

Diverse applications of industrial steam turbines



Unlike fossil-fired plants, some power generation facilities using steam turbines, like those using biomass or waste heat recovery, are low in environmental load. And, some others that use exhaust steam from steam turbines or extract steam from intermediate stages for use in plants are intended to improve the total energy efficiency of entire plants. Including geothermal power generation that has attracted attention recently, steam turbines are utilized in various power generation facilities.

Preface

Steam turbines are important facilities that have been used as prime movers for power generating facilities the world over since long ago.

Steam turbines used for power generation are classified roughly into those for utility use and those for industrial use as in-house power generation at plants.

One of the features of industrial steam turbines is an infinite variety of specification requirements. Although steam turbines are custom-made, we design and make them with our own technologies, and the flexibility shown to such requirements has been highly evaluated.

In addition, a steam turbine can be used with any kind of heat source that generates steam; it can even use exhaust steam. And, it can be used with a variety of plants, though the turbine is destined for a generic-sounding power generation purpose. The following paper gives some characteristic examples of use of steam turbines.

1 For thermal power plants

The most basic system for driving a steam turbine is to use steam generated by heat obtained by burning fuel. Fig. 1 shows, as a typical example a flow diagram.

Steam produced in the boiler drives the steam turbine, turns into water in the condenser, and is fed to the boiler again. In this process, the higher the exhaust vacuum of the steam turbine is (the lower the exhaust pressure is), the higher the generated output is. However, the heat taken away by the cooling water in the condenser for this purpose is dumped. To address this problem, steam is extracted from an intermediate stage and used to preheat water supplied to the boiler, thereby increasing the heat

efficiency of the entire plant.

In industrial steam turbines, extracted steam is not only used to preheat boiler feed water but is also used in processes to manufacture products.

And it is possible, not to reduce the exhaust pressure of the steam turbine to a vacuum but to discharge steam at high pressure and temperature for use as is and in its entirety. We offer steam turbines that meet individual needs for electricity or heat (in the form of steam), thereby contributing to high-efficiency utilization of energy.

Furthermore, fuels to be burned to produce steam are not limited to fossil fuels. Steam turbines are extensively applied to plants that burn wood chips used tires, and bagasse, attracting attention from the viewpoint of biomass power generation that reduces loading on the environment.

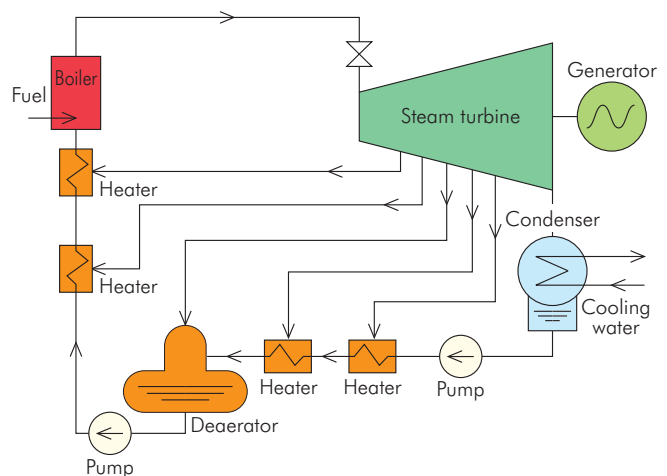


Fig. 1 Flow diagram of thermal power plant

2 For waste heat recovery power plants

A method of driving a steam turbine without burning fuel is available in which waste heat from a plant is used to produce steam. This method needs no fuel to generate electricity, thus is advantageous both in terms of reducing environmental loading and cost-effectiveness.

Major examples of this kind of application are steam turbine generator sets that use heat produced in coke dry quenching facilities or cement firing facilities.

Some systems characterized by steam turbine generator sets utilize relatively low temperature heat in the intermediate stages of the steam turbines (induction steam) for power generation purposes. Fig. 2 shows an example of the flow diagram. In addition to the main steam taken from the inlet, relatively low temperature heat is recovered from two stages for use in power generation and to effectively use energy.

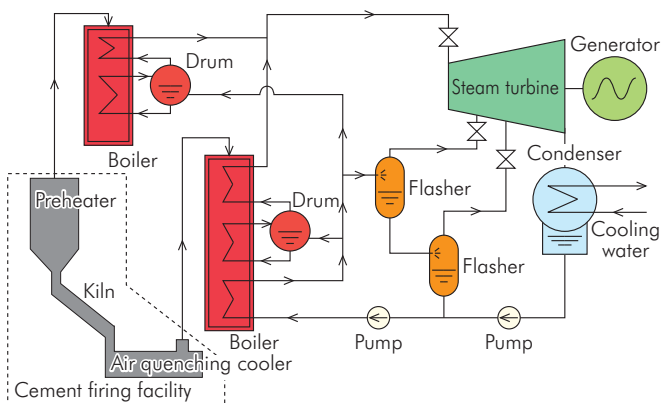


Fig. 2 Flow diagram of waste heat recovery power plant



Fig. 3 Geothermal power generation facility

3 For geothermal power plants

One of power generation systems attracting attention these days is geothermal power generation. Fig. 3 shows the appearance of a geothermal power generation facility. A geothermal power generation facility produces electric power by using steam or hot water heated by geothermal heat to drive a steam turbine. The major differences from common steam turbine generator sets are the use of saturated vapor of relatively low pressure and the poor quality of steam.

The use of low-pressure steam necessitates a steam turbine with a large structure compared with its output, while the use of saturated vapor necessitates measures against erosion that starts from the turbine inlet. In common steam turbines, steam from water of controlled quality is used, but in geothermal power generation, steam gushing from the ground is used without any treatment, which requires measures specific to geothermal power generation such as consideration for acid resistance.

Having accumulated knowledge through after-sales servicing in addition to the experience of implementing various measures before shipment since the delivery of the first unit in 1975, we are confident that we can contribute to the widespread use of geothermal power generation.

Postscript

We have a lineup of products developed from the company's history of designing and manufacturing steam turbines, such as top pressure recovery turbines that use the pressure of blast furnace gas and binary power generating turbines that use hot springs or waste gas/hot water of relatively low temperature from plants. They all contribute to a reduction in environment load.

We believe it our mission to continue making proposals for products that meet the needs of individual customers, and deliver products of high reliability.

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