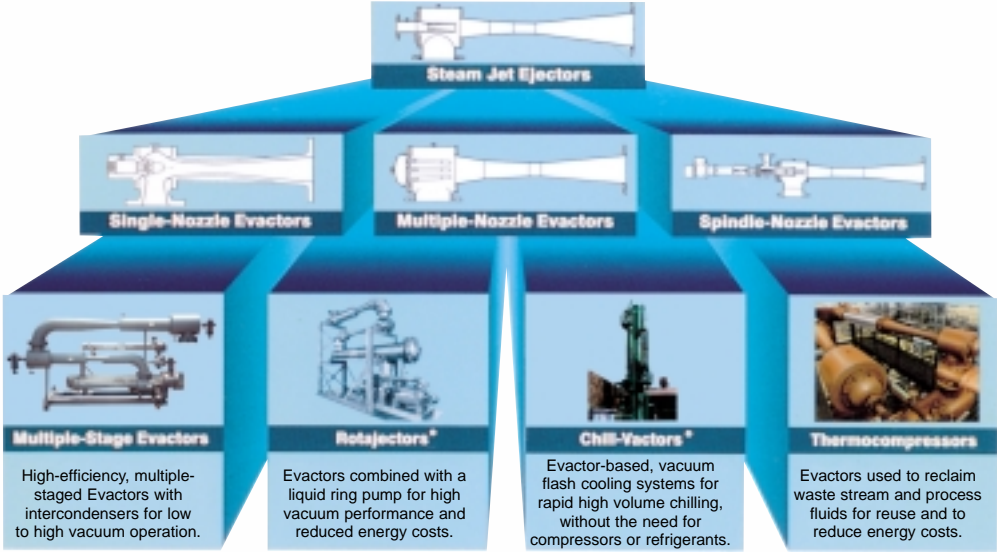


Croll-Reynolds is the leading source for innovative, high-performance Evactor (ejector) based vacuum systems for all segments of the process industries as well as power, general industrial and R&D applications.

Croll-Reynolds' full line of pipe-line desuperheaters is a logical outgrowth of the company's continuing work in Evactor design.



Croll-Reynolds Offers A Complete Selection of Pipeline Desuperheaters for Process, Power Plant and R&D Applications

Desuperheaters are used to control and reduce the temperature of superheated steam (or gas). Croll-Reynolds offers a range of direct contact, high efficiency evaporating styles.

Why do we need a Desuperheater?

Steam is the most widely used heat transport fluid. Its properties are well known and its characteristics at different levels of pressure and temperature are very predictable. Steam is used for both power generation and process operations. Unfortunately these two applications have conflicting requirements; turbines require high temperature, superheated steam for optimum efficiency, process applications require lower temperatures, closer to saturation. Yet a boiler is capable of producing steam to match only one of these conditions, and the power generation aspect is the usual winner. So, if the same steam is to be used for process applications such as heating,

stripping or sparging, the superheated steam needs to be reduced in temperature. Therefore, the need for a desuperheater.

Principle of Desuperheating

Steam is desuperheated by bringing it into contact with water and causing the water to evaporate. All Croll-Reynolds desuperheaters inject the cooling water as a fine spray to maximize the surface area for optimum evaporation. This highly turbulent area speeds the heat transfer between the steam and the water. The turbulence is caused either by the action of the spray or the venturi contour of the desuperheater internals, see figure 1. This area is followed by rapid stabilization of fluid flow and the temperature is reduced to near saturation conditions (+5-10° above saturation is common.)

The line of desuperheaters includes units to cover all applications, pipe sizes and pressure



Fig. 3 Venturi Desuperheaters for process application.

/temp ranges, up to ANSI 900 and 1470° F. Close control to near saturation conditions is common across all the range.

The actual desuperheater is, of course, just one component in a complex system. Croll-Reynolds can provide just the desuperheater or a full desuperheating system as shown in figure 2. More details on back page.

Fig. 1

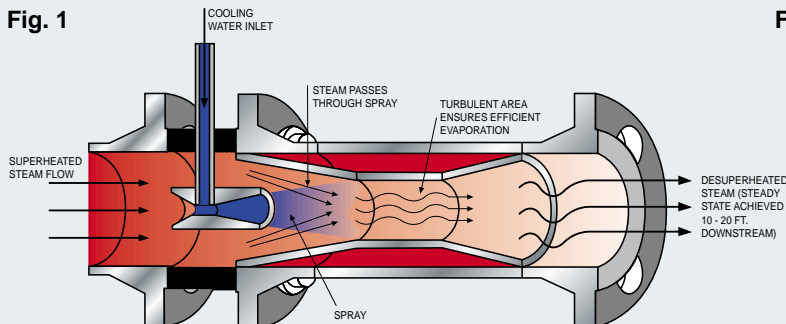
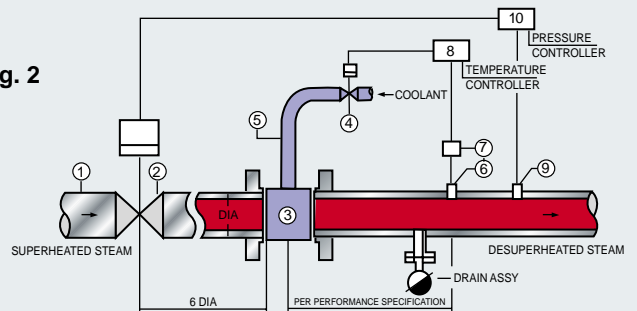


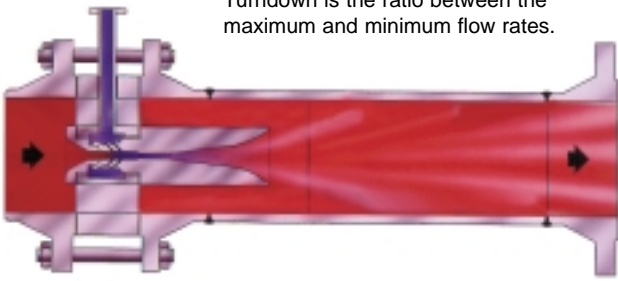
Fig. 2



- | | |
|---------------------------|---------------------------|
| 1 Steam piping | 6 Temperature sensor |
| 2 Pressure reducing valve | 7 Temperature transmitter |
| 3 Desuperheater | 8 Temperature controller |
| 4 Coolant control valve | 9 Pressure sensor |
| 5 Coolant piping | 10 Pressure controller |

Fig. 4

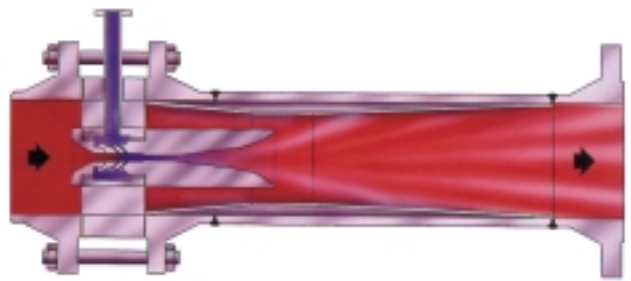
Turndown is the ratio between the maximum and minimum flow rates.



Single Venturi Desuperheater

Sizes 2" — 50"
Turndown 6:1
Cooling Water Required at 15-25 psi above steam pressure
Pre-heating of cooling liquid inside nozzle chamber ensures optimum evaporation.

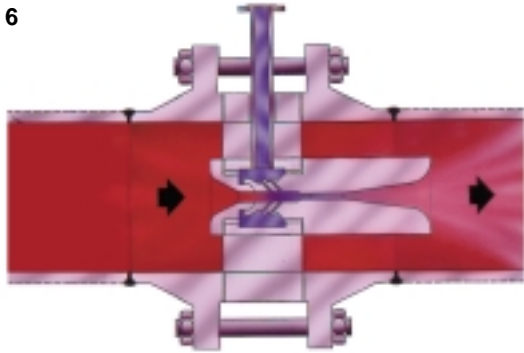
Fig. 5



Double-Venturi Desuperheater

Sizes 3" — 50"
Turndown 12:1
Cooling Water Required at 15-25 psi above steam pressure
This design works well under a wide range of conditions, including steady or variable flows, with low pressure drop.

Fig. 6



Attenuator Desuperheater

Sizes 2" — 50"
Turndown 6:1
Cooling Water Required at 15-25 psi above steam pressure
Parameters as per single venturi design. Unit is designed for insertion into pipe where downstream mixing section is not required.

Fig. 7

Multi-Nozzle Spray Desuperheater

Sizes 6" — 50"
Turndown 300:1*
Cooling Water Required at 70 psi above steam pressure

Insertion type, eliminates need for separate water control valve. *Water turndown only - steam turndown limited to 12:1.

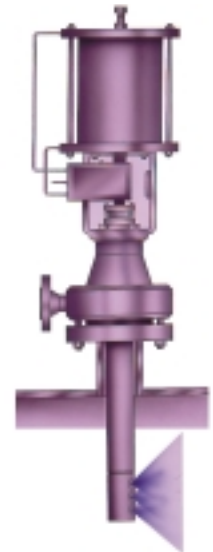


Fig. 8

Variable Nozzle Desuperheater

Sizes 6" — 50"
Turndown 40:1
Cooling Water Required at 55-70 psi above steam pressure

Insertion type, eliminates need for separate water control valve. *Water turndown only - steam turndown limited to 12:1.

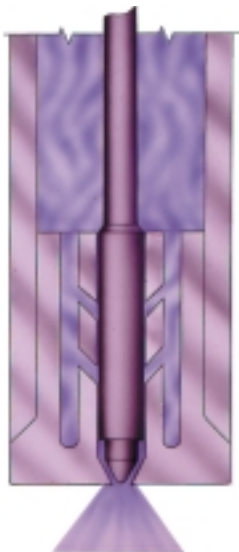
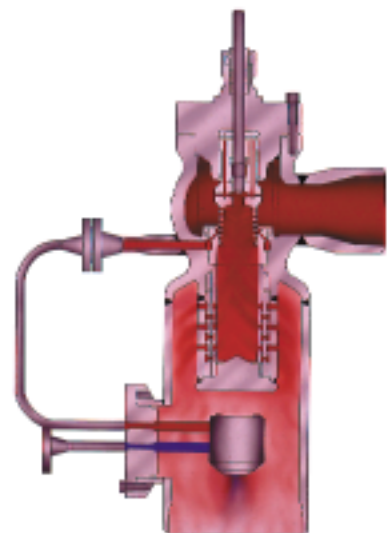


Fig. 9

Steam Conditioning Valves

Pressure reduction and desuperheating in one unit. We offer a number of styles depending on steam pressure, pressure required, cooling water parameters and turndown.



Stand-alone Desuperheater or Complete System?

Either way, Croll-Reynolds can help. If a system is required, we offer a wide range of valves and accessories, including:

- Steam pressure reducing valves
- Water control valves
- Pressure controllers and sensors
- Temperature controllers and sensors
- Interconnecting piping

Factors to be Considered when Specifying a System

The physical arrangement of a desuperheating system is very important. Factors to be considered include:

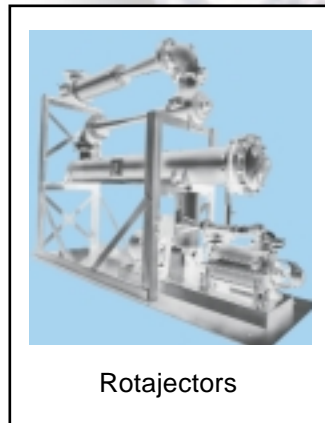
- Sensitivity and reaction time of pressure and temperature sensors and controllers. Electronic controllers provide faster response than pneumatic or mechanical units.
- Piping from pressure control valve needs to provide near laminar flow to the desuperheater so that evaporation inside desuperheater is maintained at optimum conditions.
- The distance between the desuperheater and the temperature and pressure sensors is critical. Do not deviate from our recommendations without prior consultation.
- External control valves should have an operating range wider than the desuperheater itself.
- Cooling water should be clean and free of impurities.



Fig. 10 Steam Conditioning Valves

Croll-Reynolds: *providing worldwide solutions*

Other equipment provided by Croll-Reynolds



With manufacturing, research and test facilities in Asia as well as the United States, and a network of representatives, Croll-Reynolds is a leading supplier of vacuum and related equipment for process, power plant and R&D applications worldwide.

