Appendix D BAT Assessment

Yew Tree Dairy PartCo Limited

SLR Project No.: 416.065368.00001

22 October 2024

Revision: FINAL

Making Sustainability Happen

Food, Drink and Milk Industries BRef.

Table D-1 below provides a review of the site operations against each of the BAT conclusions (BATc) within the Food, Drink and Milk Industries BRef.

Note that BAT 16, BAT 19-20, BAT 24-37 are not applicable to the processing and treatment of milk so are not included in the Table below.

Table D-1 Food, Drink and Milk Industries BREF (November 2019) - Assessment of BAT

BATc	Indicative BAT requirement	Measures in place	YTD Compliant with BAT Conclusion?
1	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: i) commitment, leadership, and accountability of the management, including senior management, for the implementation of an effective EMS; (ii) an analysis that includes the determination of the organisation's context, the identification of the needs and expectations of interested parties, the identification of characteristics of the installation that are associated with possible risks for the environment (or human health) as well as of the applicable legal requirements relating to the environment; (iii) development of an environmental policy that includes the continuous improvement of the environmental performance of the installation; (iv) establishing objectives and performance indicators in relation to significant environmental aspects, including safeguarding compliance with applicable legal requirements; (v) planning and implementing the necessary procedures and actions (including corrective and preventive actions where needed), to achieve the environmental objectives and avoid environmental risks;	YTD operate under an in-house EMS which is accredited to the BRCGS Global Food Safety Standard. YTD have confirmed that the aspects in BAT 1 are included in the EMS, which are also subject to the BRCGS auditing process.	Yes

BATc	Indicative BAT requirement	Measures in place	YTD Compliant with BAT Conclusion?
	(vi) determination of structures, roles and responsibilities in relation to environmental aspects and objectives and provision of the financial and human resources needed; (vii) ensuring the necessary competence and awareness of staff whose work may affect the environmental performance of the installation (e.g., by providing information and training); (viii) internal and external communication; (ix) fostering employee involvement in good environmental management practices; (x) Establishing and maintaining a management manual and written procedures to control activities with significant environmental impact as well as relevant records; (xi) effective operational planning and process control; (xii) implementation of appropriate maintenance programmes; (xiii) emergency preparedness and response protocols, including the prevention and/or mitigation of the adverse (environmental) impacts of emergency situations; (xiv) when (re)designing a (new) installation or a part thereof, consideration of its environmental impacts throughout its life, which includes construction, maintenance, operation and decommissioning; (xv) implementation of a monitoring and measurement programme, if necessary, information can be found in the Reference Report on Monitoring of Emissions to Air and Water from IED Installations; (xvi) application of sectoral benchmarking on a regular basis; (xvii) periodic independent (as far as practicable) internal auditing and periodic independent external auditing in order to assess the environmental performance and to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; (xviii) evaluation of causes of nonconformities, implementation of corrective actions in response to nonconformities, review of the		

BATc	Indicative BAT requirement	Measures in place	YTD Compliant with BAT Conclusion?
	effectiveness of corrective actions, and determination of whether similar nonconformities exist or could potentially occur; (xix) periodic review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness; (xx) following and taking into account the development of cleaner techniques. Specifically for the food, drink and milk sector, BAT is to also incorporate the following features in the EMS: (i) noise management plan (see BAT 13); (ii) odour management plan (see BAT 15); (iii) inventory of water, energy and raw materials consumption as well as of wastewater and waste gas streams (see BAT 2); (iv) energy efficiency plan (see BAT 6a)		
2	Establish, maintain and regularly review an inventory of water, energy and raw materials consumption as well as wastewater and waste gas streams as part of the EMS. I. Information about the food, drink and milk production processes, which incorporates all of the following features: (a) simplified process flow sheets that show the origin of the emissions; (b) descriptions of process-integrated techniques and wastewater/waste gas treatment techniques to prevent or reduce emissions, including their performance. II. Information about water consumption and usage (e.g., flow diagrams and water mass balances), and identification of actions to reduce water consumption and wastewater volume (see BAT 7). III. Information about the quantity and characteristics of the wastewater 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.	YTD confirm that the process is controlled by a computerised SCADA system and that inventories of the following are regularly reviewed and monitored: • Water; • Energy; • Raw materials; • Waste water; and • Waste gas. I (a) Process flow diagrams are available for the process. I (b) Descriptions of process-integrated, waste water and waste gas techniques to reduce emissions are available. II. The site collates information on water usage and seeks to reduce waste water volume. III United Utilities and YTD measure the characteristics of the waste water stream.	Yes

BATc	Indicative BAT requirement	Measures in place	YTD Compliant with BAT Conclusion?
	IV. 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, NOX, SOX) 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). V. 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 (see for example BAT 6 and BAT 10). VI. Identification and implementation of an appropriate monitoring strategy with the aim of increasing resource efficiency, considering energy, water and raw materials consumption. Monitoring can include direct measurements, calculations or recording with an appropriate frequency. The monitoring is broken down at the most appropriate level (e.g., at process or plant/installation level).	IV. The characteristics of the waste gas streams from the channelled emission points to air from combustion sources are monitored periodically by an external consultant. The two dust emission points are continuously monitored in real time via the SCADA system. Periodic testing of the emergency kerosene fired generator is carried out and emissions recorded. V. YTD collect data on energy consumption, energy usage, raw material consumption and outputs for the site to assess resource efficiency. VI. YTD monitor emissions to air and water.	
3	For relevant emissions to water as identified by the inventory of wastewater streams (see BAT 2), BAT is to monitor key process parameters (e.g., continuous monitoring of wastewater flow, pH and temperature) at key locations (e.g. at the inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation).	YTD confirm that key process parameters are monitored at appropriate locations. Monitoring of effluent discharged to sewer occurs at point of generation and also point of discharge. Monitoring is controlled and tracked by the SCADA system.	Yes
4	BAT is to monitor emissions to water with at least the frequency given below and in accordance with EN standards. If EN standards	The only substance which is applicable to discharges to sewer is Chloride. The site have	Yes

<table>
<tr><th>BATc</th><th>Indicative BAT requirement</th><th>Measures in place</th><th>YTD Compliant with BAT Conclusion?</th></tr>
<tr><td></td><td>are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th>Substance/parameter</th><th>Standard(s)</th><th>Minimum monitoring frequency (1)</th><th>Monitoring associated with</th></tr>
<tr><td>Chemical oxygen demand (COD) (2) (3)</td><td>No EN standard available</td><td rowspan="5">Once every day (4)</td><td rowspan="6">BAT 12</td></tr>
<tr><td>Total nitrogen (TN) (2)</td><td>Various EN standards available (e.g. EN 12260, EN ISO 11905-1)</td></tr>
<tr><td>Total organic carbon (TOC) (2) (3)</td><td>EN 1484</td></tr>
<tr><td>Total phosphorus (TP) (2)</td><td>Various EN standards available (e.g. EN ISO 6878, EN ISO 15681-1 and -2, EN ISO 11885)</td></tr>
<tr><td>Total suspended solids (TSS) (2)</td><td>EN 872</td></tr>
<tr><td>Biochemical oxygen demand (BOD_n) (2)</td><td>EN 1899-1</td><td>Once every month</td></tr>
<tr><td>Chloride (Cl^-)</td><td>Various EN standards available (e.g. EN ISO 10304-1, EN ISO 15682)</td><td>Once every month</td><td>—</td></tr>
</table>
(1) The monitoring only applies when the substance concerned is identified as relevant in the waste water stream based on the inventory mentioned in BAT 2.
(2) The monitoring only applies in the case of a direct discharge to a receiving water body.
(3) TOC monitoring and COD monitoring are alternatives. TOC monitoring is the preferred option because it does not rely on the use of very toxic compounds.
(4) If the emission levels are proven to be sufficiently stable, a lower monitoring frequency can be adopted but in any case at least once every month.</td><td>confirmed that chloride is not present in discharges to sewer.</td><td></td></tr>
<tr><td>5</td><td>Monitor channelled emissions to air with at least the frequency given below and in accordance with EN standards.</td><td>Dust from the drying process is monitored continuously to ensure that the filter performance is maintained.</td><td>Yes</td></tr>
</table>

<table>
<tr><th>BATc</th><th>Indicative BAT requirement</th><th>Measures in place</th><th>YTD Compliant with BAT Conclusion?</th></tr>
<tr><td></td><td>
<table>
<tr><th>Substance/ Parameter</th><th>Sector</th><th>Specific process</th><th>Standard(s)</th><th>Minimum monitoring frequency (1)</th><th>Monitoring associated with</th></tr>
<tr><td rowspan="6">Dust</td><td rowspan="3">Animal feed</td><td>Drying of green fodder</td><td rowspan="6">EN 13284-1</td><td>Once every three months (2)</td><td>BAT 17</td></tr>
<tr><td>Grinding and pellet cooling in compound feed manufacture</td><td>Once every year</td><td>BAT 17</td></tr>
<tr><td>Extrusion of dry pet food</td><td>Once every year</td><td>BAT 17</td></tr>
<tr><td>Brewing</td><td>Handling and processing of malt and adjuncts</td><td>Once every year</td><td>BAT 20</td></tr>
<tr><td>Dairies</td><td>Drying processes</td><td>Once every year</td><td>BAT 23</td></tr>
<tr><td>Grain milling</td><td>Grain cleaning and milling</td><td>Once every year</td><td>BAT 28</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>6</td><td>Energy efficiency - to improve energy efficiency BAT is to use one or a combination of the techniques as detailed in the BREF:
a) 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.
b) Use of common techniques, such as:
Burner regulation and control;
Cogeneration;
Energy-efficient motors;
Heat recovery with heat exchangers and/or heat pumps (including mechanical vapour recompression);
Lighting;
Minimising blowdown from the boiler;</td><td>6 (a) External contractor Inspired Energy have audited the site in 30th December 2023 in order to apply to the Climate Change Levy (CCL) scheme on behalf of the site.
An energy efficiency plan was prepared as a result of the CCL audit.
(b) YTD undertake the following:
Burner regulation and control;
Use of energy-efficient motors;
Heat recovery with heat exchangers and/or heat pumps;
Use of LED lighting;
Optimising steam distribution systems;
Preheating feed water;
SCADA process control system;
Reducing heat losses by insulation; and</td><td>Yes</td></tr>
</table>

BATc	Indicative BAT requirement	Measures in place	YTD Compliant with BAT Conclusion?
	• 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; and • Use of solar energy.	• Use of variable speed drives.	
7	Reduce water consumption and the volume of wastewater discharged using one or a combination of the techniques as detailed in the BREF. a) Water recycling and/or reuse. b) Optimisation of water flow. c) Optimisation of water nozzles and hoses. d) Segregation of water streams. e) Dry cleaning. f) Pigging system for pipes. g) High-pressure cleaning. h) Optimisation of chemical dosing and water use in cleaning-in-place (CIP). i) Low-pressure foam and/or gel cleaning. J) Optimised design and construction of equipment and process areas. k) Cleaning of equipment as soon as possible.	YTD undertake the following: • Use of a reverse osmosis plant to reuse water. • Optimisation of water flow. • Optimisation of water nozzles and hoses. • Optimisation of chemical dosing and water use in cleaning-in-place (CIP). • Optimised design and construction of equipment and process areas. Floor levels slope to acro drains that flow to sumps which are over pumped to the waste water tank, prior to discharge. • Cleaning of equipment as soon as possible.	Yes
8	Prevent or reduce the use of harmful substances (i.e., cleaning and disinfection) using one or a combination of the techniques as detailed in the BREF: a) Proper selection of cleaning chemicals and/or disinfectants;	YTD undertake the following: • Proper selection of cleaning chemicals and/or disinfectants – food grade chemicals are used; and	Yes

BATc	Indicative BAT requirement	Measures in place	YTD Compliant with BAT Conclusion?
	b) Reuse of cleaning chemicals in cleaning-in-place (CIP); c) Dry cleaning; and d) Optimised design and construction of equipment and process areas.	• Optimised design and construction of equipment and process areas. Floor levels slope to acro drains that flow to sumps which are over pumped to the waste water tank, prior to discharge.	
9	In order to prevent emissions of ozone-depleting substances and of substances with a high global warming potential from cooling and freezing, BAT is to use refrigerants without ozone depletion potential and with a low global warming potential. Suitable refrigerants include water, carbon dioxide or ammonia.	The following F-gases are used for cooling at the site : • 9 x Chiller Units: F407c with a global warming potential (GWP) of 1774; • 6 x Fridge Units: R449A – GWP of 2266; • Air conditioning in offices and electric rooms: R32 – GWP 672. The three F Gases used have zero ozone depleting potential and low global warming potential. The F gases are being phased out and replaced with alternatives. An external contractor manages the cooling systems. The site also uses a water/glycol mix for cooling the milk storage tanks.	Yes
10	To increase resource efficiency BAT is to use one or a combination of the following techniques: a) Anaerobic digestion; b) Use of residues (animal feed); c) Separation of residues; d) Recovery and reuse of residues from the pasteuriser; e) Phosphorus recovery as struvite; and f) Use of wastewater for land spreading.	YTD currently increase resource efficiency by: • Use of milk residues for animal feed; • Separation of residues; and • Recovery and reuse of residues from the pasteuriser.	Yes

<table>
<tr><th>BATc</th><th>Indicative BAT requirement</th><th>Measures in place</th><th>YTD Compliant with BAT Conclusion?</th></tr>
<tr><td>11</td><td>To prevent uncontrolled emissions to water, BAT is to provide an appropriate buffer storage capacity for wastewater.</td><td>The wastewater effluent from the process is stored in one of two wastewater tanks (90,000lt and 40,000lt) prior to discharge.</td><td>Yes</td></tr>
<tr><td>12</td><td>To reduce emissions to water, BAT is to use an appropriate combination of techniques detailed in the BREF.
<table>
<tr><th></th><th>Technique (1)</th><th>Typical pollutants targeted</th><th>Applicability</th></tr>
<tr><td colspan="4">Preliminary, primary and general treatment</td></tr>
<tr><td>a</td><td>Equalisation</td><td>All pollutants</td><td rowspan="3">Generally applicable.</td></tr>
<tr><td>b</td><td>Neutralisation</td><td>Acids, alkalis</td></tr>
<tr><td>c</td><td>Physical separation, e.g. screens, sieves, grit separators, oil/fat separators, or primary settlement tanks</td><td>Gross solids, suspended solids, oil/grease</td></tr>
<tr><td colspan="4">Aerobic and/or anaerobic treatment (secondary treatment)</td></tr>
<tr><td>d</td><td>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</td><td>Biodegradable organic compounds</td><td>Generally applicable.</td></tr>
<tr><td colspan="4">Nitrogen removal</td></tr>
<tr><td>e</td><td>Nitrification and/or denitrification</td><td rowspan="2">Total nitrogen, ammonium/ammonia</td><td>Nitrification may not be applicable in the case of high chloride concentrations (e.g. above 10 g/l). Nitrification may not be applicable when the temperature of the waste water is low (e.g. below 12 °C).</td></tr>
<tr><td>f</td><td>Partial nitritation - Anaerobic ammonium oxidation</td><td>May not be applicable when the temperature of the waste water is low.</td></tr>
<tr><td colspan="4">Phosphorus recovery and/or removal</td></tr>
<tr><td>g</td><td>Phosphorus recovery as struvite</td><td rowspan="3">Total phosphorus</td><td>Only applicable to waste water streams with a high total phosphorus content (e.g. above 50 mg/l) and a significant flow.</td></tr>
<tr><td>h</td><td>Precipitation</td><td rowspan="2">Generally applicable.</td></tr>
<tr><td>i</td><td>Enhanced biological phosphorus removal</td></tr>
<tr><td colspan="4">Final solids removal</td></tr>
<tr><td>j</td><td>Coagulation and flocculation</td><td rowspan="4">Suspended solids</td><td rowspan="4">Generally applicable.</td></tr>
<tr><td>k</td><td>Sedimentation</td></tr>
<tr><td>l</td><td>Filtration (e.g. sand filtration, microfiltration, ultrafiltration)</td></tr>
<tr><td>m</td><td>Flotation</td></tr>
<tr><td colspan="4">(1) The descriptions of the techniques are given in Section 17.14.1.</td></tr>
</table></td><td>YTD undertake physical separation to remove solids, oil and grease from wastewater released to sewer.

There are currently no direct emissions of process or contaminated wastewater to a receiving water body. The BAT-AELs in Table 17.1 do not apply to the releases to sewer.</td><td>Yes</td></tr>
</table>

<table>
<tr><th>BATc</th><th>Indicative BAT requirement</th><th>Measures in place</th><th>YTD Compliant with BAT Conclusion?</th></tr>
<tr><td></td><td>The BAT-associated emission levels (BAT-AELs) for emissions to water given in Table 17.1 apply to direct emissions to a receiving water body. The BAT-AELs apply at the point where the emission leaves the installation.

Table 17.1: BAT-associated emission levels (BAT-AELs) for direct emissions to a receiving water body
<table><tr><th>Parameter</th><th>BAT-AEL (1) (2) (daily average)</th></tr><tr><td>Chemical oxygen demand (COD) (3) (4)</td><td>25–100 mg/l (5)</td></tr><tr><td>Total suspended solids (TSS)</td><td>4–50 mg/l (6)</td></tr><tr><td>Total nitrogen (TN)</td><td>2–20 mg/l (7) (8)</td></tr><tr><td>Total phosphorus (TP)</td><td>0.2–2 mg/l (9)</td></tr></table>(1) The BAT-AELs do not apply to emissions from grain milling, green fodder processing, and the production of dry pet food and compound feed.
(2) The BAT-AELs may not apply to the production of citric acid or yeast.
(3) No BAT-AEL applies for biochemical oxygen demand (BOD). As an indication, the yearly average BOD_5 level in the effluent from a biological waste water treatment plant will generally be ≤ 20 mg/l.
(4) The BAT-AEL for COD may be replaced by a BAT-AEL for TOC. The correlation between COD and TOC is determined on a case-by-case basis. The BAT-AEL for TOC is the preferred option because TOC monitoring does not rely on the use of very toxic compounds.
(5) The upper end of the range is:
- 125 mg/l for dairies;
- 120 mg/l for fruit and vegetable installations;
- 200 mg/l for oilseed processing and vegetable oil refining installations;
- 185 mg/l for starch production installations;
- 155 mg/l for sugar manufacturing installations;
as daily averages only if the abatement efficiency is ≥ 95 % as a yearly average or as an average over the production period.
(6) The lower end of the range is typically achieved when using filtration (e.g. sand filtration, microfiltration, membrane bioreactor), while the upper end of the range is typically achieved when using sedimentation only.
(7) The upper end of the range is 30 mg/l as a daily average only if the abatement efficiency is ≥ 80 % as a yearly average or as an average over the production period.
(8) The BAT-AEL may not apply when the temperature of the waste water is low (e.g. below 12 °C) for prolonged periods.
(9) The upper end of the range is:
- 4 mg/l for dairies and starch installations producing modified and/or hydrolysed starch;
- 5 mg/l for fruit and vegetable installations;
- 10 mg/l for oilseed processing and vegetable oil refining installations carrying out soap-stock splitting;
as daily averages only if the abatement efficiency is ≥ 95 % as a yearly average or as an average over the production period.</td><td></td><td></td></tr>
<tr><td>13</td><td>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:</td><td>The site operates within a large industrial estate. The M58 is located between site and residential receptors located 435m north.

The site has not received any noise complaints since YTD took over the site in 2010. All milk processing occurs indoors.</td><td>Yes</td></tr>
</table>

<table>
<tr><th>BATc</th><th>Indicative BAT requirement</th><th>Measures in place</th><th>YTD Compliant with BAT Conclusion?</th></tr>
<tr><td></td><td>

a protocol containing actions and timelines;
a protocol for conducting noise emissions monitoring;
a protocol for response to identified noise events, e.g. complaints;
a noise reduction programme designed to identify the source(s), to measure/estimate noise and vibration exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures.

BAT 13 is only applicable to cases where a noise nuisance at sensitive receptors is expected and/or has been substantiated.
</td><td>The noise impact assessment (410.065748.00001_NIA) concluded that the noise levels within the assessed area have a minimal impact on residential receptors and that a site-specific Noise Management Plan is not required.</td><td></td></tr>
<tr><td>14</td><td>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.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a</td><td>Appropriate location of equipment and buildings</td><td>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.</td><td>For existing plants, the relocation of equipment and buildings' exits or entrances may not be applicable due to lack of space and/or excessive costs.</td></tr>
<tr><td>b</td><td>Operational measures</td><td>These include:
i. improved inspection and maintenance of equipment;
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.</td><td rowspan="2">Generally applicable.</td></tr>
<tr><td>c</td><td>Low-noise equipment</td><td>This includes low-noise compressors, pumps and fans.</td></tr>
<tr><td>d</td><td>Noise control equipment</td><td>This includes:
i. noise reducers;
ii. insulation of equipment;
iii. enclosure of noisy equipment;
iv. soundproofing of buildings.</td><td>May not be applicable to existing plants due to lack of space.</td></tr>
<tr><td>e</td><td>Noise abatement</td><td>Inserting obstacles between emitters and receivers (e.g. protection walls, embankments and buildings).</td><td>Applicable only to existing plants, as the design of new plants should make this technique unnecessary. For existing plants, the insertion of obstacles may not be applicable due to lack of space.</td></tr>
</table>
</td><td>YTD currently undertake the following noise reduction measures:

Operational:

Inspection and maintenance of equipment;
Closing of doors;
Equipment operation by experienced staff; and
Provisions for noise control, e.g. during maintenance activities.

Low noise equipment including low-noise compressors, pumps and fans.

</td><td>Yes</td></tr>
</table>

<table>
<tr><th>BATc</th><th>Indicative BAT requirement</th><th>Measures in place</th><th>YTD Compliant with BAT Conclusion?</th></tr>
<tr><td>15</td><td>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:
A protocol containing actions and timelines.
A protocol for conducting odour monitoring. It may be complemented by measurement/estimation of odour exposure or estimation of odour impact.
A protocol for response to identified odour incidents, e.g. complaints.
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.
Applicability
BAT 15 is only applicable to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.</td><td>Not applicable as:
All processing occurs indoors.
Solid waste used for pig feed is enclosed in a tank and removed from site once a day.
The site has not received any odour complaints since YTD took over the site in 2010.
No odour outside of the enclosed processing buildings was noted by SLR during the site visit</td><td>Not applicable</td></tr>
<tr><td>17</td><td>Emissions to air
BAT 17. In order to reduce channelled dust emissions to air, BAT is to use one of the techniques given below.<table><tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>a</td><td>Bag filter</td><td rowspan="2">See Section 14.2.</td><td>May not be applicable to the abatement of sticky dust.</td></tr><tr><td>b</td><td>Cyclone</td><td>Generally applicable.</td></tr></table></td><td>Bag filters are used to control particulate emissions from the two release points to air from the drying process.

BAT 17 does not include BAT-AELs for dust that apply to milk production facilities.</td><td>Yes</td></tr>
</table>

<table>
<tr>
<td>21</td>
<td>BAT 21. In order to increase energy efficiency, BAT is to use an appropriate combination of the techniques specified in BAT 6 and of the techniques given below.

<table>
<tr><th colspan="2">Technique</th><th>Description</th></tr>
<tr><td>a</td><td>Partial milk homogenisation</td><td>The cream is homogenised together with a small proportion of skimmed milk. The size of the homogeniser can be significantly reduced, leading to energy savings.</td></tr>
<tr><td>b</td><td>Energy-efficient homogeniser</td><td>The homogeniser's working pressure is reduced through optimised design and thus the associated electrical energy needed to drive the system is also reduced.</td></tr>
<tr><td>c</td><td>Use of continuous pasteurisers</td><td>Flow-through heat exchangers are used (e.g. tubular, plate and frame). The pasteurisation time is much shorter than that of batch systems.</td></tr>
<tr><td>d</td><td>Regenerative heat exchange in pasteurisation</td><td>The incoming milk is preheated by the hot milk leaving the pasteurisation section.</td></tr>
<tr><td>e</td><td>Ultra-high-temperature (UHT) processing of milk without intermediate pasteurisation</td><td>UHT milk is produced in one step from raw milk, thus avoiding the energy needed for pasteurisation.</td></tr>
<tr><td>f</td><td>Multi-stage drying in powder production</td><td>A spray-drying process is used in combination with a downstream dryer, e.g. fluidised bed dryer.</td></tr>
<tr><td>g</td><td>Precooling of ice-water</td><td>When ice-water is used, the returning ice-water is precooled (e.g. with a plate heat exchanger), prior to final cooling in an accumulating ice-water tank with a coil evaporator.</td></tr>
</table>

Table 8
Indicative environmental performance levels for specific energy consumption
<table>
<tr><th>Main product (at least 80 % of the production)</th><th>Unit</th><th>Specific energy consumption (yearly average)</th></tr>
<tr><td>Market milk</td><td rowspan="4">MWh/tonne of raw materials</td><td>0,1-0,6</td></tr>
<tr><td>Cheese</td><td>0,10-0,22 (1)</td></tr>
<tr><td>Powder</td><td>0,2-0,5</td></tr>
<tr><td>Fermented milk</td><td>0,2-1,6</td></tr>
</table>
(1) The specific energy consumption level may not apply when raw materials other than milk are used.</td>
<td>YTD undertake the following:
• Partial milk homogenisation to increase energy efficiency.
• Use of continuous pasteurisers.
• Use of an energy efficient homogeniser.
• Heat exchange in pasteurisation.
• Multi stage drying in powder production.

Energy performance levels for specific energy consumption for market milk and powder (Table 8 of BAT 21):
Market milk & Powder = 99,000MWh (gas & electricity)/730,000 (2,000 tonnes milk per day) = 0.13
*Breakdown of energy per production area not available.

YTD have verbally confirmed that they meet the performance levels for specific wastewater discharge for market milk and powder (Table 9 of BAT 21), given that the reverse osmosis plant has reduced the amount of water discharged to sewer.</td>
<td>Yes</td>
</tr>
</table>

Table 9

Indicative environmental performance levels for specific waste water discharge

Main product (at least 80 % of the production)	Unit	Specific waste water discharge (yearly average)
Market milk	m^3/tonne of raw materials	0,3-3,0
Cheese		0,75-2,5
Powder		1,2-2,7

<table>
<tr><th>BATc</th><th>Indicative BAT requirement</th><th>Measures in place</th><th>YTD Compliant with BAT Conclusion?</th></tr>
<tr><td>BAT 22</td><td>In order to reduce the quantity of waste sent for disposal, BAT is to use one or a combination of the techniques given below.

<table>
<tr><th colspan="2">Technique</th><th>Description</th></tr>
<tr><td colspan="3">Techniques related to the use of centrifuges</td></tr>
<tr><td>a</td><td>Optimised operation of centrifuges</td><td>Operation of centrifuges according to their specifications to minimise the rejection of product.</td></tr>
<tr><td colspan="3">Techniques related to butter production</td></tr>
<tr><td>b</td><td>Rinsing of the cream heater with skimmed milk or water</td><td>Rinsing of the cream heater with skimmed milk or water which is then recovered and reused, before the cleaning operations.</td></tr>
<tr><td colspan="3">Techniques related to ice cream production</td></tr>
<tr><td>c</td><td>Continuous freezing of ice cream</td><td>Continuous freezing of ice cream using optimised start-up procedures and control loops that reduce the frequency of stoppages.</td></tr>
<tr><td colspan="3">Techniques related to cheese production</td></tr>
<tr><td>d</td><td>Minimisation of the generation of acid whey</td><td>Whey from the manufacture of acid-type cheeses (e.g. cottage cheese, quark and mozzarella) is processed as quickly as possible to reduce the formation of lactic acid.</td></tr>
<tr><td>e</td><td>Recovery and use of whey</td><td>Whey is recovered (if necessary using techniques such as evaporation or membrane filtration) and used, e.g. to produce whey powder, demineralised whey powder, whey protein concentrates or lactose. Whey and whey concentrates can also be used as animal feed or as a carbon source in a biogas plant.</td></tr>
</table></td><td>YTD optimise the operation of centrifuges. The rest of the techniques are not applicable to the processing carried out at the site.</td><td>Yes.</td></tr>
<tr><td>23</td><td>In order to reduce channelled dust emissions to air from drying, BAT is to use one or a combination of the techniques given below.</td><td>YTD use bag filters on the two emission points from the drying process. YTD undertake continuous monitoring on the dust emission points.</td><td>Yes</td></tr>
</table>

<table>
<tr><th>BATc</th><th>Indicative BAT requirement</th><th>Measures in place</th><th>YTD Compliant with BAT Conclusion?</th></tr>
<tr><td></td><td>
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a</td><td>Bag filter</td><td rowspan="3">See Section 17.14.2.</td><td>May not be applicable to the abatement of sticky dust.</td></tr>
<tr><td>b</td><td>Cyclone</td><td rowspan="2">Generally applicable.</td></tr>
<tr><td>c</td><td>Wet scrubber</td></tr>
</table>

Table 17.10: BAT-associated emission level (BAT-AEL) for channelled dust emissions to air from drying
<table>
<tr><th>Parameter</th><th>Unit</th><th>BAT-AEL
(average over the sampling period)</th></tr>
<tr><td>Dust</td><td>mg/Nm^3</td><td>< 2–10 (1)</td></tr>
<tr><td colspan="3">(1) The upper end of the range is 20 mg/Nm^3 for drying of demineralised whey powder, casein and lactose.</td></tr>
</table>

The associated monitoring is given in BAT 5.
</td><td>YTD have indicated that they will meet the BAT AEL (2-10 mg/Nm^3) presented in Table 10.</td><td></td></tr>
</table>

Energy Efficiency BRef.

Table D-2 below provides a review of the site operations against each of the BAT conclusions (BATc) within the Energy Efficiency BRef.

Table D-2 Energy Efficiency BREF (February 2009) - Assessment of BAT

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
1	BAT is to implement an Energy Management System (ENEMS) that incorporates, as appropriate to the local circumstances, all of the following features (see Section 2.1. The letters (a), (b), etc. below, correspond those in Section 2.1): a. Commitment of top management (commitment of the top management is regarded as a precondition for the successful application of energy efficiency management). b. Definition of an energy efficiency policy for the installation by top management. c. Planning and establishing objectives and targets (see BAT 2, 3 and 8). d. Implementation and operation of procedures paying particular attention to: i) Structure and responsibility. ii) Training, awareness and competence (see BAT 13). iii) Communication. iv) Employee involvement. v) Documentation. vi) Effective control of processes (see BAT 14). vii) Maintenance (see BAT 15). viii) Emergency preparedness and response. ix) Safeguarding compliance with energy efficiency-related legislation and agreements (where such agreements exist). e. Benchmarking: the identification and assessment of energy efficiency indicators over time (see BAT 8), and the systematic and regular comparisons with sector, national or regional benchmarks for energy efficiency, where verified data are available (see Sections 2.1(e), 2.16 and BAT 9).	YTD do not have a formalised energy management system, currently. An energy efficiency audit was undertaken by contractor Inspired Energy in 2023 to assist with applying to the Climate Change Levy (CCL) scheme. YTD undertake energy efficient activities such as a move to more sustainable packaging, but these activities are not formally tracked. YTD to formalise an Energy Management System in accordance with BAT 1 prior to issue of the environmental permit.	Yes

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
	f. Checking performance and taking corrective action paying particular attention to: i) Monitoring and measurement (see BAT 16). ii) Corrective and preventive action. iii) maintenance of records. iv) independent (where practicable) internal auditing in order to determine whether or not the energy efficiency management system conforms to planned arrangements and has been properly implemented and maintained (see BAT 4 and 5) g. review of the ENEMS and its continuing suitability, adequacy and effectiveness by top management. For (h) and (i), see further features on an energy efficiency statement and external verification, below when designing a new unit, taking into account the environmental impact from the eventual decommissioning of the unit. development of energy-efficient technologies, and to follow developments in energy efficiency techniques. The ENEMS may be achieved by ensuring these elements form part of existing management systems (such as an EMS) or by implementing a separate energy efficiency management system. Three further features are considered as supporting measures. Although these features have advantages, systems without them can be BAT. These three additional steps are: • (see Section 2.1(h)) preparation and publication (and possibly external validation) of a regular energy efficiency statement describing all the significant environmental aspects of the installation, allowing for year-by-year comparison against environmental objectives and targets as well as with sector benchmarks as appropriate. • (see Section 2.1(i)) having the management system and audit procedure examined and validated by an accredited certification body or an external ENEMS verifier.		

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
	• (see Section 2.1, Applicability, 2) implementation and adherence to a nationally or internationally accepted voluntary system such as: o DS2403, IS 393, SS627750, VDI Richtlinie No. 46, etc. (when including energy efficiency management in an EMS) EMAS and o EN ISO 14001:1996. This voluntary step could give higher credibility to the ENEMS. However, non-standardised systems can be equally effective provided that they are properly designed and implemented.		
2	BAT is to continuously minimise the environmental impact of an installation by planning actions and investments on an integrated basis and for the short, medium and long term, considering the cost-benefits and cross-media effects.	YTD have undertaken site-wide actions to minimise environmental impact periodically (e.g. LED light bulbs and introduction of variable speed drives). However, these actions are not formalised and recorded within a continuous improvement plan currently. Formalised procedure for minimising environmental impact to be put in place prior to the issue of the environmental permit.	Yes .
3	BAT is to identify the aspects of an installation that influence energy efficiency by carrying out an audit. It is important that an audit is coherent with a systems approach (see BAT 7).	An energy efficiency audit was undertaken by contractor Inspired Energy in 2023 to assist with applying to the Climate Change Levy (CCL) scheme.	Yes
4	When carrying out an audit, ensure that the audit identifies the following aspects: • Energy use and type and its component systems and processes; • Energy-using equipment and type and quantity of energy used in the installation; • Possibilities to minimise energy use;	YTD will ensure that audits follow the requirements of BAT 4 are followed during energy audits.	Yes

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
	• Possibilities to use alternative sources or use of energy that is more efficient; • Possibility to apply energy surplus to other processes; and • Possibilities to upgrade heat quality.		
5	BAT is to use appropriate tools or methodologies to assist with identifying and quantifying energy optimisation such as: • Energy models, databases and balances; • A technique such as pinch methodology exergy or enthalpy analysis or thermo-economics; or • Estimates and calculations.	YTD to include appropriate quantifying measures in a site energy management system in accordance with BAT 5 prior to issue of the environmental permit.	Yes
6	BAT is to identify opportunities to optimise energy recovery within the installation, between systems within the installation and/or with a third party.	Whilst YTD undertake activities to optimise energy recovery within the site, this is not formally planned or recorded. YTD to formalise procedure of optimising energy recovery prior to issue of the environmental permit.	Yes
7	BAT is to optimise energy efficiency by taking a systems approach to energy management. Systems to be considered for optimising as a whole are, for example: • Process units; • Heating systems such as steam and hot water; • Cooling and vacuum; • Motor driven systems such as compressed air and pumping; • Lighting; or • Drying, separation and concentration.	The following activities are optimised as a whole onsite: • Heat exchange systems on the steam generators interacting with other areas of the process. • A vacuum is used in the evaporative process. • The whole site comprises LED lighting. • Drying, separation and concentration.	Yes
8	Establish energy efficiency indicators by carrying out all of the following:	YTD has begun the process to measure energy use at individual processes on site.	Yes

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
	• Identifying suitable energy efficiency indicators for the installation, and where necessary individual processes, systems, units and measure change over time; • Identifying and recording appropriate boundaries associated with the indicators; and • Identifying and recording factors that can cause variance in energy efficiency of the process, system, units.	However, this technology has not yet been deployed. YTD will establish energy efficient indicators prior to the issue of the environmental permit.	
9	BAT is to carry out comparisons with sector, national or regional benchmarks, where validated data are available.	Benchmarking is undertaken as part of the CCL scheme.	Yes
10	BAT is to optimise energy efficiency when planning a new installation, unit or system or significant upgrade by considering: a. The energy-efficient design (EED) should be initiated at the early stages of the conceptual design/basic design phase, even though the planned investments may not be well-defined. b. The EED should also be taken into account in the tendering process b. the development and/or selection of energy-efficient technologies (see Sections 2.1(k) and 2.3.1). c. Additional data collection may need to be carried out as part of the design project or separately to supplement existing data or fill gaps in knowledge. d. The EED work should be carried out by an energy expert. e. The initial mapping of energy consumption should also address which parties in the project organisations influence the future energy consumption and should optimise the energy efficiency design of the future plant with them. For example, the staff in the (existing) installation who may be responsible for specifying design parameters.	YTD optimise energy efficiency when planning or upgrading a unit or system.	Yes
11	Seek to optimise the use of energy between more than one process or system with the installation or with a third party.	YTD use heat exchangers to distribute heat from steam generators and also the evaporative process to integrate the	Yes

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
		cooling and heating requirements for the site as a whole.	
12	Maintain the impetus of the energy efficiency programme by using a variety of techniques such as: • Implementing specific energy efficiency measures; • Accounting for energy usage based on real (metered) values; • Creation of financial profit centres for energy efficiency; • Benchmarking; • Fresh look at existing management systems; and • Using change management techniques.	YTD implement specific energy saving measures (i.e., LED lighting, use of heat exchangers and variable speed drives).	Yes
13	Maintain expertise in energy efficiency and energy using systems by using: • Skilled staff; • Training staff offline periodically; • Sharing in-house resources between sites; • Use of appropriately skilled consultants; and • Outsourcing specialist systems and/or functions.	YTD maintain expertise in energy efficiency and energy using systems by using: • Using experienced staff who are periodically trained. • Using appropriately skilled consultants (i.e., Inspired Energy); and • Outsourcing specialist systems and/or functions (i.e., management of F Gases chilling and cooling systems).	Yes
14	Ensure that the effective control of processes is implemented by techniques such as: • Having systems in place to ensure that procedures are known, understood and complied with; • Ensuring that the key performance parameters (KPIs) are identified, optimised for energy efficiency and monitored; and	YTD use the SCADA computerised system to control processes. Procedures are in place to outline management of the process. YTS will have KPIs for energy efficiency in place prior to the environmental permit being issued.	Yes

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
	• Documenting or recording these parameters.		
15	BAT is to carry out maintenance at installations to optimise energy efficiency by applying all of the following: • Clearly allocating responsibility for the planning and execution of maintenance; • Establishing a structured programme for maintenance based on technical descriptions of the equipment, norms, etc. as well as any equipment failures and consequences; • Supporting the maintenance programme by appropriate record keeping systems and diagnostic testing; • Identifying from routine maintenance, breakdowns and/or abnormalities possible losses in energy efficiency, or where energy efficiency could be improved; and • Identifying leaks, broken equipment, worn bearings, etc. that affect or control energy usage, and rectifying them at the earliest opportunity.	YTD meet BAT 15 by implementing a planned preventative maintenance (PPM) programme.	Yes
16	Establish and maintain documented procedures to monitor on a regular basis key characteristics of operations and activities that can have a significant impact on energy efficiency.	YTD has begun the process to measure energy use at individual processes on site. However, this technology has not yet been deployed. YTD to prepare procedures on monitoring energy efficiency prior to issue of the environmental permit.	Yes
17	BAT is to optimise the energy efficiency of combustion by relevant techniques such as: • those specific to sectors given in vertical BREFs. those given below (See Table 4.1 of the BRef). • Lignite pre-drying • Coal gasification	The heat exchangers in the evaporative process are optimised by: • Advanced computerised control of combustion conditions; • Pre heating of combustion air; • Regenerative burners; • Burner regulation and control; and	Yes

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
	• Fuel drying. • Biomass gasification • Bark Pressing • Expansion turbine to recover the energy content of pressurised gases. • Cogeneration • Advanced computerised control of combustion conditions for emission reduction and boiler performance • Use of the heat content of the flue-gas for district heating • Low excess air. • Lowering of exhaust gas temperatures. • Low CO concentration in the flue-gas. • Heat accumulation. • Cooling tower Discharge. • Different techniques for the cooling system. • Preheating of fuel gas by using waste heat. • Preheating of combustion air. • Recuperative and regenerative burners. • Burner regulation and control. • Fuel choice. • Oxy firing (oxyfuel). • Reducing heat losses by insulation. • Reducing losses through furnace doors. • Fluidised bed Combustion.	• Use of insulation. The generator is for emergency use only and is run for testing less than 50 hours per year.	
18	BAT for steam systems is to optimise the energy efficiency by using techniques such as:	YTD undertake the following with regards to the steam generators:	Yes

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
	• those specific to sectors given in vertical BREFs. • those given in Table 4.2	• Use of energy-efficient design and installation of steam distribution pipework; • The feed is preheated; • Scale deposits are removed; • Pipes are insulated; and • Condensate is collected and returned for re-use.	

Techniques for sectors and associated activities where steam systems are not covered by a vertical BREF		
Techniques in the ENE BREF		
	Benefits	*Section in this document*
DESIGN		
Energy-efficient design and installation of steam distribution pipework	Optimises energy savings	2.3
Throttling devices and the use of backpressure turbines: utilise backpressure turbines instead of PRVs	Provides a more efficient method of reducing steam pressure for low-pressure services. Applicable when size and economics justify the use of a turbine	
OPERATING AND CONTROL		
Improve operating procedures and boiler controls	Optimises energy savings	3.2.4
Use sequential boiler controls (apply only to sites with more than one boiler)	Optimises energy savings	3.2.4
Install flue-gas isolation dampers (applicable only to sites with more than one boiler)	Optimises energy savings	3.2.4
GENERATION		
Preheat feed-water by using: • waste heat, e.g. from a process • economisers using combustion air • deaerated feed-water to heat condensate • condensing the steam used for stripping and heating the feed water to the deaerator via a heat exchanger	Recovers available heat from exhaust gases and transfers it back into the system by preheating feed-water	3.2.5 3.1.1
Prevention and removal of scale deposits on heat transfer surfaces. (Clean boiler heat transfer surfaces)	Promotes effective heat transfer from the combustion gases to the steam	3.2.6
Minimise boiler blowdown by improving water treatment. Install automatic total dissolved solids control	Reduces the amount of total dissolved solids in the boiler water, which allows less blowdown and therefore less energy loss	3.2.7
Add/restore boiler refractory	Reduces heat loss from the boiler and restores boiler efficiency	3.1.7 2.9
Optimise deaerator vent rate	Minimises avoidable loss of steam	3.2.8
Minimise boiler short cycling losses	Optimises energy savings	3.2.9
Carrying out boiler maintenance		2.9
DISTRIBUTION		
Optimise steam distribution systems (especially to cover the issues below)		2.9 and 3.2.10
Isolate steam from unused lines	Minimises avoidable loss of steam and reduces energy loss from piping and equipment surfaces	3.2.10
Insulation on steam pipes and condensate return pipes. (Ensure that steam system piping, valves, fittings and vessels are well insulated)	Reduces energy loss from piping and equipment surfaces	3.2.11 and 3.2.11.1
Implement a control and repair programme for steam traps	Reduces passage of live steam into the condensate system and promotes efficient operation of end-use heat transfer equipment. Minimises avoidable loss of steam	3.2.12
RECOVERY		

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
19	BAT is to maintain the efficiency of heat exchangers by both: • monitoring the efficiency periodically, and • preventing/removing fouling.	Heat exchangers are monitored by the SCADA system and PPM is undertaken to prevent fouling.	Yes
20	BAT is to seek possibilities for cogeneration inside or outside the Installation (with a third party).	Currently co-generation is being investigated as part of longer-term plans for the site.	Yes
21	BAT is to increase the power factor according to the requirements of the local electricity distributor by using techniques such as: • Installing capacitors in the AC circuits to decrease the magnitude of reactive power; • Minimising the operation of idling or lightly loaded motors; • Avoiding the operation of equipment above its rated voltage; and • When replacing motors, using energy efficient motors.	YTD use variable speed drives where possible instead of motors. The site uses power factor correction.	Yes
22	BAT is to check the power supply for harmonics and apply filters if required.	YTD do not apply this technique as it is considered to be outdated.	Not applicable
23	BAT is to optimise the power supply efficiency by using techniques such as: • Ensure power cables have the correct dimensions for the power demand. • Keep online transformer(s) operating at a load above 40 - 50 % of the rated power. • Use high efficiency/low loss transformers. Place equipment with a high current demand as close as possible to the power source (e.g., transformer).	YTD ensure that power cables have the correct dimensions for demand. The transformer is located adjacent to the southwest corner of the process building. A high efficiency transformer is used.	Yes
24	BAT is to optimise electric motors as per requirements outlined in the BREF.	YTD use more efficient variable speed drives to optimise efficiency.	Yes
25	BAT is to optimise compressed air systems using the techniques such as those in Table 4.6, according to applicability.	Compressed air systems are maintained by a specialist contractor.	Yes

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?

Technique	Applicability	Section in this document
SYSTEM DESIGN, INSTALLATION or REFURBISHMENT		
Overall system design, including multi-pressure systems	New or significant upgrade	3.7.1
Upgrade compressor	New or significant upgrade	3.7.1
Improve cooling, drying and filtering	This does not include more frequent filter replacement (see below)	3.7.1
Reduce frictional pressure losses (for example by increasing pipe diameter)	New or significant upgrade	3.7.1
Improvement of drives (high-efficiency motors)	Most cost effective in small (<10 kW) systems	3.7.2, 3.7.3, 3.6.4
Improvement of drives (speed control)	Applicable to variable load systems. In multi-machine installations, only one machine should be fitted with a variable speed drive	3.7.2
Use of sophisticated control systems		3.7.4
Recover waste heat for use in other functions	Note that the gain is in terms of energy, not of electricity consumption, since electricity is converted to useful heat	3.7.5
Use external cool air as intake	Where access exists	3.7.8
Storage of compressed air near highly-fluctuating uses	All cases	3.7.10
SYSTEM OPERATION and MAINTENANCE		
Optimise certain end use devices	All cases	3.7.1
Reduce air leaks	All cases. Largest potential gain	3.7.6
More frequent filter replacement	Review in all cases	3.7.7
Optimise working pressure	All cases	3.7.9

Table 4.6: Compressed air system techniques to improve energy efficiency

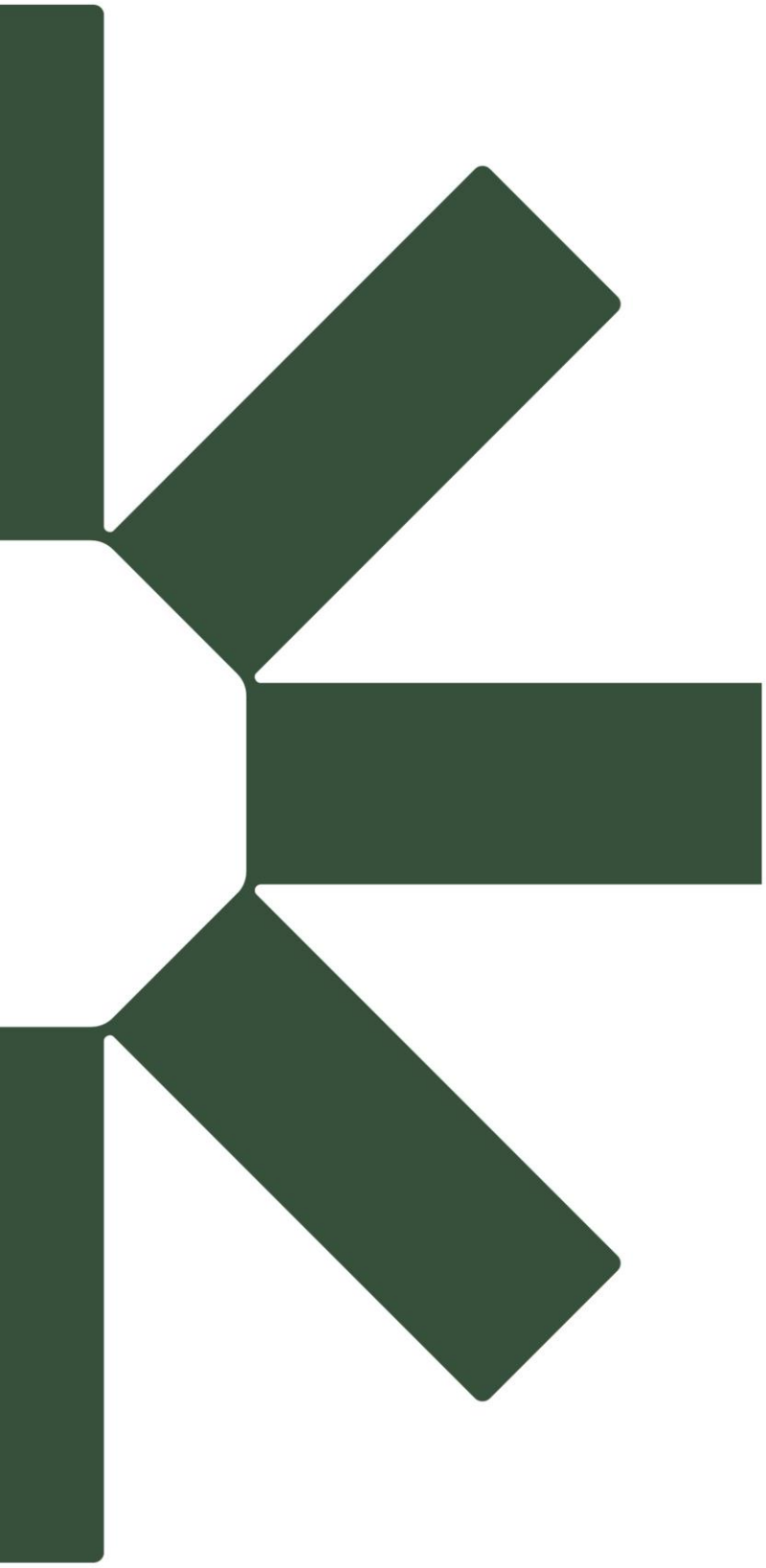
<table>
<tr><th>BAT C.</th><th>Indicative BAT requirement</th><th>Compliance Level</th><th>YTD Compliant with BAT Conclusion?</th></tr>
<tr><td>26</td><td>BAT is to optimise pumping systems by using the techniques in Table 4.7, according to applicability.
<table>
<tr><th>Technique</th><th>Applicability</th><th>Section in this document</th></tr>
<tr><td colspan="3">SYSTEM DESIGN, INSTALLATION or REFURBISHMENT</td></tr>
<tr><td>Overall system design, including multi-pressure systems</td><td>New or significant upgrade</td><td>3.7.1</td></tr>
<tr><td>Upgrade compressor</td><td>New or significant upgrade</td><td>3.7.1</td></tr>
<tr><td>Improve cooling, drying and filtering</td><td>This does not include more frequent filter replacement (see below)</td><td>3.7.1</td></tr>
<tr><td>Reduce frictional pressure losses (for example by increasing pipe diameter)</td><td>New or significant upgrade</td><td>3.7.1</td></tr>
<tr><td>Improvement of drives (high-efficiency motors)</td><td>Most cost effective in small (<10 kW) systems</td><td>3.7.2, 3.7.3, 3.6.4</td></tr>
<tr><td>Improvement of drives (speed control)</td><td>Applicable to variable load systems. In multi-machine installations, only one machine should be fitted with a variable speed drive</td><td>3.7.2</td></tr>
<tr><td>Use of sophisticated control systems</td><td></td><td>3.7.4</td></tr>
<tr><td>Recover waste heat for use in other functions</td><td>Note that the gain is in terms of energy, not of electricity consumption, since electricity is converted to useful heat</td><td>3.7.5</td></tr>
<tr><td>Use external cool air as intake</td><td>Where access exists</td><td>3.7.8</td></tr>
<tr><td>Storage of compressed air near highly-fluctuating uses</td><td>All cases</td><td>3.7.10</td></tr>
<tr><td colspan="3">SYSTEM OPERATION and MAINTENANCE</td></tr>
<tr><td>Optimise certain end use devices</td><td>All cases</td><td>3.7.1</td></tr>
<tr><td>Reduce air leaks</td><td>All cases. Largest potential gain</td><td>3.7.6</td></tr>
<tr><td>More frequent filter replacement</td><td>Review in all cases</td><td>3.7.7</td></tr>
<tr><td>Optimise working pressure</td><td>All cases</td><td>3.7.9</td></tr>
</table>
Table 4.6: Compressed air system techniques to improve energy efficiency</td><td>YTD match the pump to the correct duty.
YTD undertake PPM on the pumps located onsite and use variable speed drives.</td><td>Yes</td></tr>
</table>

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?
27	BAT is to optimise heating, ventilation and air conditioning systems by using techniques such as: • for ventilation, space heating and cooling, techniques in Table 4.8 according to applicability • for heating, see Sections 3.2 and 3.3.1, and BAT 18 and 19 • for pumping, see Section 3.8 and BAT 26 • for cooling, chilling and heat exchangers, see the ICS BREF, as well as Section 3.3 and BAT 19 (in this document).	Air conditioning systems are only used in the office and electric rooms. Automatic controls are used on these systems, along with high efficiency fans, the system is subject to PPM by a specialist contractor.	Yes
28	BAT is to optimise artificial lighting systems by using the techniques such as those in Table 4.9 according to applicability.	The site has adopted LED lighting.	Yes
29	BAT is to optimise drying, separation and concentration processes by using techniques such as those in Table 4.10 according to applicability, and to seek opportunities to use mechanical separation in conjunction with thermal processes:	YTD manages the drying process by: • Selecting the optimum separation technology to meet the specific process requirements. • Using mechanical processes (filters). • Using heat recovery. • Optimising insulation of the system.	Yes

BAT C.	Indicative BAT requirement	Compliance Level	YTD Compliant with BAT Conclusion?

Technique	Applicability	Additional information	Section in this document
DESIGN			
Select the optimum separation technology or combination of techniques (below) to meet the specific process equipments	All cases		3.11.1
OPERATION			
Use of surplus heat from other processes	Depends on the availability of surplus heat in the installation (or from third party)	Drying is a good use for surplus heat	3.11.1
Use a combination of techniques	Consider in all cases	May have production benefits, e.g. improved product quality, increased throughput	3.11.1
Mechanical processes, e.g. filtration, membrane filtration	Process dependent. To achieve high dryness at lowest energy consumption, consider these in combination with other techniques	Energy consumption can be several orders of magnitude lower, but will not achieve high % dryness	3.11.2
Thermal processes, e.g. • directly heated dryers • indirectly heated dryers • multiple effect	Widely used, but efficiency can be improved by considering other options in this table	Convective (direct) heat dryers may be the option with the lowest energy efficiency	3.11.3 3.11.3.1 3.11.3.2 3.11.3.3 3.11.3.6
Direct drying	See thermal and radiant techniques, and superheated steam	Convective (direct) heat dryers may be the option with the lowest energy efficiency	3.11.3.2
Superheated steam	Any direct dryers can be retrofitted with superheated steam. High cost, needs lifetime cost benefit assessment. High temperature may damage product	Heat can be recovered from this process	3.11.3.4
Heat recovery (including MVR and heat pumps)	Consider for almost any continuous hot air convective dryers		3.11.1 3.11.3.5 3.11.3.6
Optimise insulation of the drying system	Consider for all systems. Can be retrofitted		3.11.3.7
Radiation processes e.g. • infrared (IR) • high frequency (HF) • microwave (MW)	Can be easily retrofitted. Direct application of energy to component to be dried. They are compact and Reduce the need for air extraction. IR limited by substrate dimensions. High cost, needs lifetime cost benefit assessment	More efficient heating. Can boost production throughput coupled with convection or conduction	3.11.4
CONTROL			
Process automation in thermal drying processes	All cases	Savings of between 5 and 10 % can be achieved compared with using traditional empirical controllers	3.11.5

Table 4.10: Drying, separation and concentration system techniques to improve energy efficiency



Making Sustainability Happen