EA queries

Answers to BAT 1 to 18 of the Common Waste Gas Management and Treatment Systems in the Chemical Sector (WGC BAT Conclusions EU version)

- **BAT 1. In order to improve the overall environmental performance, BAT is to elaborate and implement an environmental management system (EMS) that incorporates all of the following features…(refer to the link above)**
  EMS Document previously delivered
- **BAT 2. In order to facilitate the reduction of emissions to air, BAT is to establish, maintain and regularly review (including when a substantial change occurs) an inventory of channeled and diffuse emissions to air, as part of the environmental management system (see BAT 1), that incorporates all of the following features…(refer to the link above)**
  EMS Document previously delivered
- **BAT 3. In order to reduce the frequency of the occurrence of OTNOC and to reduce emissions to air during OTNOC, BAT is to set up and implement a risk-based OTNOC management plan as part of the environmental management system (see BAT 1) that includes all of the following features…(refer to the link above)**
  HAZOP analysis has been completed and consequential follow up along with a robust PLC operating system and annual emission testing reduces the frequency effort of OTNOC.
- **BAT 4. In order to reduce channeled emissions to air, BAT is to use an integrated waste gas management and treatment strategy that includes, in order of priority, process-integrated recovery and abatement techniques.**
  From a technical point of view, there are two families of process operations emissions:
  1. **Gas phase outlet from dissolving operations.**
  2. **Breathing line/exhaust vapours extraction from adjustment tanks.**
  3. **Reactors depressurization process vents.**

  Comments on BAT application:
  1. **Exhaust vapors formed during dissolving operations due to reaction and sulphuric acid dilution is first abated through a spray-balls scrubbing in the 16 inch gas phase process pipe, then abated through condensation (total condenser with cooling water, with recover of condensate into the process) before being sent to emission points through a fan extraction.**
  2. **Due to the expected low temperature of the feeding product to adjustment tanks (thanks to a cooling of the stream), it is not expected any abatement technique required for the gas vent.**
  3. **Depressurization process vent streams at the end of the reactor batch is sent in a large atmospheric blowdown vessel charged with a guarantee minimum hold-up of water, through a dip pipe. Gas phase, bubbling through the water hold-up, is removed from any pollutant. Indeed, outlet temperature also is lowered via the calculated water hold-up enthalpy.**
- **BAT 5. In order to facilitate the recovery of materials and the reduction of channeled emissions to air, as well as to increase energy efficiency, BAT is to combine waste gas streams with similar characteristics, thus minimizing the number of emission points.**
  Please note that in our case, the three different chemical families of streams are kept separated in a perspective of better efficiency of abatement treatments tailored on each specifical feature of the stream.
- **BAT 6. In order to reduce channeled emissions to air, BAT is to ensure that the waste gas treatment systems are appropriately designed (e.g. considering the maximum flow rate and pollutant concentrations), operated within their design ranges, and maintained (through preventive, corrective, regular and unplanned maintenance) so as to ensure optimal availability, effectiveness and efficiency of the equipment.**
  Referring to the above mentioned families of emissions we can state that:

1. Effective transfer area in the condensers design has been oversized 50% in excess according to the calculated required transfer area enhancing by +50% the heat exchange capacity versus material and heat balance calculation.
2. No abatement system required.
3. The minimum blowdown tank hold-up properly designed to assure effective abatement of the pollutants and temperature of reactor vapour streams. The operating hold-up is 50% above the minimum, representing the appropriate oversizing.

- BAT 7. BAT is to continuously monitor key process parameters (e.g. waste gas flow and temperature) of waste gas streams being sent to pretreatment and/or final treatment.
  Referring to the above mentioned families of emissions we can state that:
  1. Key process parameters of dissolving tanks waste vapour streams (cooling water flow-rate and temperature exiting from the condenser, temperature of waste before entering the fan) are always monitored with instrumentation through the SCADA system, in particular.
  2. No abatement system required.
  3. Key process parameter in this case is the minimum water hold-up of the blowdown vessel, which is always monitored with a level transmitter and it is protected with a switch of minimum level.
- BAT 8. BAT is to monitor channeled emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
  Annual emissions testing along with robust maintenance techniques and equipment calibration.
- BAT 9. In order to increase resource efficiency and to reduce the mass flow of organic compounds sent to the final waste gas treatment, BAT is to recover organic compounds from process off-gases by using one or a combination of the techniques given below and to reuse them.
  Not applicable, there are no organic compounds.
  BAT 10. In order to increase energy efficiency and to reduce the mass flow of organic compounds sent to the final waste gas treatment, BAT is to send process off-gases with a sufficient calorific value to a combustion unit that is, if technically possible, combined with heat recovery. BAT 9 has priority over sending process off-gases to a combustion unit.
  Not applicable, there are no organic compounds.
- BAT 11. In order to reduce channeled emissions to air of organic compounds, BAT is to use one or a combination of the techniques given below. (refer to the above link)
  Not applicable, there are no organic compounds.
- BAT 12. In order to reduce channeled emissions to air of PCDD/F from thermal treatment of waste gases containing chlorine and/or chlorinated compounds, BAT is to use techniques a. and b., and one or a combination of techniques c. to e., given below. (refer to the link above)
  Not applicable, there is no generation of PCDD/F during process operations.
- BAT 13. In order to increase resource efficiency and to reduce the mass flow of dust and particulate-bound metals sent to the final waste gas treatment, BAT is to recover materials from process off-gases by using one or a combination of the techniques given below and to reuse them. (refer to the link above)

  This BAT is already applied in the chemical process of the facilities (refer to BAT 4 for vapor emissions characterization):
  1. Vapors generated during reaction in dissolving tanks are washed using fresh water through spray balls in two different points: at the beginning of vent pipe and at the vapor inlet pipe before entering the condenser. Particulate matter is absorbed into water and sent back to dissolver tanks in order to reuse them.

The handling of magnetite in order to feed the dissolvers is performed through a solid transportation system (belt conveyors plus Z-elevators) encapsulated.
2. No solid presence expected in vapor emissions for adjustment tanks.
3. No solid presence expected in vapor emissions for reactors.

- BAT 14. In order to reduce channeled emissions to air of dust and particulate-bound metals, BAT is to use one or a combination of the techniques given below. (refer to the link above)
  See BAT 13 answer.
- BAT 15. In order to increase resource efficiency and to reduce the mass flow of inorganic compounds sent to the final waste gas treatment, BAT is to recover inorganic compounds from process off-gases by using absorption and to reuse them.
  See BAT 13 answer.
- BAT 16. In order to reduce channeled emissions to air of CO, NO_X and SO_X from thermal treatment, BAT is to use technique c. and one or a combination of the other techniques given below. (refer to the link above)
  SOx formation may takes place during dissolving operations. An absorption technique is applied for SOx treatment as mentioned in point 1 of BAT 4 answer.
- BAT 17. In order to reduce channeled emissions to air of ammonia from the use of selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) for the abatement of NO_X emissions (ammonia slip), BAT is to optimize the design and/or operation of SCR or SNCR (e.g. optimized reagent to NO_X ratio, homogeneous reagent distribution and optimum size of the reagent drops).
  Not applicable, production (and by production) of neither NOx nor ammonia occurs in the plant.
- BAT 18. In order to reduce channeled emissions to air of inorganic compounds other than channeled emissions to air of ammonia from the use of selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) for the abatement of NO_X emissions), channeled emissions to air of CO, NO_X and SO_X from the use of thermal treatment, and channeled emissions to air of NO_X from process furnaces/heaters, BAT is to use one or a combination of the techniques given below.
  Not applicable, no thermal treatment applied in the facility.

Answers to How to comply with your environmental permit Additional guidance for: The Inorganic Chemicals Sector (EPR 4.03)

- Indicative BAT - You should where appropriate:
  1. Monitor and benchmark your environmental performance, and review this at least once a year. Your plans for minimizing environmental impacts should be incorporated into on-going Improvement Programs. Indicators can be derived using the Horizontal Guidance Note H1 Environmental Risk Assessment (see GTBR Annex 1). It is suggested that indicators are based on tonnes of inorganics produced (tOP) as they provide a good basis for measuring performance within an installation or a single company year on year.
  1. Site collects environmental data for Environmental performance and improvement on a monthly basis. Kemira has a dedicated Global Environmental team collecting the data to find solutions on improvements from site level and companywide. Data collections also used for submission H1 & H2
- Indicative BAT - You should where appropriate: 1. Assess the environmental impact of each process and choose the one with the lowest environmental impact. (We recognize

that your choice may be constrained, for example, by the integration of processes on a complex site).

- Among the processes for the production of coagulants for the waste water treatment, in Kemira Goole plant the production process carried out allows to obtain as final product aqueous solutions of ferric sulphate at different concentrations which is obtained starting from Fe2O3 (powder), water and sulphuric acid with potential emission in the atmosphere of Sulphur dioxide and particular matter. Anyway, technical countermeasures and mitigation actions have been put in place to lower the risk of occurring of unexpected releases. As per our knowledge, there is no other cleaner process technologies available in order to get the required product. From another environmental point of view, we may say that with the new expansion project we will achieve the complete closing of the cooling water loop (started with the previous installation of air coolers closed loop), yielding a minimization of water consumption. The overall water material balance foreseen a consumption for process only (water content transferred in the product, unavoidable by definition).
- Indicative BAT - You should where appropriate: 1. Maximize heat transfer between process streams where water is needed for cooling. Use a recirculating system with indirect heat exchangers and a cooling tower in preference to a once-through cooling system. 2. Where water is used in direct contact with process materials, recirculate the water after stripping out the absorbed substances. 3. Use cleaning techniques that reduce the quantity of water needed. 4. Establish opportunities for reuse using pinch analysis.
    1. Heat transfer between process streams is already maximized. The enthalpy in excess from product outlet from reactor is already recovered 100% heating process water fed to dissolving tanks. Moreover, as already mentioned, cooling water is a closed loop cooled via air coolers.
    2. Not applicable: water in contact with process is process water only that will be part of the final product.
    3. The separation between cooling water loop and process water loop yields in a cleaner cooling water with consequent increase of heat transfer coefficients that leads to a reduction of the quantity of the water needed.
    4. Not applicable.
- Indicative BAT - You should where appropriate: 1. Demonstrate that the chosen routes for recovery or disposal represent the best environmental option. Consider avenues for recycling back into the process or reworking for another process wherever possible. 2. Where you cannot avoid disposing of waste, provide a detailed assessment identifying the best environmental options for waste disposal.
    1. All the waste waters (including 100% of floor drains) produced during the operations are currently reused in the plant, so the disposal of waste water is near 0%.
    2. The disposal of solid waste cannot be avoided and it is generated in the filter presses that remove the solid content from the final product. To reduce the waste disposable, a washing procedure with water for the solid cake in the filter presses will be performed. This will allow to reduce the annual waste tonnage by 40%.
- Indicative BAT - You should where appropriate: 1. Consider all potential environmental impacts from the outset in any new project for manufacturing chemicals. 2. Undertake the appropriate stages of a formal HAZOP study as the project progresses through the process design and plant design phases. The HAZOP studies should consider amongst other things the points noted above.
    1. All potential environmental impacts have been investigated and mitigated through the application of Best Engineering Practices along the design of the new facilities.
    2. HAZOP exercise has been already applied during all the project phases (from basic to detail engineering).
- Indicative BAT - You should where appropriate: 1. Store reactive chemicals in such a way that they remain stable, such as under a steady gas stream, for example. If chemical additions are necessary then tests should be carried out to ensure the required chemical composition is maintained. Inhibitors may also be added to prevent reactions. 2. Vent

storage tanks to a safe location. 3. Use measures to reduce the risk of contamination from large storage tanks. In addition to sealed bunds, use double-walled tanks and leak detection channels. 4. Use HAZOP studies to identify risks to the environment for all operations involving the storage and handling of chemicals and wastes. Where the risks are identified as significant, plans and timetables for improvements should be in place.

1. No instable chemicals foreseen to be used in the process.
2. Storage tanks vents (such as sulphuric acid) already positioned in safe location on the ceiling of the vessels.
3. All large storages (tank farms) are anyway provided with second containment (basin) in order to avoid risks of contamination. Sulphuric acid unloading station (via truck) are provided with a recovery system for spills and leakages.
4. Already applied, HAZOP study has been carried out during basic engineering phase of expansion project.

- Indicative BAT - You should where appropriate: 1. Formally consider potential emissions from plant systems and equipment and have plans and timetables for improvements, where the potential for substance or noise pollution from plant systems and equipment has been identified. 2. Carry out systematic HAZOP studies on all plant systems and equipment to identify and quantify risks to the environment. 3. Choose vacuum systems that are designed for the load and keep them well maintained. Install sufficient instrumentation to detect reduced performance and to warn that remedial action should be taken.
    1. Site improvement plan along with platform Synergi for recording changes.
    2. HAZOP Completed 2024 and will be reviewed on a bi-yearly approach unless major change on plant needed.
    3. The level of automation/ instrumentation of the plant is always improving every new development in order to allow a tight adherence with today's best engineering practices in process monitoring/ control.
- Indicative BAT - You should where appropriate: 1. Carry out a systematic HAZOP study for all relief systems, to identify and quantify significant risks to the environment from the technique chosen. 2. Identify procedures to protect against overpressure of equipment. This requires the identification of all conceivable over-pressure situations, calculation of relief rates, selection of relief method, design of the vent system, discharge and disposal considerations, and dispersion calculations. In some cases careful design can provide intrinsic protection against all conceivable over-pressure scenarios, so relief systems and their consequential emissions can be avoided. 3. Maintain in a state of readiness all equipment installed in the venting system even though the system is rarely used.
    1. Already applied, HAZOP study has been performed along all project design steps. Relief valves calculated according identified worst case scenarios.
    2. Overpressures from process protected via pressure relief valves. Streams from safety valve relief are properly abated through exhausting both their own kinetic energy (blow down/ knock drum concept) and their own enthalpy energy (mixing with water hold up in safety vent tank, according to Kemira's safety procedures).
    3. This is correct for plant today, along with maintenance schedules and testing.
- Indicative BAT - You should where appropriate: 1. Consider leak detection, corrosion monitoring and materials of construction, preferably in a formal HAZOP study. Plans and timetables for improved procedures or replacement by higher integrity designs should be in place where the risks are identified as significant. 2. If corrosion is likely, ensure methods for rapid detection of leaks are in place and a regime of corrosion monitoring in operation at critical points. Alternatively, use materials of construction that are inert to the process and heating/cooling fluids under the conditions of operation. 3. For cooling water systems, use techniques that compare favorably with relevant techniques described in the "Industrial Cooling Systems" BREF.
    1. Leak detection and corrosion monitoring are applied through appropriate plant sustaining visual inspections. During the HAZOP analysis the proper MoC to be

chosen has been validated, also relying on previous empirical plant experiences and evidences.

2. Correct material of construction materials selected after rigorous testing in Kemira R&D lab

- Indicative BAT - You should where appropriate: 1. Assess the potential for the release to air of VOCs and other pollutants along with discharged purge gas and use abatement where necessary.
  1. In the plant there is no usage of flammable compounds or organic compounds that could release VOC in the atmosphere.
- Indicative BAT - You should where appropriate: 1. With a clear understanding of the physical chemistry, evaluate options for suitable reactor types using chemical engineering principles. 2. Select the reactor system from a number of potentially suitable reactor designs – conventional stirred tank reactor (STR), process-intensive or novel-technology - by formal comparison of costs and business risks against the assessment of raw material efficiencies and environmental impacts for each of the options. 3. Undertake studies to review reactor design options based on process-optimisation where the activity is an existing activity and achieved raw material efficiencies and waste generation suggest there is significant potential for improvement. The studies should formally compare the costs and business risks, and raw material efficiencies and environmental impacts of the alternative systems with those of the existing system. The scope and depth of the studies should be in proportion to the potential for environmental improvement over the existing reaction system. 4. Maximise process yields from the selected reactor design, and minimise losses and emissions, by the formalised use of optimised process control and management procedures (both manual and computerised where appropriate). 5. Minimise the potential for the release of vapours to air from pressure relief systems and the potential for emissions of organic solvents into air or water, by formal consideration at the design stage - or formal review of the existing arrangements if that stage has passed.

  The KEMIRA R&D department is involved worldwide in studying and developing processes in order to be always further in his field. From this point of view, KEMIRA is one of the top class representative firms in the world market.
- Indicative BAT - You should where appropriate: 1. Use the following features that contribute to a reduction in waste arisings from clean-outs: • Low-inventory continuous throughput reactors with minimum surface area for cleaning. • Minimum internals such as baffles and coils in the reactor. • Smooth reactor walls, no crevices. • Flush bottom outlet on reaction vessels. • All associated piping to slope back to the reactor or to a drain point. • Sufficient headroom under the reactor for collection of all concentrated drainings in drums or other suitable vessel, if necessary. • Minimal pipework, designed to eliminate hold-up and to assist drainage. • Pipework designed to allow air or nitrogen blowing. • System kept warm during emptying to facilitate draining. • HAZOP studies used to assess the potential for the choking of lines by high-melting-point material. • Campaigns sequenced so that cleaning between batches is minimised. • Campaigns made as long as possible to reduce the number of product change-overs. • Where a complete clean is necessary, use cleaning methods that minimise the use of cleaning agents, (e.g. steam-cleaning, rotating spray jets or high-pressure cleaning) or use a solvent which can be re-used. Carry out HAZOP studies to minimise the generation of wastes and to examine their treatment/disposal. • Consider use of disposable plastic pipe-liners. • Eliminate or minimise locations for solids to settle-out. • Consider duplicate or dedicated equipment where it can reduce the need for cleaning that is difficult.
  1. Already applied where applicable:
     - there is no requirement for the plant to clean reactors and dissolving tanks after each batch, only flushing with water and compressed air of discharge pipes is performed;
     - Reactors, dissolving tanks and adjustment tanks are not provided with coils and baffles are reduced to the minimum number required as per design of a correct agitation;

- Walls of dissolving tanks and reactors are as smooth as reasonably possible;
    - Bottom outlet of vessel in which chemical reactions occur is always flushed
    - Piping is properly designed to avoid accumulation points;
    - Headroom under reactors and dissolving tanks is sufficient for drains operation;
    - Pipework designed properly to fulfill the requirement;
    - Pipework designed properly to allow air blowing (no nitrogen blowing is performed during operations);
    - Temperatures during draining operations is suitable for facilitate draining operations;
    - There is no need to clean reactors and dissolving tanks after each batch, only flushing operations are conducted;
    - Complete cleaning is performed only during shut-down period of the plant, so usage of cleaning agents is minimized during a overall year of production;
    - HAZOP study has already taken into account this aspect, improvements can be proposed during HAZOP follow-up
    - Plastic pipe-liners (PTFE) are used in in the terminal parts of the pipes that are in contact with the dissolving tanks to protect the stainless steel pipes from hot vapours produced during dissolving and reaction operations
    - This point is already applied, solid disposals collection points from production are already minimized in the plant
    - This point is not applicable because no general cleaning of equipment during operations is required.
- Indicative BAT - You should where appropriate: 1. Review your operating practices and review vent flows to see if improvements need to be made. 2. Consider opportunities to enhance the performance of abatement systems.
    1. This review has been carried out during the development of this project.
    2. Opportunities to enhance the performance of abatement systems have been considered in this project: a blowdown vessel for improving the abatement of emissions from reactor has been foreseen; the installation of a dedicated fresh water pump for spray-balls abatement system for emissions of dissolving tanks will allow to increase the efficiency of this abatement technique.
- Indicative BAT - You should where appropriate: 1. Choose your separation technique following a detailed process design and HAZOP study. Follow formal operating instructions to ensure effective separation and minimisation of losses. Adhere to design conditions such as heat input, reflux flows and ratios, etc. 2. Install instrumentation to warn of faults in the system, such as a temperature, pressure or low coolant-flow alarms
    1. The only process separation technique applied in the process is the unit operation of filtration. Process operations follow strictly as per procedure all instructions indicated by supplier of the equipment in compliance of the manual.
    2. The level of automation/ instrumentation of the plant is always improving every new development in order to allow a tight adherence with today's best engineering practices in process monitoring/ control.
- Indicative BAT - You should where appropriate: 1. Use techniques which maximise physical separation of the phases (and also aim to minimise mutual solubility) where practicable. 2. When the phases are separated, use techniques which prevent (or minimise the probability and size of) breakthrough of the organics phase into a waste-water stream. This is particularly important where the environmental consequences of subsequent releases of organics to air or into controlled waters may be significant (eg. where the effluent is treated in a DAF unit or some of the organic components are resistant to biological treatment). 3. When a separation is done by hand, use a "dead man's handle", backed-up by good management, to improve the chance of the flow being properly controlled as the phaseboundary approaches. 4. Consider if automatic detection of the interface is practicable. 5. Where you are discharging to drain, consider whether there should be an intermediate holding or "guard" tank to protect against accidental losses from the organics phase.

1. The only process separation technique applied in the process is the unit operation of filtration. Process operations follow strictly as per procedure all instructions indicated by supplier of the equipment in compliance of the manual.
2. Not applicable, no organic compounds used in the plant.
3. Not applicable, no separation is done by hand.
4. Not applicable.
5. Not applicable.

- Indicative BAT You should where appropriate: 1. Use techniques to minimise, re-use and/or recycle rinse water, and to prevent breakthrough of solids. 2. Install instrumentation or other means of detecting malfunction as all of the techniques are vulnerable to solids breakthrough 3. Consider installing "guard" filters of smaller capacity downstream which, in the event of breakthrough, rapidly 'clog' and prevent further losses. 4. Have good management procedures to minimise loss of solids, escape of volatiles to air and excessive production of waste water.
  1. Already applied, rinse water is always reused in the plant. Breaktrough of solids is avoided using filters and filter presses where needed. For all process fluids streams that could be contain solids, Y-strainer on pumps suction side are installed to guarantee another barrier that allows to avoid breakthrough of solids.
  2. The level of automation/ instrumentation of the plant is always improving every new development in order to allow a tight adherence with today's best engineering practices in process monitoring/ control.
  3. Already applied, for all process phases in which solids are involved there are always guard filters.
  4. Captured by correctly selected equipment, maintenance regimes, correct process parameters, good selection of operating systems for live monitoring and plant can consume all waste water created back in to production.
- Indicative BAT - You should where appropriate: 1. Monitor the relevant process controls and set with alarms to ensure they do not go out of the required range.
  1. The level of automation/ instrumentation of the plant is always improving every new development in order to allow a tight adherence with today's best engineering practices in process monitoring/ control.
- Indicative BAT - You should where appropriate: 1. Analyse the components and concentrations of by products and waste streams to ensure correct decisions are made regarding onward treatment or disposal. Keep detailed records of decisions based on this analysis in accordance with management systems.
  1. Detailed records kept, Waste reduction targets at site/company level. Investment projects to reduce output of waste and recover base raw materials with BAT.
- Indicative BAT - You should where appropriate: 1. Formally consider the information and recommendations in the BREF on Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector (see Reference 1, Annex 2) as part of the assessment of BAT for point-source releases to air, in addition to the information in this note. 2. The benchmark values for point source emissions to air listed in Annex 1 should be achieved unless we have agreed alternative values. 3. Identify the main chemical constituents of the emissions, including VOC speciation where practicable. 4. Assess vent and chimney heights for dispersion capability and assess the fate of the substances emitted to the environment.
  1. Not applicable – all waste water re-consumed in plant process
  2. Always achieve <5% of threshold
  3. Identified through Kemira PLM team & monitored constantly
  4. Assessed with the design phase & modelling
- Indicative BAT - You should where appropriate: 1. Control all emissions to avoid a breach of water quality standards as a minimum. Where another technique can deliver better results at reasonable cost it will be considered BAT and should be used. 2. Use the following measures to minimise water use and emissions to water: • Where water is needed for cooling, minimize its use by maximising heat transfer between process streams. • Use water in recirculating systems with indirect heat exchangers and a

cooling tower rather than a once through system. (A water make-up treatment plant and a concentrated purge stream from the system to avoid the build up of contaminants are likely to be necessary.) • Leaks of process fluids into cooling water in heat exchangers are a frequent source of contamination. Monitoring of the cooling water at relevant points should be appropriate to the nature of the process fluids. In a recirculatory cooling system, leaks can be identified before significant emission to the environment has occurred. The potential for environmental impact is likely to be greater from a once through system. Planned maintenance can help to avoid such occurrences. • Reduce water used for cleaning. Strip process liquor and treat if necessary, then recycle/reuse. • Use wet air oxidation for low volumes of aqueous effluent with high levels of organic content, such as waste streams from condensers and scrubbers • Neutralise waste streams containing acids or alkalis to achieve the required pH for the receiving water. • Strip chlorinated hydrocarbons in waste streams with air or steam and recycle by returning to process where possible. • Recover co-products for re-use or sale. • Periodically regenerate ion exchange columns. • Pass waste water containing solids through settling tanks, prior to disposal. • Treat waste waters containing chlorinated hydrocarbons separately where possible to ensure proper control and treatment of the chlorinated compounds. Contain released volatile chlorinated hydrocarbons and vent to suitably designed incineration equipment. • Non-biodegradable organic material can be treated by thermal incineration. However, the thermal destruction of mixed liquids can be highly inefficient and the waste should be dewatered prior to incineration.

Decay in quality standards of water via contamination is avoided by design looking at following reasons:

- **100% of water fed to the plant outlet with the product (is part of product by recipy)**
- **cooling water loop is a closed one, with no make up required (maintenance only)**
- **tank farms of chemicals are provided with containment (basin) to avoid any spill/ leakage in the flield.**

Other topics not applicable.

- **Indicative BAT** - You should where appropriate: 1. Use the following measures to minimise emissions to land: • Use settling ponds to separate out sludge (Note: Sludge can be disposed of to incinerator, encapsulation, land or lagoon depending upon its make up.) • Chlorinated residues should be incinerated and not released to land. (Chlorinated hydrocarbons are not to be released to the environment due to their high global warming and ozone depletion potentials.) • Either recycle off specification product into the process or blend to make lower grade products where possible • Many catalysts are based on precious metals and these should be recovered, usually by return to the supplier.
  1. **Points already applied where relevant, there is no production of sludge (in the sense of conventional sludge) and chlorinated hydrocarbons are not part of current process; there is no usage of catalysts; product out of specification is already recycled into the process.**
- **Indicative BAT** - You should where appropriate: 1. Identify all potential sources and develop and maintain procedures for monitoring and eliminating or minimising leaks. 2. Choose vent systems to minimise breathing emissions (for example pressure/ vacuum valves) and, where relevant, should be fitted with knock-out pots and appropriate abatement equipment. 3. Use the following techniques (together or in any combination) to reduce losses from storage tanks at atmospheric pressure: • maintenance of bulk storage temperatures as low as practicable, taking into account changes due to solar heating etc. • tank paint with low solar absorbency • temperature control • tank insulation • inventory management • floating roof tanks • bladder roof tanks • pressure/vacuum valves, where tanks are designed to withstand pressure fluctuations • specific release treatment (such as adsorption condensation)
  1. **Correct selection of equipment, detailed maintenance regimes & visual daily checks. Installation across full site of flange guards.**

2. **Already applied where applicable, pressure/vacuum relief valves are already installed where needed and will be installed for future installations that will require them; knock-out pots are not necessary due to the installation of a 100 m3 water blowdown vessel as per previous answers.**
3. **Already applied where relevant.**

- **Indicative BAT - You should where appropriate: 1. Provide hard surfacing in areas where accidental spillage or leakage may occur, e.g. beneath prime movers, pumps, in storage areas, and in handling, loading and unloading areas. The surfacing should be impermeable to process liquors. 2. Drain hard surfacing of areas subject to potential contamination so that potentially contaminated surface run-off does not discharge to ground. 3. Hold stocks of suitable absorbents at appropriate locations for use in mopping up minor leaks and spills, and dispose of to leak-proof containers. 4. Take particular care in areas of inherent sensitivity to groundwater pollution. Poorly maintained drainage systems are known to be the main cause of groundwater contamination and surface/above-ground drains are preferred to facilitate leak detection (and to reduce explosion risks). 5. Additional measures could be justified in locations of particular environmental sensitivity. Decisions on the measures to be taken should take account of the risk to groundwater. 6. Surveys of plant that may continue to contribute to leakage should also be considered, as part of an overall environmental management system. In particular, you should consider undertaking leakage tests and/or integrity surveys to confirm the containment of underground drains and tanks.**
  1. **Already applied where applicable**
  2. **Already applied where applicable**
  3. **SOP in place and weekly stock checks completed**
  4. **All foul sewer water is consumed on site.**
  5. **Process water holding tank installed on site with site expansion and SOP. Routine EHS daily checks carried out by operators on site to maintain all bunds and containment.**
  6. **Annual drainage inspections carried out by external company and full report produced with improvements / repairs where necessary.**
- **Indicative BAT You should where appropriate: 1. Manage the operations to prevent release of odour at all times. 2. Where odour releases are expected to be acknowledged in the permit, (i.e. contained and treated prior to discharge or discharged for atmospheric dispersion): • for existing installations, the releases should be modelled to demonstrate the odour impact at sensitive receptors. The target should be to minimise the frequency of exposure to ground level concentrations that are likely to cause annoyance • for new installations, or for significant changes, the releases should be modelled and it is expected that you will achieve the highest level of protection that is achievable with BAT from the outset • where there is no history of odour problems then modelling may not be required although it should be remembered that there can still be an underlying level of annoyance without complaints being made • where, despite all reasonable steps in the design of the plant, extreme weather or other incidents are liable, in our view, to increase the odour impact at receptors, you should take appropriate and timely action, as agreed with us, to prevent further annoyance (these agreed actions will be defined either in the permit or in an odour management statement). 3. Where odour generating activities take place in the open, or potentially odorous materials are stored outside, a high level of management control and use of best practice will be expected. 4. Where an installation releases odours but has a low environmental impact by virtue of its remoteness from sensitive receptors, it is expected that you will work towards achieving the standards described in this guidance note, but the timescales allowed to achieve this might be adjusted according to the perceived risk. 5. Where further guidance is needed to meet local needs, refer to Horizontal Guidance Note H4 Odour (see GTBR, Annex 1).**

  Odours release is not a topic of current site: no odours are expected to be generated by process

- **Indicative BAT - You should where appropriate: 1. Install particularly noisy machines such as compactors and pelletisers in a noise control booth or encapsulate the noise source. 2. Where possible without compromising safety, fit suitable silencers on safety valves. 3. Minimise the blow-off from boilers and air compressors, for example during start up, and provide silencers.**
  1. **Already applied where relevant.**
  2. **Not possible to provide silencers without impacting the robustness of the safety system.**
  3. **Already applied where applicable. There are no boilers in the plant, noise level for compressors does not exceed 71 dB(A) as per declaration of supplier measured according to ISO 2151; compressors are collocated in a dedicated area to prevent noise spreading.**
- **Indicative BAT - You should where appropriate: 1. Carry out an analysis covering a broad spectrum of substances to establish that all relevant substances have been taken into account when setting the release limits. The need to repeat such a test will depend upon the potential variability in the process and, for example, the potential for contamination of raw materials. Where there is such potential, tests may be appropriate. 2. Monitor more regularly any substances found to be of concern, or any other individual substances to which the local environment may be susceptible and upon which the operations may impact. This would particularly apply to the common pesticides and heavy metals. Using composite samples is the technique most likely to be appropriate where the concentration does not vary excessively. 3. If there are releases of substances that are more difficult to measure and whose capacity for harm is uncertain, particularly when combined with other substances, then "whole effluent toxicity" monitoring techniques can be appropriate to provide direct measurements of harm, for example, direct toxicity assessment.**
  1. **Conduct and reviewed annually as part of aspects & impacts assessment. Raw materials have been the same since 2018.**
  2. **Not applicable, in the plant there is no usage of pesticides and substances that could release heavy metals.**
  3. **Not applicable.**
- **Indicative BAT - You should where appropriate: 1. Monitor and record: • the physical and chemical composition of the waste • its hazard characteristics • handling precautions and substances with which it cannot be mixed.**
  1. **Tested on site weekly by QC analyst and waste transfer notes maintained**
- **Indicative BAT - You should where environmental monitoring is needed: 1. Consider the following in drawing up proposals: • determinands to be monitored, standard reference methods, sampling protocols • monitoring strategy, selection of monitoring points, optimisation of monitoring approach • determination of background levels contributed by other sources • uncertainty for the employed methodologies and the resultant overall uncertainty of measurement • quality assurance (QA) and quality control (QC) protocols, equipment calibration and maintenance, sample storage and chain of custody/audit trail • reporting procedures, data storage, interpretation and review of results, reporting format for the provision of information.**
  1. **Annual emission testing, daily routine checks by plant operators & documented, sampling & waste procedures, data storage on site in paper format and digitally online, QC data collection both paper and digital based. All reviewed annually**
- **Indicative BAT - You should where appropriate: 1. Identify those process variables that may affect the environment and monitor as appropriate.**
  1. **This is managed and maintained locally via PLC for Raw material strength changes, weather conditions are monitored and maintained locally in respect to water management and adverse conditions.**