

Best Available Techniques (BAT) in the Pulp & Paper sector for the continual environmental improvement – Lessons learnt in Sweden

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NATUR VÅRDS 🚔 VERKET 🛎

Over time focus have shifted between different environmental problems – BAT is a moving target

1970's	1980's	1990's	2000's	Future
BOD				
Fibres				
Smell	Smell	Smell	Smell	
SO ₂	SO ₂	SO ₂		
Hg				
Toxicity	Toxicity	Toxicity		
	COD	COD		
	AOX	AOX		
	Dioxins	Dioxins		
		NO _X	NO _X	
		N and P	N and P	
			CO ₂	
			Energy	





Activated sludge plant





Design and technical data 35,000 m ³ effluents 35 ton COD/d	COD-reduction ~90%
Aeration 12 m water depth, 47.5 m diameter 22 000 m ³	Sludge production 0,16 kg/ton COD removed (guarantee)
Secondary clarifier 4 m water depth, 60 m diameter, 11 000 m ³	Electricity ~1 MW
Primary clarifier 1.8 m water depth , 52 m diameter, 3 200 m ³	Chemicals ~700 ton (mainly urea and phosphoric acid)



COD, mln tonnes

Pulp mass, min tonnes



Naturvårdsverket | Swedish Environmental Protection Agency 2018-06-06

Kg COD/tonne kraft pulp Mills producing mainly bleached pulp





1000 tonnes AOX

AOX kg/tonne of bleached chemical pulp





Emissions to water of Dioxins from Pulp & Paper Sector

• 1973	~25	g/year	Maximum use of Chlorine gas, 275,000 tonnes/year
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- 1988 **10** g/year Oxygen delignification introduced, ClO₂
- 1993 **4 g/year** Chlorine gas totally phased out
- 1999 **1** g/year Improve washing and WWTU
- 2006 **0,1 g/year** Latest emission monitoring project



Aspects regarding energy

- Phasing out of fossil fuels
- Drying of bark in order to increase energy efficiency
- Increasing of internal electricity production
- Delivery of waste heat to District heating system
- Reduction of waste water will reduce energy demand

NATUR VARDS VERKET INTERNATIONAL benchmarking – Use of heat at kraft pulp mills





Energy Balance ex. Hardwood

Energy







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The quality of the water in Lake Vänern is as good ARDS as in the late 19th centure (TOC mg/l)





Conclusions

- BAT used in Sweden since late 1960s
- BAT has supported both improved profitability (to certain extent), decreased emissions and improved environmental quality (less acidification, decreased air pollution, less toxic pollution, less eutrophication, etc.)
- Timing is important for the application of an integrated environmental permit
- Interaction with market demands and discussions between permittee and decision-making body on appropriate solutions (permit conditions), based on BAT, is key to success
- It is wise taking advantage of the long implementation period
- Costs of turning to BAT (new BAT) can be reduced dramatically when significant technological changes occur due to the market demand (growing demands, new products, new services, new values, etc.), when business and governmental interests coincide
 - In Russia, the operators of the major polluters will get about 7 years to implement the BAT approach. For many sectors, market changes could occur during such a period of time



Thank you for your attention

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