**Centrica Business Solutions UK Ltd**

**Application for an Environmental Permit at a Multi-Operator Installation**

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## Non-Technical Summary

This application is for an environmental permit for the operation of a gas fired Combined Heat and Power unit (CHP) at the Pincroft Dyeing & Printing Co. Ltd site at Market Street, Adlington, near Chorley. The application is made in the name of Centrica Business Solutions UK Ltd.

The gas fired CHP has a thermal input of 3.05 MWth and is fired with natural gas. The unit is primarily used to provide electricity and hot water/ steam for the Pincroft site. Operations at the Pincroft site include activities that are listed in Schedule 1 of the Environmental Permitting Regulations and so are regulated by the Environment Agency under the Environmental Permit EPR/ BL8651IX The Environment Agency have deemed that the CHP should be classed as a Directly Associated Activity (DAA) to the Schedule 1 activities on site and that therefore the overall site becomes a multi-operator installation with Centrica Business Solutions required to hold a stand alone DAA permit. The CHP can operate for up to 8760 hours per year

The CHP is a new installation. It is a Medium Combustion Plant and a Tranche B generator under the medium Combustion Plant and Specified Generator controls, but as described above will be regulated as a Stand-alone DAA environmental permit. The emissions to air satisfy the exhaust gas NOx emission limit of 95 mg/m3 and are discharged to the atmosphere via an exhaust stack with a stack height of 10.73m. A dispersion modelling study which identifies key human and ecological sensitive receptors has been completed in line with the outputs of the Environment Agency specified generator screening tool. This study has concluded that the emissions from the CHP at the Pincroft Dyeing & Printing Co. Ltd Adlington site will not have a detrimental impact on local air quality, human health or sensitive habitat sites.

# Introduction

This document and associated appendices form the application for an Environmental Permit to cover the operation of a Combined Heat and Power (CHP) system being installed at the Pincroft Dyeing & Printing Co. Ltd site. Centrica Business Solutions initially submitted an application for a standalone Medium Combustion plant and specified Generator Environmental Permit at the Pincroft site. This was submitted under reference EPR/WE6585AB/A001. However, during the duly made assessment stage, the Environment Agency deemed that the CHP should be classed as a Directly Associated Activity (DAA) to the Schedule 1 activities on site operated by Pincroft Dyeing & Printing Co. Ltd under the Environmental Permit EPR/ BL8651IX.

## Site Location

The CHP is located at the Pincroft Dyeing & Printing Co. Ltd site at Market Street, Adlington, near Chorley. The national Grid Reference for the site is SD 6032812690.

The application site is located to the south of Huyton Road, on the southern periphery of the village of Adlington. It is bound by the existing industrial buildings to the south and west, a car park to the east and Huyton Road to the north. The immediate locality is predominantly industrial in character where there are several examples of large and medium sized industrial units and warehouses within the vicinity. Residential properties are present to the south, on the southern side of Market Street and Waterhouse Bridge. An area of broadleaved woodland is located to the east and further south, within which the River Douglas flows in an east to west direction, approximately 95m to the south of the application site. Within the woodland and further south are open grassland areas and a further standing waterbody is to the west of the site. To the south and the east, agricultural land and pastures extend with hedgerows and rows of trees at the field boundaries.

A site plan showing the location of the CHP plant is given in Figure 1. The boundary of the CHP site is shown edged in red - this is a small area amounting to circa 234 m2 in area. The installation site boundary for the overall Pincroft site is shown edged in blue. The main release point to air – the exhaust stack (Reference No. A1) s shown in Figure 2.

## 1.2 The applicant

The application is made in the name of Centrica Business Solutions UK Ltd.

## 1.3 Existing permitted facility

The Pincroft Dyeing & Printing Co. Ltd site is permitted under the Environmental Permit EPR/ BL8651IX. This is a Section 6.4A(1) activity covering the pre-treatment and dyeing of textiles in plant with a capacity > 10 tonnes per day.

## Structure of the permit application

This section provides an overview of the proposals. This is supplemented by further details in Sections 2-6 as follows:

* Section 2 details the proposed management practices which will be in place at the plant, with specific detail covering:
	+ Accident management
	+ Energy efficiency
	+ Efficient use of raw materials and water
	+ Avoidance, recovery and disposal of wastes.
* Section 3 addresses the operational measures which will be in place to prevent and/or control the environmental effects of the proposal.
* Section 4 identifies the nature of emissions from the CHP plant and details the monitoring systems that will be in place.
* Section 5 summarises the conclusions from the detailed assessments undertaken to predict the environmental effects from the CHP plant.
* Section 6 summarises the outcome of the detailed assessments of Best Available Techniques (BAT) for the key plant and abatement systems proposed.

The information provided within this application has been set out with due regard to the Environment Agency application forms and guidance and with BAT guidance relevant for the operations and How to comply with your Environmental Permit, as now summarised within the Environment Agency website permitting pages (https://www.gov.uk/topic/environmental-management/environmental-permits). Supporting documents, assessments and application forms are provided within the appendices list as set out in the contents page.

# Management of Activities

## 2.1 General

CBS UK Ltd operates a management system which is certified to ISO 9001 and covers the design, installation, operation and management of CHPs. Management of the Pincroft CHP will be incorporated within the existing management system. The management system is also consistent with and fully aligned to the international standard for Environmental Management Systems, ISO14001. A number of the parts of the operations of CBS UK are already certified to the standard and a plan is in development to extend the certification to all of the UK operations.

## 2.2 Operations & Maintenance

The plant will be operated in line with the manufacturers’ recommendations. In addition to normal operation, the management system will address abnormal operation, including start up and shut down and foreseeable accidents and emergencies. Planned maintenance routines will ensure all key plant components which have the potential to affect environmental performance will remain in good working order. Maintenance routines for the plant will draw upon manufacturers’ recommendations unless operational experience during the lifetime of the plant indicates the need for variance.

## 2.3 Competence and training

All operators will be trained in the operation of the plant prior to commercial operation. Training will include those actions required in the event of abnormal operations and emergencies. Training will ensure that all staff are aware of the relevant elements of the management system including operational procedures and the requirements of the environmental permit. Records of training will be stored and maintained.

## 2.4 Organisation

Roles and responsibilities are clearly defined in the existing management system.

## 2.5 Accident management

Monitoring systems are installed to detect abnormal circumstances and to allow safe shutdown of equipment. Procedures to follow in the event of an accident will be detailed in the accident management plan. There will be appropriate linkage to the main Pincroft site management systems.

## 2.6 Energy Efficiency

The CHP has a thermal input of 3.05 MWth and will have an overall gross efficiency in excess of 87%. Details on plant information and energy consumption are shown in Tables 1- 3. The plant operation is capable of operating up to 8760 hours per year. However, the demand for electricity generation and steam/hot water will be dependent on activities on the main Pincroft site and the associated demand both from the scheduled activities and other site operations. Initially it is anticipated that the plant will operate for approximately 3000 hours per year.

Energy efficiency is integral to the design, management and operation of the CHP plant as described in the BAT assessment shown in section 7.

Start up and shutdown will be completed in line with manufacturers’ recommendations.

Energy efficiency is an integral part of the monitoring & control philosophy for the plant and is essential to the management system.

## 2.7 Efficient use of raw materials

Raw material requirements for the CHP will be limited in number due to the design and high efficiency of the site equipment. The main raw materials to be used within the CHP are natural gas for combustion, lubrication oils, water for the steam/ hot water systems, small quantities of water treatment chemicals for the waste heat boiler and minimal quantities of glycol for the close circuit cooling systems. Although transformers oils will be used, under normal operation there will be zero usage. Table 1 provides details of raw materials, expected usage, storage and potential environmental effects.

The gas engine at the heart of the CHP will be fired only with natural gas taken from the National Grid via the local supply network. Compared to alternative fossil fuels, natural gas has the advantage of being clean to handle and burns with no soot or solid residue. Furthermore, in terms of environmental benefits there are fewer emissions to air associated with natural gas in comparison with other fossil fuels, and there is a reduced potential for accidents associated with storage. A typical composition for natural gas is shown in Table 2.

The lubrication oil will be stored in a bunded storage tank in compliance with the oil storage regulations.

Small quantities of sodium sulphite solution and trisodium phosphate solution will be used as water treatment for the Waste Heat Boiler. Monitoring and dosing will be closely controlled to ensure that consumption rates are minimised.

The closed circuit cooling water system will utilize a water/ glycol mix and will require minimal top up. Hence consumption of glycol will be minimal.

## 2.8 water use

The water supply to the steam and hot water circuits will be taken from the main Pincroft systems. This is a non potable supply and will be treated in a small reverse osmosis plant to meet feed water quality requirements and to minimise boiler blowdown rates.

Water consumption rates will be dependent on the operation and load of the waste heat boiler. The plant has a maximum feedwater flow rate of circa 1.9 m3/ hr, but actual consumption is expected to be lower.

The CHP will utilise a closed circuit cooling water system and hence water requirements will be minimal, requiring only a small volume of water for top up.

## 2.9 Avoidance, recovery and disposal of wastes

It is anticipated that waste generation during operation of the CHP will be low, primarily resulting from maintenance activities. Waste generation will be from the following limited sources; used gas engine air intake filters, oil filters and other consumable items, waste insulation resultant from maintenance activities, waste glycol from maintenance activities and used lubricating oils. Condition monitoring techniques will be employed to ensure that lube oil operating life is optimised and therefore the need for oil changes minimised.

Operational controls for waste will be designed in line with best practice as embodied by the waste hierarchy of prevent, reuse, recycle, recover and dispose. Waste lubrication oils will be stored in a bunded waste oil tank with periodic collections for reuse/ recycling by a specialist waste management contractor. The waste oil tank has a capacity of 1200 litres and is fitted with an integral bund that is compliant with the requirements of the oil storage regulations.

 Periodic waste minimisation audits will be completed with the aim to minimise raw material consumption and therefore prevent the generation of waste.

2.10 Climate change adaptation

Climate change adaptation will be managed through the management system for the site. In addition, as part of this process and to satisfy planning permission requirements for the development, a Flood Risk Assessment (FRA) was completed for the CHP plant in accordance with the National Planning Policy Framework (NPPF). The assessment was necessitated due to the location of the application site within Flood Zone 3a.

Developments that fall within Flood Zone 3 are required to undertake a site-specific Sequential Test to ensure that development is directed to sites with lower potential risk of flooding in preference to areas at higher risk. The outcome of the Sequential Test for the CHP at Pincroft was that the proposed site is the appropriate location for the proposed development. In accordance with NPPF the next step to confirm the appropriateness of the proposed development was to undertake a site-specific FRA and demonstrate that the development adheres to the requirements of the Exception Test. The FRA demonstrated the following:

* The site lies within Flood Zone 3a as part of the floodplain of the River Douglas.
* The risk to the site from surface water flooding is low. Site drainage systems and the new development design are sufficiently resilient to cope with surface water flood risk.
* The risk to the site from fluvial flooding is medium due to its proximity to the River Douglas. However, the proposed development does not increase the risk of flooding occurring either on-site or downstream of the proposed development.
* The risk to the site from other forms of flooding such as infrastructure failure is considered negligible.

Following this assessment, it can be concluded that the proposed development passes the exemption test as:

* The proposed development will be safe for its lifetime, without increasing flood risk elsewhere as it is designed and constructed using modern engineering methods and materials and will have no impact on the efficacy of the current site drainage network on the site.
* The proposed development will provide wider sustainability benefits to the community most notably in terms of reduction in CO2 emissions and climate impact of the Pincroft facility.

# Operations

## 3.1 Overview

The gas fired CHP has a thermal input of 3.05 MWth and is fired with natural gas. The unit is primarily used to provide electricity and hot water/ steam for the Pincroft site. The electricity is supplied for site wide use on the Pincroft site including domestic use, ancillary equipment, finishing of textiles and pre-treatment & dyeing activities. Heat is recovered (using a plate heat exchanger) from the engine jacket, first stage aftercooler and oil cooler in order to generate Low Temperature Hot Water (LTHW) for the main site processes. The unfired waste heat boiler provides steam for pre-treatment and dyeing activities. The use of this high efficiency plant is expected to reduce the loading on the main site boiler house and hence the use of high efficiency plant displaces the use of lower efficiency plant . Details of the CHP plant are shown in Table 3.

## 3.2 Fuel and raw material supply, storage and handling

As described in Section 2 natural gas will be delivered to the CHP via a gas pipeline. Fuel gas will be handled via on-site reception equipment consisting of safety isolation valves, filters, pressure regulation, metering and distribution piping as required

Lubricating oil will be delivered in small quantities by road prior to offloading and storage in a dedicated storage tank. The lubricating oil storage tank has a capacity of 2200 litres and has an integral bund which is in compliance with oil storage regulations with the associated bund designed to hold 110% of the tank capacity. Water treatment chemicals for the waste heat boiler are used in small quantities and are stored in a protected area within the waste heat boiler container.

## 3.3 Combustion of fuel and power generation and steam/ hot water

Combustion will take place within the MTU 12V4000GS high efficiency reciprocating spark-ignition gas engine generator set which forms the heart of the CHP unit. The hot exhaust gas from the engine is routed to the waste heat boiler for steam generation, the waste heat boiler is unfired.

The gas engine comprises an air intake system, combustion chamber, an exhaust system and an electrical generator, together with auxiliary plant. The air intake system includes filtration to remove any contamination present, such as dirt, dust or grit, which could damage or reduce efficiency of the plant.

Natural gas and combustion air are ignited by means of a spark plug with the cylinders of the MTU engine. As the burning mixture of fuel and air expands, a piston is pushed transferring energy released from combustion to rotational energy from which a connected alternator is used to generate electricity.

Clean combustion technology will be incorporated as detailed in section 6.

Automatic monitoring and control systems will be in place to control the combustion process to ensure that the emissions from combustion are consistent with the limits in place for the plant. The control systems will be able to monitor various aspects of operation including efficiency and fuel use over the full range of ambient and fuel conditions.

As described above, the exhaust system for the MTU gas engine will comprise a silencer and ducting to convey the hot gases from the engine to the waste heat boiler and to final discharge to atmosphere via a dedicated exhaust stack. The exhaust stack is designated as release points A1.

The plant will be operated in line with manufacturers recommendations including start up and shut down procedures.

# Emissions and Monitoring

## 4.1 Emissions to air

Emissions to air from the CHP plant will result from exhaust gases generated from combustion of natural gas within the MTU gas engine. As natural gas is a clean fuel, the primary air pollutants of concern from the plant with the potential to impact on human health are NOx and CO.

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The plant has been designed to use clean combustion technology and to comply with the emission limits set in the Medium Combustion Plant and Specified generators Regulations. The emissions will meet the NOx emission limit of 95 mg/m3.

The exhaust gases will be discharged to air from a dedicated stack with an emission height of 10.73m; the location is shown in Figure 2. The release point is designated A1.

## 4.2 Emissions to land

There will be no emission to land associated with the operation of the CHP.

## 4.3 Emissions to surface waters

There will be no process water discharges to surface water sewer associated with the operation of the CHP. Surface water drainage from the concrete platform area will be connected into the main site process drainage system.

## 4.4 Emissions to on site effluent treatment plant

Small quantities of blowdown from the waste heat boiler will be discharged into the main site effluent treatment plant.

## 4.5 Fugitive emissions to air

Fugitive emissions are not considered to be a relevant issue for this application. The safe management of the CHP will ensure that the risk from fugitive emissions to air is minimised by operation in line with manufacturer’s recommendations. Protection systems will be extended to ensure safe plant start-up and emergency shut-down in the event of major faults in equipment.

It is anticipated that fugitive emissions of odour will not be significant for the new CHP plant.

## 4.6 Fugitive emissions to surface water

Fugitive emissions to surface water sewer are not considered relevant to the operations of the CHP. The oil storage facilities for lubrication oils and waste oils are bunded and the water treatment chemicals for the waste heat boiler are stored inside the boiler container. In addition, the concrete floor slab includes a 200mm wide x 150mm high reinforced concrete upstand to the platform perimeter to prevent any run off from the area.

## 4.7 Noise and vibration

An assessment of the noise effects from the CHP have been included within Appendix 4. A summary of the conclusions is shown in section 5.3.

## 4.8 Monitoring and reporting of emissions (air, water and waste)

Emissions to air

The CHP will incorporate suitable sampling ports for monitoring of emissions. Sample point locations are consistent with the Environment Agency on-line guidance “Monitoring stack emissions: low risk MCPs and specified generators” which states that single point sampling where the exhaust gases are well mixed is suitable for sampling gas concentrations.

Periodic monitoring of NOx and CO emissions will be completed for compliance purposes on a three year cycle in line with the requirements of the medium combustion plant and specified generators regulations. MCERTS certified equipment and personnel will be used for the emission monitoring.

Records will be kept of all emissions testing results and instrumentation calibration or testing documentation. Monitoring of releases to air will be controlled as part of the management system.

Emissions to water and land

Aqueous releases from the plant will be small quantities only and will be discharged to the on site effluent treatment plant. Therefore no monitoring of effluents is considered necessary.

There will be no discharges to land from the new plant.

# 5. Environmental Impacts

## 5.1 Emissions to air

An H1 assessment has been completed for the plant – the outputs from the H1 datatool are shown in Appendix 2. In addition, a dispersion model study has been completed to assess the impacts of the releases to air from the new plant. The assessment is shown in Appendix 3 and includes a stack height sensitivity analysis. The report shows that the Predicted Environmental Concentration (PEC) for NO2 is comfortably below the relevant environmental standards in each instance, and a stack height of 10.73 m provides an appropriate level of pollutant dispersion from the new system.

## 5.2 Emissions to water and on site effluent treatment plant

Due to the small quantities of boiler blowdown release and minimal contaminants, emissions to water and the on site effluent treatment plant do not require further assessment.

## 5.3 Noise and vibration

The noise impact assessment for the new plant is shown in Appendix 4. This shows that the noise climate in the area is dominated by road traffic noise from the A6. The maximum contribution of sound from the new plant is considered to be well below the level where it would contribute significantly to the ambient noise of the area and the impact on receptors is considered to be negligible.

# Best Available Techniques (BAT) Assessment

This section contains a review against the Best Available Techniques (BAT) requirements detailed in Environment Agency guidance. (BAT) means the available techniques which are the best for preventing or minimising emissions and impacts on the environment. Techniques include both the technology used and the way the installation is designed, built, maintained, operated and decommissioned.

The European Commission produces [best available technique reference documents or BREF notes](http://eippcb.jrc.ec.europa.eu/reference/) which contain ‘best available techniques’ (BAT) for installations. A review of the available BREF notes showed the following documents are available:

* The sectoral BREF relevant for the textiles industry is a first generation BREF dated July 2003
* A second generation BREF incorporating BAT Conclusions and BAT associated emission levels has yet to be formally adopted, although a final draft document has been circulated.
* A horizontal BREF dealing with energy efficiency dated February 2009

The CHP plant will operate as a Directly Associated Activity (DAA) to the main Pincroft site and therefore this BAT assessment has reviewed the available BAT that is relevant in the above documents. This has shown that the key requirements are related to energy efficient design, energy management, and co-generation.

The permitted processes on the main Pincroft site can operate without the Centrica plant and the CHP plant has not replaced any of the existing plant on the Pincroft site. The outputs from the CHP comprise electricity, low temperature hot water (LTHW) and steam.

Energy Efficient Design

*“BAT is to optimise energy efficiency when planning a new installation.* “

This was completed as part of the design for the CHP plant and resulted from detailed assessment of the energy consumption and thermal loading for the site. In this way, optimisation of the design by the utilisation of the useful heat from the CHP to match the targeted thermal load leads to energy and cost savings being maximised.

The CHP design used the government’s CHP Quality Index (CHPQI) to ensure that sufficient thermal output from the CHP unit is utilised for it to be classed as ‘good quality CHP’ – the mark of an efficient design. The CHP generates electricity and heat in the form of Low Temperature Hot water (LTHW) and steam produced in the unfired waste heat boiler.

Electricity generated by the CHP is used for site wide consumption including:

* Domestic use
* Ancillary equipment
* Finishing of textiles (listed as a DAA on the main Pincroft site environmental permit)
* Pre-treatment & dyeing of textiles (a scheduled activity)

Heat is recovered (using a plate heat exchanger) from the engine jacket, first stage aftercooler and oil cooler to generate LTHW (at circa 80oC). The LTHW circuit from the CHP unit is used to supply heat to a large process tank on the main Pincroft site, heating its contents to approximately 60oC .

The hot exhaust gases from the engine are routed via the unfired waste heat boiler to generate steam. This is used for pre-treatment and dyeing processes on the main Pincroft site. The steam pipework from the new waste heat boiler is connected into the existing steam header serving the site.

Energy management

*“BAT is to optimise energy efficiency by taking a systems approach to energy management.”*

The permitted processes on the main Pincroft site can operate without the Centrica plant and the CHP plant has not replaced any of the existing plant on the Pincroft site. However due to the high efficiency of the CHP design, the CHP takes the role of the lead energy supply unit. This optimises energy consumption for the site. However, if the listed Schedule 1 activity – pre-treatment & dyeing is not running, then the CHP will only continue to operate if the plant load is above the minimum threshold. However, if finishing of textiles also ceases, then the site load would drop below the threshold and the CHP would shut down to avoid inefficient operation.

Cogeneration

*“BAT is to seek possibilities for cogeneration inside or outside the installation (with a third party)”*

The new plant is a cogeneration plant. As shown in the table below, the CHP has an overall total efficiency of 87.2%

This BAT assessment has also considered the following issues:

* Selection of the gas engine
* Techniques for control of emissions to air

Selection of the combustion technique

The proposed plant is being installed to generate electricity. Available technologies considered within this section are gas turbines and gas engines. An alternative option is use of diesel compression ignition engines; however implementation of this combustion method would result in a wider range of pollutants generated from combustion including SO2 and particulates and greater emissions of NOx. Furthermore, there would be additional requirements for diesel storage (and associated increased potential for accidents), as well as a greater number of vehicle movements on site for fuel delivery. For these reasons, implementation of diesel compression ignition engines has been ruled out from further consideration. Selection of the fuel to be burned and the selection of natural gas over other fuels for power generation have previously been discussed in section 2.

The primary BAT issues associated with combustion plant are the ability to meet plant demand, control of emissions to air and energy efficiency (see above). These are satisfied using a natural gas fired spark ignition reciprocating engine.

Control of emission to air

Emissions of nitrogen oxides

Various methods are available for controlling emissions to air from the CHP plant, both primary measures which focus on controlling the process to avoid emissions resulting from the combustion process and secondary measures, which are end-of-pipe measures to abate emissions prior to release to air. The chosen design incorporates low NOx lean burn clean combustion technology. The lean burn system will use engine mapping and combustion control to minimise emissions and ensure compliance with the Medium Combustion Plant and specified generators emission limits. This is recognised as BAT.

The alternative, end of pipe technique that is available for this application is Selective catalytic Reduction (SCR). This would increase the cost of the plant, requires the use of a catalyst (which requires periodic replacement) and introduces an additional need for storage and use of chemicals (e.g. urea or ammonia solution). In addition, there is the potential for ammonia slip to occur leading to an increase in emissions to air from the plant. The additional costs and complexities of SCR are not considered justified for this application and therefore BAT for NOx control for the CHP plant is considered to be achieved through the use of lean burn clan combustion techniques.

Emissions of carbon monoxide

Control and management of combustion conditions within the proposed gas engine, including performance monitoring, process control techniques and suitable maintenance regimes, will be in place to minimise CO emissions

Other emissions to air

Natural gas from the National Transmission System is considered to be a sulphur free fuel and does not generate particulate emissions.

Based on the above evaluations, it is concluded that the CHP will operate techniques that are proven and reliable and it is concluded to represent Best Available Techniques (BAT).

# Figures



Figure 1: Site Plan showing the Centrica site boundary and the overall multi-operator installation boundary

 

Location of stack discharge point. Reference No. A1

Figure 2: Site Plan showing the exhaust stack release point

# **Tables**

Table 1: Raw Material consumption

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Raw Material**  | **Nature**  | **Expected usage (approximate)**  | **Storage**  | **Fate**  | **Environmental Effects**  | **Alternatives**  |
| Natural Gas  | Natural Gas with Gross Calorific Value of 40.1 MJ/m3  | 9162 MWh based on initial expected operation  | No natural gas will be stored on site. Gas connection will supply plant.  | Combusted within the gas engine.  | Various emissions to air. Potential impacts arise through acidification, vegetation and health effects and global warming.  | -  |
| Transformer Oil  | Refined mineral hydrocarbon with additives  | Zero usage - requires no top up  | No storage on site other than within transformer  | Used within step up transformer.  | Harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment. Not readily biodegradable.  | No practical alternative. There is a choice of supplier, but quality is specified by the supplier of the transformer.  |
| Lubricating Oil  | Refined hydrocarbon with additives  | Expected usage circa 12 m3 / year. Dependent on extent of operation and oil degradation  | Stored in bunded storage tank. Bund will have capacity for 110% of the stored oil volume  | Used within the gas engine and discharged as waste oil for recycling  | Harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment. Not readily biodegradable.  | No practical alternative. There is a choice of supplier, but quality is specified by engine manufacturer.  |
| Water | Non-potable supply | Quantity dependent on RO plant usage for boiler feed | Supplied from main Pincroft site | Discharged to main site effluent treatment plant | Nil | Nil |
| Glycol  | Ethylene glycol  | Used (diluted) for corrosion control within cooling circuits. Low consumption expected. | Held within cooling circuits | Minimal usage. Discharged as waste for disposal if required.  | Low toxicity to aquatic organisms. Biodegradable,  | No practical alternative |
| Water treatment chemicals | Sodium sulphiteTrisodium phosphate | Low dose rate and consumption, dependent on waste heat boiler operation | Small storage containers within waste heat boiler enclosure | Low usage. Discharged as boiler blowdown to main site effluent treatment plant. | Low toxicity | Choice of supplier, but treatment chemical specifications set by manufacturer |

Table 2: Typical Natural Gas Specification

|  |  |
| --- | --- |
| **Compound**  | **Typical Mole (per cent)**  |
| Nitrogen  | 2.22  |
| Carbon dioxide  | 0.29  |
| Methane  | 93.23  |
| Ethane  | 3.24  |
| Propane  | 0.67  |
| Butane  | 0.26  |
| Pentane  | 0.09  |
| Total Sulphur  | <0.001  |
| Gross Calorific Value  | 40.1 MJ/m3  |

Table 3: CHP Design parameters

|  |
| --- |
| **CHP parameters** |
| Engine designation | MTU 12V4000L33 |
| Electrical Output  | 1287 kW |
| Exhaust thermal Output | 687 kW |
| Jacket thermal output (engine block, lube oil, first stage aftercooler) | 690 kW |
| Total thermal output | 1377 kW |
| Gas consumption (LHV) | 3054 kW |
| Electrical efficiency (LHV) | 42.1% |
| Thermal efficiency (LHV) | 45.1% |
| Total efficiency (LHV) | 87.2% |
| NOx emissions (15% O2 dry) | <95 mg/m3 |

## Appendix 1 – Environmental Risk Assessment

## Appendix 2 – H1 tool output

## Appendix 3 – Air quality Assessment

## Appendix 4 – Noise Assessment

## Appendix 5 – site condition report

## Appendix 6 – Directors details

## Appendix 7 – Application correspondence information and priority request