

Portishead B Power Station

Ejectors

There are two three-stage air ejectors with surface inter-coolers and one quick start air ejector for each turbine. The three-stage units are condensate cooled, and each operates at a steam pressure of 500 pounds per square inch and 1,400 pounds per hour, while the quick start ejector is supplied with steam from the auxiliary steam manifold at 900 pounds per square inch and discharges directly into the atmospheric exhaust pipe.

Extraction Pumps

Two 100 per cent duty two-stage extraction pumps, located on -11 feet Ordnance datum level floor in the pump pit, are driven through vertical shafts by motors mounted on +30 feet Ordnance datum level floor. These alternating current motors are 140 horsepower, 965 revolutions per minute, 3,300 volts, and each pump, when working against a head of 285 feet, passes condensate at the rate of 9,100 pounds per minute.

Feed Heating

The feed heating train consists of four surface heaters and one direct contact de-aerator heater. Condensate is pumped from the condenser at 81.8 degrees Fahrenheit by either extraction pump and is fed through air ejector, drain cooler and two low-pressure heaters and gland heater to the high level de-aerator heater. From here it drops straight down to the boiler feed pump suction main and pumped through the two high-pressure heaters and then to the boilers. The drains are cascaded back and passed through the drain cooler before entering the condenser. Make-up is introduced into the system through the reserve feed tank. A series of magnetically operated valves on the de-aerator heater enable water to be admitted to the system from the reserve feed, but if required, water can be drawn from the system and passed into the reserve feed tank.

Associated with each pair of turbo-alternators and group of four boilers there are three 100 per cent duty electrically driven feed pumps, and two 50 per cent duty steam turbine driven pumps. Each electrically driven pump is capable of delivering feed water at a rate of 650,000 pounds per hour at 1,230 pounds per square inch, and serves two boilers, while the steam turbine driven pumps cut in automatically as a temporary standby at reduced feed delivery pressure. The centrally positioned electrically driven pump acts as a standby for each pair of boilers and is started up by hand.

Hydrogen Cooling of Alternator

Each turbine drives a 65,000 kilowatt 11,800 volts hydrogen cooled alternator. For alternators Nos. 1-4, the hydrogen pressure is 0.5 pounds per square inch, while for Nos. 5 and 6 it is as high as 15 pounds per square inch. The gas is cooled by circulating distilled water through four heat exchangers incorporated in the stator frame of each alternator. To prevent excessive leakage of hydrogen between the rotor shafts and the stator bearing end shields, oil seals are fitted on the inner bearing covers. The oil seal supply is drawn from a compartment in the main oil tank by a pump of 25 gallons per minute capacity and delivered via an oil cooler to the seals. A small portion of this oil discharges to the outboard side of the bearing and returns to the main oil tank. The remainder discharges to the generator side of the bearings and so becomes saturated with hydrogen. This oil passes to a hydrogen de-training tank. The system is provided with alarms to indicate undue rise and fall in the level of the oil in the de-training tank and also with emergency supplies from the main oil services in the event of failure of the seal oil pumps.

Hydrogen pressure is maintained automatically and the hydrogen proportion is continually and automatically analysed. The hydrogen scavenging during prolonged shut down is carried out by CO₂ displacement.