A Nighttime Power Thermal-Storage Steam Generator: JOKIGEN

IHI Inspection & Instrumentation Co., Ltd.

Food service facilities catering to schools and businesses use a large amount of steam to operate kitchen equipment such as tilting cookers and washers. In most conventional methods, boilers fueled by petrol, gas, and other fossil fuels have served as a heat source for the generation of the necessary steam. However, given the need for environmental measures to reduce the use of fossil fuels and to curb CO_2 emission, more environmentally-friendly and economical heat sources are being sought. In meeting this challenge, IHI Inspection & Instrumentation Co., Ltd. (IIC) has launched a steam generator called JOKIGEN into practical use by the application of thermal storage technology.

1. System overview

The system flow of JOKIGEN is illustrated in Figure 1. Figure 2 is a photograph showing the appearance of an installed system as an example. JOKIGEN stores the thermal energy electrically generated during the night in the thermal storage material, which is brought to a high temperature. The heat is then used during the daytime to supply steam to kitchen equipment, etc. The steam generation system is mainly composed of a feed water unit, a control module, and a thermal storage module. The thermal storage module is filled with a mixture of molten salt and magnesium oxide as a heat-transfer medium, which is heated to around 480 C by the built-in electric heater for thermal storage. The system can instantly meet the need for steam during the daytime by passing water from the feed water unit through the heat exchanger tube in the thermal-storage module. In addition, the optimally chosen thermal-storage material and the layout design of the heat-transfer element is able to provide a relatively stable amount and temperature of steam supplied from the moment JOKIGEN is started until the moment it is stopped.

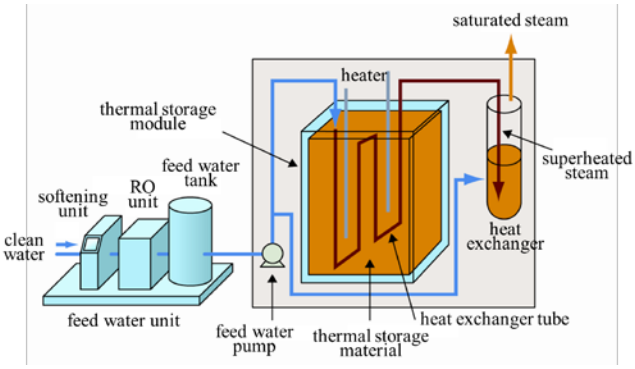

Figure 1 System Flow of JOKIGEN

2. Features of JOKIGEN

(1) Reduces operating cost

Thermal storage performed with nighttime power reduces power usage during the daytime and further saves on electricity bill thanks to the discount made available by the thermal-storage load shift contract.

(2) No need to replace existing equipment

Personnel can continue to use the steam-operated equipment that they are used to.

(3) Clean and safe

Generator exhausts no gases as the unit requires no combustion of gaseous fuel or petrol. Clean steam can be used directly as no agent is added to the feed water.

(4) No special qualifications required

The once-through boiler employed for JOKIGEN's evaporator is classified as a simplified boiler (i.e., it has a pressure of 1 MPa or less and a heat-transfer surface area of 5 m^2 or less). For this reason, no special qualifications, such as boiler engineer, are necessary.

(5) Many installation site available

The installation of JOKIGEN is not subject to regulations, including those of the Fire Service Act, and thus requires no boiler room, no fuel storage tank or piping, no exhaust unit, no fire protection and extinguishing equipment, or any other special equipment. The JOKIGEN can be installed outdoors, indoors, or on rooftops.

Figure 2 Example of an outdoor JOKIGEN installation

3. Sales performance

Since the delivery of the first JOKIGEN unit in 2005, a cumulative total of 60 units were delivered, mainly to school food service facilities, and by the end of fiscal year 2011, marking a domestic market share of nearly 95%. In recent years, progress has been made in the application of steam generators for sterilization and washing at medical institutions.

4. Summary

IIC's JOKIGEN has successfully been put into practical use as a nighttime power thermal-storage steam generator offering many features, including its allowing the continued use of the existing steam-operated equipment and the peak shift of electricity usage (leveling of power consumption) by effective use of nighttime power. The expansion of JOKIGEN's range of application will be further pursued, while its reliability continues to be maintained.