**C3.6a and C3.6b Energy Efficiency and Changes in Energy Use**

The main energy sources used at the Cranswick Sutton Fields site are electricity and natural gas. The majority of mobile plant (ie. forklift trucks) is electrically driven with some plant operating outside buildings using LPG as described in Section B3.3c, Raw Materials, of the permit variation application. The usage rate for LPG is also provided in supporting documents B3.3c and B3.6d as a raw material. Cranswick purchase all electricity from suppliers using renewable source fuels.

The site has entered into a Climate Change Agreement (CCA reference BMPA/F00182) and as such must report annually on its energy use and implement measures to improve energy efficiency.

Annual energy (electricity, natural gas and LPG) use at the site over the period 2015 to 2019 inclusive, together with total energy and primary energy equivalent, tonnes of CO2 equivalent, energy used per tonne of product generated (kWh/tonne) and CO2 generated per tonne of product generated (kg/te) in each of those years is shown in the tables below. The final row in each of the tables shows pro-rata energy use figures calculated at the current process capacity of 35,000 tonnes per year.

**Energy Use**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **Electricity (MWh)** | **Natural Gas (MWh)** | **LPG**  **(MWh)** | **Total Actual Energy (MWh)** | **Total Primary Energy Equivalent (MWh)** |
| 2015 | 11542 | 8477 | 151 | 20170 | 38637 |
| 2016 | 12958 | 8928 | 182 | 22068 | 42801 |
| 2017 | 14059 | 9801 | 207 | 24067 | 46561 |
| 2018 | 13199 | 8655 | 195 | 22049 | 43167 |
| 2019 | 13349 | 9928 | 208 | 23485 | 44843 |
| Projected at current maximum capacity of 35,000 te/yr | 15050 | 11193 | 234 | 26477 | 50557 |

Notes to table :

1. Factor 2.6 used to convert grid electricity supplied to primary energy.

**Carbon Dioxide Equivalent, Specific total energy use and specific CO2 generation**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Actual Total Energy Used (MWh)** | **Total Primary Energy Equivalent (MWh)** | **CO2 equivalent (tonnes)** | **Actual Energy used / unit product (kWh/te)** | **Primary Energy used / unit product (kWh/te)** | **CO2 generated / unit product (kg / te)** |
| 2015 | 20170 | 38637 | 7603 | 898.2 | 1720.6 | 338.6 |
| 2016 | 22068 | 42801 | 8429 | 815.0 | 1580.7 | 311.3 |
| 2017 | 24067 | 46561 | 9168 | 774.0 | 1509.3 | 297.2 |
| 2018 | 22049 | 43167 | 8507 | 750.4 | 1481.5 | 292.0 |
| 2019 | 23485 | 44843 | 8823 | 756.5 | 1444.5 | 284.2 |
| Projected at current maximum capacity of 35,000 te/yr | 26477 | 50557 | 9947 | 756.5 | 1444.5 | 284.2 |

Notes to table :

1. Conversion factor grid electricity MWh primary energy to tonnes CO2 = 0.200
2. Conversion factor natural gas MWh primary energy to tonnes CO2 = 0.185
3. Conversion factor LPG MWh primary energy to tonnes CO2 = 0.215
4. Product generated in years 2015 to 2019 = 22455, 27078, 30850, 29137 and 31045 tonnes respectively

As can be seen from the table, total energy used at the site over the period 2015 to 2019 has remained fairly constant with fluctuations being mainly attributable to process throughput. However, the total energy used per unit throughput and hence similarly the quantity of CO2 generated per unit throughput has decreased significantly during the same period. The reduction has been achieved primarily by the training and education of staff on site in the need to maintain focus on following good operating practices and observing simple energy efficient working practices such as shutting off equipment, lighting etc when not in use. Improvements have also been achieved by the introduction of more energy efficient equipment such as LED lighting, fitting single switch shut off controls on plant to facilitate rapid shutdown at break times etc and where appropriate fitting timers on plant so that it switches off automatically when not required.

Once the development is commissioned and assuming that the site is running at the absolute maximum design capacity of 260 te/day or 91,000 te/year equivalent, energy consumption in the form of electricity, gas and LPG is expected to be as shown in the table below. The table shows the total projected electricity, gas and LPG use (MWh as actual energy use and primary energy equivalent), CO2 equivalent (tonnes), energy used per unit throughput (kWh/tonne product generated, actual and primary energy use) and CO2 generated per unit product generated (kg/te). The energy use levels are projected based on manufacturers data for plant and equipment to be installed at the facility and data taken from current operations adjusted to take into account the increased scale of production activities.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Projected Maximum Annual Actual Energy Use (MWh)** | **Projected Maximum Annual Primary Energy Use (MWh)** | **Projected CO2 equivalent (tonnes)** | **Projected actual energy use / unit product (kWh/te)** | **Projected primary energy use / unit product (kWh/te)** | **Projected CO2 generated / unit product (kg / te)** |
| **Electricity** | 30000 | 78000 | 15600 | 329.7 | 857.1 | 171.4 |
| **Gas** | 38943 | 38943 | 7204 | 427.9 | 427.9 | 79.2 |
| **LPG** | 486 | 486 | 104 | 5.3 | 5.3 | 1.1 |
| **Total** | 69429 | 117429 | 22908 | 762.9 | 1290.3 | 251.7 |

Notes to table:

1. Projected gas consumption based on 3.6 MWh steam boiler, 2.9MWh thermal oil heater operating for 350 days (8400 hours) each at an average 50% loading rate.
2. Projected electricity use based on production upscaling ratio of 1.6 but using high energy efficiency plant, equipment, infrastructure and process design giving over 30% electrical energy savings compared with existing plant.
3. Projected LPG use based on projected consumption of 35 tonnes @ 13.89kWh/kg equivalent.
4. Projected maximum total product generation rate taken as 91,000 te/year

It can be seen from the tables that both current and projected energy use falls towards the lower end of the BAT benchmark range (0.25 – 2.6 MWh/te) specified in the European Food and Drink BREF document.

The main energy efficiency measures implemented at the existing facility and/or to be implemented as part of the facility extension are summarised below. In addition, the site is working towards certification under the ISO 50001 Standard.

Further information relating to energy efficiency and other BAT criteria is provided in Section B3.3a (Operating Techniques and Technical Standards) of the permit variation application.

* Energy use at the facility is tracked as part of the site’s continuous improvement programme. To assist in identifying further energy saving opportunities electricity sub-metering is installed to provide usage data for specific equipment / processing areas.
* Electric drive motors on installed plant and equipment are energy efficient with variable speed drives used on larger drive motors (generally those > 7.5kW) which operate for periods of time on part load duty.
* Energy efficient LED lighting used throughout the newly installed facility including within buildings and outdoors and being introduced to existing areas as opportunities arise or as replacement of existing equipment becomes necessary. Where appropriate lights are controlled by passive infrared detectors.
* Access to refrigerated areas controlled with alarmed and automatically closing doors.
* Heat recovered from the refrigeration plant to provide office heating and to pre-heat boiler feed water.
* Heat recovery air handling units capable of recovering more than 60% of the heat in exhaust air from offices.
* Local plant control / single switch shutdown facilities are provided to facilitate plant shutdown and avoid plant running unnecessarily during break periods.

Consideration is also being given to:

* Installing gas fired combined heat and power plant.