Why Insurance Cost are Rising for Biogas Power Generation Plants

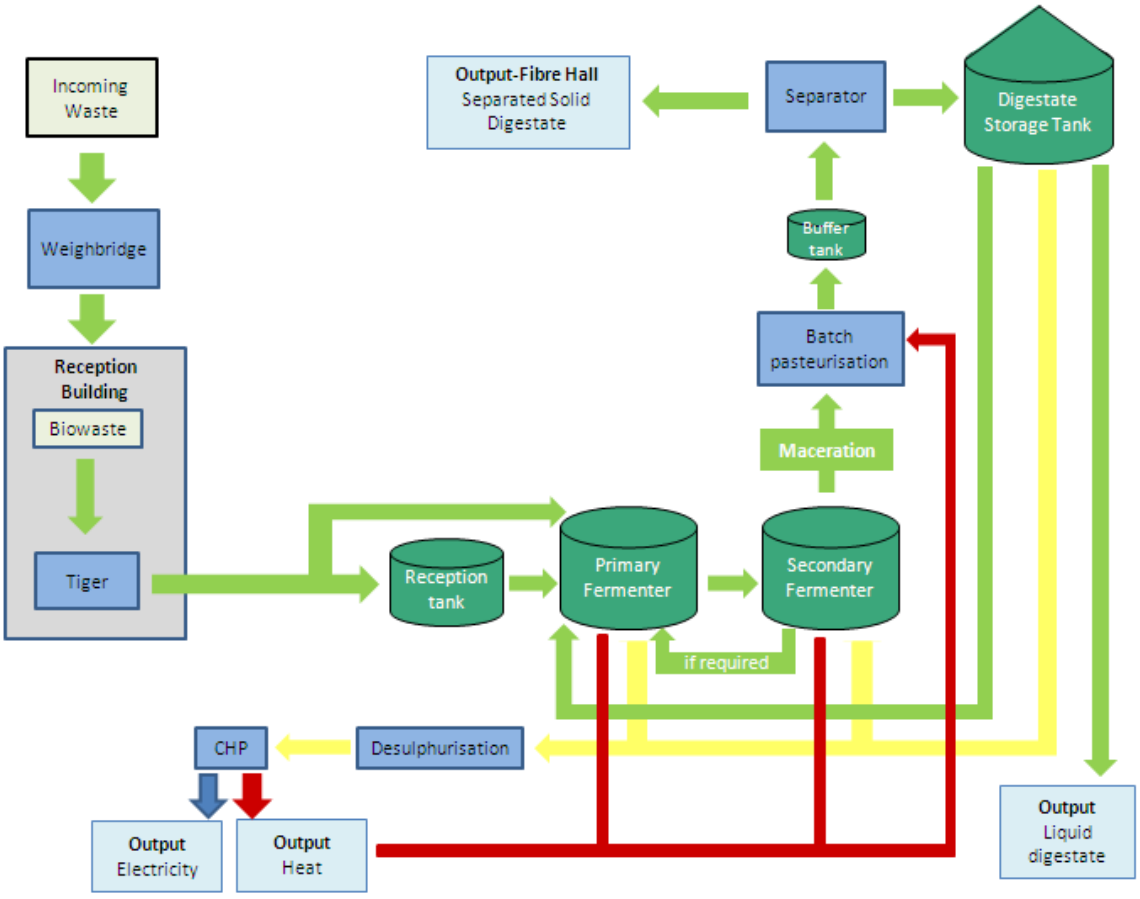
The United Kingdom has approximately 7,000 dairy farmers producing over 90 million tonnes of slurry per year. Traditionally this slurry is recycled by putting it back on the farmers' fields.

Today's farmers have recognised that by using the slurry with other feedstock through a production process called 'Biogas Generation', methane can be produced either for exportation to the National Grid or used to generate electricity and heat. The slurry and feedstock is put into a sealed concrete / steel tank, usually described as a digester or fermenter, containing live bacteria and no air. The bacteria feed on the feedstock and slurry producing methane.

This production and sale of electricity and gas provides an income for the farmer and subsidies are available from the Government for the generation of electricity and the production of heat.

Feedstock for use in the digester / fermenter can come from alternative sources; with increased separation of household food waste from plastics and cardboard, food waste can now be used with garden waste.

The diagram below is an example of how the process works using waste food and garden waste. It shows two fermentation tanks; the use of a second tank enables greater methane output.



In addition to the generation of electricity and heat through this process using a gas engine, two by-products are created. The first is a liquid digestate which can be returned to the farmer as clean fertilizer, and the second is a solid digestate which, in theory, could be sold to the public as a low grade fertilizer compound.

So what are the issues insurance companies are experiencing?

1. Design

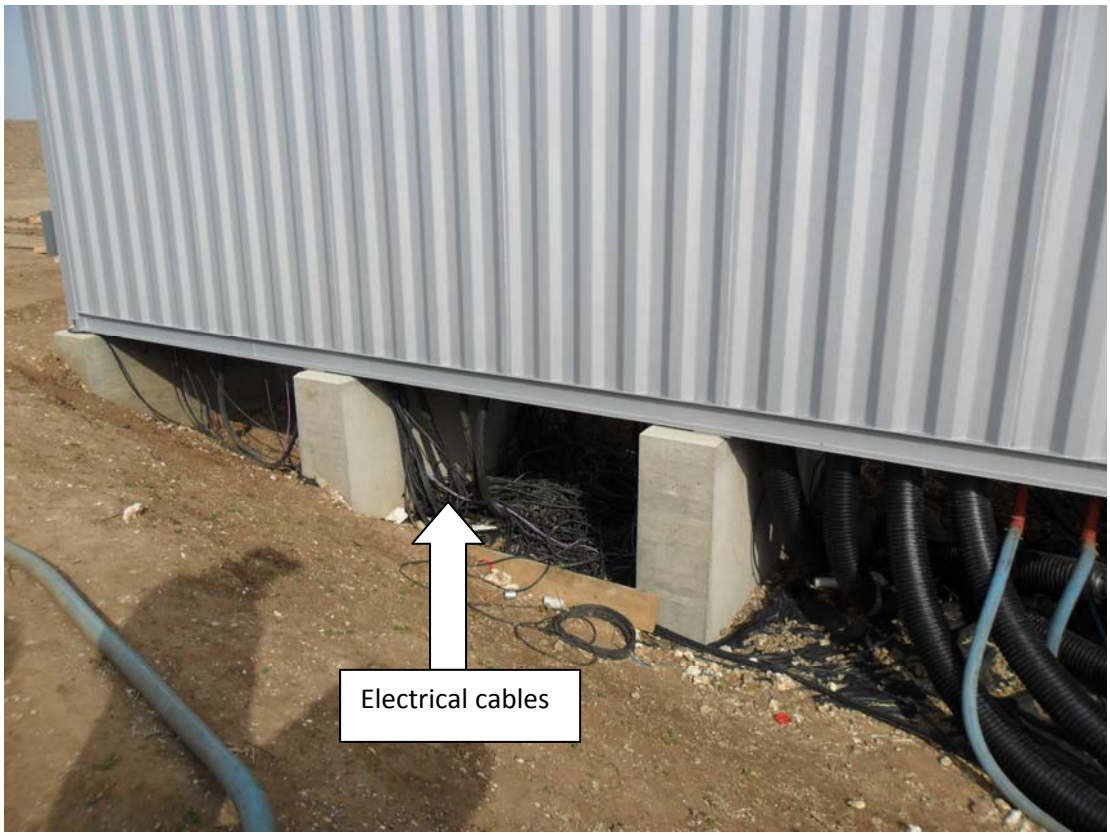
Most owners of biogas sites are professionals in other spheres so they depend on their chosen contractors to deliver a working plant. This is where difficulties can arise.

One of the biggest exposures of the process is the explosive nature of methane gas. From an insurance point of view, there should be good separation between each component of the process, including the generation plant so that if there is an explosion minimal damage is done to the overall installation. Unfortunately there are many small sites with no clear separation between plant main components and yet they are surrounded by vast open fields often owned by the same farmer or company. A number of serious explosions have occurred in Europe with all the main components on site destroyed.

An example is shown below

This type of generation requires government subsidies for it to be profitable for the owner. Subsidies vary considerably depending in which country the site is. Currently, foreign contractors are tempted to enter the UK market where a large number of construction projects are proposed. However, some selected contractors have been in undeclared financial difficulties which have often resulted in poor build quality as the company has tried to cut costs. Sometimes a plant has been partially built when the main contractor has been declared bankrupt.

The picture below shows an example of a bankrupt site with electrical cabling under the main control cabinets leaving a lot to be desired.



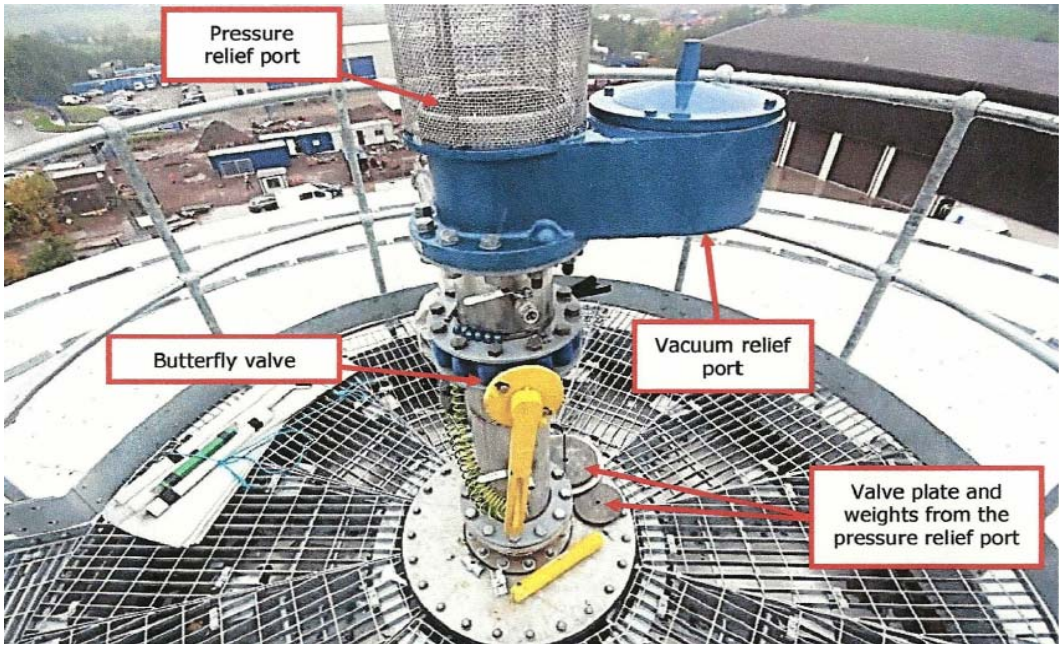
2. Construction

Over time there have been significant changes in the construction of digestate tanks. In the early days, tanks were of riveted construction with mastic internal sealing, but the industry experienced complete failure of this type of tank due to the corrosive nature of feedstock during conversion to biogas and digestate. Corrosion on rivets and riveted seams created leakage and, in some instances, complete failure of the tank. Sites were flooded with tank contents with digestate leaching into water courses and electrical components completely destroyed.

Now tanks are either bolted or welded steel or constructed from concrete. They tend to be partially buried and have bunded membranes with leakage alarms fitted.

The picture on the next page shows a new installation tank being fitted out with insulation and membrane clearly visible.

Perhaps one of the largest claims recently made during construction was when a site was in the final stages of testing. Nitrogen was left in the digester tanks overnight as a purge gas prior to bacteria and feedstock being introduced into the tank. However, a differential was caused by a change in temperature from day to night creating a vacuum. This is not usually a problem because tanks are fitted with safety and vacuum valves but, unbeknown to the insurers, the main contractor had fitted a shut-off valve between the digester tank and the vacuum/safety valve (as shown below) to prevent nitrogen leakage.



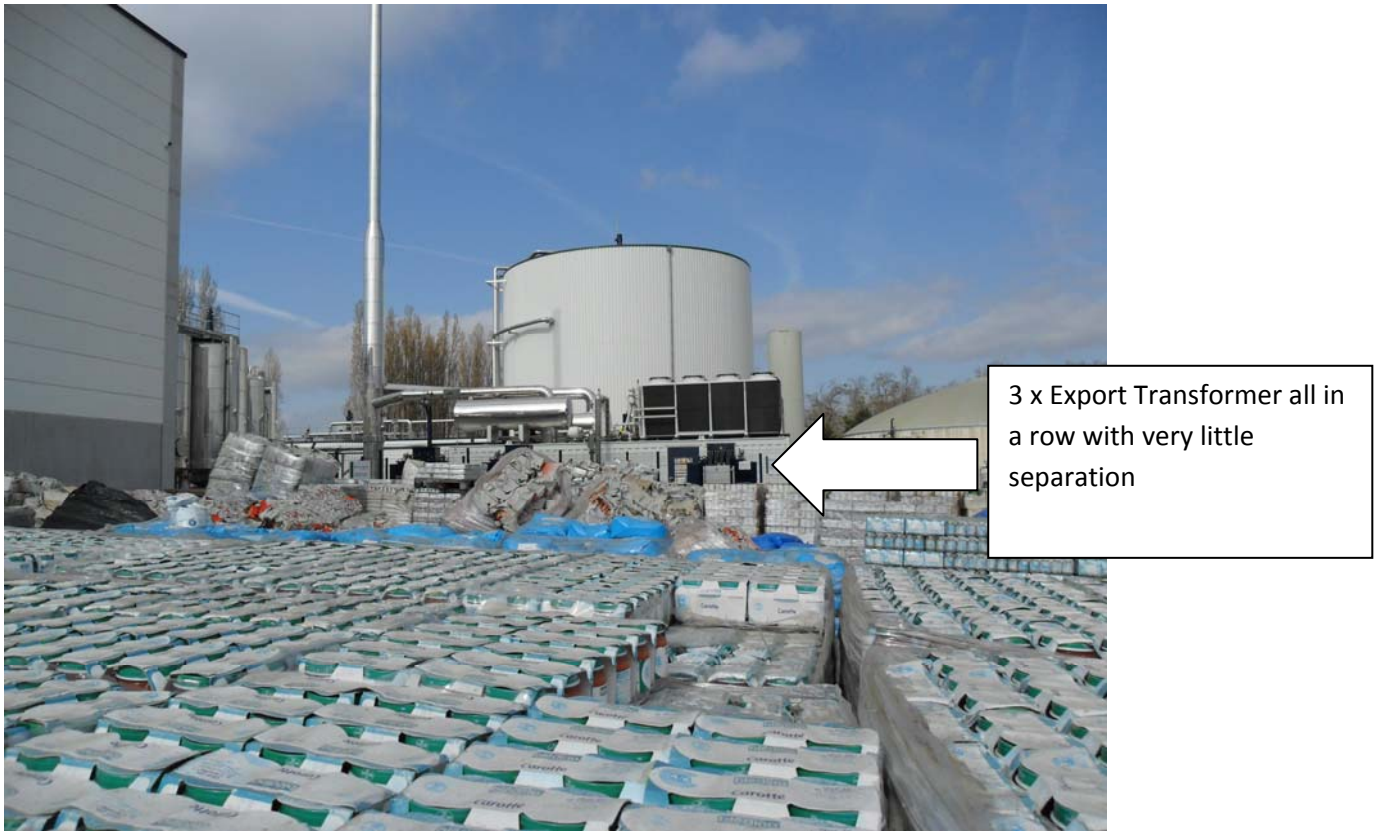
The consequence of this was that the tanks were sucked in (see image below) causing damage requiring major repairs which delayed construction by approximately twelve months.

3, Operation

The range of skills plant operators have varies considerably from very agricultural to a full professional team. This is often evident in the plant operation claims. To give some examples of poor engineering and management two images are shown below.

The first shows the main gas line into the engine with its pipework supported by a wooden prop. This is the main gas line into the engine, apparently the line had a problem.

The second shows food waste and packaging adjacent to the main transformers for the site. An electrical failure in a transformer could, potentially, start a fire which could spread to, and destroy, the main buildings



It is essential for any insurance company involved in this business to have policy terms which require:

A) Competent site operators

The main contractor for the build should provide training for the site operators which can be supplemented by off-site courses such as those provided by the “Waste Management Industry Training and Advisory Board” known as WAMITAB.

B) Operations and Maintenance contracts

These must be in place for the site engine. The main engine manufacturers in the biogas business are Jenbaucher (G.E.), Rolls Royce and Caterpillar. Other engines in the market place, such as 2G, are derivatives of these. Typical engine contracts will give an availability of the engine of between 92% and 95% with call out times within twenty-four hours.

As the cost of an engine contract is seen as expensive by some, insurers have experienced very expensive claims due to lack of competence as site owners attempt to maintain engines themselves. The engines require full professional engineers with the correct knowledge and skills to maintain them as they are more complex than most farm machinery. Engineers should be from the manufacturer or their recommended agent.

C) Management of feedstock in the biogas process

Feedstock needs to be of the correct mix for effective production of biogas. If the mix is too rich, for example, with excess alcohol or fish stock, the bacteria get very excited and generate too much gas which causes foaming. If the mix is too lean the bacteria die so very little gas is generated.

The industry manages the feedstock process through a combination of the design of the plant, careful input of the correct feedstock materials and constant monitoring of the digestate tank.

Laboratory tests are regularly taken and most sites send samples to an outside specialist laboratory for monitoring. Feedback from the laboratory tests allows the input stock to be adjusted to prevent issues occurring. However, it is the experience of insurers that some owners look to maximise the output of biogas beyond the design of the plant so the feedstock becomes very rich with excess foaming occurring on top of the liquid level. To counteract the foaming, a knock-down compound (silicone oil based mixture) should be on site. This can be fed in on top of the foaming to reduce its effects. Some plant designs do not have an injection spray bar so the foam has a tendency to block safety valves resulting in over pressurisation of the tank. If this occurs and the tank has a soft double membrane (shown in green below) the membrane becomes stretched beyond its design.

If this type of incident occurs the tank must be emptied with all valves cleaned and checked for operation. New membrane covers are required to be fitted and checked. If the Environment Agency becomes involved in this type of incident it can take over a year before

a plant can be brought back into operation as the site owner has to prove Competence and appropriate design of the plant and so on.

Insurers are now insisting that biogas plant owners have the knock down kit which can be injected and also large discharge valves allowing emergency lowering of the digestate into a tank or trailer.

Conclusion

As a consequence of the significant losses insurers have experienced in the biogas industry insurance rates have risen and the excess period and money deductible before any claims can be made have been increased.