# Application for Variation of Permit BN6137IK, Davidstow Creamery

## Supporting Information: The Medium Combustion Plant Directive (MCPD): Derating of Existing Biomass Boilers

**Non-Technical Summary**

Dairy Crest Ltd trading as Saputo Dairy UK (SDUK) operates the Davidstow Creamery under an Environmental Permit issued by the Environment Agency (EA).

Davidstow Creamery (the site) comprises the Creamery which receives milk from supplying farms in the South West to produce primarily cheddar cheese and demineralised whey powder. The Creamery is supported by a Water Processing Facility (WPF) that receives process water from the Creamery which it treats to a high standard for reuse in the Creamery and discharge to the local River Inny.

Creamery operations require heat which is produced as steam in five boilers; two of which are fuelled with biomass wood pellets and three are fuelled with kerosene.

The proposed change described in this application concerns only the boilers. No changes are proposed for the Creamery or WPF.

The Medium Combustion Plant Directive (MCPD) introduces new emission limit values (ELVs) for point source emissions to air brought into force by the Environmental Permitting (England and Wales) Regulations 2016, as amended. The new MCP ELVs comprise oxides of nitrogen, oxides of sulphur and particulate matter, sometimes referred to as dust.

The size of the MCP and when it was put into operation determines the deadline when changes to emission limits take place with MCPs with a thermal input of greater than 5 MWth having to comply from 1st January 2025 and MCPs with a thermal input greater than 1 MWth but less than 5 MWth from 1st January 2030.

This variation application proposes to change the kerosene boilers at the site to more effective alternatives (change to each of kerosene boiler burners to reduce emissions) and to limit the thermal input of the biomass boilers to delay the ELV compliance deadline from January 2025 to January 2030.

SDUK is in the process of finalising its plans to change its operations in response to climate change. Greenhouse gas emissions have already been significantly reduced and further changes are being planned to reduce energy use and to move to low or no carbon types of energy.

The change proposed by this application is intended to provide additional time to allow changes to energy use and fuels to take place in order to achieve further large reductions in greenhouse gas emissions at the site.

## 1. Background and Introduction

### 1.1 Overview of the Davidstow Creamery Installation

The Davidstow Creamery Installation is operated by Dairy Crest Ltd trading as Saputo Dairy UK (SDUK) under Environmental Permit BN6137IK.

In summary the Installation comprises:

- A Creamery which receives milk from farms in the South West of the UK and produces cheddar cheese, demineralised whey powder and a prebiotic called Galacto oligosaccharide (GOS) made from lactose power supplied by others.

  Creamery operations are supported by various utility operations including five steam raising boilers, two of which are fuelled with biomass wood pellets and three boilers are fuelled with kerosene.

- A Water Processing Facility (WPF) which receives process water from the Creamery which it treats to a high standard consistent with EA advocated Best Available Techniques (BAT) before discharging a proportion of the treated water to the River Inny. A significant proportion of the treated water is returned to the Creamery for reuse in order to reduce freshwater imports from the environment.

This variation application considers only the steam raising boilers.

The 'listed activities' covered by EPR/BN6137IK version 9 are summarised in Table 1 below.

**Table 1 – Listed Activities in EPR/BN6137IK v9 Schedule 1 Table S1.1**

| EPR Schedule 1 Reference | Activity | Description |
|---|---|---|
| Section 6.8 Part A(1)(e) | Treating and processing milk, the quantity of milk received being more than 200 tonnes per day (average value on an annual basis) | Creamery operations |
| Section 6.8 Part A(1)(d)(i): | Treating and processing materials intended for the production of food products from animal raw materials (other than milk) at a plant with a finished product production capacity of more than 75 tonnes per day | |
| Section 5.4 Part A(1)(a)(i): | Disposal of non-hazardous waste in a facility with a capacity exceeding 50 tonnes per day by biological treatment | Water Processing Facility |
| **Section 5.1 Part A(1)(b): Note 2** | **The incineration of non-hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 3 tonnes per hour Note 4** | **Facility to use waste wood pellets Note 2 with EWCs 03 01 05 and 15 01 03 Note 3 as fuel in the biomass boilers** |
| **Directly Associated Activities Note 1** | **Three oil-fired boilers of thermal input 11.5 MW, 10.5 MW and 10.5 MW Note 1** | Receipt of fuels to emission of combustion gases |
| | Waste storage and disposal | Receipt of raw materials and the disposal of waste products |

Note 1 - Subject to this variation application

Note 2 – Only virgin wood pellets (as opposed to waste wood) are currently used as a fuel for the biomass boilers

Note 3 – The listed EWCs are understood to be exempt from the Waste Incineration Directive under Annex 2(2)

Note 4 – Biomass fuel feed rate does not exceed 3 tonnes per hour per boiler or in aggregate

## 1.2 Regulatory Context

The Medium Combustion Plant Directive (MCPD) introduces new Emission Limit Values (ELVs) for combustion plant with a rated net thermal input of greater than 1 MW thermal (MWth) and less than 50 MWth.

Specifically for Davidstow, the MCPD introduces different ELVs for emissions of oxides of nitrogen ($NO_x$), sulphur dioxide ($SO_2$) and Particulate Matter (PM) also referred to as dust.

Prior testing of emissions from the kerosene (gas oil) boilers (consistent with the requirements of Permit EPR/BN6137IK/000V9) has shown them to be compliant with current ELVs and future MCPD $SO_2$ and PM limits. However emissions of $NO_x$ have been close to, and have at times, exceeded the forthcoming new limit for $NO_x$.

Prior testing of emissions from the biomass boilers has shown them to be compliant with current ELVs and future MCPD $NO_x$ and $SO_2$ limits however emissions of PM exceed the forthcoming MCPD ELV.

The timing of implementation of the MCPD depends on whether an MCP is new or existing and its thermal capacity. The size of each of the existing boilers installed at the Davidstow Creamery, their current designated Release Point and the applicable timing of MCPD are shown in Table 2 below.

**Table 2 - Current 'Existing' Combustion Plant at Davidstow Creamery**

| Boiler | Fuel | Designated Release Point under BN6137IK | Net Thermal Input | Applicable timing of ELVs under the MCPD |
|---|---|---|---|---|
| S1 | Kerosene | A1 | 11.5 | 1st January 2025 |
| S2 | Kerosene | A2 | 10.5 | 1st January 2025 |
| S3 | Kerosene | A7 | 10.5 | 1st January 2025 |
| **N4** | **Biomass** | **A8** | **6.2** | **1st January 2025** Note 1 |
| **N5** | **Biomass** | **A9** | **6.2** | **1st January 2025** Note 1 |
| Note 1 - Subject to this variation application | | | | |

The proposed changes outlined below are required to ensure that all MCPs at the site are able to meet the relevant ELVs. The proposed changes alter the compliance dates for boilers N4 and N5 listed in Table 2. Please refer to Section 2 and Table 3 for further information.

### 1.3 Climate Change Context and Rationale for the Proposed Change

SDUK's parent company Saputo Inc. has committed to, and is now in the process of, setting Science Based Targets to reduce both its operational Greenhouse Gas (GHG) emissions, commonly referred to Scope 1 (fuels used on site) and 2 (imported energy notably electricity use) as well as its wider supply chain or Scope 3 emissions.

SDUK has already achieved significant decarbonisation of its operations. Of relevance to the Davidstow Creamery are:

- Investment in energy efficiency measures to reduce energy use in line with BAT,
- Investment in biomass wood pellet fuelled boilers which supply around 70% of the heating requirements of the Creamery,
- Investment in a 5 MWp solar facility which supplies around 13% of electricity demand, and
- Switching the supply of imported electricity to certified renewables rated as zero carbon.

As part of its commitment to mitigating the effects of and adapting to Climate Change, SDUK is in the process of assessing additional opportunities to further reduce its operational GHG emissions. We have set an ambition to reduce the GHG intensity of our UK operations (of which Davidstow is the most significant) by 90% by 2030 versus a 2017 baseline.

For each of our UK manufacturing facilities we have undertaken a detailed review of further decarbonisation opportunities. For the Davidstow Creamery, this has included a review opportunities to utilise:

- additional energy efficiency measures such as recovery of waste heat from powder drying operations to reduce fuel input to steam generating boilers,
- additional on-site and nearby renewable electricity generation,
- the use of low/ zero carbon rated fuels such as hydrogen and Hydrotreated Vegetable Oil (HVO), and
- electrification of heating requirements to reduce steam heat demand hence fuel input to the steam generating boilers.

The waste heat recovery and electrification projects noted above have been entered as Industrial Energy Transformation Fund grant applications in early 2024 (currently awaiting government determination).

The current principal fuel, biomass wood pellets, are rated zero carbon and have proven effective in reducing Scope 1 emissions by circa 14,000 tonnes $CO_2e$ per year. However recent and forthcoming changes to regional and UK energy infrastructure may present more environmentally and cost-effective means of long-term decarbonisation.

The proposed changes described below effectively defers the MCPD compliance date for the biomass boilers by 5 years. The additional time enabled by this deferral will provide SDUK with sufficient time to further develop and finalise its long-term decarbonisation strategy for the Davidstow Creamery in light of known developments in technology and regional and UK energy infrastructure.

### 1.4 Other 'Live' Permit Variations

The Davidstow Creamery currently operates under version 9 of Permit BN6137IK which came in to effect on 10th November 2020.

Separate to this application for variation, three other variations are currently being considered by the EA:

- Operator initiated variation submitted by Dairy Crest Ltd in May 2022 which proposes a number of changes to the Creamery and WPF operations,
- Regulator initiated variation relating to changes to ELVs for the discharge of treated water to the River Inny referred to as Release Point W2, and
- Regulator initiated variation to implement the requirements of the BAT Reference Document for the Food, Drink and Milk sector commonly referred to as the FDM BREF.

### 1.5 Other Relevant Permits and Licenses

Dairy Crest Ltd operates the Davidstow Creamery under GHG Permit UK-E-IN-13300 effective from 25th January 2023 as part of the UK Emissions Trading Scheme (UK ETS).

Separate to this application to vary the Environmental Permit, an application to vary the GHG Permit will be submitted via the web based Manage your Emissions Trading Scheme reporting (METS) system before the end of 2024.

## 2. Proposed Changes

### 2.1 Overview

During 2024 efficient, low emission, multi fuelled burners have been installed in each of the three kerosene fuelled boilers to ensure compliance with the MCPD ELVs. Following installation of each burner emissions testing is being conducted to evidence compliance with MCPD limits. Initial results (albeit not yet tested to MCERTS standards) show NOx levels of 160-180 mg/Nm$^3$ i.e. compliant with the relevant ELV defined by the MCPD shown in Table 4 below.

Changes to the kerosene boiler burners:

- Reduce of emissions of combustion gases,
- Do not introduce any new, or entail any changes to the heights or locations of Release Points, and
- Entail costs that are significantly lower than 50% of the cost of a new comparable MCP.

This application also considers permanent changes to (i.e. reduction of) the net rated thermal input to below 5 MWth for the two biomass fuelled boilers N4 and N5, with associated change to the date of MCPD compliance ELVs coming into effect as shown in Table 3 below. Proposed ELVs are summarised in Table 4.

**Table 3 – Proposed Changes to Combustion Plant at Davidstow Creamery**

| **Boiler** | **Fuel** | **Designated Release Point under BN6137IK** | **Net Thermal Input** | **Applicable timing of ELVs under the MCPD** |
|---|---|---|---|---|
| S1 | Kerosene | A1 | 11.5 | Upon installation |
| S2 | Kerosene | A2 | 10.5 | Upon installation |
| S3 | Kerosene | A7 | 10.5 | Upon installation |
| **N4** | **Biomass** | **A8** | **4.9** | **1st January 2030** |
| **N5** | **Biomass** | **A9** | **4.9** | **1st January 2030** |

**Table 4 – Proposed Changes to ELVs as specified in Schedule 3 Table S3.1 of BN6137IK v9**

| **Release Point** | **Current ELV** mg/Nm$^3$ | | **Rational for Revised ELV** | **Proposed ELV** mg/Nm$^3$ |
|---|---|---|---|---|
| A1 | $NO_x$ | 1,000 | MCPD limits for new, gas oil fired MCP other than engines and gas turbines | 200 |
| | PM | 100 | | - |
| | $SO_2$ | 1,000 | | - |
| A2 | $NO_x$ | 1,000 | | 200 |
| | PM | 200 | | - |
| | $SO_2$ | 1,000 | | - |
| A7 | $NO_x$ | 1,000 | | 200 |
| | PM | 200 | | - |
| | $SO_2$ | 1,000 | | - |
| A8 | $NO_x$ | 1,000 | As per existing ELVs for boilers fuelled with biomass | 1,000 |
| | PM | 200 | | 200 |

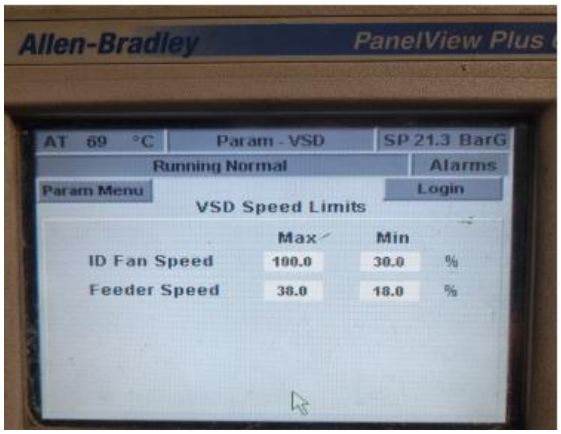
| | | | | |
|---|---|---|---|---|
| | $SO_2$ | 300 | with a net rated thermal input of <5 MWth. | - Note 1 |
| A9 | $NO_x$ | 1,000 | | 1,000 |
| | PM | 200 | | 200 |
| | $SO_2$ | 300 | | - Note 1 |
| Note 1 – MCPD Annex 2, Part 1, Tables 1 and 2 state that the $SO_2$ limit of 300 mg/$Nm^3$ "does not apply in the case of plants firing exclusively woody solid biomass" | | | | |

## 2.2 Description of the Proposed Change

The net rated thermal input of steam raising boilers N1 and N2 fuelled with biomass wood pellets will be reduced from 6.2 MWth to less than 5 MWth with a resultant MCPD compliance date of 1st January 2030.

The boiler net thermal input capacity will be reduced through changes to the wood pellet feed rate.

Currently, the pellet feed rate can be set through manual changes on the Allen Bradley SCADA boiler control system via changes to the pellet feed motor speed as shown in the image of the control screen shown below. The proposed change will restrict the maximum wood pellet feed rate to a feed rate consistent with a thermal input of less than 5 MWth.



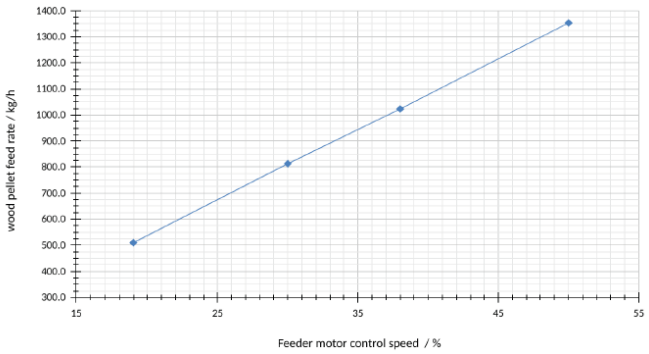

The maximum set point for the pellet feed rate will be restricted via the SCADA software system with any future change only being accessed via an administrator password. The SCADA has three levels of password-controlled access i.e. operator, engineer and administrator. A change to the pellet feed rate can only be accessed at administrator level and this password will only be assigned to the SDUK Senior Vice President Supply Chain (who has no day to day responsibility for operation of the Davidstow Installation) and not to the company operating the boilers on SDUK's behalf (Veolia).

## 2.3 Evidencing the Effectiveness of the Change in Restricting Net Thermal Input Capacity

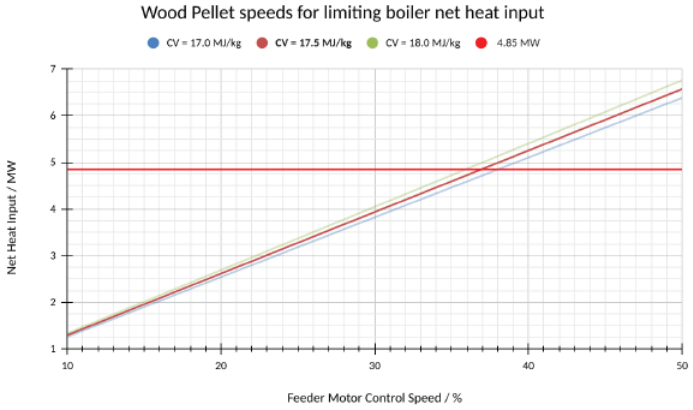
Boiler trials were conducted in May 2024 by Veolia on SDUK's behalf to assess the relationship between wood pellet feed motor speed and net rated thermal input capacity.

The trials evaluated:

- various pellet feed motor speeds and the associated wood pellet feed delivery mass rate as shown below




- the Calorific Value (CV) of the fuel used during the trial and multiple, similar wood pellet fuels received at Davidstow to assess variability in order to convert pellet feed mass rate to MW thermal input as shown below

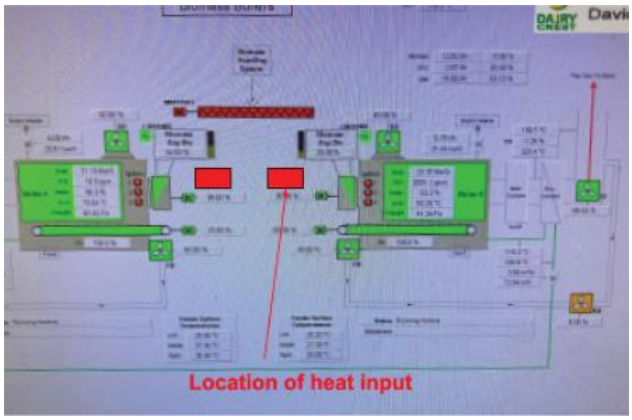



The boiler trials concluded that, in order to ensure that the net heat input is <5 MWth, the feeder speed must be below 37% equivalent to 4.85 MWth.

The trial report is provided as **Appendix A1.**

## 2.4 Evidencing the Permanence of the Proposed Change in Restricting Net Thermal Input Capacity

This net heat input will be displayed on the remote SCADA screens in the area of the control screen shown in the image below. The heat input data will also be exported into the Veolia eSight system with data being retained consistent with condition 4.1.1(d) of Permit BN6137IK v9 and can be made available to the EA and other external auditors to demonstrate that the heat input has not been greater than 5 MWth.




## 2.5 Effect of the Proposed Change on Emissions to Air via Release Points A8 and A9

The derated biomass boiler trials carried out in May 2024 described above (also see Appendix A1) included measurement of emissions to air undertaken by an appropriately certified contractor (Anchem). The trials were conducted on Boiler 5 and are representative of both Boiler 4 and Boiler 5 as their designs are identical.

The results are summarised below and indicate that only one of the three tests (Test 2) showed compliance with the current ELV for Particulate Matter of 200 mg/Nm$^3$. However, there is a known issue with a deficiency of the grit arrestor particulate abatement system for Boiler 5 as noted in the trial report. The EA have previously been notified of this issue via a Schedule 5 notification reference '02-2024'.

Repairs to the grit arrestor are underway and similar historic repairs to defective grit arrestors have demonstrated an approx. two fold reduction in Particulate Matter emissions concentration. SDUK is therefore confident of achieving the current ELVs for Boilers 4 and 5 under the revised mode of operation with derated biomass boilers.

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| Particulate matter / mg/Nm3 | 208.65 | 196.07 | 209.82 |
| Measurement Uncertainty / mg/m3 | 7.90 | 7.05 | 7.74 |
| Flue gas flowrate / m3/h | 6715 | 6274 | 6797 |
| Oxygen / % dry | 10.8 | 10.7 | 10.2 |
| Carbon monoxide / mg/Nm$^3$ | Approx 400 | Approx 500 | Approx 1200 |
| Oxides of nitrogen / mg/Nm$^3$ | 195 to 229 | | |

## 2.6 Effect of the Proposed Change on Greenhouse Gas Emissions

Reducing the maximum thermal input of the two biomass boilers by approx. 1.3 MWth (2.6 MWth for both boilers) will increase demand on the three kerosene boilers by an approximately equivalent amount in order to satisfy the head demands of Creamery operations.

This is expected to increase kerosene fuel use by approximately 30% with resultant increase in GHG emissions.

The inclusion of flue gas recirculation on all three kerosene boilers as part of the burner upgrade to return heat to the combustion chamber will benefit efficiency and lower fuel consumption hence in part offsetting some of the increase in kerosene use. The new kerosene boiler burners are multi fuel and 'future proof' to potentially accommodate alternate low/no carbon fuels such as those described in Section 1.3

It should be noted that SDUK's energy/ GHG strategy includes changes to heating of the powder dryer including recovery of waste heat and electrification of part of the dryer as described in Section 1.3. The combined effect of these two projects is to reduce the heat demand from the steam raising boilers by circa 2 MWth effectively reducing much of the emissions described above.

Derating the biomass boilers also enables alternate fuels and technologies to be progressed with the aim of significantly reducing or eliminating the use of kerosene which would reduce Scope 1 GHG emissions by up to 8,000 – 9,000 tonnes $CO_2e$ per year.

## 3. Implications of Proposed Changes to Permit Conditions

Table 5 considers the wider effects of the proposed change relative to each condition of EPR/BN6137IK version 9.

**Table 5 – Implications of Proposed Changes to Permit Conditions**

| **Permit Condition** | | **Implications of Changes Proposed in this Application** |
|---|---|---|
| 1.1 | General Management | None. The kerosene and biomass boilers will continue to form part of Davidstow's ISO14001:2015 certified management system as shown in Certificate of Approval reference ISO 14001 – 0043770 which expires 23rd February 2026 |
| 1.2 | Energy Efficiency | Changes proposed by this application affect the mix of fuels used at the Installation (as described in Section 2.6) but will not materially affect the kWh/tonne finished products<br>The inclusion of flue gas recirculation on all three kerosene boilers as part of the burner upgrade will return heat to the combustion chamber and will benefit efficiency hence lower fuel consumption |
| 1.3 | Efficient Use of Raw Materials | No new materials are being introduced as part of this proposed change. Existing infrastructure for the receipt and handling of solid and liquid fuels is adequate to accommodate the changes proposed in this variation application. |
| 1.4 | Avoidance, recovery and disposal of wastes produced by the activities | No additional wastes will be created as part of this proposed change |
| 3.1 | Monitoring of Emissions to water, air or land | No changes to monitoring locations, methods or frequency are proposed |
| 3.2 | Emissions of substances not controlled by emission limits | Changes described herein are covered by the MCPD and associated ELVs |
| 3.3 | Monitoring | No changes are proposed to monitoring requirements defined in Table S3.1 of existing Permit BN6137IK version 9 |
| 3.4 | Odour | The proposed change has no effect on the odour emissions profile of the installation |
| 3.5 | Noise and Vibration | The proposed change has no effect on noise emissions |
| 3.6 | Pests | Not applicable |
| 4.1 | Records | No changes are proposed to record keeping, reporting or notification |
| 4.2 | Reporting | |
| 4.3 | Notifications | |
| Schedule 3 – Emissions and Monitoring | | Changes to ELVs for emissions to air are summarised in Section 2.1 Table 4 above and are consistent with the requirements of the MCPD |

## Appendix A1 - Veolia Biomass Boiler Derating Trial Report