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(54) **STEAM COMPRESSING AND STORING
DEVICE FOR WASTE HEAT BOILER**

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(57) **ABSTRACT**

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Disclosed is a steam compressing and storing device for a waste heat boiler, which is connected to the waste heat boiler generating steam by collecting waste heat from external facilities and stores the steam, the steam compressing and storing device including: a first steam storage unit that is communicably connected to the waste heat boiler and has a heat insulating structure to receive the steam and store the steam in an insulated state; a steam compressor that is communicably connected to the first steam storage unit and receives, from the first steam storage unit, and compresses the steam; and a second steam storage unit that is communicably connected to the steam compressor and has a heat insulating structure to receive the compressed steam from the steam compressor and store the compressed steam in an insulated state.

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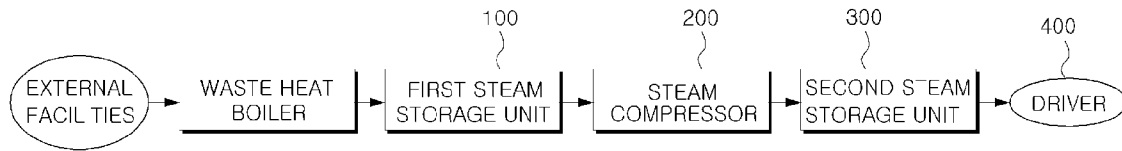
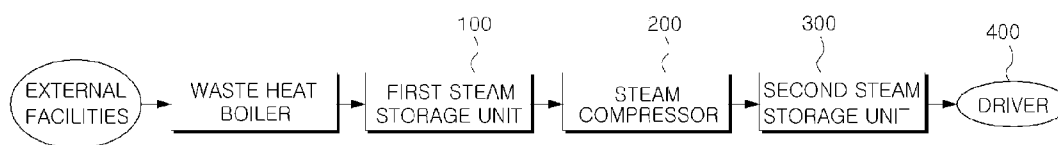


FIG. 1



STEAM COMPRESSING AND STORING DEVICE FOR WASTE HEAT BOILER

CROSS-REFERENCE TO RELATED PATENT APPLICATION

[0001] This application claims the benefit of Korean Patent Application No. 10-2015-0066705, filed on May 13, 2015, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a steam compressing and storing device, and more particularly, to a steam compressing and storing device for a waste heat boiler, which compresses and stores steam generated by the waste heat boiler.

[0004] 2. Description of the Related Art

[0005] Waste heat is energy thrown in the surrounding environment in fields of production or consumption, and types and forms of the waste heat are various.

[0006] A discharge amount of the waste heat is increasing according to recent enhancement and expansion of industries, and it is determined that an amount of latent energy in the waste heat is also enormous.

[0007] In addition, interests in new and renewable energy are rapidly increasing as energy supply methods are diversified due to exhaustion of fossil fuels, and energy using waste heat is receiving attention as a type of the new and renewable energy.

[0008] Accordingly, waste heat utilizing apparatuses that recover and reuse waste heat are being developed, and examples of the waste heat utilizing apparatuses include a waste heat recovery device, a heat exchanger, and a waste heat boiler.

[0009] Here, the waste heat boiler generates steam and hot water by using, as a heat source, heat energy generated from an incinerator, a blast furnace, a melting furnace, or chemical process facilities. Since the waste heat boiler is operable without having to use a separate combustion apparatus and recovers a flue gas that is thrown in the atmosphere and causes a greenhouse effect, the waste heat boiler promotes energy reduction and at the same time prevents air pollution.

[0010] KR 1984-0007163 discloses a technology about such a waste heat boiler. Here, the waste heat boiler operative to provide low cost steam from heat that would otherwise be lost includes means for supplying incoming feedwater thereto, a steam drum for receiving the incoming feedwater, a feedwater control valve for regulating the rate of flow of the incoming feedwater to the steam drum, a steam generating bank for receiving circulating water from the steam drum and for heating the circulating water to produce steam therefrom, and separating means for receiving a water-steam mixture from the steam generating bank and for effecting a separation of the water and steam from the water-steam mixture into separate entities, the improvement comprising means for attenuating cyclic thermal shrink and swell in the steam drum by effecting a preheating of the incoming feedwater before the incoming feedwater is received within the steam drum and is assimilated with the water that is already present in the steam drum.

[0011] However, since a temperature and pressure of steam generated by such a general waste heat boiler are low, the general waste heat boiler is usually used for low pressure generation, such as preheating, heating, or cooling of combustion air that requires relatively low pressure and low temperature steam, and is unable to be used for steam turbine generation driven by using process steam or high pressure steam of at least 7 bar (absolute atmosphere).

[0012] As such, when a waste heat boiler is used only for low pressure generation, only some of energy in steam is used and most of the energy is discharged into the atmosphere, and thus the energy is wasted and atmosphere warming may occur.

SUMMARY OF THE INVENTION

[0013] The present invention provides a steam compressing and storing device for a waste heat boiler, which changes and stores steam generated by the waste heat boiler to a high pressure state to increase utilization of the steam.

[0014] According to an aspect of the present invention, there is provided a steam compressing and storing device for a waste heat boiler, which is connected to the waste heat boiler generating steam by collecting waste heat from external facilities and stores the steam, the steam compressing and storing device including: a first steam storage unit that is communicably connected to the waste heat boiler and has a heat insulating structure to receive the steam and store the steam in an insulated state; a steam compressor that is communicably connected to the first steam storage unit and receives, from the first steam storage unit, and compresses the steam; and a second steam storage unit that is communicably connected to the steam compressor and has a heat insulating structure to receive the compressed steam from the steam compressor and store the compressed steam in an insulated state.

[0015] The steam compressing and storing device may further include a driver that is communicably connected to the second steam storage unit to be driven by using the compressed steam stored in the second steam storage unit.

[0016] The driver may be a steam turbine.

[0017] The steam generated by the waste heat boiler may have pressure from 1 to 7 bar and a temperature from 100 to 170° C.

[0018] The steam compressor may be a centrifugal compressor using an impeller or a volumetric compressor using a screw or a piston.

[0019] The steam compressed by the steam compressor may have pressure from 5 to 15 bar and a temperature from 152 to 250° C.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The above and other features and advantages of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

[0021] FIG. 1 is a schematic diagram of a steam compressing and storing device for a waste heat boiler, according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Hereinafter, the present invention will be described more fully with reference to the accompanying drawings, in

which exemplary embodiments of the invention are shown. The terms or words used herein must not be interpreted in their common or dictionary definitions, but must be interpreted in the meanings and concept corresponding to the aspect of the present invention, based on the principle that the inventor(s) can suitably define the concept of terms in order to describe the invention in the best manner.

[0023] Accordingly, the embodiments and drawings described herein are only preferred examples, and do not represent the technical aspects of the present invention. Thus, one of ordinary skill in the art understands that the invention may be embodied in many different forms.

[0024] One or more embodiments of the present invention will now be described with reference to accompanying drawings.

[0025] FIG. 1 is a schematic diagram of a steam compressing and storing device for a waste heat boiler, according to an embodiment of the present invention.

[0026] Referring to FIG. 1, the steam compressing and storing device (hereinafter, referred to as a storing device) according to an embodiment of the present invention is used to compress and store steam generated by a waste heat boiler, and includes a first steam storage unit 100, a steam compressor 200, and a second steam storage unit 300.

[0027] The waste heat boiler recovers waste heat discharged from external facilities, and generates steam heated by using the waste heat. Here, examples of the external facilities include facilities used in concentration processes, ion manufacturing processes, steel manufacturing processes, and petrochemical processes, but are not limited thereto. The waste heat boiler may heat the steam at a temperature from 100 to 150° C. Also, the heated steam may have pressure of 1 to 7 bar (absolute pressure) and a temperature of 100 to 170° C., which is relatively low temperature and low pressure steam.

[0028] The first steam storage unit 100 may be communicably connected to the waste heat boiler and have a heat insulating structure to receive the steam and store the steam in an insulated state. The first steam storage unit 100 may include a storage body in which the steam supplied from the waste heat boiler is accommodated, and an insulating layer surrounding a circumference of the storage body, but is not limited thereto. The first steam storage unit 100 stores the steam and may uniformly provide the steam to the steam compressor 200 that is described below. Here, the steam compressor 200 may include a steam adjusting valve that is provided at an outlet end to which the stored steam is discharged and adjusts a moving amount of the steam.

[0029] The steam compressor 200 is communicably connected to the first steam storage unit 100, and receives, from the first steam storage unit 100, and compresses the steam. Here, the steam compressor 200 may include an impeller. For example, the steam compressor 200 may include a housing in which the steam is temporarily accommodated, a rotation shaft that is included in the housing and is connected to a motor, and an impeller perpendicularly extending from the rotation shaft. The steam compressor 200 may be a centrifugal compressor using an impeller or a volumetric compressor using a screw or a piston.

[0030] For example, when the steam compressor 200 is a centrifugal compressor, the impeller may be rotated at a high speed in one direction while steam is accommodated in the

housing. At this time, the steam may get centrifugal force by high speed rotation of the impeller and may be compressed by the centrifugal force.

[0031] Alternatively, when the steam compressor 200 is a volumetric compressor, the steam compressor 200 may include a screw or a piston such that internal volume of the housing is reduced in one direction. At this time, as volume of the housing is reduced, pressure of the steam may be increased, and thus the steam may be compressed.

[0032] Here, the steam compressor 200 may compress the steam to a noncondensable gas state to change the steam to a high pressure state. The compressed steam may have pressure of 5 to 15 bar (absolute pressure) and a temperature of 152 to 250° C., but is not limited thereto.

[0033] The steam compressed by the steam compressor 200 as such is supplied to the second steam storage unit 300 that is described below. Here, the steam adjusting valve adjusting the moving amount of the steam may be provided between the steam compressor 200 and the second steam storage unit 300.

[0034] The second steam storage unit 300 may be communicably connected to the steam compressor 200 and have a heat insulating structure to receive the steam and store the steam in an insulated state. Here, the second steam storage unit 300 may include a storage body in which the steam received from the steam compressor 200 is accommodated, and an insulating layer surrounding a circumference of the storage body, but is not limited thereto.

[0035] The storage device may further include a driver 400 communicably connected to the second steam storage unit 300. Here, the driver 400 may be a generating apparatus, such as a steam turbine. The driver 400 may include a nozzle and a turbine blade, and may obtain power by jetting and expanding high pressure steam by using the nozzle, pushing the high pressure steam that is jetted at a high speed to the turbine blade that is rotating, and rotating a shaft according to an impact or reactive action.

[0036] Alternatively, the driver 400 may be other process facilities, and the process facilities may be driven by converting pressure of the high pressure steam to mechanical energy.

[0037] The storage device according to the present invention has following effects. First, steam having high pressure of 5 to 15 bar may be generated by compressing steam generated by the waste heat boiler, thereby driving a steam turbine or process facilities that were unable to be driven by using low pressure steam generated by a general waste heat boiler. Accordingly, utilization of the waste heat boiler may be increased, and in addition, an energy collecting efficiency of waste heat may be increased.

[0038] Second, the steam generated by the waste heat boiler and the steam compressed by the steam compressor 200 are stored in the insulated state, and thus a loss of heat energy generated while storing the steam may be reduced.

[0039] While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the following claims.

What is claimed is:

1. A steam compressing and storing device for a waste heat boiler, which is connected to the waste heat boiler

generating steam by collecting waste heat from external facilities and stores the steam, the steam compressing and storing device comprising:

- a first steam storage unit that is communicably connected to the waste heat boiler and has a heat insulating structure to receive the steam and store the steam in an insulated state;
 - a steam compressor that is communicably connected to the first steam storage unit and receives, from the first steam storage unit, and compresses the steam; and
 - a second steam storage unit that is communicably connected to the steam compressor and has a heat insulating structure to receive the compressed steam from the steam compressor and store the compressed steam in an insulated state.
2. The steam compressing and storing device of claim 1, further comprising a driver that is communicably connected

to the second steam storage unit to be driven by using the compressed steam stored in the second steam storage unit.

3. The steam compressing and storing device of claim 2, wherein the driver is a steam turbine.

4. The steam compressing and storing device of claim 1, wherein the steam generated by the waste heat boiler has pressure from 1 to 7 bar and a temperature from 100 to 170° C.

5. The steam compressing and storing device of claim 1, wherein the steam compressor is a centrifugal compressor using an impeller or a volumetric compressor using a screw or a piston.

6. The steam compressing and storing device of claim 1, wherein the steam compressed by the steam compressor has pressure from 5 to 15 bar and a temperature from 152 to 250° C.

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