

SYSEM DESCRIPTION SAA/SAG VENTILATION SYSTEM GAS TURBINE	Respons. dept GPMI	Date 040209	Reg. M DB 101
	Prepared Peter Mattsson		YAMAMA CEMENT

Table of Contents

Table of Contents	1
Purpose of the system	2
General description of the system	2
Main components	2
Function	5
<i>Start up</i>	5
<i>Continuous operation</i>	6
<i>Turbine stop</i>	6
<i>Stand still</i>	6
Disturbances	6
<i>Gas turbine trip</i>	6
<i>Generator breaker trip</i>	6
<i>Loss of power supply</i>	6
<i>Other faults</i>	6
Technical specification	6
<i>Design criteria and standards</i>	6
<i>Dimensioning data</i>	6
<i>Engineering data</i>	7
<i>Emergency power supply</i>	7
<i>Installation</i>	7
<i>Materials</i>	7
<i>Component data</i>	7
Testing and service	7
<i>Testing during normal operation</i>	7
<i>Accessibility during normal operation</i>	7
Index of Components	8

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Purpose of the system

The gas turbine room ventilation system is designed to supply the gas turbine room with necessary amount of air for cooling and sufficient ventilation flow to achieve non-hazardous area.

That is:

- To keep a slight overpressure in the GT room.
- To ensure that there is at least 90 airchanges / hour.
- The shut off dampers shall close when the fire fighting system is activated.

The auxiliary room ventilation system is designed to supply the auxiliary room with necessary amount of air for cooling.

General description of the system

Refer to P&ID 2046031 "GT10B2"

The system comprises an air intake duct that leads the air into the enclosure at the gas turbine inlet end and an outlet duct withdrawing the air from the opposite end of the enclosure, where the heat radiation is highest.

The inlet and outlet consist of galvanised steel sheet ducts containing silencers, shut off dampers and a fan. Filters are used if outdoor air is used for ventilation.

Ventilation with overpressure is used for the GT unit .

The shut off dampers prevent air from entering the enclosure, thereby maintaining the CO₂ concentration, in case of fire. If the fire fighting system is activated the shut off dampers are closed and the fan is stopped automatically.

The ventilation system for the auxiliary room is combined with the ventilation system for the GT room. Air is taken from the same inlet filter house and the outlet is lead to atmosphere.

The auxillary inlet system consists of shut off damper and two fans. The outlet is lead throu the shut off damper to atmosphere .

Ventilation with overpressure in the auxiliary room is used for all applications.

Main components

- Inlet weather louver

SAG10AT005

The weather louver prevents objects and precipitation from entering the ventilation inlet.

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- Air inlet filter
SAG10AT015
The inlet filter consists of several standard sized sections and prevents particles from entering the GT room and Aux-room.

- Differential pressure manometer ,filter house .
SAG10CP003
The manometer is monitoring the differential pressure across the filter sections .

- Shut off damper, AUX room
SAA10AB005
The shut off damper prevents air from entering the enclosure, thereby maintaining the CO2 concentration, in case of fire.

- Limit switch, shut off damper
SAA10AB005-S11

- Shut off damper, AUX room
SAA10AB010
The shut off damper prevents air from entering the enclosure, thereby maintaining the CO2 concentration, in case of fire.

- Limit switch, shut off damper
SAA10AB010-S11

- Ventilation fan, Aux. room
SAA10AN005
The fan is of axial flow type, and driven by an AC-motor. The fan unit is installed in the ventilation duct.
The fan can be operated in automatic or manual mode.

- Ventilation fan 2, Aux. room
SAA10AN010

- Differential pressure transmitter, aux-fan units .
SAA10CP005
The transmitter is monitoring the differential pressure across the aux-fan units.
Low differential pressure (L1) initiates an fan switch-over .

- Air outlet filter
SAA10AT020

2004-02-10 The outlet filter prevents particles from entering the Auxilliary room during ventilation
Roger Jonsson standstill.

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- Inlet silencer
SAG10BS005

SAG10BS010
The silencer prevents noise breakout to the environment.
- Shut off damper, inlet
SAG10AB005
The shut off damper prevents air from entering the enclosure, thereby maintaining the CO2 concentration, in case of fire.
- Limit switch, inlet shut off damper
SAG10AB005-S11
- Shut off damper, inlet
SAG10AB010
The shut off damper prevents air from entering the enclosure, thereby maintaining the CO2 concentration, in case of fire.
- Limit switch, inlet shut off damper
SAG10AB010-S11
- Differential pressure transmitter, GT room
SAG10CP005
The transmitter is monitoring the differential pressure between the outside and inside of the gas turbine enclosure.

Low differential pressure (L1) initiates an alarm.
This might be caused by an open door in the enclosure, closed inlet shut off damper, malfunction of the fan/driver or clogged inlet.

High differential pressure (H1) initiates an alarm.
This might be caused by closed outlet shut off damper.
- Shut off damper, outlet
SAG10AB020
The shut off damper prevents air from entering the enclosure, thereby maintaining the CO2 concentration, in case of fire.
- Limit switch, outlet shut off damper
SAG10AB020-S11
- Ventilation fan 1
SAG10AN005
The fan is of axial flow type, and driven by an AC-motor. The fan unit is installed in the ventilation duct and is certified for use in hazardous area.

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The fan can be operated in automatic or manual mode. The fan is used as a redundant object together with fan 2 and either of them can be selected for auto or standby operation.

- Differential pressure transmitter, fan unit
SAG10CP010

The transmitter is monitoring differential pressure across the fan unit.

Low pressure (L1) initiates a fan switch-over.

Low pressure (L2) initiates a turbine trip after 30 seconds.

- Ventilation fan 2
SAG10AN010

The fan is of axial flow type, and driven by an AC-motor. The fan unit is installed in the ventilation duct and is certified for use in hazardous area.

The fan can be operated in automatic or manual mode. The fan is used as a redundant object together with fan 1 and either of them can be selected for auto or standby operation.

- Non-return valve, fan unit
SAG10AA010
SAG10AA015

The non-return valve is installed in the fan unit and prevents back flow through the fan not in operation.

- Outlet silencer
SAG10BS020

The silencer prevents noise breakout to the environment.

- Outlet weather louver
SAG10AT040

The weather louver prevents objects and precipitation from entering the ventilation outlet.

Function

Operation of the system is fully automatic.

Start up

When the gas turbine start sequence is activated the pre-selected ventilation fan will be ordered on.

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Continuous operation

During continuous operation the fan gives a constant flow. The fan function is monitored by the differential pressure transmitter measuring across the fan unit.
The ventilation system function is monitored by the differential pressure transmitter measuring between the outside and inside of the gas turbine enclosure.

Turbine stop

The ventilation FG shall be in operation during 3 hours after a turbine stop.
After 3 hours the heat radiation from the gas turbine has decreased sufficiently to allow the fans to be stopped.

Stand still

The ventilation FG can be manually operated any time during stand still, except when a gas warning is active.

Disturbances

Gas turbine trip

The ventilation shall be in operation during the first 3 hours of the GT unit cooling down.

Generator breaker trip

N/A.

Loss of power supply

Loss of AC power supply stops the ventilation and closes the shut off dampers after a time delay. Loss of fire fighting system 24 VDC closes the shut off dampers

Other faults

Fault in connecting systems:
Failure in fire fighting system may close the shut off dampers, resulting in improper ventilation. See also fire fighting system description.

Technical specification

Design criteria and standards

Dimensioning data

Heat dissipation from Aux: 10 kW
Heat dissipation from GT: 220 kW
Minimum number of air changes
in the GT room: 2004-02-10 90 per hour

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Design ambient temperature: Max. inlet +55 °C
 Min inlet -15 °C
 Design overpressure: + 50-200 Pa
 Sound pressure level: According to gas turbine unit specification

Engineering data

Design air flow GT-room: 9,5 m³/s
 Design air flow Aux-room: 0,8 m³/s

Emergency power supply

The solenoids operating the shut off dampers are powered from the fire fighting system.

Installation

The ventilation air in/outlet are separate units installed on the GT enclosure roof. The outlet is divided in three ducts from the enclosure, one in front and two behind the GT exhaust.

Materials

Material will be selected regarding to GT enclosure.
 Ducts and units in galvanised steel

Component data

See the system lists

Testing and service

Testing during normal operation

The standby fan can be tested during normal operation by manually initiating fan switch-over.

Accessibility during normal operation

Filters in the air inlet can be changed during normal operation.

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Index of Components

S

SAA10AB005 Shut Off Damper, Inlet	3	SAG10AB010-S11 Limit Switch, Inlet Shut Off Damper	4
SAA10AB005-S11 Limit Switch, Shut Off Damper	3	SAG10AB020 Shut Off Damper, Outlet	4
SAA10AB010 Shut Off Damper	3	SAG10AB020-S11 Limit Switch, Outlet Shut Off Damper	4
SAA10AB010-S11 Limit Switch, Shut Off Damper	3	SAG10AN005 Ventilation Fan 1	4
SAA10AN005 Ventilation Fan, Aux. Room	3	SAG10AN010 Ventilation Fan 2	5
SAA10AN010 Ventilation Fan, Aux. Room	3	SAG10AT005 Inlet Weather Louver	2
SAA10AT020 Air Outlet Filter	3	SAG10AT015 Air Inlet Filter	3
SAA10CP005 Differential Pressure Transmitter, aux-fan units	3	SAG10AT040 Outlet Weather Louver	5
SAG10AA010 Non-Return Valve, Fan Unit	5	SAG10BS005 Inlet Silencer	4
SAG10AA015 Non-Return Valve, Fan Unit	5	SAG10BS010 Inlet Silencer	4
SAG10AB005 Shut Off Damper, Inlet	4	SAG10BS020 Outlet Silencer	5
SAG10AB005-S11 Limit Switch, Inlet Shut Off Damper	4	SAG10CO003 Differential pressure manometer ,filter house	3
SAG10AB010 Shut Off Damper, Inlet	4	SAG10CP005 Differential Pressure Transmitter, GT Room	4
		SAG10CP010 Differential Pressure Transmitter, Fan Unit	5

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