

Appendix I – BAT Conclusions Assessment

APPENDIX I – BAT CONCLUSIONS ASSESSMENT

Activities in the pulp, paper & board sector, and hence the Kimberly-Clark operations are covered by the following document:

2014/687/EU – BAT -Conclusions for the production of pulp, paper and board.

Within this document there are 53 individual BAT- Conclusions. The document was originally published on 30th September 2014 and required steps to be taken to ensure full compliance within 4 years – hence by 30th September 2018.

Kimberly-Clark, Barrow, provided an evaluation of the compliance of their operations (as undertaken at the time) with the BAT-Conclusions requirements in a formal response (Regulation 60 response) submitted to the EA on 30th March 2015.

Following evaluation of the response the EA varied the permit and as a result the EA introduced the improvement conditions IC1 and IC2 into the environmental permit to address non-compliant areas at that stage. The BAT-Conclusions assessment was revisited in 2020.

For the purposes of this variation the BAT-C requirements have been reviewed in order to ensure that following the modifications compliance will still be achieved and that any specific requirements for new plant have been addressed during the design process/specification of the new equipment/facilities.

As this variation is for the installation of new boiler plant and the remainder of the Mill operations (tissue manufacture, converting, operation of the onsite effluent treatment plant etc.) will continue as per the existing arrangements only those BAT-C requirements relevant to the boiler plant project have been considered in the Table below.

Many of the BAT-Conclusions were previously (2015/2020) designated as not applicable to the operations undertaken at KC Barrow. These were:

- BAT Conclusions for Kraft Pulping – 19 to 32 inclusive;
- BAT Conclusions for Sulphite Pulping – 33 to 39 inclusive;
- BAT Conclusions for Mechanical/Chemical Pulping – 40 and 41;
- BAT Conclusions –
 - 3 - Release of chelating agents,
 - 4 - Water & wastewater management from wood storage and preparation,
 - 9 – Monitoring of emissions to air from lime kilns, recovery boilers etc.,
 - 11 – Monitoring of sulphur emissions,
 - 48 - Fresh water use and emissions from speciality paper mills,

- 49 – Emissions of coating colours and binders,
- 50 – Pollution loading into receiving waters for the whole Mill,
- 51 - VOC emissions from coaters.

None of the previously non-applicable BAT- Conclusions have now become applicable due to the proposed modifications.

In addition the following BAT-Conclusions are not considered applicable to the new boiler plant project.

- BAT Conclusions
 - 7 – Emissions of odorous compounds from the waste water system. (The discharge from the boiler plant (boiler blowdown etc) into the overall site system which is routed to the onsite ETP prior to discharge via W1 is only a small fraction of the overall discharge volume),
 - 10 – Monitoring of emissions to water. (This BAT- Conclusion relates to the final discharge to receiving waters. The boiler plant discharges are routed through the onsite ETP prior to discharge),
 - 13 – Emissions of nutrients into receiving waters. (As above discharges from the boiler plant are to the onsite ETP),
 - 14 – Emissions of pollutants into receiving waters – primary, secondary treatment (As above),
 - 15 - Tertiary treatment (As above),
 - 16 – Emissions of pollutants into receiving waters from biological wastewater treatment plants (As above),
 - 42-46 These BAT-Conclusions relate to Processing Paper for Recycling. (The boiler plant project does not have any impact on existing recycling operations),
 - 47 – Reduction in generation of waste water in papermaking processes.(This BAT-conclusion is not relevant to boiler plant operations),
 - 52 - Waste generation in papermaking processes. (This BAT-conclusion is not relevant to boiler plant operations),.

The assessment concludes that due to the proposed modifications KCs operations at Barrow will continue to meet the BAT-Conclusions requirements – details below.

BAT Conclusion	BAT – Conclusion Requirements	Comment
1 – Environmental Management Systems (EMS)	In order to improve the overall environmental performance of the plants for the production of pulp, paper and board, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features: i. commitment of the management, including senior management; The scope (e.g. level of details) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have. ii. definition of an environmental policy that includes the continuous improvement of the installation by the management; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures paying particular attention to: (a) structure and responsibility (b) training, awareness and competence (c) communication (d) employee involvement (e) documentation (f) efficient process control (g) maintenance programmes (h) emergency preparedness and response (i) safeguarding compliance with environmental legislation;	KC Barrow has ISO 14001 certification for the current EMS. See Appendix D for a summary of the current EMS. The existing EMS will be reviewed and amended as necessary to accommodate the proposed modifications discussed in the EPR Variation and to ensure continued compliance with the BAT1 requirements. The EMS will be amended to include operating and maintenance procedures for the new boiler systems and include operation of the new reverse osmosis water treatment system, and condensate return system. The new procedures will cover operation of the new boiler plant on natural gas, hydrogen and a mix of natural gas/hydrogen. The new procedures will also cover liaison requirements with the HPF and hydrogen pipeline operator.

	v. checking performance and taking corrective action, paying particular attention to: (a) monitoring and measurement (see also the Reference Document on the General Principles of Monitoring) (b) corrective and preventive action (c) maintenance of records (d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; vi. review of the EMS and its continuing suitability, adequacy and effectiveness by senior management; vii. following the development of cleaner technologies; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; ix. application of sectoral benchmarking on a regular basis.	
2 – Materials management & good housekeeping	BAT is to apply the principles of good housekeeping for minimising the environmental impact of the production process by using a combination of the techniques given below: a. Careful selection and control of chemicals and additives	Materials management & good housekeeping procedures will be reviewed and amended as necessary to accommodate the proposed modifications discussed in the EPR Variation and to ensure continued compliance with the BAT2 requirements.

	b. Input-output analysis with a chemical inventory, including quantities and toxicological properties c. Minimisation of the use of chemicals to the minimum level required by the quality specifications of the final product d. Avoiding harmful substances (e.g. Nonylphenol ethoxylate-containing dispersion or cleaning agents or surfactants) and substitution by less harmful alternatives) e. Minimise the input of substances into the soil by leakage, aerial deposition and the inappropriate storage of raw materials, products or residues. f. Establish a spill management programme and extend the containment of relevant sources, thus preventing the contamination of soil and groundwater g. Proper design of the piping and storage systems to keep the surfaces clean and to reduce the need for washing and cleaning	The Project considered in the design phase the selection of chemicals for use in the boiler house water treatment process to ensure that appropriate chemicals were selected and would be used, handled and stored in facilities that complied with the BAT2 requirements and in quantities that were minimized.
5 - Water & Wastewater management	In order to reduce freshwater use and generation of waste water, BAT is to close the water system to the degree technically feasible in line with the pulp and paper grade manufactured by using a combination of the techniques given below. This BATC has Associated Performance levels (AEPL) for waste water flow. You must indicate where in the appropriate ranges of AEPL's you currently are. a. Monitoring and optimising water usage (Generally applicable) b. Evaluation of water recirculation options (Generally applicable)	The water and wastewater management procedures will be reviewed and amended as necessary to accommodate the proposed modifications discussed in the EPR Variation and to ensure continued compliance with BAT5 requirements. The Project considered in the design phase the use of water in the new boiler plant to ensure that water use could be minimized, condensate could be recycled wherever possible and compliance with the BAT5 requirements was achieved.

	c. Balancing the degree of closure of water circuits and potential drawbacks; adding additional equipment if necessary <i>(Generally applicable)</i> d. Separation of less contaminated sealing water from pumps for vacuum generation and reuse <i>(Generally applicable)</i> e. Separation of clean cooling water from contaminated process water and reuse. <i>(Generally applicable)</i> f. <i>Reuse of process water to substitute for freshwater (water recirculation and closing of water loops).</i> <i>(Applicable to new plant and major refurbishments. Applicability may be limited due to water quality and/or product quality requirements or due to technical constraints (such as precipitation/incrustation in water system) or increase odour nuisance.)</i> g. In-line treatment of (parts of) process water to improve water quality to allow for recirculation or reuse. <i>(Generally applicable)</i>	Water use monitoring is incorporated into the new boiler plant, condensate recycling is optimized where possible. Discharges from the water treatment facilities and blowdown from the boiler cannot be avoided but will be minimized as far as possible.
6 – Energy consumption and efficiency	In order to reduce fuel and energy consumption in pulp and paper mills, BAT is to use technique (a) and a combination of the techniques given below. a. Use an energy management system that includes all of the following features: i) Assessment of the mills overall energy consumption and production. ii) Locating, quantifying and optimising the potentials for energy recovery	The energy management procedures will be reviewed and amended as necessary to accommodate the proposed modifications discussed in the EPR Variation and to ensure continued compliance with BAT6 requirements. The Project considered in the design phase energy use to ensure that energy use in the boilers could be minimized, energy efficiency could be maximised and energy recovery could

	iii) Monitoring and safeguarding the optimised situation for energy consumption (Generally applicable) b. Incinerate waste and residues from the production of pulp and paper with high organic content and calorific value to recover energy (Only applicable if the recycling or reuse of wastes and residues from the production of pulp and paper with a high organic content and high calorific value is not possible) c. Cover the steam and power demand of the production processes as far as possible by the cogeneration of heat and power (CHP)(Applicable for all new plants and for major refurbishments of the energy plant, as far as the economic viability is ensures. Applicability in existing plants may be limited due to the mills layout and available space) d. Use of excess heat for the drying of biomass and sludge, to heat boiler feedwater and process water, to heat buildings, etc. (Applicability of this technique may be limited in cases where the heat sources and locations are far apart) e. Use of thermo compressors (Applicable to both new and existing plants for all grades of paper and for coating machines, as long as medium pressure steam is available). f. Insulation of steam and condensate pipe fittings (Generally applicable)	be adopted wherever possible, and compliance with the BAT6 requirements was achieved. Energy use (natural gas/hydrogen) will be monitored and recorded. The design includes for heat recovery from flue gases and optimises energy usage wherever possible. Steam and condensate pipework and the boilers will be insulated to minimise heat losses. Condensate recovery will be improved compared to the existing situation. CHP was initially considered as a possibility but was ruled out as not viable at either Barrow or Northfleet due to a variety of factors – primarily economic viability, practicality - layout, space, existing electricity supply replacement issues, etc.
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	g. Use of energy efficient vacuum systems for dewatering (Generally applicable) h. Use of high efficiency electrical motors, pumps and agitators (Generally applicable) i. Use of frequency inverters for fans, compressors and pumps (Generally applicable) j. Match steam pressure levels with actual pressure needs (Generally applicable)	
8 – Monitoring of key process parameters and of emissions to water and air	BAT is to monitor the key process parameters according to the table <i>(list)</i> given below. <u>Air</u> Pressure, temperature, oxygen, CO and water vapour content in flue-gas for combustion processes (Continuous) <u>Water</u> Water flow, temperature and pH P and N content in biomass, sludge volume index, excess ammonia and ortho-phosphate in the effluent and microscopy checks of the biomass (Periodic) Volume flow and CH₄ content of biogas produced in anaerobic waste water treatment (Continuous) H₂S and CO₂ contents of biogas produced in anaerobic waste water treatment (Periodic)	The BAT requirements for the monitoring of key process parameters and emissions to air in the flue -gas from the combustion in the new boilers will be met by the new system. The BAT requirements for monitoring to water are not considered applicable for the ne boiler plant discharges.

12 – Waste Management	In order to reduce the quantities of wastes sent for disposal, BAT is to implement a waste assessment (including waste inventories) and management system, so as to facilitate waste reuse, or failing that, waste recycling, or failing that, "other recovery", including a combination of the techniques given below. a. Separate collection of different waste fractions (including separation and classification of hazardous waste) <i>(Generally Applicable)</i> b. Merging of suitable fractions of residues to obtain mixtures that can be better utilised. <i>(Generally Applicable)</i> c. Pre-treatment of process residues before reuse or recycling. <i>(Generally Applicable)</i> d. Material recovery and recycling of process residues on site. <i>(Generally Applicable)</i> e. Energy recovery on or off site from wastes with high organic content. <i>(For off-site utilisation the applicability depends on the availability of a third party)</i> f. External material utilisation. <i>(Depending on the availability of a third party)</i> g. Pre-treatment of waste before disposal. <i>(Generally Applicable)</i>	The existing waste management procedures will be reviewed and amended as necessary to accommodate the proposed modifications discussed in the EPR Variation and to ensure continued compliance with the BAT12 requirements. The Project considered in the design phase the generation of waste from the new boiler plant to ensure that waste generation could be minimized, waste could be recycled wherever possible and compliance with the BAT12 requirements was achieved. Only small quantities of waste are envisaged as being generated by the new boiler plant operations. The existing boiler plant does not generate significant quantities of waste. Existing waste management procedures and disposal routes will be followed where appropriate.
17 – Emissions of Noise	In order to reduce the emissions of noise from pulp and paper manufacturing, BAT is to use a combination of the techniques given below.	The existing noise management procedures will be reviewed and amended as necessary to accommodate the proposed modifications

	a. Noise reduction programme. Description: a noise-reduction programme includes identification of sources and affected areas, calculations and measurements of noise levels in order to rank sources according to noise levels and identification of the most cost effective combination of techniques, their implementation and monitoring <i>(Generally applicable)</i> b. Strategic planning of the location of equipment, units and buildings. Description: noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screened <i>(Applicable to new plants. In the case of existing plants, the relocation of equipment and production units may be restricted by the lack of space or by excessive costs.)</i> c. Operational and management techniques in buildings containing noisy equipment. Description: this includes: improved inspection and maintenance of equipment to prevent failures; closing of doors and windows of covered areas; equipment operation by experienced staff; avoidance of noisy activities during night-time; provisions for noise control during maintenance activities <i>(Generally applicable)</i> d. Enclosing noisy equipment and units. Description: enclosure of noisy equipment such as wood handling,	discussed in the EPR Variation and to ensure continued compliance with BAT17 requirements. The Project considered in the design phase the generation of noise from the new boiler plant operations to ensure that noise generation could be minimized and compliance with the BAT17 requirements was achieved. Appropriate mitigation has been included in the new facilities where required. A noise impact assessment for the project is presented in Appendix F. This assessment also considers compliance with the relevant BAT-Conclusions.
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	hydraulic units and compressors in separate structures, such as buildings or soundproofed cabinets where internal-external lining is made of impact-absorbent material (Generally applicable) e. Use of low-noise equipment and noise-reducers on equipment and ducts. (Generally applicable) f. Vibration insulation. Description: vibration insulation of machineries and decoupled arrangement of noise sources and potentially resonant components (Generally applicable) g. Soundproofing of buildings. Description: this potentially includes use of; sound-absorbing materials in walls and ceilings; sound-isolating doors; double-glazed windows (Generally applicable) h. Noise abatement. Description: noise propagation can be reduced by inserting barriers between emitters and receivers. Appropriate obstacles include protection walls, embankments and buildings. Suitable noise abatement techniques include fitting silencers and attenuators to noisy items of equipment such as steam releases and dryer vents (Applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by the lack of space). i. Use of larger wood-handling machines to reduce lifting and transport times and noise from logs falling onto log piles or the feed table.	
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	<i>(Generally applicable)</i> j. Improved ways of working, e.g. Releasing logs from a lower height onto log piles or the feed table; immediate feedback of the level of noise for the workers. <i>(Generally applicable)</i>	
18 Decommissioning	- In order to prevent pollution risks when decommissioning a plant, BAT is to use the general techniques given below. a. Ensure that underground tanks and piping are either avoided in the design phase or that their location is well known and documented. b. Establish instructions for emptying process equipment, vessels and piping. c. Ensure a clean closure when the facility is shut down, e.g. To clean up and rehabilitate the site. Natural soil functions should be safeguarded, if feasible. d. Use of a monitoring programme, especially relative to groundwater, in order to detect possible future impacts on site or in the neighbouring areas. e. Develop and maintain a site closure or cessation scheme, based on risk analysis, that includes a transparent organisation of the shutdown work taking into account relevant local specific conditions.	The requirements of BAT 18 have been considered during the design phase to ensure that compliance with BAT 18 is achieved. No underground tanks or pipework (other than gas supply pipework) is to be installed and any potential future decommissioning issues have been avoided where possible by specification of equipment and materials of construction and layout design. The site SCR monitoring regime is to be reviewed in 2026 and will consider the new boiler plant proposals. In addition any site closure or decommissioning plans for the site will be updated to accommodate the proposed modifications. See Appendix G for an update on the SCR.

53 - Energy Consumption and efficiency	In order to reduce the consumption of thermal and electrical energy, BAT is to use a combination of the techniques given below. a. Energy saving screening techniques (optimised rotor design, screens and screen operation) <i>(Applicable to new mills or major refurbishments)</i> b. Best practice refining with heat recovery from the refiners <i>(Applicable to new mills or major refurbishments)</i> c. Optimised dewatering in the press section of paper machine/wide nip press <i>(Not applicable to tissue paper and many speciality paper grades)</i> d. Steam condensate recovery and use of efficient exhaust air heat recovery systems <i>(Generally Applicable)</i> e. High efficient refiners <i>(Applicable to new plants)</i> f. Optimisation of operation mode existing refiners (e.g. Reduction of "no load" power requirements) <i>(Generally applicable)</i> g. Optimised pumping design, variable speed drive control for pumps, gearless drives <i>(Generally Applicable)</i> h. Cutting edge refining technologies <i>(Generally Applicable)</i> i. Steam box heating of the paper web to improve the drainage properties/dewatering capacity <i>(Not applicable to tissue paper and many speciality paper grades)</i>	The project considered the requirements of BAT53 within the design and specification of the new plant and equipment. Steam Condensate recovery has been optimized and heat recovery from the flue-gas system to pre-heat incoming air is to be installed. Pump specification has been optimized and efficient motors will be installed wherever possible
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	j. Optimised vacuum system (e.g. Turbo fans instead of water ring pumps) <i>(Generally Applicable)</i> k. Generation optimisation and distribution network maintenance <i>(Generally Applicable)</i> l. Optimisation of heat recovery, air system, insulation <i>(Generally Applicable)</i> m. Use of high efficient motors (EFF1) <i>(Generally Applicable)</i> n. Preheating of shower water with a heat exchanger <i>(Generally Applicable)</i> o. Use of waste heat for sludge drying or upgrading of dewatered biomass <i>(Generally Applicable)</i> p. Heat recovery from axial blowers (if used) for supply air of drying hood <i>(Generally Applicable)</i> q. Heat recovery of exhaust air from Yankee hood with a trickling tower <i>(Generally Applicable)</i> r. Heat recovery from the infrared exhaust hot air <i>(Generally Applicable)</i>	
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