

Technical Note:
Dairy Partners (Cymru
Wales Ltd) Odour Review

December 2021



Experts in air quality
management & assessment

Document Control

Client	Dairy Partners (Cymru Wales) Ltd	Principal Contact	Andrew Jones
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Report Prepared By:	Paul Outen and Adam Dawson
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Air Quality Consultants Ltd
23 Coldharbour Road, Bristol BS6 7JT Tel: 0117 974 1086
119 Marylebone Road, London NW1 5PU Tel: 020 3873 4780
aqc@aqconsultants.co.uk

Registered Office: 23 Coldharbour Road, Bristol BS6 7JT
 Companies House Registration No: 2814570

Executive Summary

Dairy Partners (Cymru Wales) Ltd mozzarella production facility in Newcastle Emlyn, Carmarthenshire, have been receiving ongoing odour complaints from local residents.

Two visits to the site were undertaken by Air Quality Consultants to recommend, then assess, the effectiveness of a range of best practice odour mitigation measures. During the first visit, a number of odours were detected onsite and at nearby receptors. Odour mitigation to the sludge export tanker, DAF tanks, sludge tanks and decommissioned tanks was therefore recommended.

During the second visit following the installation of odour control units, and implementation of other operational measures to reduce odour emissions, a lower odour intensity was noted when compared to the previous visit, and no odour was detected at nearby receptors.

Contents

1	Introduction	3
2	Odour Review	5
3	Suggested Next Steps.....	11
4	Odour Control Measures Implemented and Resurvey	13
5	Summary.....	16
6	Appendices	17
A1	Professional Experience.....	18
A2	Onsite Odour Mitigation.....	19

1 Introduction

- 1.1 This technical note sets out the findings of a site odour review of the Dairy Partners (Cymru Wales) Ltd mozzarella production facility in Newcastle Emlyn, Carmarthenshire. The facility produces approximately 360 tonnes of mozzarella per week and contains its own effluent treatment plant (ETP) to treat wastewater from the production process prior to discharge off site. In 2020 the ETP was replaced with newer technology; however, recently the facility has been subject to regular complaints relating to odours from the plant from two nearby residential properties.
- 1.2 It is understood that the facility's environmental permit variation application, retrospectively required to support the operation of the new ETP, has been refused by Natural Resources Wales (NRW) due to, in part, the ongoing odour complaints received from local residents.
- 1.3 The odour review involved a visit to the facility on 20th July 2021 to determine the likely source(s) of the alleged nuisance odours, and to identify if the ETP is being operated in accordance with the Best Available Techniques (BAT) for the minimisation and control of odour emissions. A subsequent visit was undertaken on the 18th November 2021 to investigate the impact additional odour control techniques have had on the site's odour generation.
- 1.4 This technical note has been produced by AQC's specialist odour practitioners (the professional experience of the consultants who completed this assessment are summarised in A1) and draws upon information provided in the following documents:
- European Commission. *Best Available Techniques (BAT) Reference Document for the Food, Drink and Milk Industries. Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control)*. 2019; and
 - European Commission. *Integrated Pollution Prevention and Control Reference Document on Best Available Techniques for the Waste Treatments Industries*. 2006.
- 1.5 The location of the ETP within the wider facility boundary, and the locations of two residential properties from which complaints are regularly received, are shown in Figure 1.

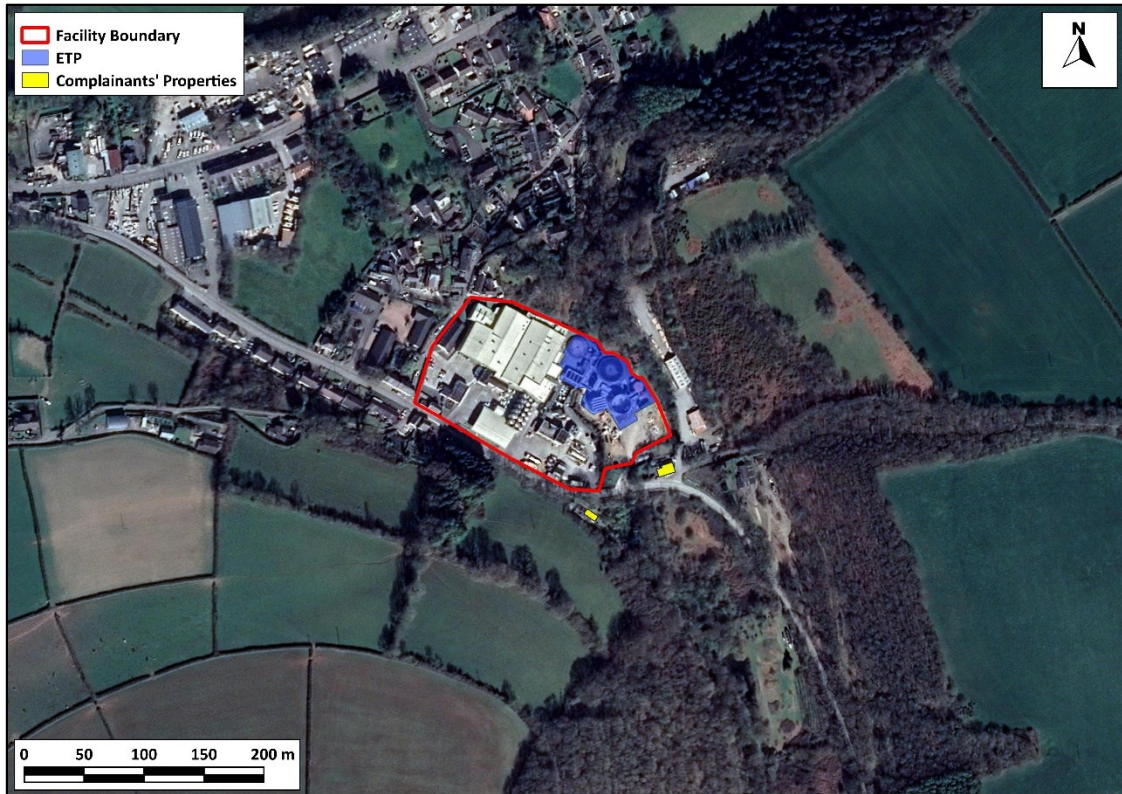


Figure 1: Location of ETP and Complainants

Imagery ©2021 Google.

2 Odour Review

Process Description

- 2.1 The ETP operates continuously and is thus a continuous source of potential malodours.
- 2.2 Effluent from the cheese manufacturing process is channelled from the facility via an open crude pit to a large, covered, circular balance tank. The effluent is then pumped into the DAF1 tank (DAF: Dissolved Air Flotation) which diffuses air through the effluent causing the suspended solids to rise to the surface, which are then skimmed off the liquid's surface and pumped away from the tank to the sludge tanks.
- 2.3 The DAF-treated effluent is then conveyed to a large, open aeration tank where the liquid is aerated allowing remaining solids to settle on the bottom of the tank. These solids are then conveyed to the two sludge tanks.
- 2.4 The treated liquid from the aeration tank is then conveyed to the DAF2 tank for further treatment, with the floated solids again skimmed from the surface and pumped to the sludge tanks.
- 2.5 The treated, clean effluent is then conveyed to the treated effluent tank prior to discharge to the watercourse.
- 2.6 Sludge is removed from the sludge tanks by road tanker approximately three times per week, with each tanker removing up to 26 m³ of sludge over a period of approximately 25 minutes per filling event. As the tanker fills, the displaced air from inside the tanker is discharged to the atmosphere via an extract valve on the base of the vehicle.
- 2.7 Dairy waste (i.e., not effluent to be treated by the ETP) is conveyed to an open sludge pit for storage; it is removed from this pit periodically by road tanker.
- 2.8 The layout of the ETP is shown in Figure 2.

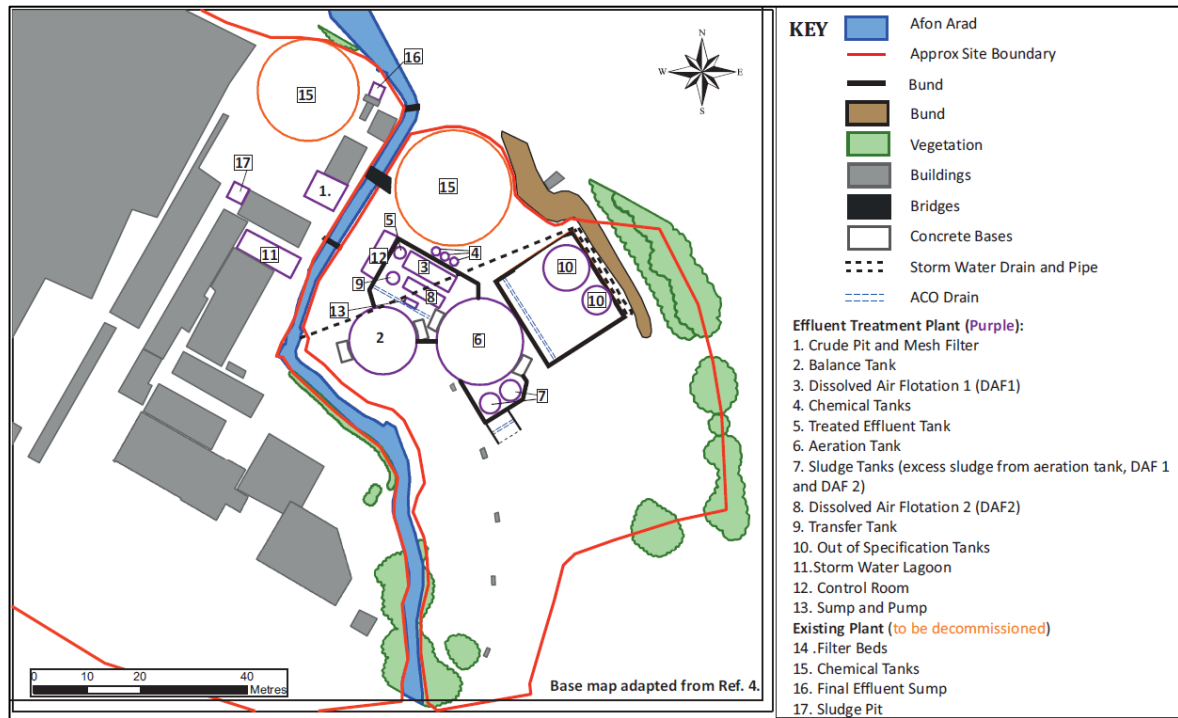


Figure 2: Layout of ETP

Image taken from Envireau Water drawing P20-197/Dairy Partners SW Risk Assessment/FIG 2 ETP Layout Revised.cdr.

Review of Odour Sources

2.9 The odour review identified several sources at the ETP which have the potential to generate malodours. The most significant sources of odour emissions, and/or areas that were not employing BAT, were identified to be the following:

- DAF tanks 1 and 2;
- Sludge tanker exports;
- Decommissioned DAF tank;
- Open crude and sludge pits;
- Spillages associated with sludge tanker filling; and
- Drop heights of liquid discharge pipes.

2.10 It is recognised that there are additional sources of potential odour at the ETP; however, the sources listed above represent the most significant sources of malodours and have been identified as the likely cause of odour nuisance at the nearby residential properties.

Review of BAT and Suggested Improvements

- 2.11 Whilst the ETP is generally well operated and maintained, the review identified several areas which were not compliant with BAT for the control and minimisation of odours. These have been summarised in Table 1, along with the suggested improvements required to achieve BAT.
- 2.12 It should be noted that, although the aeration tank is uncovered, it was not identified as a significant source of odours at the ETP and thus has not been considered in the measures set out below.

Table 1: Review of BAT

Odour Source	Observations – Not BAT	Suggested Improvements to Achieve BAT
DAF Tanks 1 and 2	Both DAF tanks are covered which will offer some containment of odours. However, the headspace air is not extracted, and thus highly odorous air builds up in the tanks' headspaces. This highly concentrated odorous air is released to the atmosphere via small gaps in the DAF covers and during maintenance when the covers are opened; this does not allow for adequate dispersion of odours.	It is understood that the tanks are fitted with vents; however, these are currently sealed. Therefore, the vents should be opened to prevent the build-up of odours in the headspaces. The air should be treated prior to discharge to the atmosphere (see below).
	There is no treatment of the headspace air meaning that the odorous air, which is judged to be extremely unpleasant in character, is discharged to the atmosphere.	The headspace air should be treated by a suitably designed and specified odour control unit (OCU) prior to discharge to the atmosphere. During the site visit, it was noted that the DAF tanks' covers are fitted with vents which are sealed. A potential solution may therefore be to install carbon filtration on these vents so that all discharged air passes through the filters prior to release. It should be noted that the carbon filters would need to be carefully specified and replaced regularly in accordance with the supplier's recommendations.
Crude and Sludge Pits	The crude and sludge pits are open with no covering, other than a metal grill which offers no containment of odours.	The pits should be covered to provide containment of the odours. However, unless the headspace air is to be extracted and treated by an OCU, a tight fitting or fully sealed cover should be avoided to prevent the accumulation of odorous headspace air. An impermeable cover which allows some air exchange with the atmosphere (e.g., via a vent or small permitter gaps) would likely offer an adequate level of odour control for these tanks given their distance from the residential properties.

Odour Source	Observations – Not BAT	Suggested Improvements to Achieve BAT
	<p>When sludge is removed by tanker from the open sludge pit (understood to take place much more infrequently than the exports from the sealed tanks) a hose is placed into the sludge and pumped out into the tanker. This will agitate the liquid, increasing its exposed surface area to the atmosphere and thus increasing the odour emission potential.</p>	<p>Consideration should be given to how this procedure can be undertaken in accordance with BAT. Measures may include:</p> <ul style="list-style-type: none"> covering the pit (see above). A cover allowing a small area for air exchange would ensure that the headspace of the pit is under negative pressure whilst sludge is removed (i.e., fresh air will be drawn into the pit thus minimising the escape of odours); and provision of a freshwater hose adjacent to the pit so that the tanker's hosing can be cleaned of sludge immediately following removal from pit.
Sludge Tanker Exports	<p>The displaced air from the tanker during filling is discharged to the atmosphere untreated and at low level.</p>	<p>The discharged air should be treated prior to being released to the atmosphere. A potential solution to this would be to install carbon filters on the air outlet of the tanker. It should be noted, though, that given the high velocity and large volume of the displaced air, the carbon filters would need to be carefully specified and replaced regularly in accordance with the supplier's recommendations.</p>
Spillages	<p>Following tanker filling, highly odorous residual sludge leaks from the pipe onto the floor. Whilst there is a hose available to clean up the spillage, it is not located immediately adjacent to a drain resulting in a build-up of odorous residue on the ground.</p>	<p>The location of tanker filling should be located closer to the sludge export tanks, on the concrete slab, directly above the existing drain.</p>
Discharge of Liquids into Tanks	<p>Liquid is discharged into the sludge and crude pits well above the maximum sludge/effluent surface levels. This results in turbulence of the waste, increasing its exposed surface area to the atmosphere and thus increasing the odour emission potential.</p>	<p>Where possible, pipes discharging liquids into open tanks/pits should be extended so that they discharge below, or very close above, the surface of the effluent/sludge.</p>
Decommissioned Tanks	<p>The decommissioned DAF tank, which has now been replaced by the new DAF plant, is no longer in use; however, it remains in situ and may contain odorous residue.</p>	<p>To achieve BAT, all decommissioned tanks (including the old DAF tank and disused humus tanks currently filled with rainwater) should be fully cleaned to ensure that no odorous residue remains in the tanks. Any runoff from the cleaning should be channelled directly to drain, or through the ETP, to avoid the build-up of odorous residues at the site.</p>

Odour Survey of Surrounding Area

- 2.13 During the tanker filling event, and following the site odour review under non-tanker operations, the assessor surveyed the local area, with specific focus on odours near to the complainants' properties.
- 2.14 During the survey the wind direction was north-westerly, meaning odours from the facility were being transported by the wind to the residential properties located to the southeast of the site. Furthermore, the ambient temperature at the time of the survey was 29°C. Very warm temperatures and light north-westerly winds are worst-case meteorological conditions for the potential for adverse impacts at the nearby residential properties; thus, the observations made during the survey are likely to represent a worst-case scenario in terms of offsite odour impacts.

During Tanker Export

- 2.15 During the tanker sludge export event, odours described as being “*very strong, acrid and very unpleasant*” were identified near to the residential property to the south of the facility. The odours were scored by the assessor as a 5¹ on the VDI scale²; this demonstrates that the odour was ‘very strong’. The odours were, however, very short in duration and relatively infrequent during the filling event; during the approximately 20 minutes it took to transfer the sludge from the tanks into the tanker, very strong and unpleasant odours were detected six times with each odorous event lasting approximately 10 seconds or less. Nevertheless, the assessor noted that the odours, when detectable, were of an intensity and offensiveness that has potential to result in annoyance at the nearby residential properties.

Under Normal Site Operations

- 2.16 Following the odour review, the assessor surveyed the immediate surrounding area with particular focus on the two residential properties from which complaints have been received (see Figure 1).
- 2.17 At the two residential properties, intermittent odours described as being “*sour, rotten*” were detected by the assessor under normal operations at the ETP. However, the odours were identified as being lower in intensity and offensiveness than those detected during the tanker filling event (scored by the assessor as a maximum 4¹ on the VDI scale²; this demonstrates that the odour was ‘strong’). Nevertheless, intermittent and offensive odours generated by the ETP were clearly identifiable at both residential properties for the duration of the survey.

¹ 0 = no odour, 1 = slight/very weak odour, 2 = slight/weak odour, 3 = distinct odour, 4 = strong odour, 5 = very strong odour, 6 = extremely strong odour.

² Verein Deutsche Ingenieure. *Determination of Odorants in Ambient Air by Field Inspection (VDI 3940)*. 1993.

Meteorological Conditions

- 2.18 In general, odours will be transported by the wind and will not be detectable at locations upwind of a source. The exception to this is during very light wind conditions when odours may disperse against the wind direction, although typically only for relatively short distances.
- 2.19 The wind roses for 2016 to 2020 from the Trawsgoed meteorological station presented in Figure 3 demonstrates that the prevailing wind in the region is from the south-southeast and northwest, with few other significant components. This demonstrates that the residential properties are downwind of the facility quite frequently.

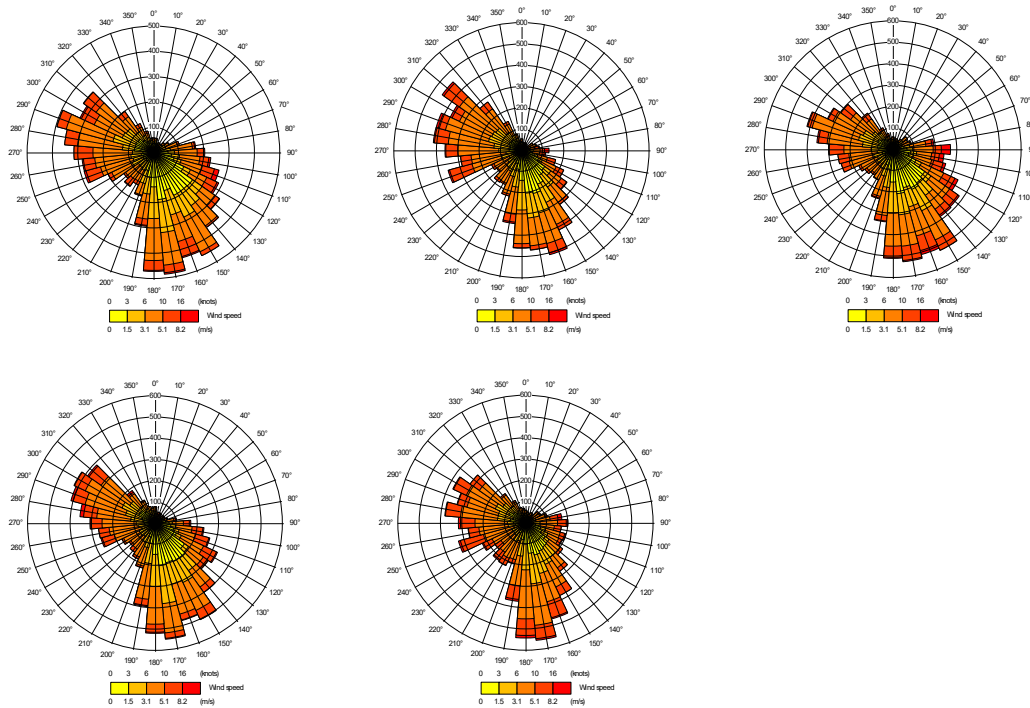


Figure 3: Wind Rose for Trawsgoed 2016 to 2020 Inclusive (left to right, top to bottom)

3 Suggested Next Steps

3.1 Whilst the ETP is generally well operated and maintained, the odour review identified several areas which were not compliant with BAT for the control and minimisation of odours. These have been summarised as follows:

- DAF tanks 1 and 2;
- Sludge tanker exports;
- Decommissioned DAF tank;
- Open crude and sludge pits;
- Spillages associated with sludge tanker filling; and
- Drop heights of liquid discharge pipes.

3.2 Furthermore, a qualitative review of the surrounding area, with particular focus on the two residential properties from which complaints are regularly received, identified that unpleasant odours associated with the ETP are detectable offsite.

3.3 Therefore, it is recommended that the following measures be implemented at the ETP to ensure that the works is operated in accordance with BAT for the minimisation and control of odours:

- Treat the headspace air of the DAF tanks using suitable odour abatement technology such as carbon filtration;
- Treat the displaced sludge tanker air using suitable odour abatement technology such as carbon filtration;
- Fully clean all decommissioned tanks, and cover if any residual odour remains after cleaning;
- Cover crude and sludge pits;
- Improve the tanker filling operations to ensure that spillages can be washed directly to drain; and
- Lower the drop heights of liquid discharge pipes to minimise turbulence in open tanks and pits.

3.4 In addition to the above, it is recommended that the Odour Management Plan (OMP) for the site is reviewed and updated to reflect both the new plant at the ETP, and the additional measures set out in Paragraph 3.3 once implemented. The OMP should include maintenance procedures for all odour

abatement systems that are installed at the ETP and detail the procedure for the replacement of activated carbon should this type filtration be used.

- 3.5 It is also recommended that an AQC odour specialist revisit the ETP to review the odour control measures once implemented, and to resurvey the surrounding area to determine the effectiveness of the controls. The visit should be undertaken during warm, dry weather on the same day as a tanker export event.

4 Implemented Odour Control Measures and Resurvey

Implemented Odour Control Measures

4.1 Following AQC's initial visit and recommendations, Dairy Partners (Cymru Wales) have implemented the following odour control measures:

- installation of a carbon odour control unit to treat the outlet air released during sludge tanker exports;
- use of a concrete pad to allow for effective clean up during any sludge spillage during sludge tanker exports;
- installation of carbon filters on the outlets of the DAF tanks;
- regular cleaning of the sludge pit (shown as tank 17 in Figure 2) and removal of sludge to an enclosed tank (shown as tank 10 in Figure 2) before offsite tanker removal;
- tarpaulin covers have been placed over the crude pit and mesh filter tanks; and
- cleaning of decommissioned tanks.

4.2 It has not been possible to lower the drop height of liquid discharge pipes to minimise turbulence in open tanks and pits. This is due to the potential for lowering of the pipes to cause blockages when the effluent levels rise.

Odour Survey of Surrounding Area

4.3 During the second visit, a repeat odour sniffing exercise was undertaken during filling of the sludge tanker. During this assessment, the outlet air was treated using the new carbon odour control system, and both the sludge from the effluent plant and dairy operations, now in tank 10 in Figure 2, was removed. A similar exercise was also conducted once the tanker had left site.

4.4 During the surveys, the winds were light (7 mph) and from a westerly direction. Conditions were dry, with an ambient temperature of approximately 13°C at the time of the survey. While conditions were not optimum for maximum odour generation (optimum conditions being warm temperatures and light winds), given the proximity required to be observed during the visit and the light winds, it is judged to have been a suitable time to assess the impacts of the measures implemented.

During Tanker Export

4.5 During the sludge removal, odours were described as being "*occasional strong*", "*infrequent*", "*weak*" and "*barely recognisable*". During the time it took to export the sludge from the tanks into the tanker, strong and unpleasant odours were detected 2-3 times, in each case the odour lasted for a few seconds at most. It was noticed that one of these stronger odour events occurred when the pipes

were swapped between effluent tanks. The odours were scored by the assessor at a maximum of 4³ on the VDI scale⁴. This is an improvement on the previous survey, where odours were noted to be up to 5³ on the VDI⁴ scale.

- 4.6 Mild odours were occasionally detectable, noted to be 2³ or 3³ on the VDI⁴ scale; however, for the majority of the time, no odour was present onsite or at nearby receptors.

Under Normal Site Operations

- 4.7 Following the tanker filling event, the assessor surveyed the same area again to establish if the observed odours were related solely to the tanker filling or were more representative of typical, continuous operations.
- 4.8 It was noted that odours were similar once the tanker had left site, this being infrequent mild odours with occasional stronger instances. The odours were scored by the assessor as no more than 4³ on the VDI⁴ scale. The locations of odours detected, either during tanker filling or under normal operation, are presented in Figure 4.

³ 0 = no odour, 1 = slight/very weak odour, 2 = slight/weak odour, 3 = distinct odour, 4 = strong odour, 5 = very strong odour, 6 = extremely strong odour.

⁴ Verein Deutsche Ingenieure. *Determination of Odorants in Ambient Air by Field Inspection (VDI 3940)*. 1993.



Figure 4: Locations of Observed Odours

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5 Summary

- 5.1 This technical note sets out the findings of a site odour review of the Dairy Partners (Cymru Wales) Ltd mozzarella production facility in Newcastle Emlyn, Carmarthenshire. The facility produces approximately 360 tonnes of mozzarella per week and contains its own effluent treatment plant (ETP) to treat wastewater from the production process prior to discharge off site. In 2020 the ETP was replaced with newer technology; however, recently the facility has been subject to regular complaints relating to odours from the plant from two nearby residential properties.
- 5.2 The odour review involved a visit to the facility on 20th July 2021 to determine the likely sources of the alleged nuisance odours, and to identify if the ETP is being operated in accordance with the Best Available Techniques (BAT) for the minimisation and control of odour emissions. Following the review, it was determined the most likely sources of odour were from sludge tanker exports, the DAF tanks, and open crude and sludge pits. These significant sources of odour have now been addressed using a combination of carbon odour control, improved sludge storage and improved housekeeping measures.
- 5.3 On the 18th November 2021, a second visit was undertaken to observe the odour generation of the facility following the implementation of the above measures. Odours observed during tanker export and normal operations were very similar, with a lower odour intensity when compared to the previous visit. This implies that the carbon OCU was successful at removing odours, which were noted as very strong near residential properties during the first visit. Furthermore, no odour was detected at any of the complainant locations, which again is an improvement relative to the first visit.
- 5.4 It cannot be completely guaranteed that no future odour annoyance or complaints will occur. This is due to the nature of onsite activities, where changes in operation may result in short term odour generation, the range of meteorological conditions, and the very close proximity and likely sensitised nearby residents. However, a range of measures have been implemented to reduce the odour, which based on site visits, appears to be effective at reducing normal operational offsite odour pollution to a low level. It is strongly recommended that an Odour Management Plan (OMP) is developed for the facility to manage daily operations to minimise odour generation as far as practicable, and to detail the approach to receiving, handling and addressing any future odour complaints.

6 Appendices

A1	Professional Experience.....	18
A2	Onsite Odour Mitigation.....	19

A1 Professional Experience

Laurence Caird, MEarthSci CSci MEnvSc MIAQM

Mr Caird is an Associate Director with AQC, with over 15 years' experience in the field of air quality and odour management and assessment. He has carried out air quality and odour assessments for a wide range of residential and commercial developments, airports, industrial processes, road schemes and energy-from-waste installations throughout the UK and abroad. Mr Caird's experience in terms of odour assessment includes odours from poultry farms and other intensive livestock farming, wastewater treatment, brewing and distilling, meat processing, sugar refining, various processes using paints and solvents and a large number of commercial kitchens. He has acted as expert witness in relation to the assessment of air quality or odour impacts at a number of previous planning appeals, and is a contributory author to the IAQM's *Guidance on the assessment of odours for planning*.

Paul Outen, BSc (Hons) MEnvSc MIAQM

Mr Outen is a Principal Consultant with AQC, with over eleven years' experience in the assessment of air quality and odours. He undertakes air quality and odour assessments covering residential and commercial developments, industrial installations, road schemes, energy centers and mineral and waste facilities. These involve qualitative assessments, and quantitative modelling assessments using the ADMS dispersion models, for both planning and permitting purposes. He has also presented evidence at public hearings. Mr Outen has a particular interest in odour assessment, and has extensive experience in the assessment of odours across a wide range of industries throughout the UK, Europe and Asia. He also has experience in pollutant monitoring techniques. He regularly undertakes site audits for various installations to advise on pollution control and mitigation strategies. He is a Member of both the Institution of Environmental Sciences and Institute of Air Quality Management.

Mr Adam Dawson, BSc (Hons) MSc MIAQM AMEnvSc

Adam Dawson is a Senior Consultant with AQC with over eight years' experience in the field of air quality assessment. He undertakes air quality and odour assessments for AQC, covering residential and commercial developments, industrial installations, energy centres and waste facilities. He has experience using a range of dispersion models including ADMS-Roads, ADMS-5 and Breeze AERMOD to complete quantitative modelling assessments, for both planning and permitting purposes. He previously spent over two years as part of the Environment Agency's permitting team, so has extensive experience of the permitting process and industrial emissions. He is a Member of the Institute of Air Quality Management and an Associate Member of the Institution of Environmental Sciences.

A2 Onsite Odour Mitigation



Figure A2.1: Carbon Odour Control Unit Operating during Tanker Export



Figure A2.2: Carbon Odour Control Unit on DAF Outlet