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HOLMEN

# Environmental work at Iggesund mill



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## Intro

Iggesund Mill is an integrated pulp and paperboard mill encompassing a pulp factory for manufacturing fully bleached sulphate pulp from softwood and hardwood, a paperboard factory and an aerated biological pond followed by chemical flotation for treating wastewater from the factories. Iggesund Mill is located just south of Hudiksvall on the Iggesundfjärden bay. A few kilometres north of Hudiksvall lies Strömsbruk, where paperboard from both Iggesund Mill and Holmen's mill in Workington is laminated and plastic coated. The Group has its own port facility in Skärnäs which organizationally belongs to Iggesund Mill.

## Environmental work 2020

In 2020, the focus of Iggesund Mill's environmental work, in addition to day-to-day operations, has been on its environmental targets. These are described in a separate section.

In 2019 work began to produce energy targets together with operators in the Recovery/Energy section to see what it was possible to achieve in everyday operations to reduce annual energy consumption. These efforts have continued in 2020 with excellent results. Work to improve energy efficiency has been focused on reducing blowing-off of excess steam, lower consumption of steam soot in the recovery boiler, higher and more even dry content in black liquor from evaporation, and improved white liquor quality, which together are judged to have resulted in a combined energy saving of approximately 40 GWh/year.

In 2019–2020 some measures were introduced in the bleaching process on the hardwood pulp line where two washing stages were shut down, resulting in a cut in electricity consumption of approximately 5.5 GWh/year. As a first step before installation of one-way soot blowing, a new soot blowing control system was installed in late 2020. The new control system offers potential to cut steam consumption. It is difficult to judge the size of the reduction at the moment as calibration of the system is in progress. In the next step, one-way soot blowing will be installed, and this is estimated to lead to an energy saving of 20 GWh/year.

An energy survey has been conducted at Strömsbruk. Several measures were identified with an annual total savings potential of 1.7 GWh of thermal energy and 768 MWh of electricity. Work is in progress to prioritize which measures are to be carried out in 2021.

Work to increase the proportion of liquid biofuel in the form of pitch oil in the kiln at Iggesund Mill continued in 2020. In 2019 the proportion increased from approximately 80 per cent to approximately 95 per cent and this high level of 95 per cent was maintained in 2020.

The mill is also working to reduce its use of water. In 2020 two washing stages were removed on the hardwood pulp line, resulting in a reduction in water consumption of approximately 100 m<sup>3</sup>/h each.

In 2020 a periodic inspection was conducted focusing on temporary discharge/emissions to receiving water via the stormwater drain. An action plan was drawn up based on the results in order to tackle critical points.

The “External treatment” project was concluded in late 2020. Iggesund Mill has improved the impact of several stages of the treatment plant and the results can be seen in reduced wastewater flows, improved treatment of wastewater from paperboard production containing slip and improved process chemistry in the chemical flotation process. In addition to efficiency improvements in wastewater treatment, Iggesund Mill has installed an oxygen stage including a washing stage following the digester on the hardwood line. This combined with increased aeration has resulted in biological treatment becoming more efficient with higher TOC reduction in the aerated pond (from 30 to 45 per cent). The measures carried out have helped to reduce the need for chemical precipitation in the flotation facility, still complying with the emission criteria by a good margin. The reduced need for chemical flotation means Iggesund Mill has also reduced consumption of precipitation chemicals and reduced the production of chemical sludge by 65 per cent in 2020 compared with 2019. This in turn has reduced the number of transports to landfill and resulted in lower electricity consumption.

In 2020 a trial was conducted in the solid fuel boiler to investigate opportunities to incinerate part of the chemical sludge arising in the wastewater treatment facility.

In terms of waste management at the mill, during the year stations were set up in all departments to sort household waste. In the pulp department work is in progress to gradually replace fluorescent light fittings with LED lighting so as to increase lifetime and reduce the amount of hazardous waste in the form of fluorescent tubes. An external recycling company is responsible for managing hazardous waste at Iggesund Mill and for ensuring that a safety advisor is available. Amounts, volumes and management of hazardous waste are compiled in monthly reports, reports are sent to the Swedish Environmental Protection Agency’s hazardous waste register in line with applicable legislation, and an annual summary is provided in the environmental report.

## Permits of operation

In October 2018 Iggesund Mill received a new permit under the Environmental Code for production of 500 000 tonnes of pulp and 450 000 tonnes of paperboard. This new permit incorporates Skärnäs Terminal. The permit was first claimed on 1 January 2019.

The coating and laminating plant at Strömsbruk have been classified as a ‘C’ plant with an obligation to notify its environmental activities to the authorities since 2007/2008.

The company is covered by the rules on fossil carbon dioxide emissions trading. It holds a permit for carbon dioxide emissions and has been awarded emission allowances for the trading period 2013–2020. An application for a permit for the period 2021–2030 has been submitted to the Swedish Environmental Protection Agency.

## Environmental certifications

### ISO 14001

- Iggesund Mill's environmental management system has been certified to ISO 14001 since 2001.
- The production units at Strömsbruk and Skärnäs Terminal are covered by all certifications.

### ISO 50001

- Iggesund Mill's energy management system was certified in 2005, and this system was upgraded in line with ISO 50001 in 2011.
- The production units at Strömsbruk and Skärnäs Terminal are covered by all certifications.

### PEFC™ and FSC® ([FSC-ID](#))

- The company also has both PEFC™ och FSC® ([FSC-ID](#)) certification for the wood raw material.
- The production units at Strömsbruk and Skärnäs Terminal are covered by all certifications.

### ISO 45001

- Iggesund Mill's Health and safety management system has been certified under OHSAS 18001 since September 2016 and was upgraded to ISO 45001 in 2020.
- The production units at Strömsbruk and Skärnäs Terminal are covered by all certifications.

## Investments / environmental and energy measures during 2020

- New conveyors for sludge in wastewater treatment
- Investment in the softwood line to save energy in filtrate
- New turpentine cooler for better thermal economy
- Noise reduction measures (will continue in 2021)
- New TOC and AOX analysers in the environmental lab
- Logistics area for interim storage and drying of waste
- Investment to enable capping of the Strömsbruk industrial landfill site (setting up site huts, scrap removal, etc.)

## Production disturbances, incidents and complaints during 2020

Iggesund Mill is always focused on designing out risks that could cause environmental incidents. In 2020 incidents requiring reporting to the supervisory authority occurred on 17 occasions. The majority of these consisted of various types of discharge into to stormwater drains and receiving water. The events were investigated and rectified. Three oil leaks occurred at Strömsbruk. These were also reported to the supervisory authority.

One case where guide values were exceeded at Iggesund Mill concerned criteria under Ordinance 2013:252 on major incineration facilities. The value exceeded was for SO<sub>2</sub> over 24 hours, and it occurred during trial incineration of chemical sludge in the solid fuel boiler. The event was reported to the County Administrative Board, which passed it on to the prosecution authorities in line with legislation. It was proposed that a corporate fine be imposed on Iggesund Mill but the preliminary investigation was dropped after the company made its statement.

## Follow-up on environmental and energy targets 2020

Using the outcome figures for the previous year as a basis.

- The proportion of biogenic fuel consumption (excluding vehicle fuel) is to exceed 98 per cent
  - Outcome: 97.8 per cent. The fact that the target was not met in full is due to a number of minor incidents affecting the boilers, which led to more heating oil needing to be used.
- We are to draw up a roadmap for a fossil-free mill
  - This has been delayed and the work will continue in 2021.
- Energy use per tonne of Invercote is to be less than 5.0 MWh/tonne
  - Outcome: 5.8 MWh/tonne. The work will continue in 2021 (see measures under “Planned environmental and energy measures in 2021”).
- Wastewater flow is to be less than 65 000 cubic metres per day
  - Outcome: 62 153 cubic metres per day – see explanation above.
- By 30 June 2020 it must be possible to sort household waste throughout Iggesund Mill.
  - This has been attained, containers for sorting household waste are now installed throughout the mill.

# Planned environmental and energy measures 2021

Installation of one-way soot blowing in the recovery boiler (SP5) estimated to lead to an energy saving of approximately 20 GWh/year.

A new lye analyzer estimated to lead to an energy saving of 5.3 GWh/year.

About 13 sources of noise will be tackled during the year to reduce external noise to 45 dB(A) at night.

## Environmental and energy targets 2021

- Biogenic fuel consumption (excluding vehicle fuel) is to exceed 98.5 per cent
- Energy use per tonne of Invercote is to be less than 5.7 MWh/tonne
- Wastewater flow is to be less than 54.8 m<sup>3</sup> per tonne of Invercote
- The amount of production waste is to be less than 3 200 tonnes per month, a reduction of 5 per cent compared with 2020
- The weight of unsorted small-scale production waste is to fall by 50 per cent compared with 2019.

## Water environment at Iggesund mill

Iggesund Mill is located at the point where the Iggesundån river flows into the Iggesundsfjärden bay. Byfjärden joins it from the north. Iggesundsfjärden and Gårdsfjärden join together through the Snokskärssundet inlet, and the Dukarsundet inlet links Gårdsfjärden with the sea. The narrow inlets have a low water turnover.

The company takes part in the programme for coordinated monitoring of receiving bodies of water in north-eastern Hälsingland, which involves monitoring the environmental impacts of different activities on the water systems concerned, including lakes, watercourses and coastal waters. The company also carries out sampling from the receiving bodies of water in the vicinity of the mill as part of its self-inspection.

Data is reported below along with an assessment of the status of Gårdsfjärden regarding plant nutrients, oxygen level, etc. based on data from the 2020 summary of coordinated monitoring of receiving waters.

### Chemical Oxygen Demand (COD)

Iggesund Mill was the land source of an estimated 30 per cent of the total chemical oxygen demand (based on measuring total organic carbon) in Iggesundsfjärden and Gårdsfjärden in 2020.

### Visible depth

In 2020 the average annual value for visible depth at control point K179, located in the middle of Gårdsfjärden, was 3.0 m, which was an improvement compared with 2019 when the average annual value was 1.8 m. The assessment for the three-year period 2018–2020 is a moderate status for visual depth. Since 2000 there has been a significant increase in the visual depth.

### Plant nutrients

The overall status of Gårdsfjärden in terms of nutrients (nitrogen and phosphorus) for the three-year period 2018–2020 is unchanged compared with 2017–2019 and is judged to be good for Gårdsfjärden.

There is no clear trend over time in terms of an increase or reduction of nitrogen and phosphorus at the coastal station. During 2020, the total phosphorus level at the K179 measuring station was on average 25 µg/l and the average total nitrogen level was 280 µg/l. The average levels for 2019 were 22 µg/l and 256 µg/l respectively.

Transport calculations show that point emissions from Iggesund Mill in 2020 were equivalent to approximately 28 per cent and 65 per cent respectively of total nitrogen and phosphorus entering Gårdsfjärden.

### Oxygen saturation

The oxygen level in the bottom water at K179 was generally high during 2020, but during the summer months there were periods when the oxygen level was not as high. The lowest measured oxygen level was 7.1 mg/l, which was higher than the average of the lowest measured oxygen levels for the period 2014–2019 but somewhat lower than the lowest value in 2019 (9.1 mg/l). The oxygen status was judged to be high overall at the measuring station.

### Metals

The status of specific pollutants (arsenic, copper, chromium and zinc) was judged to be good from sampling in 2020, except for arsenic which was judged to be moderate because the limit value for the average annual value was exceeded.

For the priority substances (cadmium, nickel and lead) the values were below the limit values/assessment criteria in respect of average annual value and maximum permitted concentration. The status of these parameters was therefore judged to be good.



### Chlorophyll

The chlorophyll status was classified as moderate for the three-year period 2018–2020, corresponding to the classification in 2019. The maximum chlorophyll level was 4.9 ug/l compared with 2019 when it was 6.3 ug/l.

### Macro-algae

The status assessment for macro-algae based on a calculation of the ecological quota could not be carried out because the transects surveyed did not meet the requirements for the calculation. Only one (bird's nest stonewort) of the requirement for at least three reference species was observed. Instead the status assessment was performed based on the occurrence of bladder wrack and perennial red and brown algae that are, by definition, associated with a high status. Since there was a lack of these species on the floor of Gårdsfjärden, which was instead dominated by filamentous annual algae such as green algae, brown algae/sea felt and sea lettuce/gutweed, the status was judged to be poor/bad.

### Comments

The mill's emissions of eutrophication substances have fallen sharply since the 1980s. In trial fishing in 1987, the fish life in Gårdsfjärden was characterised as typical of areas of water high in nutrients. Some changes in the direction of more normal status were noted in 1996, but fish production remained high and with a preponderance of the carp family.

Recovery proceeds slowly in such enclosed areas as Gårdsfjärden, where large amounts of organic material and mineral nutrients from earlier emissions have accumulated on the bottoms. In 1996 impairment of liver function and reproduction was observed in perch in Gårdsfjärden. However, growth and survival were normal. Further studies of perch in the waters off Iggesund were performed in 2001, with similar results to those found in the study in 1996.

Reproductive studies were performed on both perch and zebra fish in 2001 and 2002. The results show that perch that have spawned in the receiving body of water produce eggs with just as good hatchability and larval survival as the perch in an unaffected reference area, and the studies in the laboratory on zebra fish did not indicate any effects.

In late 2009 a treatment plant was brought on line with chemical flotation after the existing aerated lagoon. This has resulted in a reduced load on the receiving bodies of water, particularly regarding mineral salts.

In connection with an application for a new environmental permit, the company conducted a follow-up fish study in autumn 2009, which showed that a small number of significant differences, which cannot be regarded as biologically significant, existed between the sites studied. No evidence was discovered of the inhibition of reproduction found in previous studies, and the results therefore indicate clear recovery.

The fish study was conducted before the chemical flotation plant was commissioned, which means that the recovery that has occurred must have had another cause, such as internal measures already taken. As part of the permit application procedure, a hard-bottom inventory

was also conducted in August 2010, and the study showed that there has been a large-scale improvement in the inner reaches of Gårdsfjärden and the outer reaches of Enångersfjärden since 1987.

It is impossible today to differentiate the effect of outflow from the Iggesundsån river in the studied reaches of Gårdsfjärden on the plant communities on the bottoms from the effect of the point source Iggesund Mill in the same receiving body of water. There is no visible toxic effect. The sediments in Gårdsfjärden are finely divided, oxidised and teeming with life. Filtering organisms such as freshwater fungi, barnacles and hydras occur on rocks. Nor do TOC concentrations in water and sediment suggest any unusual conditions.

The existence of what is termed fibre sediment – sediment with elements of pulp fibres and other waste products from earlier pulp and paper production – outside Sweden's forest industry facilities has attracted considerable attention in recent years. Fibre banks have been found outside Iggesund Mill in the inner part of the Iggesunds-fjärden bay and in the adjoining Byfjärden. In autumn 2017, fish were caught at different distances from Iggesund Mill with the aim of studying any spread of sediment-bound pollutants and their uptake in fish. The fish were analysed for content of metals and organic substances.

All morphological measurements, fish growth and fat content were at a level that can be considered normal for coastal fish and the differences between the locations were numerically small. For the variable GSI (gonadosomatic index), the median value varied considerably between the sites and the spread between individuals at each site was significant. A larger number of individuals in different length classes would have been needed to evaluate any significant differences in this variable between fish areas. Mercury content at all sites was below the EU's limit values for fish for consumption by a reassuring margin. From a general Swedish perspective too, the mercury content can be considered to be low.

Content of other studied trace metals was determined in liver samples. There was a small numerical difference in content between the sampling locations and it was not possible to distinguish any site with substantially different values. The results confirm the general picture obtained from other recipient surveys, that metals originating in forest industry emissions are often found in sediment but have low bioavailability.

When it comes to the chlororganic substances studied (PCB, DDT, HCB PCDD/Fs), generally a weak gradient was observed with slightly higher levels in Byfjärden, which gradually tail off. In comparison with chemical status assessment criteria for PCDD/Fs and PCBs, findings were below current threshold values by reassuring margins. Nor can the levels in themselves be considered to be high in relation to measurements taken in other areas around the Swedish coast, including background locations with no impact from urban activity.

Overall, the survey shows that the sediment-bound pollutants found as higher content levels in parts of the area have a limited spread to the surrounding ecosystem and minor uptake in fish. The levels in the fish studied are relatively low and in the region of those measured in background areas without any direct anthropogenic effects.

New fish surveys using a similar methodology to the one used in 2017 will be carried out in 2021.

## Key figures

Iggesund Mill	2020	2019	2018	2017	2016
<b>Production, 1 000 tonnes</b>					
Paperboard	324	311	290	293	296
Market pulp	84	79	66	54	56
<b>Raw materials</b>					
Wood, million m <sup>3</sup> solid volume under bark <sup>1)</sup>	1,77	1,76	1,65	1,65	1,66
Chemicals, 1 000 tonnes <sup>2)</sup>	83,5	108	90,1	80,2	82,4
Filler, pigment, 1 000 tonnes <sup>2)</sup>	45,3	46,5	47,5	47,3	46,5
Water use, million m <sup>3</sup>	33,5	34,9	38,0	38,5	37,5
<b>Thermal energy, GWh</b>					
Production at the mill from recovered liquors, bark and wood residues	2 557	2 558	2 479	2 434	2 522
Fossil fuels	67	53	101	105	105
<b>Electrical energy</b>					
Production at the mill, GWh	282	309	304	256	347
Consumption, MWh	474	467	470	467	370
	758	128	608	588	939
<b>Energy deliveries, GWh</b>					
Thermal energy <sup>3)</sup>	124	138	142	125	113
<b>Emissions to air</b>					
Sulphur dioxide, (counted as sulphur, S), tonnes	40	27	36	33	33
Nitrogen oxides, tonnes	575	528	585	586	611
Particulates, tonnes	25	21	40	26	31
Fossil carbon dioxide, 1 000 tonnes (Scope 1)	15,8	12,1	25,7	24,0	26,7
Biogenic carbon dioxide, 1 000 tonnes	815	847	876	811	884
<b>Emissions to water</b>					
COD, (organic matter), 1 000 tonnes	4,8	4,8	5,1	4,8	4,8
Suspended solids, tonnes	635	718	874	813	975
AOX, (chlorinated organic matter), tonnes	37,4	43,3	47,5	46,3	50,2

## Environmental work at Iggesund mill



Nitrogen, ton	70	50	59	53	59
Phosphorus, ton	7,7	4,8	4,8	4,1	4,1
By-products, 1 000 tonnes					
To energy production internally/externally	224	244	246	252	250
Utilised or for recovering <sup>4)</sup>	44	64	36	70	84
Waste, 1 000 tonnes					
Tall oil <sup>5)</sup>	16	10	13	14	12,8
Hazardous <sup>6)</sup>	1,6	1,7	1,4	1,1	1,3
Sent to landfill (wet) <sup>7)</sup>	0,2	0,4	7,0	1,8	0,1

1. At Group level, wood consumption is computed net, taking into account internal deliveries of chips from the Iggesund Sawmill to Iggesund Mill.
2. 100 per cent active substance. The quantity of commodities was 112 tonnes for chemicals and 59 200 tonnes for filler and pigment.
3. Thermal energy from Iggesund mill is delivered to nearby Iggesund sawmill (122 GWh). Thermal energy is also delivered to the district heating network of the local community (2,0 GWh)
4. By-products used, for example, as filling material, construction material or for the production of soil products.
5. For delivery to the chemical industry.
6. Hazardous waste is dealt with by an authorized collection and recovery contractor. Oil-containing waste from docking ships at Skärnäs Terminal is dealt with. The volume of this waste in 2020 totaled 147 (295) tonnes (not included in the figure).
7. Can also be considered as non-hazardous waste.