Process Automation

IMI CCI

DAM
Steam Desuperheater

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DAM

Steam Desuperheater

Desuperheating is used to improve the thermal efficiency of heat transfer processes by lowering the temperature of the steam to close to saturation temperature.

The DAM steam desuperheater is used in applications where large spray water flow is required when desuperheating the steam, and where the demand for saturated steam is high.

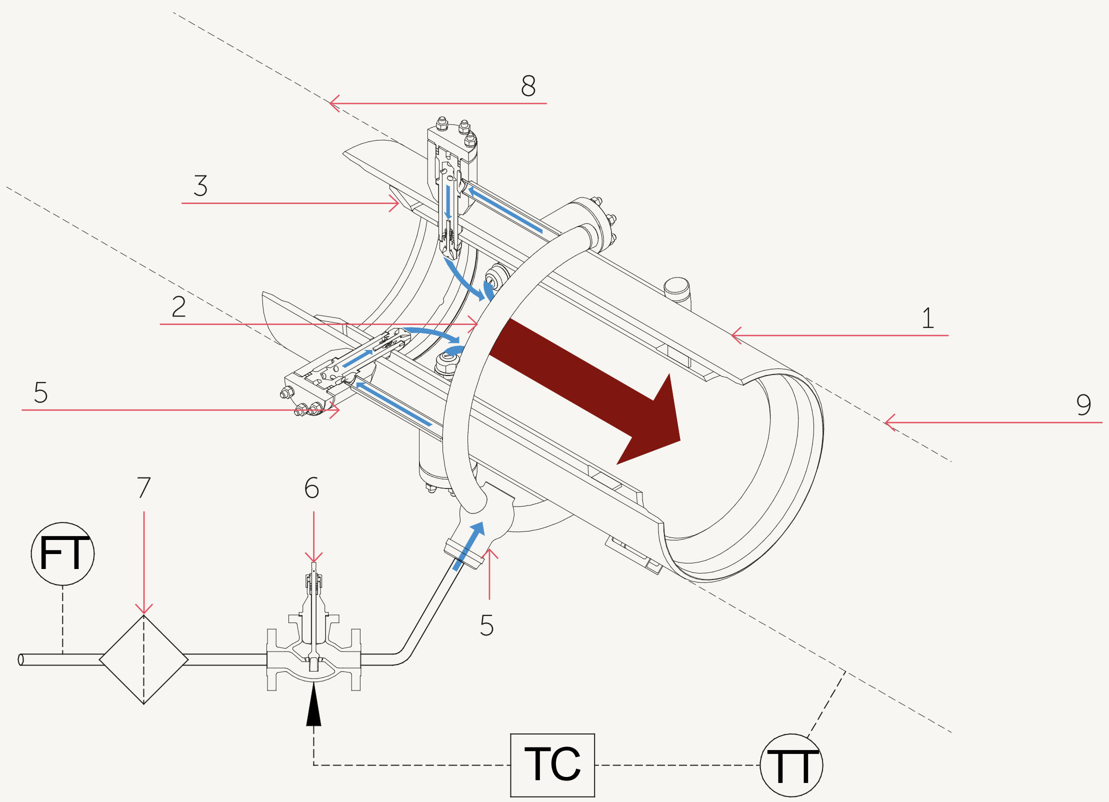
The DAM is a high performing ring style desuperheater with a welded flow profiling liner for superior evaporation and performance. It complies with all existing standards and is always pressure tested on both the steam side as well as the water side.

Key features

The DAM desuperheater is installed in the steam pipe with a number of water atomising nozzles attached.

The size of the nozzles, their number and insertion length may differ depending on steam desuperheating needs and steam pipe diameter.

- The nozzles receive water from a common spray water pipe encircling the steam pipe, supplying water evenly across the nozzles.
- Spray water flow is controlled via an external spray water valve connected to the DAM water connection piece. This valve is regulated via a temperature control system that uses the downstream steam temperature to determine the amount of spray water needed. The placement of the temperature transmitter and the installation of the steam pipe are of critical importance for achieving accurate steam temperature regulation. For more information, see IMI 'II500.11 – System design considerations for DAM desuperheaters'.
- A flow profiling liner is welded to the inside of the DAM body to improve system turndown and to protect the steam pipe against thermal shock and erosion in the downstream pipe.



1. DAM body.
2. Water pipe.
3. Liner.
4. Water connection piece.
5. Spray nozzle.
6. Spray water control valve.
7. Strainer.
8. Upstream steam pipe.
9. Downstream steam pipe.

TT. Temperature sensor/ transmitter
TC. Temperaturecontrol
FT. Spray water flow transmitter.

Benefits

- Excellent steam temperature control for severe applications
- Designed to handle large spray water flow quantities
- Distributes the spray water evenly in the steam desuperheater
- Negligible pressure drop in the steam line
- Welded profiling liner installed as standard
- Nozzle design prevents flashing inside the nozzle
- Each nozzle maintains a certain water atomisation pressure at any flow condition
- Can be redesigned as flow meter

Spray nozzle

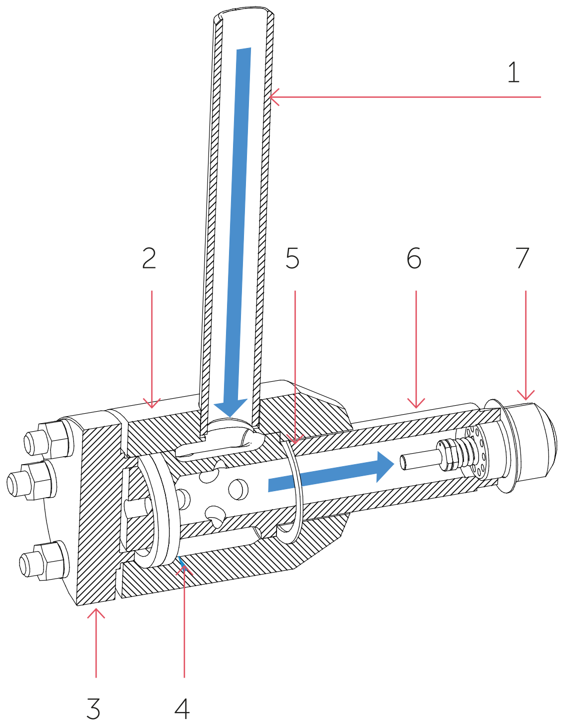
The atomising spray nozzle is housed inside a nozzle holder inserted into the pipe outlet. Water is routed through the pipe leg and the nozzle chamber before being supplied to the spray nozzle.

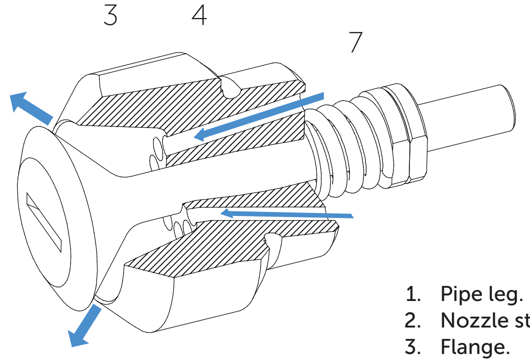
- The nozzle itself has a spring loaded plug which extends as the pressure in nozzle holder increases. The amount of water being injected by each nozzle is determined by a number of factors, including the diameter of the nozzle body opening, adjustment of the spring, and the pressure differential between the steam pipeline and the water pipeline.

- The cooling water enters the inner nozzle chamber through a number of water channels. Water is rotated around the nozzle plug thanks to the special arrangement of the water channels. The plug and the seat are designed to create maximum water velocity at the nozzle edge point. The high velocity of the water when it leaves the nozzle guarantees fine atomisation, quickly evaporating the spray water.

- In order to maintain a specific opening water pressure inside the inner nozzle chamber, the nozzle plug is preloaded by a spring. The force required to open the nozzle is set by the adjustment nut.

- As the nozzles spray perpendicular to the steam flow, the high relative velocity of water to steam creates an efficient secondary level of atomisation.



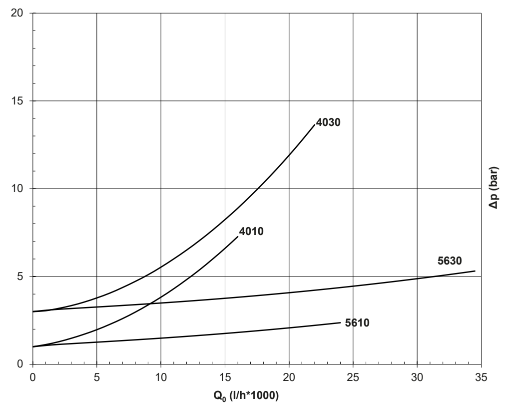


1. Pipe leg.
2. Nozzle stud.
3. Flange.
4. Packing.
5. Gasket.
6. Nozzle holder.
7. Spray water atomising nozzle.

Opening Pressure (OP) nozzle specification

Spring-loaded OP nozzles come in a number of sizes with different capacities and opening pressures. Opening pressure (Δp) is defined as the pressure differential between the water inlet and the DAM outlet.

Q_0 = Required cooling water flow (l/m).



Applications

- Steam turbine exhaust.
- Steam turbine extraction.
- Process steam.

General product specification

Capacity
Unlimited (Depends on size and number of orifices).

Rangeability
Nozzle turndown: Limited only by turndown of selected water control valve.

System turndown: Minimum steam velocity depends on pressure, temperature and superheat, but should typically not be below 6-8 m/s (20-25 ft/s).

Materials
Nozzle body
X19CrMoVNb11.1, AISI 616.

Plug
X19CrMoVNb11.1, AISI 616.

Spring
Heat resistant spring steel.

Adjustment nut
X20Cr13, AISI 420.
Steam pipe/liner
10CrM0910, A335-P22 or 14CrM044, A335- P11or St35.8, A105 or A-182 F91, X10CrM0VNb9 1.

Water pipes
13CrM044, A335-P11 or St35.8 (A105)

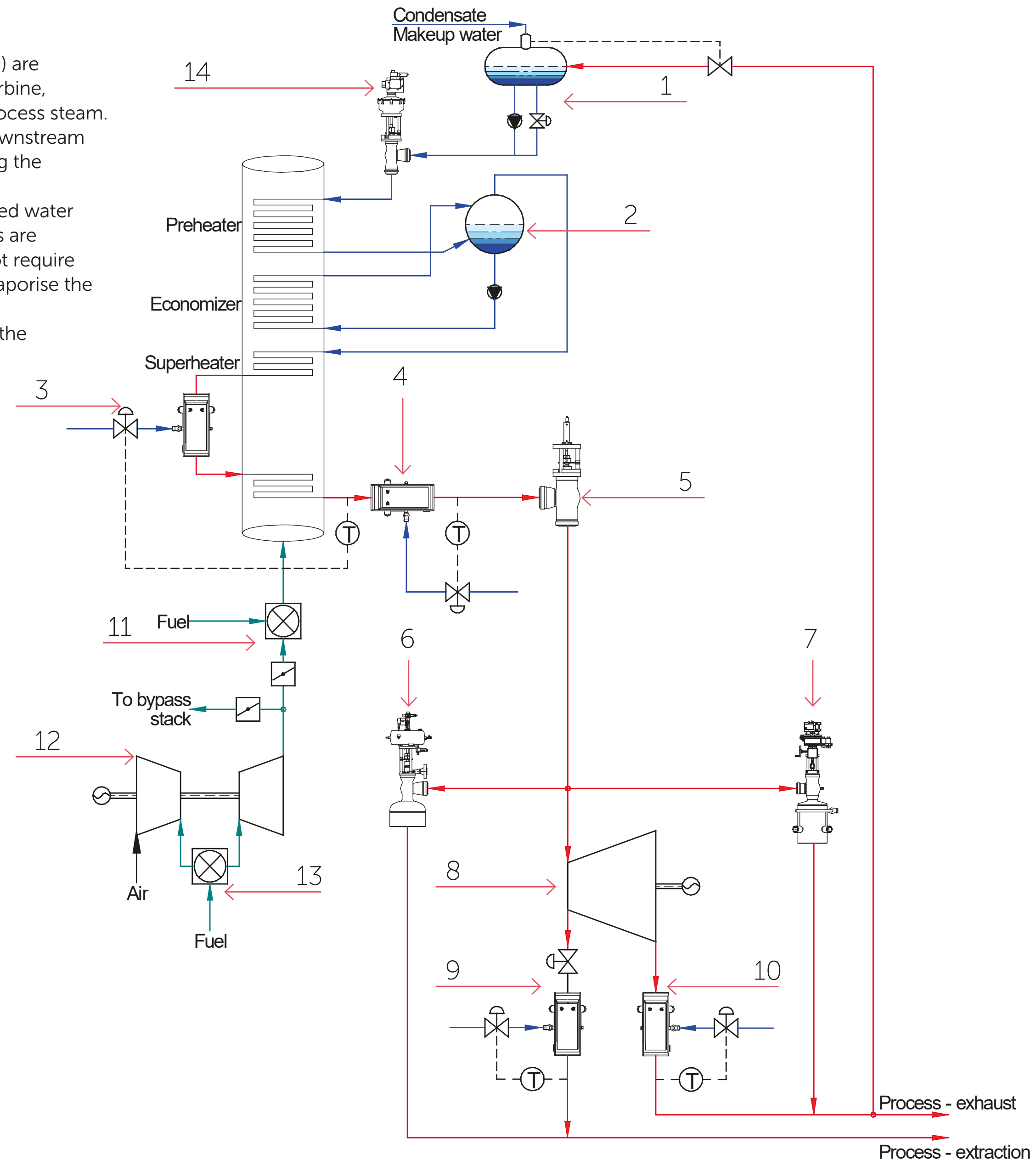
Pressure class
DIN PN 16-320
ANSI 150-2500

*Alternative nozzle and spring material in Inconel is available for high temperature applications and conditions without water injection.

Example

Two DAM desuperheaters (9 and 10) are installed downstream of a steam turbine, reducing the temperature of the process steam. Temperature sensors are placed downstream from the desuperheaters, measuring the desuperheated steam.
Spray water is supplied from the feed water tank (1). As the DAM desuperheaters are mechanically atomising, they do not require high pressure atomising steam to vaporise the water droplets.
Steam that can instead be used for the desalination plant.

1. Feed water tank.
2. Drum.
3. Inter-stage attemperator.
4. Final stage attemperator.
5. Main stop valve.
6. HP/IP bypass.
7. HP/LP bypass.
8. Backpressure steam turbine.
9. DAM extraction desuperheater.
10. DAM exhaust desuperheater.
11. Supplementary ring.
12. Gas turbine.
13. Firing chamber.
14. Feed water control valve.



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