are approximately EUR 10 billion. UPM shares are listed on NASDAQ OMX Helsinki. UPM – The Biofore Company – www.upm.com

The water used at the Jämsänkoski mill is sourced from Lake Koski-Keskinen and the Iso-Ryöni ravine, while the water source for the Kaipola mill is the Tiirinselkä basin in Lake Päijänne. Both mills use the Vierelä landfill site for the intermediate storage of power plant ash.

The environmental impact of the mills, in terms of watercourses and fishery, is being monitored by Nab Labs Oy in Jyväskylä, Finland. There is also a monitoring programme, which is approved by the Centre for Economic Development, Transport and the Environment and is managed in co-operation with the Water Supply Company owned by town of Jämsä. Air quality is being monitored in co-operation with the town of Jämsä and Jämsän Aluelämpö Oy.



UPM Jämsä River Mills Environmental Performance in 2016 is a supplement to the Corporate Environmental of UPM's pulp and paper mills (available at www.upm.com) and provides mill-specific environmental performance data and trends for the year 2016. The annually updated mill supplements and the UPM Corporate Environmental Statement together form the joint EMAS Statement of UPM Corporation. The next Corporate Environmental Statement and also this supplement will be published in 2018.

Review of 2016

During 2016, the Jämsä River Mills continued to further develop their operations. The development work focused on improving the cost efficiency of production and flexibility of working methods, and promoting a culture of safety at work. By economic performance the company creates value to the entire surrounding community.

The dismantling of Jämsänkoski's Paper Machine 5, which was permanently closed in March 2015, was completed at the end of 2016. Still after the changes that have taken place in recent years, the economic impact of the Jämsä River Mills on local communities is considerable.

The global demand for printing papers continues to decline, the demand for label and packaging paper remains stable. The annual production volume of the Jämsä River Mills was almost at the same level as in the previous year. A development project to reduce energy consumption was launched in the production of mechanical pulp in Kaipola. A permanent reduction in the availability of recovered paper has decreased the production volume of deinked pulp, in contrast, the production capacity of mechanical pulp is being increased.

In 2016, the lost-time accident frequency (LTAF, the number of lost-time work accidents per million hours of work) was 3,7 within UPM as a whole. The corresponding figure at the Jämsä River Mills was 5,6. In 2012, when UPM launched the Step Change in Safety initiative, the mills' lost-time accident frequency was 11. The work carried out has halved the number of lost-time accidents.

Thorough investigation of serious accidents and the reports compiled have revealed that the most essential factor in improving occupational safety is conducting risk assessments and making the

work environment safe before a task is started. A culture of safety stems from everyone's attitude. It is shown in the quality of individuals' actions, their working methods and in how they work with others. A culture of safety is not inherent but is learned by doing in the working community. Because of this, the Jämsä River Mills have launched a three-year safety training programme, which aims to strongly support the development of a culture of occupational safety.

In 2016, UPM introduced a global reporting tool, One Safety, for all UPMers and contractors. One Safety covers environment, health and safety, product and process safety as well as security. The objective is to harmonise UPM's safety and environmental operations and to increase commitment to a safe and sustainable working culture.

In the Jämsä River Mills, 3,700 safety walks and discussions, as well as nearly 2,500 observations related to improving safety, were recorded using the One Safety tool. Among the entries, 140 were environmental observations and small deviations, which were processed in the daily operations of the mills in accordance with the One Safety operations model.

Efficient recycling of waste in Jämsä River Mills

One of UPM's aim is that the company's mills will not send any waste to landfills or to incineration without energy recovery by 2030. The objective supports the United Nations' global sustainability objectives for 2030.

The Jämsä River Mills is one of the forerunners in reaching UPM's objectives concerning the reduction of waste. Processes have been developed to minimise the generation of waste, and the fractions



generated are reused mainly by means of recycling.

Already in recent years the volume of waste sent to landfills has been very low and in 2016 no waste from Jämsä River Mills was sent to landfill. All waste is recycled in its current form or after further treatment. Forms of waste that cannot be used at the mill or by any other party are incinerated for energy. Because transporting the fractions far away from the mill for further processing is not financially or environmentally feasible, local partners play an important role in meeting the objective.

Exceptional disturbance at the Kaipola waste water treatment plant

At the beginning of 2016, the biological wastewater treatment plant of the Kaipola mill experienced a disturbance in the treatment of effluent, which resulted in an abnormally heavy load on the watercourse. The organic load of effluent treated in January and the organic load and nutrient load of effluent treated in February exceeded the environmental permit limits. However, untreated effluent was not discharged into the watercourse at any time. The disturbance was an exceptional event in the history of the operation of the mill's waste water treatment plant, which dates back to the late 1980s.

The biological process in the wastewater treatment plant is sensitive to variations of the organic load, temperature, pH value, nutrient and oxygen content. When the disturbance was investigated in February, it was discovered that some of the air diffuser tubes belonging to the aerator basins were broken. This resulted in too low concentration of dissolved oxygen in the biological part, which lead to insufficient processing of the organic load. The malfunctioning air diffuser tubes were repaired at the beginning of March and replaced completely with tubes of a different type in August. The malfunctioning tubes had been installed in the spring of 2013. They were inspected and any broken tubes were replaced in the autumn of 2015. The overall user experience gives the expected maintenance interval of air diffuser tubes as approximately five years. A complaint

has been filed with the supplier concerning the poor quality of the broken tubes and their very short operational time.

The impact of the measures taken during the intensified monitoring of the treatment plant was followed up by means of additional samples, laboratory analyses and examinations of the microbes of the biological part. To accelerate recovery from the disruption, mill production was restricted, which reduced the organic load to the wastewater treatment plant.

The environmental authority at the Central Finland Centre for Economic Development, Transport and the Environment was aware of the disturbance at the mill's wastewater treatment plant and of the measures taken. Additional sample collection at the Tiirinselkä and Lehtiselkä observation points to monitor the Keski-Päijänne waterways was agreed on at a meeting in February. The observation results revealed a higher than normal short-term oxygen consumption in the effluent load that exceeded the permit limits near the bottom at the nearest observation point at Tiirinselkä. The oxygen content in the water layer closest to the bottom at this observation point has varied widely from one year to another, so over the long-term, the level measured at this point was not exceptionally low. According to the results, the turbidity, solids and nutrient values were also higher than usual.

The sample collection, in accordance with the watercourses monitoring programme, is carried out from March to October. The oxygen content near the bottom of the lake at the nearest observation point at Tiirinselkä returned to normal at the beginning of March, and the turbidity value and ammonium nitrogen content also decreased. The impact of effluent was considerably lower at the Lehtiselkä observation point further out on the lake than at the Tiirinselkä observation point. The wastewater treatment plant operations quickly returned to normal at the beginning of March and the environment was not contaminated. UPM has submitted a report on the disturbance, including the corrective measures taken, to the environmental authorities.

Radiation leak during transport of a measuring device

In March 2016, the Finnish Radiation and Nuclear Safety Authority (STUK) reported that the source of the caesium-137 isotope detected in Helsinki was a measuring device used by UPM and sent for disposal. The measuring device that caused the radiation leak had been used at the TMP plant of the Jämsänkoski mill. It was removed during the TMP plant demolition work, after which it was transferred to a sealed radiation source warehouse at the Kaipola mill. Detailed working instructions are adhered to in the handling of radiation sources. UPM handed the devices over to an external company for transportation at the beginning of March. A metering crew from the Finnish Radiation and Nuclear Safety Authority verified the cleanliness of UPM's facilities in Kaipola and Jämsänkoski. No signs of caesium contamination were detected in the metering at the UPM facilities, and the facilities were declared clean.

Feedback from local residents

Despite the measures taken, we have received feedback from residents living in the vicinity of both mills concerning unpleasant odours from the wastewater treatment plants. A long-term trial was carried out in Kaipola, in which the functioning of the treatment plant was supported by increasing the amount of good microbes. The method used in the trial was new for forest industry effluents, but was known to be effective in preventing odours in municipal sewage. The fact that the composition of forest industry effluent varies in different production settings was considered a challenge, and so far, no single method has been established for completely eliminating unpleasant odours. The chemical phenomena contributing to the generation of odour are known and have been studied in the forest industry. Among others, theses on odour problems have been compiled at universities, and the issue has been researched in co-operation with UPM's R&D. Based on the studies conducted thus far, the most effective way to prevent odour is to oxygenate effluents. Both mills have been employing this method for several years.

The elimination of unpleasant odours at the mills continues to be one of the most important objectives. Both mills continue to carry out tests related to the prevention of unpleasant odours and seek new solutions.

Enquiries and external assessments

Enquiries on environmental issues primarily concerned product safety, the origins of the wood used, forest certification schemes and the use of ecolabels. Product safety is especially important in the case of label and packaging paper used by the food industry. Certifications for use involving contact with food obtained for the label papers guarantee that the products comply with German BfR recommendation No. XXXVI and US FDA Regulation 21 CFR, parts 170 to 189. The Jämsänkoski Specialty Papers was audited for ISO 22000 certification in the autumn. The certificate ensures the compliance of our operations when we are part of the food supply chain. The raw materials used in our products are suitable for end use with food products, and our processes and products comply with the cleanliness requirements. The raw materials we use and our end products are always traceable.

Our operations are evaluated by the authorities and independent external environmental specialists. The scheduled external audit of the ISO 14001 environmental system, ISO 9001 quality system and the EES+ energy efficiency system conducted in the autumn revealed one minor deviation. The deviation did not concern the management of environmental matters. Rather, it was related to notifications being processed in two different systems, due to the One Safety system implementation taking place in the middle of the reporting period.

Increased attention to energy efficiency

UPM signed a new energy efficiency agreement for energy-intensive industries for 2017–2025 and set a new continuous target to improve energy efficiency by 1% annually. The Jämsä River Mills annually report on the energy consumption of the previous year and the related streamlining in the Motiva monitoring system. The mills' goal is to implement energy-efficient technology whenever feasible in terms of

technical and financial factors as well as health, safety and the environment. In February, the Kaipola mill carried out UPM's internal energy audit. The ideas generated by the audit will be deployed in production lines if possible.

Responsibility targets driving operations

UPM has set objectives and indicators for the areas of financial, social and environmental responsibility. Environmental responsibility covers sustainable products, climate, use of water and forests, as well as reduction of waste. Some of the targets are ongoing and have been extended to 2030. UPM's targets were included in the Jämsä River mills' vision for 2017.

The issues caused by the disturbance at the Kaipola wastewater treatment plant at the beginning of the year have been systematically processed and the implementation of corrective measures has been monitored regularly. In accordance with UPM's guidelines, exceptional disturbances are communicated to the other mills. An unambiguous and permanent goal at both mills and power plants is to not exceed the environmental permit limits.

The Kaipola mill filed an environmental permit review application at the end of 2015. The environmental permit review was based on the entry into force of the

BAT conclusions on pulp, board and paper production, published in 2014, and on the specification of the permit regulation concerning noise. Kaipola's permit was granted in February 2017, and the appeal period ended in March 2017.

A joint monitoring plan for environmental protection at the Kaipola mill and the power plant was approved in September 2016. The monitoring plan describes the implementations of obligations stated in the environmental permit decision.

The Jämsänkoski paper mill received an environmental permit decision at the end of 2016. An appeal has been filed and the decision is not legally binding. The environmental permit application was filed since the environmental permit had to be reviewed to ensure compliance with any changes in the mill's operations, the BAT conclusions and the new Environmental Protection Act. The application also included a baseline report on the mill area soil and groundwater.

An environmental permit review application for the Vierelä landfill site in Jämsänkoski was submitted to the Regional State Administrative Agency for Western and Inland Finland in September 2014. A decision concerning the application has not yet been forthcoming.



Pia Siirola-Kourunen

Pia Siirola-Kourunen, Environmental Manager

Antti Hermonen

Antti Hermonen, General Manager

Air

Emissions from the power plants were below permit limits. Compared to the previous year, the total fossil carbon dioxide emission levels decreased slightly at the Kaipola power plant, but increased somewhat at the Jämsänkoski plant. The forest energy stocks still remained at a relatively low level compared to previous years, and use of peat increased slightly as a result. Other emissions remained at the previous year's level. A new adjustment model for burning control was implemented at the Kaipola power plant. This will improve burning in terms of the management of nitrogen oxides and CO₂ emissions and overall efficiency compared with earlier adjustment solutions.

There were no considerable changes in the level of fuel need at either power plant.

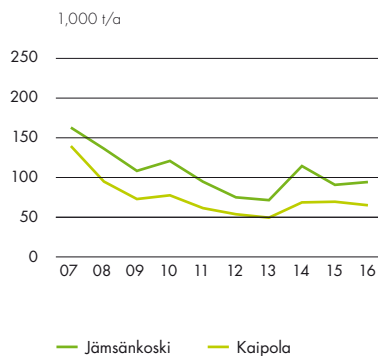
The use of biofuels – forest energy, bark and sludge – remained at the same level as in the previous year. Their share of the total fuel consumption was approximately 70%. The use of oil amounted to less than 2% of the total at both plants.

The air quality in the town of Jämsä has been assessed by means of particle measurements, and the results have mainly been good. In particle measurements carried out in the spring, air quality was satisfactory due to the dust from the streets. The key sources of particulates in the air are traffic, heating of buildings and a variety of other, more minor sources. According to the results, industry and energy production plants generate very minor particle emissions.

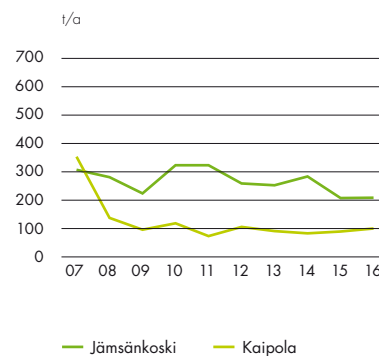
Most nitrogen emissions in the Jämsä region come from road traffic and the production of energy. The nitrogen oxide content levels measured in the downtown area are below the guideline value.

The Central Finland Centre for Economic Development, Transport and the Environment has approved the monitoring plan, required by the environmental permit, for the Kaipola power plant.

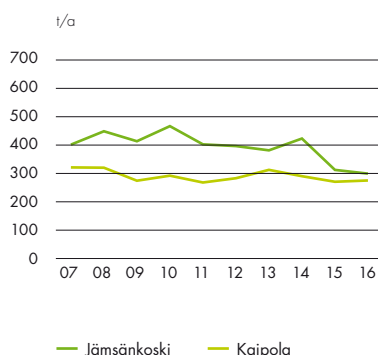
Fossil carbon dioxide, CO₂



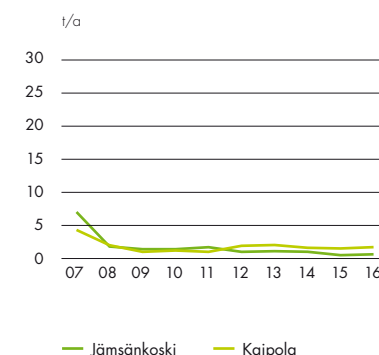
Sulphur dioxide, SO₂



Nitrogen oxides, NO_x

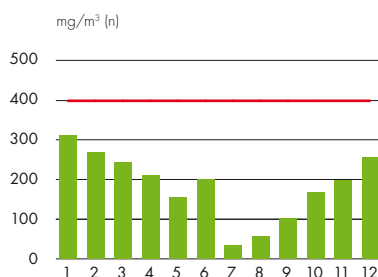


Particulates



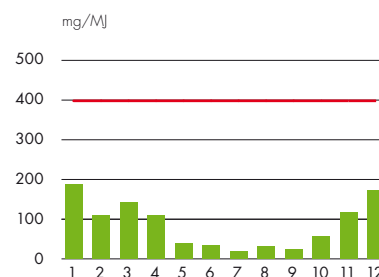
SPECIFIC EMISSIONS FROM THE POWER PLANT'S MAIN BOILER, Jämsänkoski

Sulphur dioxide, SO₂

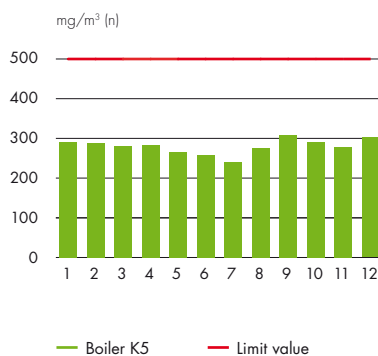


SPECIFIC EMISSIONS FROM THE POWER PLANT'S MAIN BOILER, Kaipola

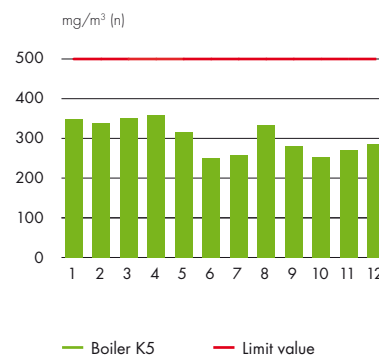
Sulphur dioxide, SO₂



Nitrogen oxides, NO_x



Nitrogen oxides, NO_x



Water

In compliance with UPM's environmental principles, the mills use water responsibly. The goal is to minimise the impact of the operations on the local watercourses. The joint monitoring programme concerning Lake Päijänne has revealed that most of the nutrient load is caused by scattered loading from forestry and agriculture. In accordance with the 2015 joint monitoring results, Kaipola's effluents accounted for 7% of the phosphorus load and 2% of the nitrogen load in the monitored area. Correspondingly, Jämsänkoski's effluents accounted for 8% of the phosphorus load and 2% of the nitrogen load in the monitored area. The water quality in the monitored area does not limit the occurrence of any demanding species of fish.

The volume of process water used per tonne of paper produced remained at the previous year's level. The volume of process water used complied with the target level and the best available technology (BAT ref 2014) level.

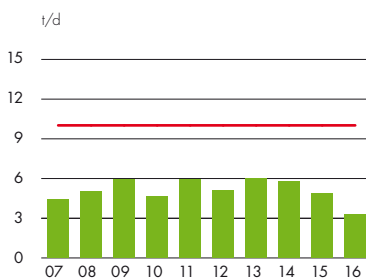
The effluent load of the Kaipola mill increased from the previous year in terms of organic load, solids and nutrient load. After the treatment plant recovered from the disturbance that took place the beginning of the year, the load of treated effluents in the watercourse returned to the previous year's level. Due to the disturbance, the operational monitoring of activities was intensified throughout the

year. The Kaipola mill's environmental permit includes monthly effluent discharge limits for chemical oxygen demand (COD), phosphorus and nitrogen. In addition, an annual discharge limit has been imposed for COD and target values are in place for phosphorus and nitrogen.

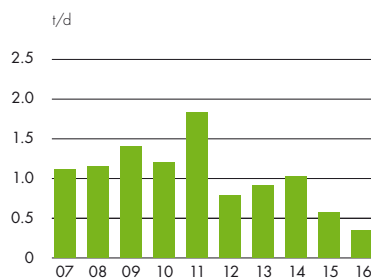
The effluent load of the Jämsänkoski mill complied with the permit limits allowed by the environmental permit. The environmental permit for the Jämsänkoski mill includes effluent discharge limits for COD and phosphorus. The effluent load at the Jämsänkoski mill decreased from the previous year in terms of COD, solids, phosphorus and nitrogen.

JÄMSÄNKOSKI

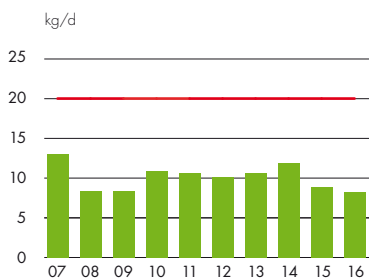
Chemical oxygen demand, COD



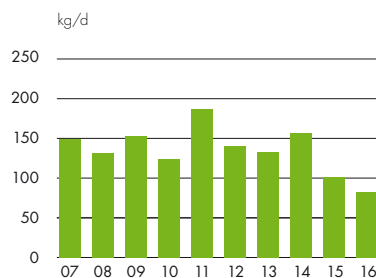
Total suspended solids, TSS



Phosphorus, P



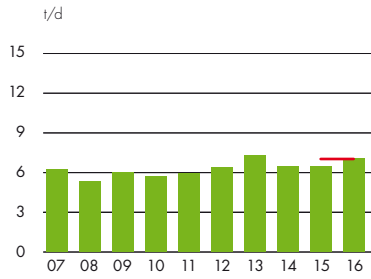
Nitrogen, N



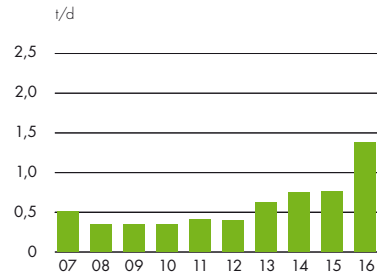
— Limit value

KAIPOLA

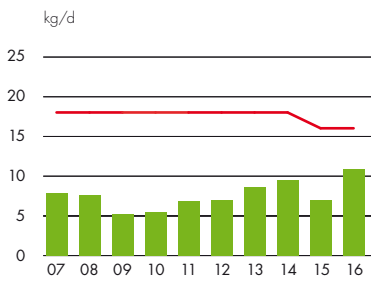
Chemical oxygen demand, COD



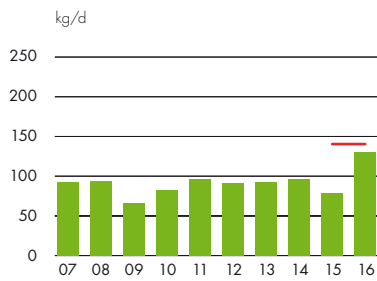
Total suspended solids, TSS



Phosphorus, P



Nitrogen, N



— Limit value

Biofuel accounts for 75% of the energy that the Kaipola power plant generates.



Waste

The amount of waste was slightly higher year-on-year at the Jämsä River Mills. In Jämsänkoski, the amount of actual process waste decreased, but a portion of the scrap metal generated in the dismantling of Paper Machine 5 and designated for reuse is reflected in the annual reporting of process waste.

Power plant ash is the largest waste fraction at both mill units. The amount of ash was slightly lower than in the previous year. The decreased use of recovered paper reduced the amount of ash being generated at Kaipola. All of the ash produced was reused. A significant portion of the ash was used for soil improvement, mainly in fields. The ash contains high amounts of calcium and also important trace elements, such as magnesium

and potassium. The ash complies with the requirements of the Finnish Fertiliser Product Act, and Evira monitors ash properties on a regular basis.

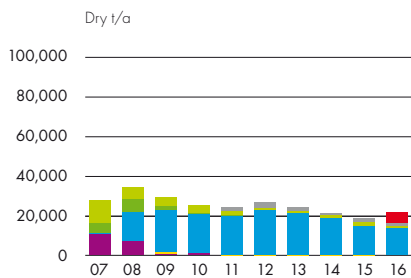
Another significant reuse application of the ash was in the reconstruction of forest roads. The ash is used instead of stone. Ash has been observed to improve both the carrying capacity and the frost heaving resistance of the road.

In addition to ash, the most important waste fractions were soil from forest energy and drum reject from the de-inking plant. As in previous years, the deinking reject containing primarily wood fibres and plastic was sent to a local waste management company to be used as a raw material for recovered fuel. The

soil was sifted and reused in the Himos area. The wood materials separated in the sifting process were forwarded to the Kaipola power plant for burning. The mills' waste oils were sent to regeneration plants for reuse.

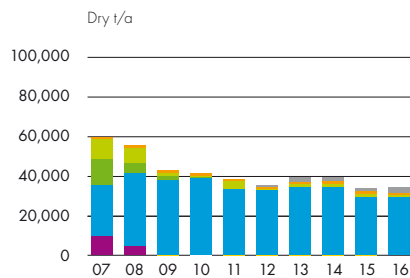
Waste generated at the mills is carefully separated into different fractions, which are then reused as raw materials or for energy. Oils, metals, plastics, papers and cardboards are recycled. Hazardous waste is sent to EKOKEM Oy in Riihimäki for processing and treated using various methods. Wood waste, plastics, and paper and board waste unsuitable for recycling are used for recovered fuel and sent to the UPM Rauma power plant for burning, for example.

Process waste, Jämsänkoski



- Reused fibre clay
- Ash delivered to landfill
- Other waste delivered to landfills
- Reused metals
- Reused ash
- Soil from energy wood
- Other reused waste

Process waste, Kaipola



- Reused fibre clay
- Ash delivered to landfill
- Other waste delivered to landfills
- Reused metals
- Reused ash
- Soil from energy wood
- Other reused waste
- Drum reject to utilization

Environmental parameters 2016

The figures related to production as well as raw material and energy consumption are published as aggregated figures on group level in the UPM Corporate Environmental Statement.

Production capacity	Paper	1,345,000 t
Raw materials	Wood Recovered paper Chemical pulp Fillers and coating pigments Process chemicals	See UPM Corporate Environmental Statement for more information.
Energy	Biofuels and fossil fuels Purchased energy	Biofuels 71%, fossil fuels 29% See UPM Corporate Environmental Statement for more information.
Emissions to air	Particulates Sulphur dioxide, SO ₂ Nitrogen oxides, NO ₂ Carbon dioxide, CO ₂ (fossil)	2.3 t 309 t 572 t 158,691 t
Water intake	Process and cooling water	22,030,000 m ³
Discharges to water	Cooling water Effluent volume Chemical oxygen demand, COD Biological oxygen demand, BOD ₇ Phosphorus, P Nitrogen, N	7,264,000 m ³ 14,766,000 m ³ 3,773 t 286 t 7.0 t 78 t
Waste	Waste to landfill	0 t
	Reused waste	56,014 t*
	– Ash	42,875 t
	– De-inking reject	1,115 t
	– Soil	4,334 t
	– Metals	5,841 t
	– Other	1,849 t
	Hazardous waste	171 t
	– of which recyclable waste oil	72%
Size of mill area	Jämsänkoski and Kaipola	120 ha

* dry t/a




The printing papers manufactured at the Jämsä River Mills are used widely for various magazines, catalogues and advertisement products.

Performance against targets in 2016

Targets	Target achieved?	Comments
Increasing the reliability of the Kaipola wastewater treatment plant	No	1 category 3 deviation, 1 category 4 deviation
Further development of water supply at Kaipola	Yes	Used, warm cooling water is reused efficiently to produce chemically treated water, especially in winter
Sulphur dioxide no longer used for bleaching at Jämsänkoski	Yes	Sulphur dioxide is not permanently stored at the mill
Amount of waste sent to landfill from the Jämsä River Mills reduced from 60 to 40 t/a	Yes	No waste sent to landfill

Environmental targets 2017

Target and indicator	Responsibilities by department
0 piece environmental deviations in categories 3–5	Fast reaction to deviations
Increasing the reliability of the Kaipola wastewater treatment plant	Development project implemented according to plan
Preventing odour problems	Planned test programme implemented
Reusing the ash stockpiled at Pitkäniemi landfill	Earth construction projects identified



Validation statement

As an accredited environmental verifier (FI-V-0001), Inspecta Sertifiointi Oy has examined the environmental management system and the information of UPM Jämsä River Mills Environmental Performance 2016 report and of UPM Corporate Environmental statement 2016. On the basis of this examination, the environmental verifier has herewith confirmed on 2017-04-07 that the environmental management system, this UPM Jämsä River Mills Environmental Performance report and the information concerning UPM Jämsä River Mills of UPM Corporate Environmental statement are in compliance with the requirements of the EMAS Regulation (EC) No 1221/2009.

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