BAT in the Food, Drink and Milk Industries

General BAT Conclusions

BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all the following features:	
1.1 commitment and leadership of the management, including senior management to the implementation of an effective EMS	*The operator is part of Tulip's group's environmental corporate strategy and operates and EMS in accordance with ISO14001:2015. The Senior Management Team are committed to implementation of the EMS.*
1.2 an environmental policy, developed by management, that includes the continuous improvement of the environmental performance of the installation;	*The operator is part of Tulip's group's environmental corporate strategy and operates and EMS in accordance with ISO14001:2015. A corporate Environmental Policy is in place.*
1.3 a preliminary analysis that includes the determination of the organisation's context, the identification of the needs and expectations of interested parties, the identification of aspects of the installation with a significant impact on the environment, and the (human health) risks associated with such aspects as well as the applicable legal requirements relating to the environment; establishing environmental objectives, and environmental performance indicators, in relation to significant environmental aspects, including on safeguarding compliance with applicable legal requirements;	*Site level organisational context documents in place, as well as site level description of key issues and local stakeholder interests and needs.* *Site Aspects and Impacts Register in place.* *A compliance register tool in place includes ongoing audits of compliance.* *Improvement objectives, targets and KPI's set in line with Group Strategy and going forward with year on year reduction sin energy and water use.*
1.4 planning, and implementing the necessary procedures, and actions (including financial planning and investment) to achieve the (environmental) objectives	*Continuous Improvement programme in place to achieve efficiency targets.*
1.5 determination and provision of the required resources,	*Resourcing is discussed and allocated by the senior management team on the basis of current projects and action plans.*
1.6 structure and responsibility in relation to environmental aspects and objectives;	*Organisation and Responsibilities for the EMS at Tulip Redruth*
1.7 carrying out training and other activities to ensure: staff awareness of the potential environmental impact of their actions and activities, necessary competence and involvement of staff at all levels; definition of internal and external communication processes in relation to environmental aspects;	*Organisation and Responsibilities for the EMS at Tulip Redruth* *Internal and external communications procedures in place.*
1.8 record keeping of relevant documentation and information;	*Mixture of electronic and hard copy records kept on-line and on site.*
1.9 effective operational planning and process control;	*Process Procedures and SOP's for all manufacturing activities*
1.10 implementation of appropriate maintenance programmes;	*Electronic maintenance scheduling and response system*

1.11 paying particular attention to emergency preparedness and response;	*Redruth Emergency Plans*
1.12 when (re)designing a (new) installation or a part thereof, consider the environmental impacts throughout its service life, including from its eventual decommissioning;	*Project Management processes consider environmental impacts through the project life cycle*
1.13 implementation of monitoring and measurement;	*Summary of Environmental Monitoring sets out parameters that are monitored at Redruth including production, raw materials use, packaging use, incidents/spills, energy use, water use, product waste, solid waste, air emissions, effluent.*
1.14 application of sectoral benchmarking, e.g. via the EMAS Sectoral Reference Document on Food and Beverage Manufacturing, on a regular basis;	*Tulip produce annual reports which may allow this.*
1.15 periodic independent (where practicable) internal auditing and periodic, independent external auditing in order to monitor and assess the environmental performance and compliance obligations and to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained;	*The site receives external audits from Group of its EMS. Regular site-based internal audits of the EMS are also carried out.*
1.16 evaluation of causes for nonconformities, implementation of corrective actions in response to nonconformities, review of the effectiveness of corrective actions, and determination of whether similar non-conformities exist or could potentially occur;	*Actions arising from audits or inspections or as a result of incident investigations are recorded and tracked to close out.*
1.17 review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;	*Management Review procedure and process in place as part of the EMS.*
1.18 following and taking into account the development of cleaner techniques.	*Individual department heads responsible for tracking developments in technology in their areas.*
1.19 noise management plan	*There is no history of noise complaints at the site. As part of the EMS the operator has in place all the components of an noise management plan which includes a protocol for actions and timelines in the event of an incident, monitoring and responding to noise incidents, inventory of noise sources, risk assessment and operational controls aimed at preventative maintenance, management, monitoring and inspection of all potential sources.*
1.20 odour management plan	*There is no history of odour complaints at the site. As part of the EMS the operator has in place all the components of an odour management plan which includes a protocol for actions and timelines in the event of an incident, monitoring and responding to odour incidents, inventory of odour sources, risk assessment and operational controls aimed at preventative maintenance, management, monitoring and inspection of all potential sources.*
1.21 inventory of water, energy and raw materials consumption as well as of waste water and waste gas streams	*Summary of Environmental Monitoring sets out parameters that are monitored at Redruth including production, raw materials use, packaging use,*

	incidents/spills, energy use, water use, product waste, solid waste, air emissions, effluent. *All parameters reported electronically to UK group system.*
1.22 energy efficiency plan	*Energy efficiency targets are in place and KPI's tracked to ensure site progress towards climate change agreement targets.*

BAT 2. In order to increase resource efficiency and to reduce emissions , BAT is to establish, maintain and regularly review (including when a significant change occurs) an inventory of water, energy and raw materials consumption as well as of waste water and waste gas streams, as part of the environmental management system (see BAT 1), that incorporates all of the following features:	
2.1 Information about the food, drink and milk production processes, including: (a) simplified process flow sheets that show the origin of the emissions; (b) descriptions of process-integrated techniques and waste water/waste gas treatment techniques to prevent or reduce emissions, including their performance.	*HACCP plans describe the process flow. The main application provides a summary of these as well as the techniques employed in the new plant to minimise wastes and emissions.*
2.2 Information about water consumption and usage (e.g. flow diagrams and water mass balances), and identification of actions to reduce water consumption and waste water volume	*Water consumption is monitored and tracked, and reduction targets are in place.*
2.3 Information about the quantity and characteristics of the waste water streams, such as: (a) average values and variability of flow, pH and temperature; (b) average concentration and load values of relevant pollutants/parameters (e.g. TOC or COD, nitrogen species, phosphorus, chloride, conductivity) and their variability.	*The effluent plant operation is periodically reviewed and process optimised by retained 3rd party specialists. This includes inspection, calibration and analysis of wastewater influent streams including the parameters highlighted.*
2.4 Information about the characteristics of the waste gas streams, such as: (a) average values and variability of flow and temperature; (b) average concentration and load values of relevant pollutants/parameters (e.g. dust, TVOC, CO, NO X , SO X) and their variability; (c) presence of other substances that may affect the waste gas treatment system or plant safety (e.g. oxygen, water vapour, dust).	*Combustion plant emissions have been screened and risk assessed as part of this application.*
2.5 Information about energy consumption and usage, the quantity of raw materials used, as well as the quantity and characteristics of residues generated, and identification of actions for continuous improvement of resource efficiency.	*Energy consumption, raw materials and waste streams are monitored and tracked. The information collected is used to generate recommendations for improvement projects, which will be taken forward for business case/capex where feasible.*
2.6 Identification and implementation of an appropriate monitoring strategy with the aim of increasing resource efficiency, taking into account energy, water and raw materials consumption. Monitoring can include direct measurements,	*As above.*

calculations or recording with an appropriate frequency. The monitoring is broken down at the most appropriate level.	

BAT 3. For relevant emissions to water as identified by the inventory of waste water streams (see BAT 2), BAT is to monitor key process parameters (e.g. continuous monitoring of waste water flow, pH and temperature) at key locations (e.g. at the inlet and/or outlet of the pretreatment, at the inlet to the final treatment, at the point where the emission leaves the installation).	
Flow rate is monitored constantly. Continuous pH monitoring in place. Temperature is not routinely measured.	
BAT 4. BAT is to monitor emissions to water 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.	
Chemical oxygen demand (COD) (daily)	*Period spot samples analysed off site in addition to testing undertaken by South West Water.*
Total nitrogen (TN) (daily)	
Total organic carbon (TOC) (daily)	
Total phosphorus (TP) (daily)	
Total suspended solids (TSS) (daily)	
Biochemical oxygen demand (BOD n) (monthly)	
Chloride (Cl -) (monthly)	

BAT 5. BAT is to monitor channelled emissions to air with at least the frequency given below and in accordance with EN standards.	
Dust (annual)	*N/A Currently no requirement to monitor air emissions.*

BAT 6. In order to increase energy efficiency, BAT is to use energy efficiency plan and an appropriate combination of the common techniques	
6.1 Energy efficiency plan An energy efficiency plan, as part of the environmental management system (see BAT 1), entails defining and calculating the specific energy consumption of the activity (or activities), setting key performance indicators on an annual basis (for example for the specific energy consumption) and planning periodic improvement targets and related actions. The plan is adapted to the specificities of the installation.	*The elements of a plan are in place. The operator measures energy consumption and benchmarks progress against KPI's. Projects identified on an ongoing basis through CI which can contribute to meeting energy efficiency targets.*
6.2 Use of common techniques Common techniques include techniques such as: - burner regulation and control; - cogeneration; - energy efficient motors; - heat recovery with heat exchangers and/or heat pumps (including mechanical vapour recompression);	*Condensate return in place on boilers.* *Boiler blowdown minimised through use of a conductivity probe.* *Compressed air systems are optimised. Leak surveys are carried out and leaks fixed where identified.* *Variable speed drives will be used on pumps and motors.* *Frequency controllers will be used on motors.*

- lighting; - minimising blowdown from the boiler; - optimising steam distribution systems; - preheating feed-water (including the use of economisers); - process control systems; - reducing compressed air system leaks; - reducing heat losses by insulation; - variable speed drives; - multiple-effect evaporation; - use of solar energy.	*Projects identified on an ongoing basis through CI which can contribute to meeting energy efficiency targets.*

BAT 7. In order to reduce water consumption and the volume of waste water discharged, BAT is to use BAT 7.1.1 and one or a combination of the techniques 7.1.2 to 7.2.6 given below.	
7.1 Common Techniques	
7.1.1 Water recycling and/or reuse Recycling and/or reuse of water streams (preceded or not by water treatment), e.g. for cleaning, washing, cooling or for the process itself.	*Water recycling opportunities are review as part of the CI process and have delivered water saving opportunities including cooling water and condensate returns.*
7.1.2 Optimisation of water flow Use of control devices, e.g. photocells, flow valves, thermostatic valves, to automatically adjust the water flow.	*The manufacturing processes are partly automated and controlled by a PLC system. This includes temperatures, flows and levels.*
7.1.3 Optimisation of water nozzles and hoses Use of correct number and position of nozzles; adjustment of water pressure.	*Cleaning water is pressure controlled.* *Hoses with nozzles used for some environmental cleaning.*
7.1.4 Segregation of water streams Water streams that do not need treatment (e.g. uncontaminated cooling water or uncontaminated run-off water) are segregated from waste water that has to undergo treatment, thus enabling uncontaminated water recycling.	*Effluent and surface water drainage are physically segregated minimising the amount of uncontaminated water that is treated on site.*
7.2 Techniques related to cleaning operations	
7.2.1 Dry cleaning Removal of as much residual material as possible from raw materials and equipment before they are cleaned with liquids, e.g. by using compressed air, vacuum systems or catchpots with a mesh cover.	*Teams are trained and asked to operate to 'Clean as you Go' principles to minimise waste to drain and employ dry clean up where possible.* *Tubs/bins are scraped out prior to cleaning.* *Catchpots in place on factory drains to prevent large solids reaching effluent plant.*
7.2.2 Pigging system for pipes Use of a system made of launchers, catchers, compressed air equipment, and a projectile (also referred to as a 'pig', e.g. made of plastic or ice slurry) to clean out pipes. In-line valves are in place to allow the pig to pass through the pipeline system and to separate the product and the rinsing water.	*N/A*
7.2.3 High-pressure cleaning Spraying of water onto the surface to be cleaned at pressures ranging from 15 bar to 150 bar.	*Cleaning water is pressure controlled.*
7.2.4 Optimisation of chemical dosing and water use in cleaning-in-place (CIP)	*N/A*

Optimising the design of CIP and measuring turbidity, conductivity, temperature or pH to dose hot water and chemicals in optimised quantities.	
7.2.5 Low-pressure foam and/or gel cleaning Use of low-pressure foam and/or gel to clean walls, floors and/or equipment surfaces.	*Mobile scrubber unit utilised in curing area all techniques utilised on site*
7.2.6 Optimised design and construction of equipment and process areas The equipment and process areas are designed and constructed in a way that facilitates cleaning. When optimising the design and construction, hygiene requirements are taken into account.	*The development process takes into account the hygiene requirements of the process and ensure efficient cleaning can be facilitated. New equipment installations go through HAZOP and HACCP process to identify any potential issues.*
7.2.7 Cleaning of equipment as soon as possible Cleaning is applied as soon as possible after use of equipment to prevent wastes hardening.	*Teams are trained and asked to operate to 'Clean as you Go' principles to minimise waste to drain and employ dry clean up where possible. Dry clean up equipment is available in all manufacturing areas.*

BAT 8. In order to prevent or reduce the use of harmful substances, e.g. in cleaning and disinfection, BAT is to use one or a combination of the techniques given below.	
8.1 Proper selection of cleaning chemicals and/or disinfectants Avoidance or minimisation of the use of cleaning chemicals and/or disinfectants that are harmful to the aquatic environment, in particular priority substances considered under the Water Framework Directive. When selecting the substances, hygiene and food safety requirements are taken into account.	*Cleaning chemicals appropriate to meet customer and food standards and systems are used, plus other chemicals used for environmental cleaning, water and effluent treatment. See raw materials inventory in main application for a full list of chemicals used.*
8.2 Reuse of cleaning chemicals in cleaning-in-place (CIP) Collection and reuse of cleaning chemicals in CIP. When reusing cleaning chemicals, hygiene and food safety requirements are taken into account.	*N/A-*
8.3 Dry cleaning	*Teams are trained and asked to operate to 'Clean as you Go' principles to minimise waste to drain and employ dry clean up where possible. Dry clean up equipment is available in all manufacturing areas.*
8.4 Optimised design and construction of equipment and process areas	*The process take into account the hygiene requirements and ensure efficient cleaning can be facilitated. New equipment installations go through HAZOP and HACCP process to identify any potential issues.*

BAT 9. In order to increase resource efficiency, BAT is to use one or a combination of the techniques given below.	
9.1 Anaerobic digestion Treatment of biodegradable residues by microorganisms in the absence of oxygen, resulting in biogas and digestate. The biogas is used as a fuel, e.g. in a gas engine or in a boiler. May	*Not on site, but effluent sludge goes to AD off-site.*
9.2 Use of residues Residues are used, e.g. as animal feed.	*Residues are sent of site as ABP in preference to waste.*

9.3 Separation of residues Separation of residues, e.g. using accurately positioned splash protectors, screens, flaps, catchpots, drip trays and troughs.	*All waste streams are separated.*
9.4 Recovery and reuse of residues from the pasteuriser Residues from the pasteuriser are fed back to the blending unit and are thereby reused as raw materials.	*N/A*
9.5 Phosphorus recovery as struvite	*N/A*
9.6 Use of waste water for landspreading After appropriate treatment, waste water is used for landspreading in order to take advantage of the nutrient content and/or to use the water.	*N/A*

BAT 10. In order to prevent uncontrolled emissions to water, BAT is to provide an appropriate buffer storage capacity for waste water.	
10.1 Buffer storage capacity determined by a risk assessment.	*There is sufficient divert capacity on the effluent plant. Effluent is continuously monitored to allow for automatic divert if required.*
10.2 Measures to treat waste water from buffer storage The waste water from this buffer storage is discharged after appropriate measures are taken (e.g. monitoring, treatment, reuse).	*As above – diverted effluent would be fed back through the system for treatment prior to release.*

BAT 11. In order to reduce emissions to water, BAT is to use an appropriate combination of the techniques given below.	
11.1 Preliminary and primary treatment	
11.1.1 Equalisation	*N/A*
11.1.2 Neutralisation	*pH adjustment*
11.1.3 Physical separation, e.g. screens, sieves, grit separators, oil/fat separators, or primary treatment tanks	*DAF plant.*
11.2 Aerobic and/or anaerobic treatment (secondary treatment)	
11.2.1 Aerobic and/or anaerobic treatment (secondary treatment), e.g. activated sludge process, aerobic lagoon, upflow anaerobic sludge blanket (UASB) process, anaerobic contact process, membrane bioreactor.	*Not on site.*
11.3 Nitrogen Removal	
11.3.1 Nitrification and/or denitrification	*N/A*
11.3.2 Partial nitritation – Anaerobic ammonium oxidation	
11.4 Phosphorus recovery and/or removal	
11.4.1 Phosphorus recovery as struvite	*N/A*
11.4.2 Precipitation	*N/A*
11.4.3 Enhanced biological phosphorus removal	*N/A*
11.5 Final solids removal	
11.5.1 Coagulation and flocculation	*DAF plant.*
11.5.2 Sedimentation	*N/A*

11.5.3 Filtration (e.g. sand filtration, microfiltration, ultrafiltration)	*N/A*
11.5.4 Flotation	*N/A*
11.6 BAT-associated emission levels (BAT-AELs) for direct emissions to a receiving water body	
11.6.1 Chemical oxygen demand (COD) (25-100 mg/l)	*Effluent from site discharged to WWTW*
11.6.2 Total suspended solids (TSS) (4-50 mg/l)	
11.6.3 Total nitrogen (TN) (2-20 mg/l)	
11.6.4 Total phosphorus (TP) (0.2-2 mg/l)	

BAT 12. In order to prevent or, where that is not practicable, to reduce noise emissions, BAT is to set up, implement and regularly review a noise management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:	
12.1 a protocol containing actions and timelines;	*Plant or equipment with the potential to create noise is internal or enclosed (e.g. compressors, boilers, all processing equipment).* *Tankers switch off engines while off-loading.* *Facilities for delivery vehicles to plug in during loading of finished product will be provided to minimise noise from vehicle engines at despatch.* *Movement of product on to trailers is via a sealed platform between the trailer and the building which will minimise external noise.*
12.2 a protocol for conducting noise emissions monitoring;	*Noise monitoring is carried out periodically.*
12.3 a protocol for response to identified noise events, e.g. complaints;	*Complaints procedure in place.*
12.4 a noise reduction programme designed to identify the source(s), to measure/estimate	*There is no history of noise complaints at the site from routine production operations. As part of the EMS the operator has in place all the components of an noise management plan which includes a protocol for actions and timelines in the event of an incident, monitoring and responding to noise incidents, inventory of noise sources, risk assessment and operational controls aimed at preventative maintenance, management, monitoring and inspection of all potential sources.*
12.5 noise and vibration exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures.	*Noise and vibration monitored internally as part of occupational H&S.*

BAT 13. In order to prevent or, where that is not practicable, to reduce noise emissions, BAT is to use one or a combination of the techniques given below	
13.1 Appropriate location of equipment and buildings Noise levels can be reduced by increasing the distance between the emitter and the receiver, by using buildings as noise screens and by relocating buildings' exits or entrances.	*Plant or equipment with the potential to create noise is internal or enclosed (e.g. compressors, boilers, all processing equipment).*
13.2 Operational measures These include: i. improved inspection and maintenance of equipment;	*Ongoing PPM system in place.* *Tankers switch off engines while off-loading.* *Facilities for delivery vehicles to plug in during*

ii. closing of doors and windows of enclosed areas, if possible; iii. equipment operation by experienced staff; iv. avoidance of noisy activities at night, if possible; v. provisions for noise control, e.g. during maintenance activities.	*loading of finished product will be provided to minimise noise from vehicle engines at despatch. Movement of product on to trailers is via a sealed platform between the trailer and the building which will minimise external noise.*
13.3 Low-noise equipment This includes low-noise compressors, pumps and fans.	*Considered as part of the design specification for all new equipment*
13.4 Noise control equipment This includes: i. noise reducers; ii. insulation of equipment; iii. enclosure of noisy equipment; iv. soundproofing of buildings.	*The design of any new building and equipment will consider BAT for the control of noise.*
13.5 Noise abatement Inserting obstacles between emitters and receivers (e.g. protection walls, embankments and buildings).	*N/A*

BAT 14. In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:	
14.1 Protocol containing actions and timelines	*Odour has been considered as part of this application and within the EMS. The measures taken to manage and reduce odours, actions to take in the event of odour being identified are explained as part of this application.*
14.2 Protocol for conducting odour monitoring.	*No formal odour monitoring is routinely undertaken*
14.3 Protocol for response to identified odour incidents, e.g. complaints.	*The site has a complaints procedure as part of the EMS .*
14.4 An odour prevention and reduction programme designed to identify the source(s); to measure/estimate odour exposure; to characterise the contributions of the sources; and to implement prevention and/or reduction measures.	*The EMS identifies potential sources, how they are managed and actions to be taken in the event of reportable odour.*