CHP NOX REDUCTION OVERVIEW

Airbus Broughton

Report Summary

In compliance with condition 4.2.6 of Environmental permit EPR/BM3965IA. The permit requires that availability of NOx reduction techniques for the gas fuelled CHP engines is reviewed every two years.

The following considers alternatives available for the eight CHP sets at the site.

Tuning for NOx (Ignition Timing)

The current CHP's are tuned for NOx emissions, whilst ensuring engine efficiency and managing CO and VOC's.

Reduction of Air Manifold Temperature

The current CHP's have intercoolers fitted to ensure optimal air manifold temperature and increase heat recovery and hence overall efficiency.

Exhaust Gas Recirculation

The current CHP's are lean burn engines and this method of NOx reduction is not recommended for this type of engine.

Selective Catalytic Reduction

This technology is not fitted to the CHP's and so was considered further in its application to the CHP's at Broughton. Selective Catalytic Reduction (SCR) works by mixing the hot exhaust gasses in a reactor where a urea solution is introduced in the presence of a catalyst reducing the NOx to N_2. The system components consist of a long mixing duct where the urea is introduced to the exhaust gases and catalyst housing where the reduction process takes place.

In addition to the mixing chamber itself the SCR system includes a series of parts to ensure efficient NOx reduction. These include:

- Sensors to measure emissions both before and after the reaction to qualify the emissions reduction.
- Urea day tank and bulk storage to ensure safe transfer into the reactor. This is facilitated by a dedicated transfer pump.

- An SCR control panel with remote communication ability. This will alert the user to any deviation from standards in reactor pressure, temperature, pump operation and NOx level output. The panel will also coordinate SCR operation with the run signal from the CHP's control system.

Each SCR system is bespoke in that it is manufactured to achieve the NOx levels specified on each facility. The main variable being the size of the mixing duct and catalyst, the other is the amounts of urea being injected. One example of a system based in Battersea has seen an SCR set up to achieve levels of 15mg/Nm3 at 5% O_2.

For comparison purpose the permitted maximum NOx level for the Broughton CHP's is 500 mg/Nm3 with each unit averaging less than 300mg/Nm3 during 2016 monthly testing.

To illustrate potential SCR installation at Broughton an example target of 100mg/Nm3 has been used. This would represent an improvement upon current emissions plus the SCR operation offers certainty that the target level is achieved consistently.

Prices were gained to install the SCR technology onto all 8 CHP engines on site. The estimates show a £400,000 investment in equipment would be required and installation costs would be additional. A breakdown of these costs can be provided but are commercially confidential.

The SCR catalysts have their own operation and maintenance needs in addition to the CHP. As the dosing process consumes urea there is a need to for additional stock to be bought in as required. Anticipated use over a 24 hour running profile would see replenishment needed every 8 weeks based on a 2500l bulk storage tank. The cost of urea is variable but 6 deliveries per year of 2500l using an example 0.46p per litre provides an example cost of £6900 per annum per unit.

A significant complication of retrofitting these technologies to the current CHP's at Airbus Broughton is the limited physical space available in the engine enclosures. As the SCR operates best with exhaust gas temperatures over 300 °C it has to be located between the engine and the exhaust gas heat exchanger.

The total length of an SCR reactor and mixing duct for a Caterpillar engine is 715 cm. The engine bays at Broughton are typically 1000 cm x 400 cm and already occupied by existing equipment. Our investigation has shown that there is no space within any of the enclosures on site and therefore new or additional enclosures would be required.

The CHP units at Airbus Broughton are approximately 50% through their lifespan and have approximately 10 years of life left.

The practicality of installing SCR technology at this stage is severely hampered by the spacing concerns as their original design would have sought to already optimise the space available. For this reason at this time there is no capital investment allocated to the introduction of SCR technology.

However the next step is to establish a strategy for the future of the CHP at Broughton as they move into the latter stage of their working life and we will consider SCR technology.