FICHTNER

Consulting Engineers Limited

R&P Clean Power

Raw materials inventory

ENGINEERING CONSULTING

Document approval

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Contents

1 Raw materials

The main raw materials anticipated to be stored at the ERF are presented in Table 1. The quantities and storage capacities should be considered indicative prior to completion of detailed design of the ERF.

Table 1: Types and amounts of primary raw materials

Material	Estimated storage capacity (tonnes)	Estimated annual consumption (tonnes/year)	Description
RDF	2,250[1]	185,607	Refused Derived Fuel processed at the Facility. Annual consumption is based on RDF with a net calorific value (NCV) of 10.5 MJ/kg and the Facility operating for 8,000 hours.
Auxiliary fuel	96	590	Fuel (diesel) supplying the auxiliary burners, the emergency diesel generator and fire pump engine.
Urea (40%)	69	967	Reduction agent for NOx abatement
Hydrated Lime ($Ca(OH)_2(s)$)	80	3,850	Acid gas reagent for flue gas treatment.
PAC	37	61	Powdered Activated Carbon

1.1 RDF

RDF will be delivered in heavy goods vehicles (HGVs) with payloads of ca. 24 tonnes. An average of 694 tonnes will be delivered per day. Incoming HGVs enter through the main entrance before proceeding to the weighbridges where they will have the quantity of fuel checked. Vehicles will proceed to the fuel reception hall, containing 4 tipping bays, where delivery vehicles will empty their loads directly into the bunker. Then, RDF is managed, mixed and loaded into a hopper using overhead cranes.

The RDF will be stored in a waste bunker with approximately 6,000 m^3 storage capacity (including stacking), sufficient to process RDF for ca. 4 days at 100% MCR.

1.2 Auxiliary fuel

The auxiliary fuel feeding the auxiliary burners during boiler start-up and shutdown will be heating oil to BS 2869 Class A2 (10 ppm sulphur content) or D (1000 ppm sulphur content) or road diesel / Ultra-Low Sulphur Diesel (ULSD).

The type of fuel oil stored for the emergency diesel generator (EDG) and the firewater pump engine will be road diesel / ULSD.

Diesel will typically be delivered in vehicle payloads of 29.8 tonnes (35 m^3) and will be stored in a tank with a net capacity of ca. 160 m^3. Two separate tanks will be installed if two types of auxiliary

[1] Tonnage will depend on the density of the RDF delivered to the ERF. The tonnage in Table 1 is based on a density of 375 kg/tonne (i.e. density of the RDF when stored in the bunker).

fuel (e.g. heating oil and road diesel/ULSD) are used for the auxiliary burners and the EDG/firewater pump.

1.3 Urea

Urea solution (urea water solution 40 % w/w) is used as reactant for NOx reduction in the selective non-catalytic reduction (SNCR) process. The urea solution will be injected into the furnace at appropriate locations.

Urea will typically be delivered in vehicle payloads of 38.9 tonnes. It is stored into a dedicated tank with a capacity of 63 m^3 (ca. 69 tonnes).

1.4 Hydrated Lime

Hydrated lime is used in the flue gas treatment (FGT) area as sorbent in the acidic gases' reduction process. Lime is injected in the flue gases that enter the reaction tower between the boiler and the baghouse filter.

Hydrated lime will typically be delivered in vehicle payloads of 29.8 tonnes. It is stored into a dedicated silo with a capacity of approximately 200 m^3.

1.5 PAC

Powdered Activated Carbon (PAC) is used as the second sorbent in the process for heavy metal and dioxin removal from exhaust gases. It is injected in the flue gas in the reaction tower between the boiler and the baghouse filter.

PAC will typically be delivered in vehicle payloads of 24.5 tonnes and stored into a dedicated silo with a capacity of ca. 200 m^3.

1.6 Other materials

Various other materials will be used in small quantities for the operation and maintenance of the Facility. These could include, but not be limited to, the following:

1. hydraulic oils and silicone-based oils, used as lubricants for bearings and hydraulic actuators in the combustion grate and other equipment;
2. calibration gases for the continuous emissions monitoring system (CEMS);
3. refrigerant gases for air conditioning plant;
4. glycol/anti-freeze for cooling;
5. boiler water dosing chemicals, such as:
    a. oxygen scavenger, typically dosed into the feed water to chemically remove oxygen and to passivate iron surfaces to improve resistance to corrosion;
    b. volatile corrosion inhibitor, dosed into the boiler drum to chemically reduce the CO_2 concentration, therefore, reducing the acidity of the condensate.
6. wastewater neutralisation chemicals sodium hydroxide and hydrochloric acid, used as PH controllers in the neutralisation basin of wastewater.
7. Demineralisation plant chemicals, such as:
    a. sodium hydroxide and hydrochloric acid, used as alkalinizing and acidic cleaner respectively for the reverse osmosis plant;

b. sodium hypochlorite, used as water disinfectant in the reverse osmosis plant;
c. sodium bisulfite, used for pretreatment in the reverse osmosis plant as a biostatic and for the removal of free chlorine; and
d. antiscalant, dosed into the feed water to the reverse osmosis plant to prevent membrane scaling.

These will be supplied to standard specifications offered by main suppliers. All chemicals will be handled in accordance with COSHH Regulations as part of the ERF's quality assurance procedures and full product data sheets will be available on site.

The operator will maintain a detailed inventory of raw materials used on-site and periodic reviews will be carried out in light of new products and developments. Any significant changes of material, where it may have an impact on the environment, will not be made without firstly assessing the impact and seeking approval from the EA.

2 Water use, effluents and drainage

An indicative water flow diagram is presented in document ref. S4081-0100-0005. A summary of the key aspects associated with water usage, effluents generation and drainage is provided in the sections below.

2.1 Surface water

The surface water drainage system will be separated from the process effluent drainage system to ensure that only uncontaminated surface water is discharged off-site.

The surface water network has been designed based on Sustainable Drainage Systems (SuDS) principles, a brief summary of the proposed scheme is provided below. Further details are available in Chapter 13 (Water Resources) of the Environmental Statement submitted as part of the planning application for the ERF.

2.1.1 ERF runoff

Runoff generated by the ERF's roofs and hardstanding areas will be intercepted and drained to new SuDS attenuation features (below-ground cellular storage structures, detention basin) located in the site's western area. Flows discharging from the attenuation features will drain through a new swale and into a wetland area. From the wetland area, runoff is directed towards the existing watercourse at the site western boundary, which flows north and merges with the Darklands Brook, a tributary of the River Trent.

Pollution control features (e.g. trapped gullies, interceptors or similar) will be installed at appropriate locations in the piped network to prevent oil and hydrocarbon contaminants from entering the surface water network. Flow controls will also be installed to manage peak flows. There will be an isolation system in place to prohibit the discharge of any contaminated effluent off-site during emergency occurrences (e.g. in a fire or spill event).

2.1.2 ERF access road

The access road providing access from Willshee's Depot 3 site into the ERF is positioned at a lower elevation and cannot practicably drain into the ERF site drainage system described in 2.1.1 above. Instead, the access road will be served by a standalone drainage system, with gullies to drain runoff to a new SuDS swale. The swale will attenuate runoff from the access road, with a controlled discharge into the existing concrete lined channel (the Darklands Brook) used by the existing MRF located at the northern boundary of site.

2.2 Domestic supply and effluents

Mains water will be supplied to the ERF for domestic and sanitary uses in the staff welfare areas.

Foul flows generated by the ERF will be treated on site via a private package water treatment plant. Treated effluent will then be discharged via the proposed SuDS network (swale and wetland area) located on the north west corner of the site. From here, effluents are directed along with the ERF runoff to the watercourse at the site western boundary, which later merges with the Darklands Brook.

2.3 Process supply and effluents

It is anticipated that the ERF will consume approximately 5.1 tonnes per hour of mains water. Mains water will be supplied to the ERF's process for the following purposes:

- Provision of make-up water for the steam water cycle (to fill the boiler and to replace water leaving the system as blown down) and, if used, sootblowing of the economiser.

  Make up water of suitable quality will be produced in a demineralisation water treatment plant (DWTP). The system will utilise either reverse osmosis, ion exchange technology or a combination of both. The design of the DWTP is subject to detailed design and will be confirmed prior to commencement of operation;
- Provision of water to the FGT plant and the boiler shower cleaning system. The quantity required in the FGT plant is dependent on the technology used and therefore the water consumption may change for different technology suppliers. It has currently been assumed that water will be used to control the flue gas temperature as part of the FGT system. If a fully dry process is used, then overall water consumption may be reduced.
- Replacement of water exiting the bottom ash quench bath. Water used for the quenching of bottom ash produced in the combustion process will exit the system entrained within the ash. Consumption of mains water for ash quenching is expected to be nil or very limited as process effluents will be used for this purpose.
- Other uses, including odour/dust suppression, hardstanding washdown and replenishment of the firewater tank.

The Facility will be a 'zero discharge' installation during normal operations. Process effluents produced in the operation of the Facility will be re-used within the process. Process effluents will be stored within a 'dirty water pit' prior to reuse.

There will be infrequent occurrences when excess process effluents are generated, such as during emptying of the boiler. In these instances, excess effluents will require discharge. Any excess process effluent will be tankered off-site for treatment at a suitably licensed waste management facility.

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