Non-technical summary

The aim of this project is to provide a local facility which will capture food waste and waste connected with the food industry in the area and process it into renewable energy in the form of renewable gas, sometimes known as biomethane. The project is working with Adnams plc who have a strong commitment to caring for the environment and to their green credentials. This project will build on this by processing waste from their brewery and from their hotels and pubs to give renewable energy. They are also looking to convert their delivery vehicles to run on the biomethane produced by the facility to reduce the emissions from their diesel trucks.

The process which is used is termed Anaerobic Digestion and it is an entirely natural process occurring widely in nature. The breakdown of the waste under controlled conditions also recycles the organic matter and plant nutrients back into a form of biofertiliser, also known as Digestate. This material is used in place of chemical fertilisers to aid fertility in agricultural soils. The wastes which the facility seeks to process is currently sent to landfill where it generates emissions of methane which contribute significantly to greenhouse gas emissions.

As the plant is to process materials which decompose naturally, it is a critical aspect of the design of the plant that all the operations are carried out under controlled conditions to ensure that they are hygienic and don't produce any offensive odours. For example, the waste is unloaded inside an air tight building which is under negative air pressure. The wheels of the waste delivery vehicles are washed inside the building before they leave. The air from the building is also treated to destroy odours before it is discharged. The waste is heated to over 70℃ to destroy pathogenic organisms, at the commencement of the process. The entire anaerobic digestion process is undertaken is fully sealed vessels which are not open to the atmosphere. The digestate produce is taken off site in sealed tanker vehicles before land application. The cleaned and filtered water will be recycled within the plant or used for irrigation on site. The biogas produced by the AD process will be further refined after the AD process into a gas that is the same as that in the natural gas grid. It is planned that some of that gas will be put into the national gas grid, in accordance with national policy for renewable energy, and some will be used to power goods vehicles in place of non renewable diesel.

A general overview of the Anaerobic Digestion process is given below. The numbers in parenthesis refer to the items of equipment shown in Figure 1.

Food waste will be collected from commercial establishments and institutions such as pubs, hotels, schools, and food processing companies. This will be delivered into the facility at a rate of approx 8 lorry loads per working day. The official estimates of the waste arisings within 30 miles of the plant are in the region of 96,000 tonnes a day, so this facility, which has a design capacity of 12,500 t/yr will only be taking a modest fraction of the waste produced locally.

The trucks are weighed in over the weighbridge and reverse into the building when they tip the waste into a designated area (1). The truck leaves the building over a wheel wash and the doors of the building are closed.

The food waste is loaded into the pre-treatment equipment (2) where it is first pulverised to break it up and to open any plastic packaging.

It then is pumped to a tank (3) where any heavy items such as stones or cutlery sink to the bottom. Air is bubbled through the liquid causing any plastic to float to the top. The heavy contaminants and the plastics are then removed and will be disposed of in landfill unless a recycling option becomes available elsewhere.

The waste food is then further minced up to reduce the particle size to less than 12 mm and it undergoes a pasteurisation process (4) to kill of any harmful pathogens.

This pasteurised material is then mixed with liquid waste from the brewery and any additional water required by the process. Rainwater will be collected to provide any water requirement.

This material is then pumped into the AD tanks (5). The digestion process is a continuous one. As material is pumped into the AD tanks an equal amount is pumped out. The material stays in the tanks approximately 30 days. As the material breaks down biogas is given off. This goes to the gas receiver pipe (6) and to the gas upgrade system (7) located in the gas compound. This is a secure compound containing the gas upgrade system, the digestate upgrade system and a gas flare (8). The gas flare is a concealed flare and the flame will not be visible. It is for use only when the gas upgrade system is not available for example during maintenance.

Within the gas upgrade system the biogas is purified to biomethane at which point it is effectively the same as natural gas, except it is renewable and not fossil energy source. This will then be exported to the national grid and/or be used a vehicle fuel.

The liquid pumped out of the AD tanks goes to a digestate upgrade system (9). It passes through a series of microfilters at less than 1 µm which filters out all particles from the water including bacteria. The cleaned up water passes to the algae biomass production pond (10). The warm nutrient water will used to support and grow microalgae. The effect of this will be to trap the nutrients in new biomass, and thereby help to purify the water before it is used for irrigation. The algae will be harvested and fed back into the AD system as another source of biomass energy. The thickened particulate matter from the digestate upgrade system is pumped to the bunded slurry storage tank (11) for storage prior to being spread on fields as a liquid fertiliser.

The process is computer monitored both locally and remotely. The tanks and other vessels are all bunded to prevent accidental pollution, and full environmental safeguards are built into the design of the facility. It is a fundamental element of the approach taken that the removal of one source of pollution and greenhouse gasses, foodwaste in landfill, should not result in any new sources of pollution or inconvenience in the area. The facility is modest in size, designed to provide a facility to recycle local waste arisings, to return nutrients and organic matter back into the soil, and to produce renewable gas and vehicle fuel to benefit local users.

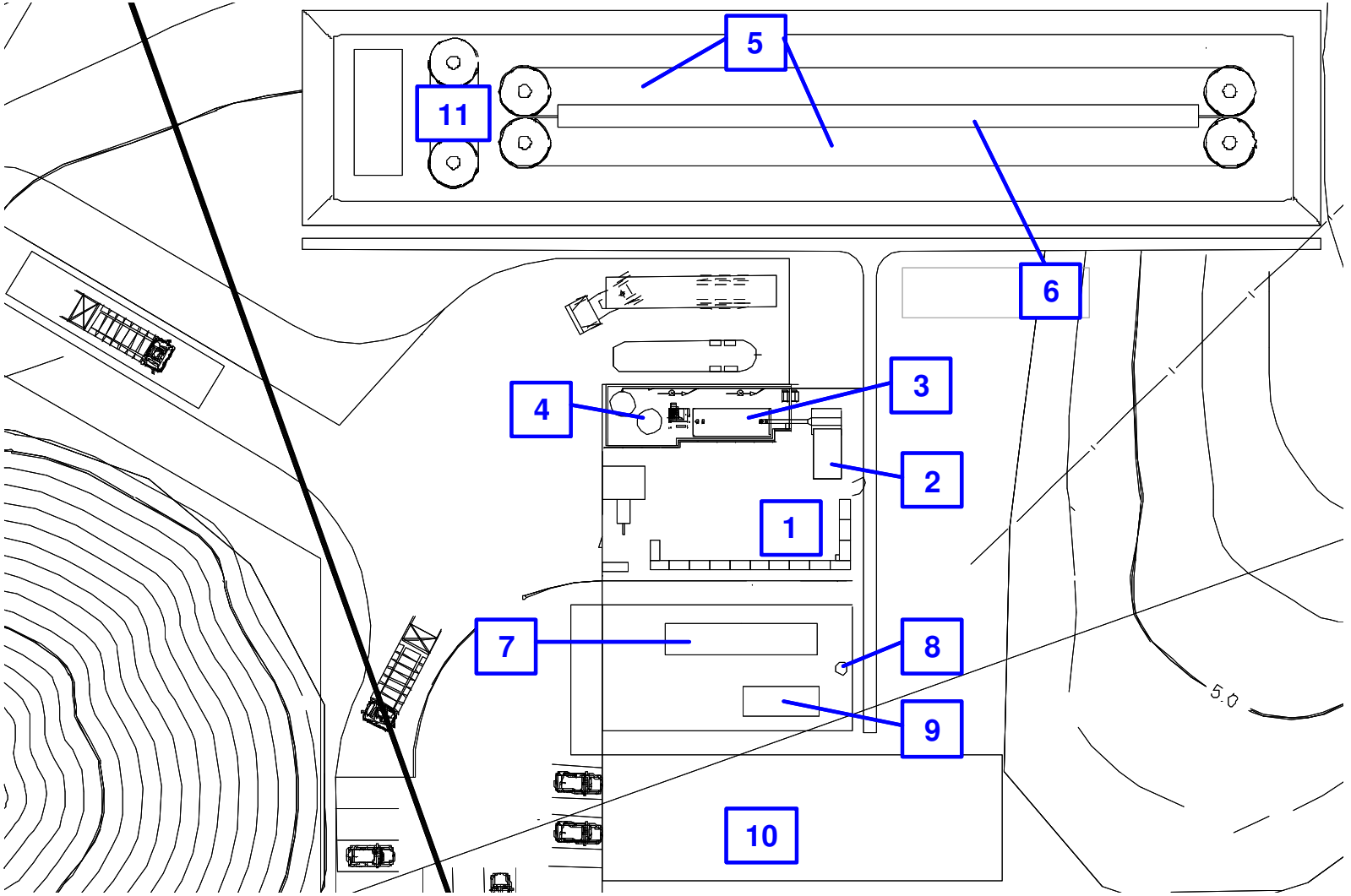

Figure 1 Layout of AD facility