

Venturi Desuperheater

The lowest cost of ownership solution for desuperheating high temperature and high pressure steam or low hydrocarbon gas (such as butane and propylene)

In power plants and (petro)chemical production plants steam is used for generating power and/or as utility for process operations such as heating. The steam is usually available in a “superheated” condition: a state in which the steam is heated beyond its saturated level making it dry and compressible. This has the advantage that no condensation of water occurs (causing erosion and friction) and that smaller pipeline diameters can be applied for plant wide steam distribution.

However, for efficient use in for example heat exchange applications, the superheated steam has to be transformed to a lower temperature or even to a saturated condition. This can be achieved with a desuperheater: a device with the aim to reduce the temperature of the incoming steam to a controlled condition by direct injection of water.

Since the late 1950s, Kiekens-DSH has designed, fabricated, installed and commissioned thousands of desuperheaters worldwide.

The key feature of the Venturi Desuperheater is that it can obtain a stable conditioned steam flow temperature. The In-line Venturi Desuperheater achieves this by combining an increase in steam velocity at the entrance with controlled water addition via a special designed streamlined (wing shaped) spray nozzle.

FUNCTIONALITY

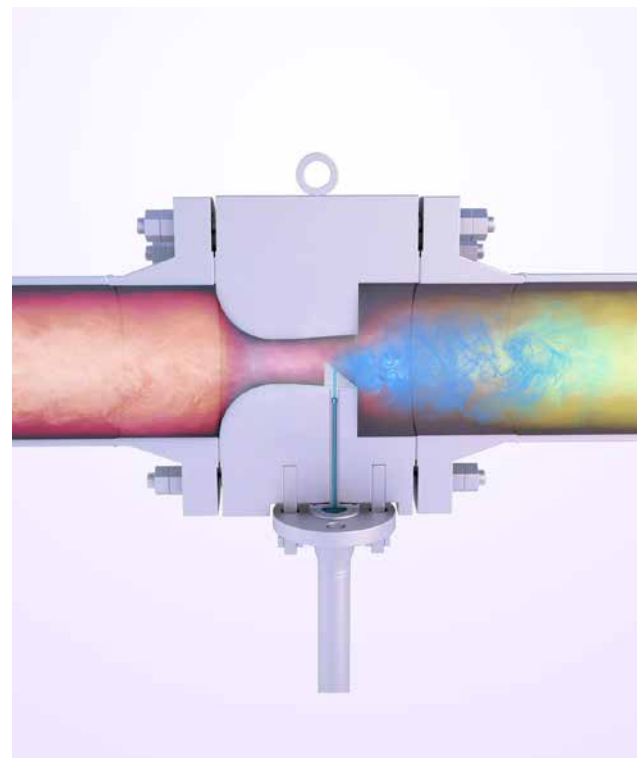
On the surface of the special spray nozzle a thin film of water is formed. The dynamic energy of the steam flow breaks the surface tension of this film, creating a conical shaped spray of water. Ideally the added cooling water shall be fully atomized to ensure temperature stability and to prevent thermal shock in the downstream lines.

Ideal mixing of the superheated steam and the water is achieved with a high steam flow turbulence. This is caused by the special shaped spray nozzle and the Venturi effect: the phenomenon that under a pipe construction (i.e. an orifice), the velocity of a fluid increases while the pressure decreases.

The steam flow that can be handled by a Venturi Desuperheater depends on the available pressure drop within the pipeline system. In order to provide steam with sufficient dynamic energy to have fully atomized water, a pressure drop of at least 0,05 bar is allowed for induction of the Venturi effect. For applications with high turn down and a limited available pressure drop, two Venturi Desuperheaters can be installed in parallel.

For correct operation, only a relative short pipe run is required, both upstream and downstream of the desuperheater. The actual required length mainly depends on the steam flow velocity and the related required cooling water quantity.

Water evaporation up to 40% relative to the inlet steam flow is possible with the Venturi Desuperheater.



Flow profile of superheated steam that enters on the left and ideally mixes with the atomized water directly behind the spray nozzle to a desuperheated steam flow exiting on the right.

SPECIFICATIONS

Kiekens-DSH supplies the In-line Venturi Desuperheater in accordance with the following technical specifications:

Venturi Desuperheater	
Material - Body	Various kinds of forged steel: from carbon to low/high alloy steel up to special materials such as Incoloy
Material - Spray Nozzle	SS316Ti
Pipe connections	Flanged pattern connections or butt weld joints (see pictures)
Piping Codes & Standards	ANSI, ASME U stamp, BS, CU-TR, DIN, IBR, PED or any other internationally accepted standard
Pipe run alignment	Any position
Steam Flow range	30 kg/h to 1000 tons/h
Temperature range	Up to 600°C, depending on the material selection
Pressure range	Up to 250 bar, depending on the material selection
Diameter range	Any
Water side turndown ratio	40:1
Steam side turndown ratio	Determined by available pressure drop ratio
Lifetime	30 years, with low maintenance requirements

OPTIONS

The following options can be quoted upon your request:

- Spare parts and replacements.
- Integration in a skidded solution, including the pipeline runs and auxiliary equipment such as steam and water control valves.

PIPE CONNECTIONS



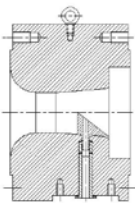
Example of a desuperheater with flanged connections seen from the steam outlet-side.



Example of a desuperheater with butt weld joints. The inlet side has a smaller diameter than the outlet, which avoids the use of expanders in the connecting steam line.

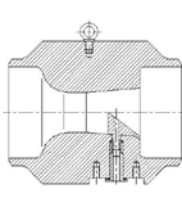
AVAILABLE CUSTOM MADE MODELS

TYPE-111



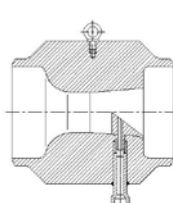
Standard design with flanged pattern connections

TYPE-121



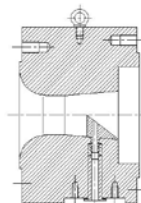
Butt weld joint design with flanged pattern water connection

TYPE-122



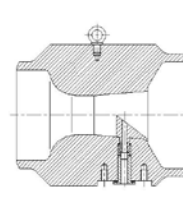
Standard design with butt weld joint connections

TYPE-211



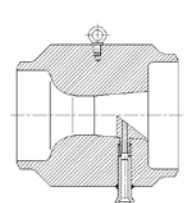
Inlet side smaller than outlet side with flanged pattern connections

TYPE-221



Inlet side smaller than outlet side with butt weld joints and flanged pattern water connection

TYPE-222



Inlet side smaller than outlet side with butt weld joint connections

Visit our website for a video with more information about the functionality of our Venturi Desuperheater!

The following specific Kiekens Desuperheater product sheets are available:

- Venturi Desuperheater
- Multiple Nozzle Spray (MNS) and Quench Desuperheater



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