

Kimberly-Clark Corporation
Coleshill

BAT conclusions (Pulp and Paper including board,
tissue and RCF)

March 2015

8.1.1 Environmental management systems (EMS)

BAT 1

1. 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;
 - 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.

Environmental management system BAT assessment

Coleshill Mill has an established Environmental Management System (EMS) to ensure that environmental protection is of primary consideration to the activities of the Site. The EMS provides a documented environmental management plan written to implement the Site's environmental policy, to make certain that all the effects of the activities of the Site conform to the Site policy and its associated objectives and targets, to continually reduce the impact on the environment and to strive for continuous improvement.

Kimberly-Clark Corporation has developed its own Environmental Health and Safety (EHS) management system that is aligned to, and functionally compatible with, ISO 14001 and ISO 18001. The alignment to ISO standards allows individual facilities to gain external certification of their MS as and when required by external business drivers. The Coleshill Mill achieved ISO14001 certification in 2009. A copy of the Site Environmental Policy and ISO14001 certificate is included in the Appendix – BAT 1

The KC EHS MS has been instigated at all K-C operating facilities since 2005. Successful implementation of the K-C EMS at each facility is determined by an annual site based self-assessment, periodic internal Corporate EHS audits and, where necessary, third party external audits. Copies of all internal and external audits are available as hard copy at the facility

The KC and Coleshill EHS MS is comprised of the following elements:

ELEMENT 1 - POLICY AND ORGANIZATION

Element 1.1 – EHS Policy

Element 1.2 – Leadership Roles and Responsibilities

Element 1.3 – EHS Steering Committee

Element 1.4 – Employee Involvement

ELEMENT 2 – PLANNING

Element 2.1 – Identification of EHS Regulatory and Legislative Requirements and K-C Standards

Element 2.2 – EHS Aspects/Hazards and Impacts

Element 2.3 – Critical Task Analysis

Element 2.4 – Critical EHS Equipment

Element 2.5 – EHS Improvement Plan

ELEMENT 3 - IMPLEMENTATION AND OPERATION

Element 3.1 – Training Awareness and Competence

Element 3.2 – Communication

Element 3.3 – Control of Documents and Records

Element 3.4 – Operational Control

Element 3.5 – Emergency Preparedness and Response

ELEMENT 4 - CHECKING AND CORRECTIVE ACTION

Element 4.1 – Monitoring and Measurement

Element 4.2 – Evaluation of Regulatory Compliance

Element 4.3 – Incident Investigation

Element 4.4 – Planned Inspections

Element 4.5 – Corrective and Preventive Actions

Element 4.6 – EHS Assessments

ELEMENT 5 - MANAGEMENT REVIEW

Element 5.1 – Management Reviews

A management review to check the effectiveness of the EMS is carried out annually and monthly Environment Meetings include EMS performance as an agenda item. References to Programs, Procedures or Work Instructions throughout this response are controlled documents forming part of the Site's EMS.

BAT 1 - COMPLIANT

8.1.2 Materials management & good housekeeping

BAT 2

2. 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
 - 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

All chemicals and raw materials are selected and used on site as per Environment Procedure (SP 028 – Chemical Management (see Appendix - BAT 2). This procedure together with EP 13 (see below) addresses all of the techniques listed in BAT 2.

Biocide is used on the tissue machine process where microbiological activity can cause problems. Washouts are carried out on the paper machine as required. De-foamers used in Coleshill mill are shown to have biodegradability >95%.

Mercury free caustic is in use on our tissue machine. All dyes used are non-toxic and harmless to aquatic life.

Chemical dosing is controlled as per SP 28 to ensure minimum quantities are used as required by the process and product requirements. Dosing of chemicals is proportional to production / flow rates. Routine checks are carried out to monitor addition rates and chemical strength. In addition the use of nutrient, boiler chemicals, biocides, clarifier chemicals and creping chemicals are monitored on a routine basis by external suppliers. All key process chemicals additions are interlocked to the appropriate process to prevent over dosing during a shut down.

Nonylphenol ethoxylate containing substances are not used on site and replacement chemicals are reviewed to ensure less harmful alternatives are considered. SP 28 ensures that the introduction, delivery and storage, replenishment and use of hazardous substances are managed to prevent any harm to personnel or the environment. All materials are assessed through COSHH, Chemical Passport and the Safety Management of Change Process. An inventory of all chemicals used on site, including quantities and toxicological properties is maintained within the site COSHH database (see also Table 1: Raw Material Inventory, below). The data gathered for all of these processes ensures consideration is given to the following concerns when selecting raw materials.

- Spillages
- Chemical content of material.
- Biodegradability
- Hazardous by products resulting from side reactions or natural breakdown of the material.
- Impacts on the Effluent Treatment Plant (ETP) and the discharges from the ETP.
- Dosing control

All chemicals are stored in bunded areas on impermeable ground and to the requirements of SP 28. At no point are materials allowed to be transported over permeable ground. Delivery pipework is within the bunded or process area and no drain valves are fitted to the bunds. Monthly inspections are carried out to verify the integrity of bunds. (see Appendix - BAT 2 for copy of Site Environment Audit)

Contamination of soil and groundwater is prevented as detailed in EP 13 - Control of Spills (see Appendix - BAT 2) and the KC Coleshill Crisis Management Manual (hardcopy available at facility).

Washouts and housekeeping is carried at periodic intervals on the paper machine and the recycled fibre plant as dictated by product quality specifications, machine runability and Health and Safety requirements. Housekeeping tours are carried out on a weekly basis by the machine operators, these are split up into designated areas which cover the whole process, any findings are logged on the KC haztrax systems to be resolved.

BAT 2 –COMPLIANT

Kimberly-Clark Corporation, Coleshill Mill
BAT Gap Analysis: Compliance With BAT Conclusions as contained in the Revised Pulp & Paper BREF

Raw material/function	Chemical nature/ Composition	Addition rates	Addition point	Fate % to product	Fate % to ETP	Fate % to waste	Fate % to air	Environmental impact of raw material	Practical alternatives
Waste paper	Mixed papers	Up to 100 %	DIP Hydrapulper	75%	25%	25%*	0%	Taken to animal bedding	None
Solubiliser	Sodium hydrosulphite	0.3%	Bleaching to RF	Est 60%	Est 40%	0%	0%	Raises effluent pH.	None
Flocculent	Cationic polyacrylamide	0.1%	Effluent	0%	100%	0%	0%	Rapidly eliminated from the aquatic medium by irreversible absorption onto suspended matter	None
Flocculent	Anionic polymer	0.1%	Kroftas	0%	100%	0%	0%	Not expected to cause environmental problems	None
Coagulant	Cationic polymer	0% to 0.1%	Effluent	0%	100%	0%	0%	Not expected to cause environmental problems	None
Coagulant	Anionic water soluble polymer	0% to 1.0%	Krofta	Est 50%	50%	0%	0%	Not expected to cause environmental problems	None
Adhesive	An aqueous solution of a cationic polymer – epichlorohydrin resin	2.5%-3.5%	Yankee Cylinder	0%	1%	99%	0%	Contributes to BOD Low ecotoxicity	None
Felt Conditioner	Aqueous alkaline solution of phosphate ,inorganic salt and surfactant	0.2% to 0.8%	Felt	0%	100%	0%	0%	None established	None
Wet strength additive	Cationic polymer in aqueous solution	1% to 5% dependant on product	Machine chest	50%	50%	0%	0%	Not readily biodegradable.	None
Biocide	Formic acid and hydrogen peroxide	0.005%	Backwater	0%	100%	0%	0%	May lower PH thus harmful to aquatic life	None
Release agent	Fatty acid ethoxylate	0.07%	Yankee cylinder	Est 50%	Est 50%	0%	0%	No long term ecological problems	None
Defoamer	Emulsion of organic hydroxy compounds, fatty acid esters and surfactants	0.06%	Backwater	0%	100%	0%	0%	Biological Elimination 97%	None
Dye	Azo dyestuffs	Up to 0.2%	Stock system	Est 95%	Est 5.0%	0%	0%	No long term ecological problems	None

Table 1: Raw Material Inventory

BAT 5

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)
- c. Balancing the degree of closure of water circuits and potential drawbacks; adding additional equipment if necessary
(Generally applicable)
- d. Separation of less contaminated sealing water from pumps for vacuum generation and reuse
(Generally applicable)
- e. Separation of clean cooling water from contaminated process water and reuse.
(Generally applicable)
- f. Reuse of process water to substitute for freshwater (water recirculation and closing of water loops).
(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.)
- g. In-line treatment of (parts of) process water to improve water quality to allow for recirculation or reuse.
(Generally applicable)

The site has established water usage as a Key Performance Indicator (KPI) and this data is reviewed daily, weekly and monthly during productions and management meetings. Information on water usage is shared by the means of daily tracking sheets, weekly dashboards and through the monthly Environment Meeting as specified in the site EMS.

Specific water usage on the paper machine and the total for the mill is shown in the table below (Table 2: Coleshill Water Usage). From a site total perspective the water usage is below the AEPL range and significant reductions were carried out in 2014 with new recycling programs

		2012	2013	2014	AEPL Range
SITE	Production (Tonnes @ 6% moisture)	27545	26916	29263	
	Water Usage (m ³)	528716	557431	433855	
	m ³ /tonne	19.19	20.71	14.82	5.125-21.25m3/tonne

Table 2: Coleshill Water Usage

Short loop water recycling is maximised on the tissue machine.

The paper machine has a filtration system on its primary water loop, which clarifies the white water and returns the filtrate for use in the pulper and consistency dilution water. Filtrated water usage for the machine showers on the

felt and wire sections is maximised so as not to impact machine runnability or product quality. Excess white water from the paper machine is fed to Dissolved Air Flotation (DAF) system and white water is used in the De-Inking plant and water systems. , the clarified water from the DAF passes through further fine screening before being used on the machine showers. A simplified diagram showing the water loops on the paper machine is included in the Appendix - BAT 5 (BAT 5 Water System Summary).

Backwater tanks have been sized so as to provide adequate storage to balance the generation of backwater and its requirement for stock dilution. No additional fresh water make-up is required on any of the white water or excess water storage tanks.

The wire and felt sections both require water continuously and intermittently for cleaning. In general the external showers are all provided by filtrated white water while the inside showers use freshwater.

All wash-down hoses use recycled water. Seal water from the tissue machine vacuum pumps passes through ultra-fine screening along with a percentage of recycled water before being re-used again as fresh water make-up. Control of the solids level in this water loop are monitored on line.

BAT 6 - COMPLIANT

8.1.4 Energy consumption and efficiency

BAT 6

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
 - 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

BAT Gap Analysis: Compliance With BAT Conclusions as contained in the Revised Pulp & Paper BREF

(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)
- 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)

Energy is a major cost element of site production and is therefore subject to regular management scrutiny. Energy use per asset is tracked on daily basis by the asset teams, on a monthly basis via the Site Environmental Meeting, and Senior management regularly reviews energy usage and costs. Monthly reports are compiled detailing energy consumption across the site. This provides baseline data and monitors progress on energy reduction measures. In addition this data is used to compare actual energy usage against detailed site specific energy benchmarks and to ensure compliance with Corporate Environmental Performance Standards. Each KC manufacturing site has a designated Energy Co-ordinator with responsibility for tracking energy use, monitoring energy efficiency and implementing capital energy projects. Energy use and progress against site specific targets is tracked through the KC EHS Management System as described in BAT 1.

A list of waste generated on site is included in the Appendix - BAT 12. Were practical all wastes are recycled or re-used. The De-Inked Plant rejects, Sludge crumb and general waste are not suitable for recycling (due to mixed nature of waste streams) and are processed off-site into Refuse Derived Fuel (RDF) before being used as in a waste to energy plant. The CV of these materials is as shown below:

DIP Rejects 33 – 44 Mj/kg
General Waste 18 – 24 Mj/kg

The KC Global Energy Services Team (GEST) periodically assesses the viability CHP at all KC manufacturing sites. Corporate objectives for installing CHP include:

- Reduction in mill energy costs to provide a competitive advantage.
- Stabilize mill energy supplies.
- Additional efficiency improvement through commercialization of well-designed process interconnection.
- Reduction of global carbon dioxide emissions.

In order for a KC facility to qualify for internal investment in a CHP plant the site must meet the following corporate criteria:

- Strategic manufacturing site.
- Energy Price Ratio above 3.5.
- Projected high purchased electricity prices for next 5 years.
- Simple payback of < 3 years

A detailed analysis of possible gas turbine and gas engine installations for all KC UK manufacturing sites was completed by GEST in October 2014. Potential projects for Coleshill could not achieve < 4.4 yr payback and the decision was taken not to proceed to detailed engineering design, pending a

review by GEST in 2016. A hardcopy of the 2014 CHP analysis is available at the facility.

Corporate energy support programs carried out by GEST include performance of periodic audits of the efficiency and safety of major combustion units, advice on design and installation of new boilers and other similar equipment, assistance with conservation and heat recovery projects and preventative maintenance programs for electrical distribution systems.

Heat recovery is employed throughout the facility and includes air to air heat exchangers and air to water heat exchangers. PM has a heat exchanger on the hood exhaust, with a cascade hood arrangement to improve efficiency. The heat exchanger is used for both make-up air and combustion air.

Corporate support programs include performance of periodic audits of the efficiency and safety of major combustion units, advice on design and installation of new boilers and other similar equipment, assistance with conservation and heat recovery projects and preventative maintenance programs for electrical distribution systems.

Heat recovery is employed throughout the facility and includes air to air heat exchangers and air to water heat exchangers on the hood exhaust, with a cascade hood arrangement to improve efficiency. The heat exchanger is used for both make-up air and combustion air. The air to air heat exchanger uses the hood exhaust air to heat up the incoming combustion & make-up air, thereby reducing the energy requirement. In order to reduce fuel and energy consumption on PM1 we recirculate hot air through the hood system. Heat from the boiler stacks via the economiser is used to pre-heat boiler feedwater.

Thermo compressor is installed on the paper machine using steam for drying. The use of the thermo compressor is to control the Yankee steam pressure on the ingoing steam line to the Yankee and uses the main steam's motive force to draw in recirculated steam from the Yankee (standard on Yankee dryer technology)..

Throughout the site over 95% of the steam and condensate lines are lagged and insulation maintenance is included in the Preventative Maintenance schedule. In 2010 the Yankee cylinder sides were also fully insulated to reduce steam consumption.

Vacuum generation on all of the machines represent a major use of electrical energy and hence vacuum levels are carefully matched to production and process requirements. PM has 2 vacuum pumps installed of which both are used during normal running. Trials have been run to use only one vacuum pump but the speed loss negated the energy saving.

Key to energy use on the machines is the forming, felt and pressure roll design. Felt design is a multi-axial press fabric which allows for excellent drainage and sheet dryness. Fabric vendors regularly monitor and report on the performance of the fabrics and ensure the latest design of clothing is utilised on the machines. Polyurethane Suction Pressure Roll covers are installed on the PM and the drainage hole pattern was changed to increase the open area which effectively improves the post pressure roll consistency and consequently reduces drying energy.

All new motors purchased are IE3. Rewound motors can still be rewound at IE2. For motor selection, we use reputable suppliers such as ABB or Brook Crompton

Frequency invertors are used throughout the site on various applications. Energy consumption of pumps and fans throughout the facility is periodically reviewed and a cost: benefit analysis carried out on the applicability of installing further inverter drives. As part of this process the site is installing an energy saving initiative to install variable speed drives on the Washer feed after removing the LD cleaners in the de-ink plant.

The boiler is fitted with an economiser for water temperature control. Steam pressure at the boiler is 14 bar and this feed into a common header that distribute steam to the paper machine and the DIP this pressure cannot be reduced any further as losses in efficiency occur. Steam demand can range from 4-7 tonnes. The boiler was converted to dual fuel burners in the early nineties, natural gas or gas oil. The burners have air atomisation when on oil and Gas if there is no steam. An automatic continuous blow down (TDS) system maintains boiler total dissolved solids at the correct level.

In 2014 the Global Energy Services Team started a project to roll out Lean Energy across all KC Manufacturing sites. Lean Energy is a Lean Focused Improvement approach used to reduce energy overconsumption:

- Deployment of visual management, operating system modifications and mindset and capabilities training;
- Focus on reducing variability in processes and products;
- Full engagement to create an energy conservation culture among associates.

Energy metering and visual dashboards will be installed during 2015 and all of the KC UK manufacturing facilities will implement the diagnostic phase of Lean Energy in 2015.

BAT 6 - COMPLIANT

8.1.5 **BAT 7**

In order to prevent and reduce the emission of odorous compounds originating from the waste water system, **BAT is to use a combination of the techniques given below.**

- a. Design paper mill processes, stock and water storage tanks, pipes and chests in such a way as to avoid prolonged retention times, dead zones or areas with poor mixing in water circuits and related units, in order to avoid uncontrolled deposits and the decay and decomposition of organic and biological matter.
(I Applicable for odours related to water system closure)
- b. Use of biocides, dispersants or of oxidising agents (e.g. Catalytic disinfection with hydrogen peroxide) to control odour and decaying bacteria growth.
(Applicable for odours related to water system closure)
- c. Installation of internal treatment processes ("kidneys") to reduce the concentrations of organic matter and consequently possible odour problems in the white water system.
(Applicable for odours related to water system closure)

BAT Gap Analysis: Compliance With BAT Conclusions as contained in the Revised Pulp & Paper BREF

- a. Implementing closed sewer systems with controlled vents, using chemicals in some cases to reduce the formation of and to oxidise hydrogen sulphide in sewer systems.
(II. Applicable for odours related to waste water treatment and sludge handling, in order to avoid conditions where waste water or sludge becomes anaerobic).
- b. Avoid over-aeration in equalisation basins (balance tanks) but maintain sufficient mixing.
(II. Applicable for odours related to waste water treatment and sludge handling, in order to avoid conditions where waste water or sludge becomes anaerobic).
- c. Ensuring sufficient aeration capacity and mixing properties in aeration tanks; revise the aeration system regularly.
(II. Applicable for odours related to waste water treatment and sludge handling, in order to avoid conditions where waste water or sludge becomes anaerobic).
- d. Guarantee proper operation of secondary clarifier sludge collection and return sludge pumping.
(II. Applicable for odours related to waste water treatment and sludge handling, in order to avoid conditions where waste water or sludge becomes anaerobic).
- e. Limit retention time of sludge in sludge storages by sending the sludge continuously to the dewatering units.
(II. Applicable for odours related to waste water treatment and sludge handling, in order to avoid conditions where waste water or sludge becomes anaerobic).
- f. Avoid the storage of waste water in the spill basin (balance tank) longer than is necessary; keep the spill basin empty.
(II. Applicable for odours related to waste water treatment and sludge handling, in order to avoid conditions where waste water or sludge becomes anaerobic).
- g. If sludge dryers are used, treatment of thermal sludge dryer vent gases by scrubbing and/or bio filtration (such as compost filters).
(II. Applicable for odours related to waste water treatment and sludge handling, in order to avoid conditions where waste water or sludge becomes anaerobic).
- h. Avoid air cooling towers for untreated effluent by applying plate heat exchangers.
(II. Applicable for odours related to waste water treatment and sludge handling, in order to avoid conditions where waste water or sludge becomes anaerobic).

Historically the facility does not have an issue with odorous compounds originating from the paper machine, DIP or effluent treatment plant. No external substantiated complaints related to odour have been received by the mill within the last 5 years.

All process tanks and agitators have been designed to optimise machine performance and therefore avoid prolonged water or stock retention. The continuous nature of the tissue process does not allow for stagnation within the water or stock loops. During routine fabric and felt changes all stock chests are cleaned out and no deposition issues have been identified during these shut downs.

Biocide is dosed into thick stock and back water loops as referenced in BAT 5.

Levels of organic matter in the white water systems are kept to a minimum by the use of dissolved air flotation (DAF) units on each paper machine. Each DAF is maintained by the paper machine asset team and a weekly service visit is made by an external contractor to ensure high solids removal efficiency (>85%) is maintained. Further clarification is also applied using such strainers and filters in order to minimise freshwater usage as referenced in BAT 5.

The effluent treatment plant (ETP) is designed to avoid odour build up and controlled according to the Effluent Control Plan (see BAT 16).A copy of the

standard work available on hard copy at the mill. The aeration tank blowers are controlled using pressure, speed and on line oxygen analysers allow visibility of correct dissolved oxygen levels. As the effluent plant is an activated sludge system correct oxygen levels must be maintained to prevent anaerobic conditions developing and filamentous bacteria flourishing. Over aeration is detrimental to the air distribution membranes and damages forming flocs preventing good settlement. The ETP balance tank has blowers (variable speed drives) and mixers to ensure even mixing and provide a consistent flow going forward.

Sludge is constantly pumped out of the primary ETP clarifier and into the sludge tank as well as a direct sludge feed from the De-Inking Plant. From the ETP sludge tank the material is continuously pumped up to a rotary screw thickener then sludge Screwpress where it is dewatered before disposal. All waste water from the presses goes directly back into the ETP process and is not retained. Sludge exiting the Screwpress is fed into a covered storage building stored. Housekeeping of sludge within the storage area is managed on a daily basis. Continuous removal of the sludge and stock rotation of the shed prevents the potential build-up of odour.

Sludge dryers are not used on site and untreated effluent is not cooled , although to ensure temperature consent limits are met cooling on the treated effluent are required, this has been carried out with the use of fresh water but in 2015 the installation of 2 x splash aerators.

BAT 7 - COMPLIANT

8.1.6 Monitoring of key process parameters and of emissions to water and air

BAT 8

BAT is to monitor the key process parameters according to the table (*list*) given below.

Air

Pressure, temperature, oxygen, CO and water vapour content in flue-gas for combustion processes

(Continuous)

Parameter

Water

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)

All monitoring of key process parameters is carried out as required by the existing EPR permit (see below, Table 3: EPR Monitoring Requirements) Additional sampling is undertaken at our Effluent Treatment Plant to ensure process stability

BAT Gap Analysis: Compliance With BAT Conclusions as contained in the Revised Pulp & Paper BREF

The boilers are subject to standard tests on a daily basis (5 days) by KC and Bi - weekly basis by an external contractor. The weekly service comprises of makeup water analysis comprising of total hardness, pH, Iron. Specific tests on alkalinity, pH, total dissolved solids, sulphite and polymer are conducted on the boilers. Carbon monoxide and oxides of nitrogen are monitored on the boilers emissions on a six monthly basis using an accredited MCerts contractor as required by the EPR permit Weekly evaporation tests are conducted, with daily blow downs and continuous oxygen monitoring and temperature monitoring in the stack.

	Parameter	Source	Monitoring frequency	Mointoring Std/Method
Air		point of release from papermaking and finished product activities		
	Particulates	Boiler/ Dust extract/ Hoods	6 monthly	BS EN 13284-1
	Oxides of nitrogen	Boiler/ Dust extract/ Hoods	6 monthly	BS EN 14792
	Carbon monoxide	Boiler/ Dust extract/ Hoods	6 monthly	BS EN 15058
Water	Total Suspended Solids	TET Discharge Composite	Per Discharge	CSP-10-20
	Total Suspended Solids	Clarifier	Daily x 2	CSP-10-20
	BOD	TET Discharge Composite	Weekly	ISO/IEC 17025
	COD	Clarifier	Daily	CSP-10-24
	pH	TET Discharge Composite	Continuous	
	pH MLSS	MLSS Basin	Continuous	
	Basin Temperature °C	MLSS Basin	Continuous	
	Temperature °C	TET Discharge Composite	Continuous	
	Volume Discharge	TET Discharge Composite	Continuous	
	Mercury	TET Discharge Composite	Quarterly	ISO/IEC 17025
	Pentachlorophenol	TET Discharge Composite	Quarterly	ISO/IEC 17025
	Cadmium	TET Discharge Composite	Quarterly	ISO/IEC 17025
	AOX	TET Discharge Composite	Quarterly	ISO/IEC 17025
	Total Nitrogen	TET Discharge Composite	Weekly	ISO/IEC 17025
	Total Phosphorus	TET Discharge Composite	Weekly	ISO/IEC 17025
	Organic Analysis	TET Discharge Composite	Annually	ISO/IEC 17025
	RAS Consistency %	RAS Sump	Daily	CSP-10-20
	Phosphate	MLSS Filtrate	Daily x 2	CSP-10-27
	Nitrate	MLSS Filtrate	Daily x 2	CSP-10-27
	Ammonia	MLSS Filtrate	Daily x 2	CSP-10-27
	Ammonia	TET Discharge Composite	Per Discharge	CSP-10-27
	MLSS Volatiles %	MLSS Basin	Daily x 2	CSP-10-20
	Ash %	MLSS Basin	Daily x 2	CSP-10-26
	MLVS	MLSS Basin	Daily x 2	CSP-10-20
	SSVI	MLSS Basin	Daily x 2	CSP-10-22

Table 3: EPR Monitoring Requirements

All ETP results are recorded on the Effluent Daily Log (Excel spreadsheet) and results tracked during daily production meetings.

No anaerobic treatment plants are in operation on the site.

BAT 8 - COMPLIANT

BAT 10

BAT is to carry out the monitoring and measurement of emissions to water, as indicated below, on a regular basis according to EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards which ensure the provision of data of an equivalent scientific quality.

Chemical Oxygen Demand (COD) or Total Organic Carbon (TOC)

Monitoring associated with BAT 19, BAT 33, BAT 40, and BAT 45

Daily

BOD₅ or BOD₇

Monitoring associated with BAT 19, BAT 33, BAT 40, BAT 45

Weekly

Total Suspended Solids (TSS)

Monitoring associated with BAT 19, BAT 33, BAT 40, and BAT 45

Daily

Total Nitrogen

Monitoring associated with BAT 19, BAT 33, BAT 40, and BAT 45

Weekly

Total Phosphorus

Monitoring associated with BAT 19, BAT 33, BAT 40, and BAT 45

Weekly

EDTA, DTPA

-

Monthly where EDTA or DTPA chelating agents are used in the process

AOX (according to EN ISO 9562:2004)

-

Once every two months, but N/A to plants that provide evidence that no AOX is generated or added via chemical additives and raw materials

Relevant metals (e.g. Zn, Cu, Cd, Pb, Ni)

-

Once per year

Monitoring methods of the above parameters are carried out to the methods specified in Table 3. Copies of external test results confirming the test standards used are available as hardcopy at the facility.

8.1.7 Waste Management

BAT 12

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)
(Generally Applicable)

- b. Merging of suitable fractions of residues to obtain mixtures that can be better utilised.
(Generally Applicable)
- c. Pre-treatment of process residues before reuse or recycling.
(Generally Applicable)
- d. Material recovery and recycling of process residues on site.
(Generally Applicable)
- e. Energy recovery on or off site from wastes with high organic content.
(For off-site utilisation the applicability depends on the availability of a third party)
- f. External material utilisation.
(Depending on the availability of a third party)
- g. Pre-treatment of waste before disposal.
(Generally Applicable)

A full list of wastes generated on site showing the EWC, treatment and disposal method is shown in Appendix – BAT 12 (Waste Register). Waste is collected, handled, treated and disposed of in accordance with procedures EP10 Duty of Care and EP16 Waste management, segregation and landfill minimization (Appendix – BAT 12).

The Environmental Procedures referenced above provide for administration, recording, monitoring and auditing of waste disposal practices on site. The site waste management controls cover the following:

- Wastes routinely generated;
- Wastes currently authorised for disposal;
- Auditing contractors; and
- Provision of waste description and transfer notes
- Waste segregation and collection
- Pre-treatment of manufacturing wastes where applicable
- Material recovery and recycling

Releases of solid waste and sludges occur indirectly. All waste of this nature is collected in a controlled manner, appropriately stored, compacted and consigned for off-site disposal, recycling or treatment observing the necessary duty of care using a registered contractor. Tissue broke produced on site is baled and reprocessed on site.

No manufacturing wastes undergo thermal processing on-site and off-site energy recovery from waste is as described in BAT 6.

BAT12 - COMPLIANT

8.1.8 Emissions to Water

BAT 13

In order to reduce nutrient (nitrogen and phosphorus) emissions into receiving waters, **BAT is to substitute chemical additives with high nitrogen or phosphorus contents by additives containing low nitrogen and phosphorus contents.**

(Applicable if the nitrogen in the chemical additives is not bio available (i.e. It cannot serve as nutrient in biological treatment) or if the nutrient balance is in surplus).

Process additives or chemicals with high Nitrogen and Phosphorus content (see BAT 2 – Table 1) are not used on site. A nutrient containing N and P is added at the effluent plant in order to provide the necessary macro-nutrients for healthy biological growth. Dosing of the nutrient is automatically metered and is a proportional to incoming flow with the addition ratioed to BOD loading. See also BAT 16

BAT 13- COMPLIANT

BAT 14

In order to reduce emissions of pollutants into receiving waters, **BAT is to use all of the techniques given below.**

- a. Primary (physico-chemical) treatment
- b. Secondary (biological) treatment

(Not applicable to plants where the biological load of waste water after the primary treatment is very low, making biological treatment technically or economically not viable, e.g. Some paper mills producing speciality paper).

The site ETP and mill water systems comprises of primary (dissolved air flotation and screening) and secondary (activated sludge) treatment.

paper machine and DIP flows through a coarse screen to the primary treatment and excess water fed to the to the ETP balance tank (1500M3). The balance tank provides dilution mixing to give an even flow of consistent quality going forward.

The flow from the CBT (combined balance tank) is fed to the inlet end of the aeration basin along with the RAS (returned activated sludge) the aeration basin capacity is 3500m3 , aeration is provided from an Aerzen blower and distributed through 4 mixers, dissolved oxygen is monitored on the inlet and centre of the aeration basin and the inverter controlled Aerzen blower controls the DO to the desired setpoint.

The aeration basin also has temperature and PH instruments provided continuous readings on line back to the DCS.

The outlet of the aeration basin is weired into the de gas chamber before feeding the settlement clarifier, activated sludge is drawn up through syphon's to the clarifier bridge and feeds into the RAS Sump where nutrients are added prior to the activated sludge being return to the aeration basin infeed, Surplus activated sludge is also taken from the RAS sump and fed to the combined sludge tank ready for pressing.

The treated effluent from the clarifier flows over the weir and feeds the treated effluent sump where it is the transferred to the Treated effluent tanks ready for discharge.

The TET is discharged on high tide and also has a minimum level requirement before discharge will take place; this allows us to discharge at a maximum of once every 24hours.

The surplus activated sludge fed to the combined sludge holding tank, along with the mill sludge gained from the mill DAF's and the Screwpress Opfti daf. The sludge is fed to a rotary screw thickener and a Screwpress to form a crumb which is then transferred to a covered sludge house before being removed from site. The water removed from the RST and Screwpress is fed to a small DAF where the sludge is returned to the combined sludge holding tank and the water returned to the combined balance tank ready for feeding back through the aeration basin.

BAT 14- COMPLIANT

BAT 15

When further removal of organic substances, nitrogen or phosphorus is needed, **BAT is to use tertiary treatment as described in section 8.7.2.2.**

Tertiary treatment is not a requirement. The plant has been designed to meet urban waste water treatment standards, and all discharge results are within existing permit limits and proposed BAT AELs.

BAT 15- COMPLIANT

BAT 16

In order to reduce emissions of pollutants into receiving waters from biological waste water treatment plants, **BAT is to use all of the techniques given below.**

- a. Proper design and operation of the biological treatment plant.
- b. Regularly controlling the active biomass.
- c. Adjustment of nutrient supply (nitrogen and phosphorus) to actual need of the active biomass.

The current effluent plant was upgraded in 2008 and was designed to meet all applicable BATs. The Effluent Plant is controlled 24 hours a day 365 days of the year with a 5 shift rota. There is day staff support available.

The effluent plant is managed through the Effluent Plant Control plan. This is a detailed spreadsheet tool that covers all of the following elements:

Centreline settings, housekeeping, prevention checks, and maintenance schedules for the 6 process zones listed below.

1. Combined Balance tank
2. Aeration basin and Blowers
3. Secondary clarifier, RAS, SAS pumps
5. Activated sludge/ chemical systems
6. Screw press and polymer.

A copy of the Effluent Plant Control Plan is available in hardcopy at the facility.

Daily testing is required as per current permit requirements as well as additional testing to aid process understanding (refer to BAT 8). The plant is controlled via an Experion DCS system and visual monitoring of conditions throughout the process.

Activated Sludge wastage is checked and adjusted according to a combination of sludge age, mixed liquor suspended solids in the aeration basin and visual inspection of the plant. Surplus activated sludge is increased or decreased to ensure optimum population of biology, ensuring good settlement and sludge age.

Nutrient is dosed to actual need of the active biomass. Nutrient residuals and changes to addition rates are documented as per the requirements of the Effluent Plant Control Plan.

BAT 16 - COMPLIANT

8.1.9 Emissions of Noise

BAT 17

In order to reduce the emissions of noise from pulp and paper manufacturing, **BAT is to use a combination of the techniques given below.**

- 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
(Generally applicable)
- 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
(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.)
- 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
(Generally applicable)
- d. Enclosing noisy equipment and units. Description: enclosure of noisy equipment such as wood handling, 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.
- 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.
(Generally applicable)
- 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.
(Generally applicable)

Kimberly-Clark Coleshill Mill is located in an industrial zone adjacent to Aber Road . The mill operates continuously, 24 hours a day, seven days a week and emits steady noise principally from the paper machines and their associated steam vents, stacks, pumps, motors and compressors.

The site has received one external noise complaints within the last 5 years,(2010) where a full noise survey was carried out over a period of time, resulting in a change to the vacuum pump exhaust Attenuators were fitted (see appendix BAT17).

All high end noise emitters such as compressors, blowers and hydraulic units are housed within sound proof booths or existing buildings. Infrequent operations such as 'blowdowns' are conducted according to set conditions that prescribe the time of day and length of activity for the operation.

All new equipment or changes to existing equipment would be required to go through the site Management of Change process, SP 016 SMOC (see Appendix - BAT 17). This procedure requires that the noise impact from site changes is considered before any changes are made and that those impacts are mitigated accordingly. In addition to SMOC all major re-builds are subject to planning approval and compliance to planning conditions.

Operational and Management techniques include on-site Condition Monitoring. This is carried out on a Scheduled basis according to the Management Maintenance System (MMS) and is managed through the Emonitor database. A combination of KC and contractors initially check all the machine bearings and download the information into the system. In addition to routine monitoring any abnormal noise emissions would be checked via ultrasound equipment .North west total or Scenic acoustic attend site to provide supplementary labour as required to cover our KC condition monitoring /vibration analyst to analyse the findings and can deem for example that a bearing needs lubrication on the drive shaft, lock nuts are loose or there is vibration on bearing and they provide an exception report to the site engineering teams who then cascade the information to the relevant asset teams for correction.

Air leak noise surveys are carried out periodically and results published to the engineers in each area to action.

Doors are maintained shut in order to comply with site noise limits and to meet British Retail Consortium Requirements.

BAT 17 - COMPLIANT

8.1.10 Decommissioning

BAT 18

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.

All information included in the original IPPC application related to site decommissioning is still applicable. Existing underground pipes and tanks are documented on site engineering drawings and no new underground structures have been added since 2001. Future upgrades to the plant would go through the site Management of Change process (see also BAT 17) that would ensure impact to ground and groundwater was assessed during the initial project design.

No spills, incidents or uncontrolled discharges have occurred on site that would impact the results of the surveys completed for the IPPC Phase 1a Risk Assessment.

Site closure or cessation would be carried out in accordance with the Coleshill KC Site Closure Plan and in accordance with KC Corporate requirements (see Appendix BAT 18).

BAT 18- COMPLIANT

8.5 BAT conclusions for processing paper for recycling

The BAT conclusions in this section apply to all integrated RCF mills and to RCF pulp mills. For integrated RCF paper mills, BAT 49, BAT 51, BAT 52c and BAT 53 of papermaking also apply, in addition to the BAT conclusions mentioned in this section.

8.5.1 Materials management

BAT 42

In order to reduce the risk of contamination or to prevent contamination of soil and groundwater and to reduce wind drift of paper for recycling and diffuse dust emissions from the paper for recycling yard, **BAT is to use one or a combination of the techniques given below.**

- a. Hard surfacing of the storage area for paper for recycling
(Generally applicable)
- b. Collection of contaminated run-off water from the paper for recycling storage area and treatment in a waste water treatment plant (uncontaminated rainwater e.g. From roofs can be discharged separately)
(Applicability may be restricted by the degree of contamination of run-off water (low concentration) and/or the size of the waste water treatment plants (large volumes))
- c. Surround the terrain of the paper for recycling yard with fences against wind drift.
(Generally applicable)
- d. Cleaning regularly the storage area and sweeping associated roadways and emptying gully pots to reduce diffuse dust emissions. This reduces wind-blown paper debris, fibres and the crushing of paper by on-site traffic that may cause additional dust emission, especially in the dry season.
(Generally applicable)
- e. Storage of bales or loose paper under a roof to protect the material from weather influences (moisture, microbiological degradation processes etc).
(Applicability may be restricted by the size of the area)

Extensive concrete hard standing exists in all major operational areas. The concrete acts as a suitable and effective barrier to the potential contamination of soil and groundwater.

All bunded areas and external drains on the south road flow to the fresh water interceptor and then back in to the mill prior to the effluent treatment plant for treatment prior to licensed discharge into the River Dee. No releases are envisaged from any dry or solid raw materials either by seepage or leaching. In all cases liquid releases would be diluted by the process effluent flow and treated in the effluent treatment plant.

All raw materials are stored under cover. There is a fully covered tent storing finishing supplies and all recycled paper is stored in a fully covered waste yard, all off-loading of waste paper is carried out inside the waste yard which provide storage and shelter from the prevailing wind. There is a high turnover of bales so accumulation of material is low. The site is swept by a mechanical sweeper twice a week. Site boundary and internal fences prevent drifting of loose material.

5S standards are implemented around the mill to ensure high levels of housekeeping are met, these standards are checked on a daily and weekly basis by the leadership team

BAT 42 - COMPLIANT

8.5.2 Waste water and emissions to water

BAT 43

*In order to reduce fresh water use, waste water flow and the pollution load, **BAT is to use a combination of the techniques given below.***

- a. Separation of the water systems.
(see section 8.7.2.1)
- b. Countercurrent flow of process water and water recirculation.
(see section 8.7.2.1)
- c. Partial recycling of treated waste water after biological treatment.
(Many RCF paper mills recycle a partial stream of biologically treated waste water back into the water circuit, especially mills producing corrugated medium or testliner).
- d. Clarification of white water
(see section 8.7.2.1)

Fresh water is not used in the DIP unless filling the system from Empty. Unclarified water from the DIP process is collected separately from the other mill water systems and flows back through the DIP plant counter-current to stock flow. The unclarified water and the excess flow passes to the DIP dissolved air flotation (Krofta) unit. Clarified water from the DIP Krofta is then used for pulper dilutions and stock dilution. Excess DIP clarified water flows to the ETP balance tank. Final treated effluent is also returned to the mill for use on non-critical process showers, Clarified water tank top up, all process hoses and recycled back through a fine filter combined with vacuum seal water for use as fresh water.

BAT 43 - COMPLIANT

BAT 44

*In order to maintain advanced water circuit closure in mills processing paper for recycling and to avoid possible negative effects from the increased recycling of process water, **BAT is to use one or a combination of the techniques given below.***

- a. Monitoring and continuous control of the process water quality
(See section 8.7.2.1. Techniques a) to c) are applicable to RCF mills with advanced water circuit closure.)
- b. Prevention and elimination of biofilms by using methods that minimise emissions of biocides.
(See section 8.7.2.1. Techniques a) to c) are applicable to RCF mills with advanced water circuit closure.)
- c. Removal of calcium from process water by a controlled precipitation of calcium carbonate.
(See section 8.7.2.1. Techniques a) to c) are applicable to RCF mills with advanced water circuit closure.)

Primary and secondary treatment systems are continuously monitored via the site DCS. In addition the shift manufacturing team regularly monitor

performance of the Krofta's, and the chemical supplier for the DAF's checks their process performance on a weekly basis. Stock chests and water loops are routinely ran empty and washed out during maintenance shuts. Calcium carbonate build up within the mill water loops is not a significant issue and is controlled with the oxidating biocide program running in the mill. removal of calcium from the process water is not required.

Corrosion coupons are fitted into the tissue machine headbox balance line and are routinely checked by the chemical supplier, online redox potential and PH measured on the excess water along with routine testing to compare against on-line meter. Conductivity, dip slides and ATP testing also carried out by chemical supplier on a weekly basis. (Reports available in hard copy at the mill)

BAT 44 - COMPLIANT

BAT 45

In order to prevent and reduce the pollution load of waste water into receiving waters from the whole mill, **BAT is to use a suitable combination of the techniques specified in BAT 13, BAT 14, BAT 15, BAT 16, BAT 43 and BAT 44.**

(For integrated RCF mills, emissions from papermaking are included in the BAT-AELs since the white water circuits of the paper machine are closely connected with those of the stock preparation. Note: all BAT AEL's only apply to direct discharges from the installation and not to discharges to sewer.)

BAT associated emission levels

Table 8.19

BAT associated emission levels for the direct waste water discharge to receiving waters from the integrated production of paper and board from recycled fibres pulp, produced with deinking on site.

COD

0.9 - 3.0 (for tissue paper, levels up to 4kg/t may occur)
Yearly average in kg/t

Total Suspended Solids (TSS)

0.08 - 0.3. 0.1 - 0.4 for tissue paper
Yearly average in kg/t

Total N

0.01 - 0.1. 0.01 - 0.15 for tissue paper mills
Yearly average in kg/t

Total Phosphorus

0.002 - 0.01. 0.002 - 0.015 for tissue paper

Yearly average in kg/t

Adsorbable organically bound halogens (AOX)

0.05 for wet strength paper

Average of samples obtained during one year in kg/t

BOD

No BAT AEL set but expected to be low (around 25mg/l) as 24-hour composite sample

	2012	2013	2014	Complaint (Y/N)
Nitrogen (kg/tonne)	0.09	0.08	0.042	Y
Phosphorous (kg/tonne)	0.007	0.019	0.003	Y
COD (kg/tonne)	4.9	3	1.187	Y
TSS (kg/tonne)	1.34	1.27	0.387	Y
BOD mg/l (Average)	16.37	11.66	5.18	Y
AOX	0.00000174	0.00000130	0.00000118	Y

Table 4: ETP Emission Levels

Management of the ETP as per BAT 16 ensures the final discharges results are within the BAT AELs listed in Table 4.

In April 2013 Delyn mill closure had a positive effect on the stabilisation of the ETP there for in 2014 All BAT AEL's met.

BAT 45 - COMPLIANT in 2014

8.5.3 Energy consumption and efficiency

BAT 46

In order to reduce energy consumption, **BAT is to reduce electrical energy consumption within RCF processing paper mills by use of a combination of the techniques given below.**

- a. High consistency pulping for disintegrating paper for recycling into separated fibres
(New plants and for existing plants in case of major refurbishment)
- b. Efficient coarse and fine screening by optimising rotor design, screens and screen operation which allows the use of smaller equipment with lower specific energy consumption.
(New plants and for existing plants in case of major refurbishment)
Energy saving stock preparation concepts extracting impurities as early as possible in the re-pulping process, using less and optimised machine components, thus restricting energy intensive processing of the fibres.
(New plants and for existing plants in case of major refurbishment)

Waste paper recycling is carried out at 19- 21% consistency depending upon the grade of incoming wastepaper and the use of the RCF pulp.

The RCF plan. Current coarse and fine screens rotors and baskets are monitored regularly for excessive wear and replaced / re-built accordingly. No new equipment installation or major re-furbishment is planned for the RCF plant.

The current RCF plant produces up to 120 tonnes per day of de-inked stock utilising 100% wood free waste paper. Grades of waste paper currently used are coloured heavy letter, multi-grades, sorted office waste, White Heavy letter and Light letter

The process is designed to take out large impurities as early as possible with progressive reduction in contamination removal as stock passes through the plant. The RCF can be broken down into 6 unit operations:

1. Pulping
2. Thick stock cleaning
3. Flotation / Fine screening
4. Washing/thickening/dispersing
5. High consistency storage and flow to paper machine.

1. Pulping

Waste paper and water are mixed and slushed by shearing action in a high consistency pulper. The waste paper is broken down and large particles of contaminants (plastics, rags, metal etc) are separated from the fibre. The stock discharges through a Poire, which screens out contaminants. The stock is pumped to a vessels referred to as "Dump Chest " at approximately 4.5% consistency and the contaminants are collected in a skip for disposal as per BAT 12.

2. Thick Stock Cleaning

The purpose of this section is to remove the heavy weight contaminants (e.g. grit, staples, pins, and rubber bands) from the stock. The stock from the dump chest flows to the holding chest where the consistency is adjusted to 3.2%. Stock under pressure enters a high density centrifugal cleaner where some of the contaminants are removed from a junk trap and discharged to a skip. The accepted stock passes through a pressure screen, with holes. Here the rejects are removed continuously and allowed to flow to a smaller pressure screen with holes reject from this second screen are discharged to skip on a timed basis. Accepts from the thick stock cleaning are fed to flotation via a thick stock headbox.

3. Flotation Cells

The purpose of this stage is to remove ink particles, and other small contaminants, from the stock. Stock from the headbox is first diluted with the backwater to approximately 1% consistency. Air is mixed into the thin stock. The air / stock mixture then passes through the flotation cell that utilises the hydrophobic nature of the ink particles to float the ink to the surface of the de ink cell. Cleaned stock from the de-ink cell flows to the fine screens and the contaminants are vacuumed into the de ink sludge tank then pumped to the mill sludge tank. From the Deink cell the stock is subjected to centrifugal cleaning and screening in order to remove stickies and fine contraries, and the cleaned stock passes to the screen accepts tank. Rejects are passed to a second, then tertiary stage to recover fibre. Rejects from here are sent to the effluent systems

4. Washing/Thickening/Dispersing

The purpose of this stage is to clean the stock further by washing, thickening and dispersing processes. The stock from the Screened stock chest flows into a Vario split washer where it is washed and thickened to remove any small contaminants. The stock leaving the washer at about 10% consistency is processed to remove more water in a wire press system to achieve approximately 30% consistency. The stock is then heated and sent through a disperser. Any remaining impurities not removed are pacified and finely distributed in the stock.

5. High Consistency Storage and Flow to Machines

The purpose of this stage is to store the stock, at high consistency, before pumping to the machines. Stock enters the top of the stock tower at 15% consistency. It flows slowly down the tower where, at the bottom, the stock is diluted to about 5% consistency and pumped to the second side of the washer to remove any remaining impurities then fed to the final stock chest. From there it is diluted to 4% and sent to the machines.

BAT 46 - COMPLIANT

8.6 BAT conclusions for paper making and related processes

The BAT conclusions in this section apply to all non-integrated paper mills and board mills and to the paper and board making part of integrated kraft, sulphite, CTMP and CMP mills. BAT 49, BAT 51, BAT 52c and BAT 53 of papermaking apply to all integrated pulp and paper mills. For integrated kraft, sulphite, CTMP and CMP pulp and paper mills, the reader should also refer to the process-specific BATs for pulping that apply, in addition to the BAT conclusions mentioned in this section.

8.6.1 waste water and emissions to water

BAT 47

In order to reduce the generation of waste water, **BAT is to use a combination of the techniques given below. See section 8.7.2.1 for detailed description of the technique**

- a. Optimum design and construction of tanks and chests
(Applicable to new plants and to existing plants in case of a major refurbishment)
- b. Fibre and filler recovery and treatment of white water
(Generally applicable)
- c. Water recirculation

BAT Gap Analysis: Compliance With BAT Conclusions as contained in the Revised Pulp & Paper BREF

(Dissolved organic, inorganic and colloidal materials (DisCo) may restrict the water reuse in the wire section)

- d. Optimisation of showers in the paper machine
(Generally applicable)

All process tanks, chests and agitators have been designed to optimise machine performance and therefore avoid prolonged water or stock retention.

Paper machine operates with a dissolved air flotation unit as referenced in BAT 5 to ensure effective treatment of white water. Fresh water showers are automatically switched off and on with machine speed to ensure usage kept to a minimum. Optimisation of fibre recovery will be completed as per BAT 44.

Paper machine contains numerous showers such as lubrication showers, high pressure needle showers and felt flooded nip showers (see Appendix BAT Water System Summary). Shower Water is treated as necessary to achieve the clarity and quality for that shower application. All showers automatically shut off on shutdown and, depending upon the application, water feed pumps for the pumps are proportional to machine speed. The showers on the tissue machines are operated in accordance with the KC Best Practice Felt and Fabric Showering document – a copy of which is available in hardcopy at the mill.

BAT 47 - COMPLIANT

8.6.3 Waste generation

BAT 52

In order to minimise the amount of solid waste to be disposed of, **BAT is to prevent waste generation and to carry out recycling operations by the use of a combination of the techniques given below (also see general BAT 20).**

- a. Fibre and filler recovery and treatment of white water. See section 8.7.2.1
(Generally applicable)
- b. Broke recirculation system. Broke from different locations/phases of paper making process is collected, repulped and returned to the fibre feedstock.
(Generally applicable)
- c. Recovery of coating colours/recycling of pigments. See section 8.7.2.1
- d. Reuse of fibre sludge from primary waste water treatment. Sludge with a high fibre content from the primary treatment of waste water can be reutilised in a production process.
(Applicability may be limited by product quality requirements)

Water is recovered via the Kroftas for re use in the process. All water put to drain from the process is treated via the Effluent Treatment plant. Treated effluent is returned to the mill and used in the Deinking process for final and process dilution showers and hose water. Fibre collected in the paper machine Krofta's contains predominantly short fibre (fines) and is heavily contaminated with trash from the white water loop and is therefore not currently suitable for re-use on the tissue machines, trials have been carried out in the past to re-use the tissue machine krofta sludge but analysis shows

the sludge to be highly contaminated with stickies which effects the quality of the final sheet. The reuse of fibre from the RCF Krofta is not possible due to the high level of fillers and colour found in the sludge.

Coleshill mill re -uses all broke on site. The paper machine has its own system for re use of the broke. All tissue from the converting is processed through a broke pulper combined with the tissue machine broke and fed back into the stock. when the paper machine is shutdown converting broke can be baled then re-processed.

Coating colours / pigments are not applied at the Coleshill facility.

BAT 52 - COMPLIANT

8.6.4 Energy consumption and efficiency

BAT 53

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)
(Applicable to new mills or major refurbishments)
- b. Best practice refining with heat recovery from the refiners
(Applicable to new mills or major refurbishments)
- c. Optimised dewatering in the press section of paper machine/wide nip press
(Not applicable to tissue paper and many speciality paper grades)
- d. Steam condensate recovery and use of efficient exhaust air heat recovery systems
(Generally Applicable)
- e. High efficient refiners
(Applicable to new plants)
- f. Optimisation of operation mode existing refiners (e.g. Reduction of "no load" power requirements)
(Generally applicable)
- g. Optimised pumping design, variable speed drive control for pumps, gearless drives
(Generally Applicable)
- h. Cutting edge refining technologies
(Generally Applicable)
- i. Steam box heating of the paper web to improve the drainage properties/dewatering capacity
(Not applicable to tissue paper and many speciality paper grades)
- j. Optimised vacuum system (e.g. Turbo fans instead of water ring pumps)
(Generally Applicable)
- k. Generation optimisation and distribution net work maintenance
(Generally Applicable)
- l. Optimisation of heat recovery, air system, insulation
(Generally Applicable)
- m. Use of high efficient motors (EFF1)

BAT Gap Analysis: Compliance With BAT Conclusions as contained in the Revised Pulp & Paper BREF

- (Generally Applicable)
- n. Preheating of shower water with a heat exchanger
(Generally Applicable)
- o. Use of waste heat for sludge drying or upgrading of dewatered biomass
(Generally Applicable)
- p. Heat recovery from axial blowers (if used) for supply air of drying hood
(Generally Applicable)
- q. Heat recovery of exhaust air from Yankee hood with a trickling tower
(Generally Applicable)
- r. Heat recovery from the infrared exhaust hot air
(Generally Applicable)

The paper machine was upgraded in 1999. Stock approach screens, rotors and baskets are monitored regularly for excessive wear and replaced / re-built accordingly. No new equipment installation or major refurbishment is planned for the paper machines.

Refining practices are based on specific targets to control specific energy per tonne produced. Plate design is selected in order to optimise finished product quality and energy use based on the types of furnish utilised on the paper machine. Each refiner has a maintenance schedule. Inspections of plates and bearings are carried out four times a year on scheduled maintenance shuts.

Condensate is returned from the Yankee steam system at a rate of 70%. When this return rate drops when providing steam to the disperser to approximately 50%.

Liquid ring vacuum pumps are used on the paper machine as described in BAT 6. No major refurbishment to replace the vacuum pumps with turbo blowers is planned.

Paper machine halls and the de-inking plant are not heated or cooled. Extract fans are located throughout the manufacturing buildings and are controlled to achieve optimal ventilation as per Health and Safety guidelines.

High efficiency motors and invertors are used across site as described in BAT 6 response.

Additional heat input to the shower water loops is not required owing to the high water temperature achieved by short loop recycling.

Additional drying of the RCF sludge is not currently practical owing to the location of the sludge press (ETP is located on the south road approx. 300meters from the boiler).

Heat recovery from Yankee hoods is carried out as described in the BAT 6 response. Heat is also recovered through the Yankee condensate system where flash steam from the 1st separator is re-used through a thermo-compressor for live steam back into Yankee cylinder, the flash steam from the 2nd separator is used as live steam for heat in the disperser. The remaining condensate is then used to heat the hot well which supplies the feed water to the boiler.

Axial blowers and infrared dryers are not used at the Flint site.

Looking at implementation of a lean energy monitoring scheme on Flint site.

BAT 53 - COMPLIANT