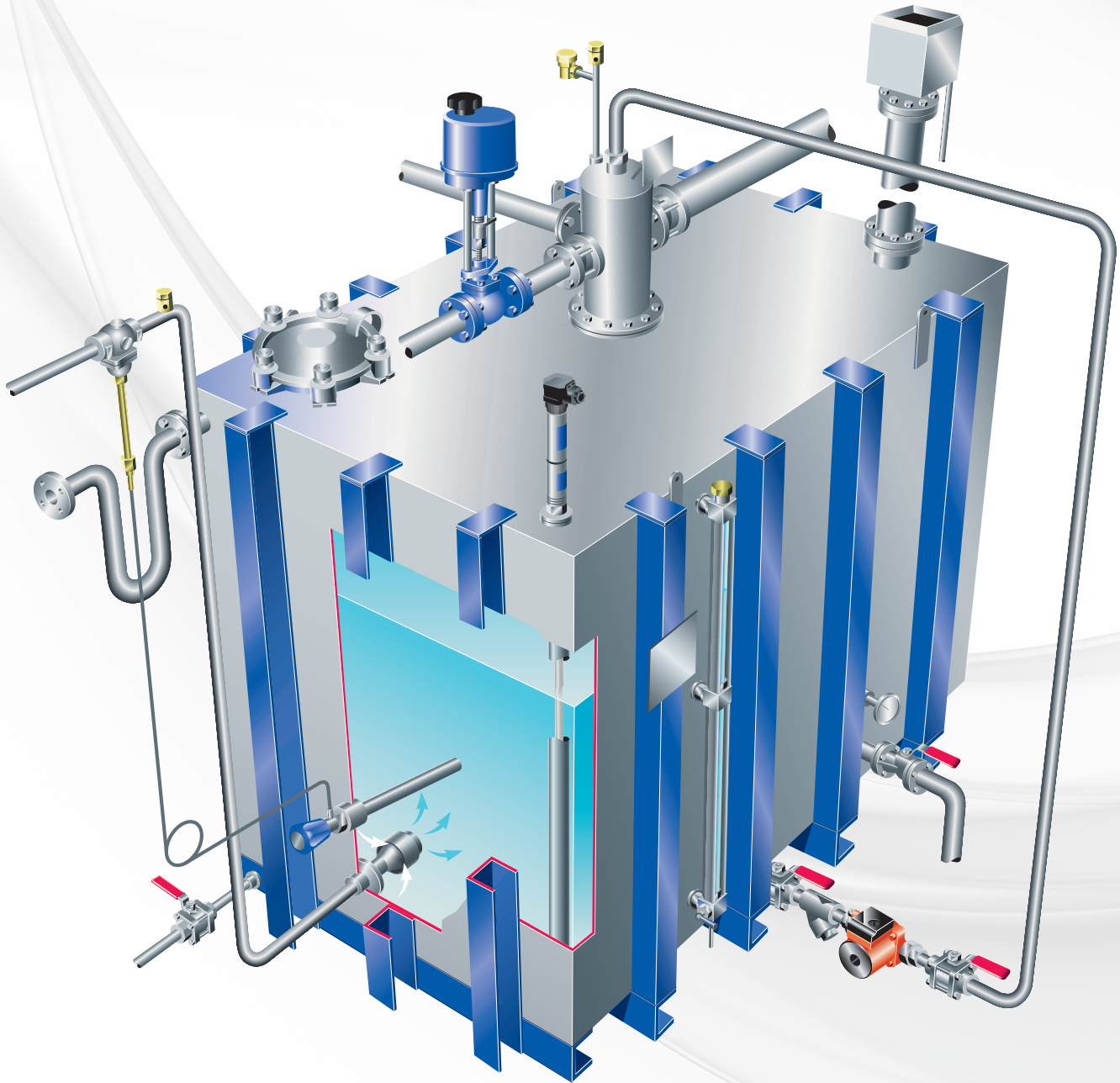


Boiler feedtank systems



First for Steam Solutions

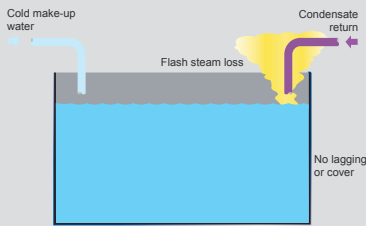
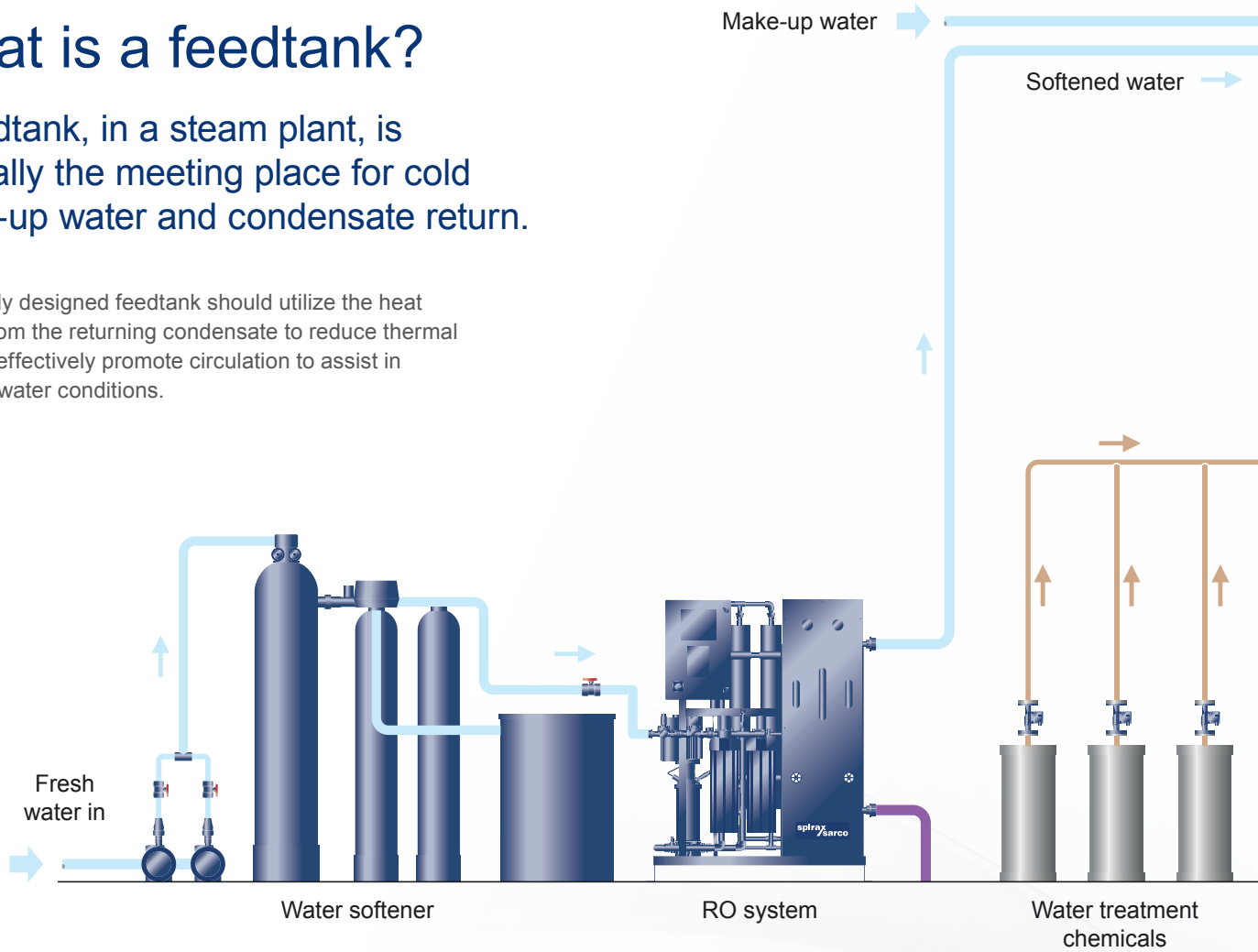
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What is a feedtank?

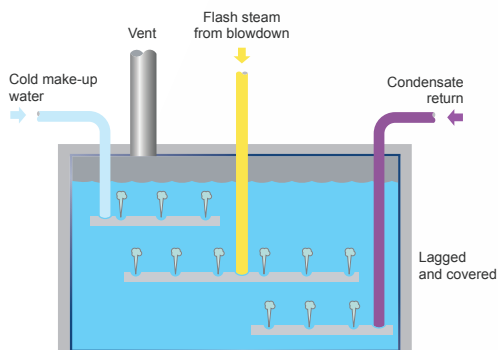
A feedtank, in a steam plant, is normally the meeting place for cold make-up water and condensate return.

A correctly designed feedtank should utilize the heat energy from the returning condensate to reduce thermal loss and effectively promote circulation to assist in constant water conditions.



Incorrectly designed feedtanks tend to not take advantage of the returning condensate to promote natural agitation and retain heat within the tanks water. If precious heat energy is lost due to inefficient tank design then the result may end in further oxygen being retained in the feed water, higher chemical costs, increased fuel and boiler operation costs

FEATURES



BENEFITS

The incoming source water would normally require pre-treatment to help reduce the reliance on water treatment chemicals and to help prevent scale formation on heat transfer surfaces. This subject is best left for water treatment specialists as the pre-treatment and chemical program should be considered for independent applications.

Cold water make up, returning condensate and other energy recovery systems need to encourage mixing improving thermal efficiency and assisting in dissolved gas removal.

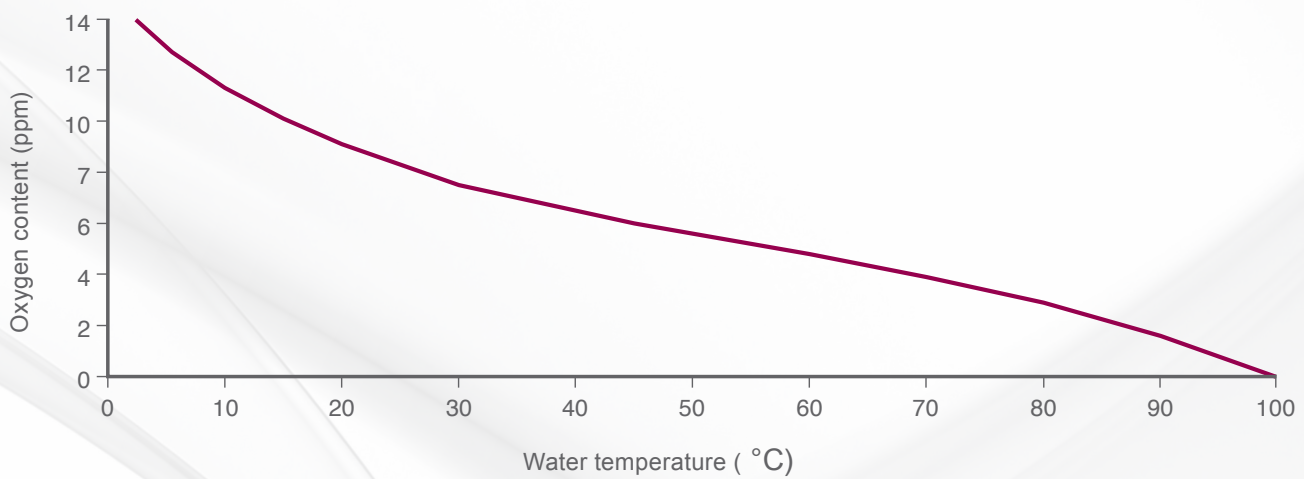
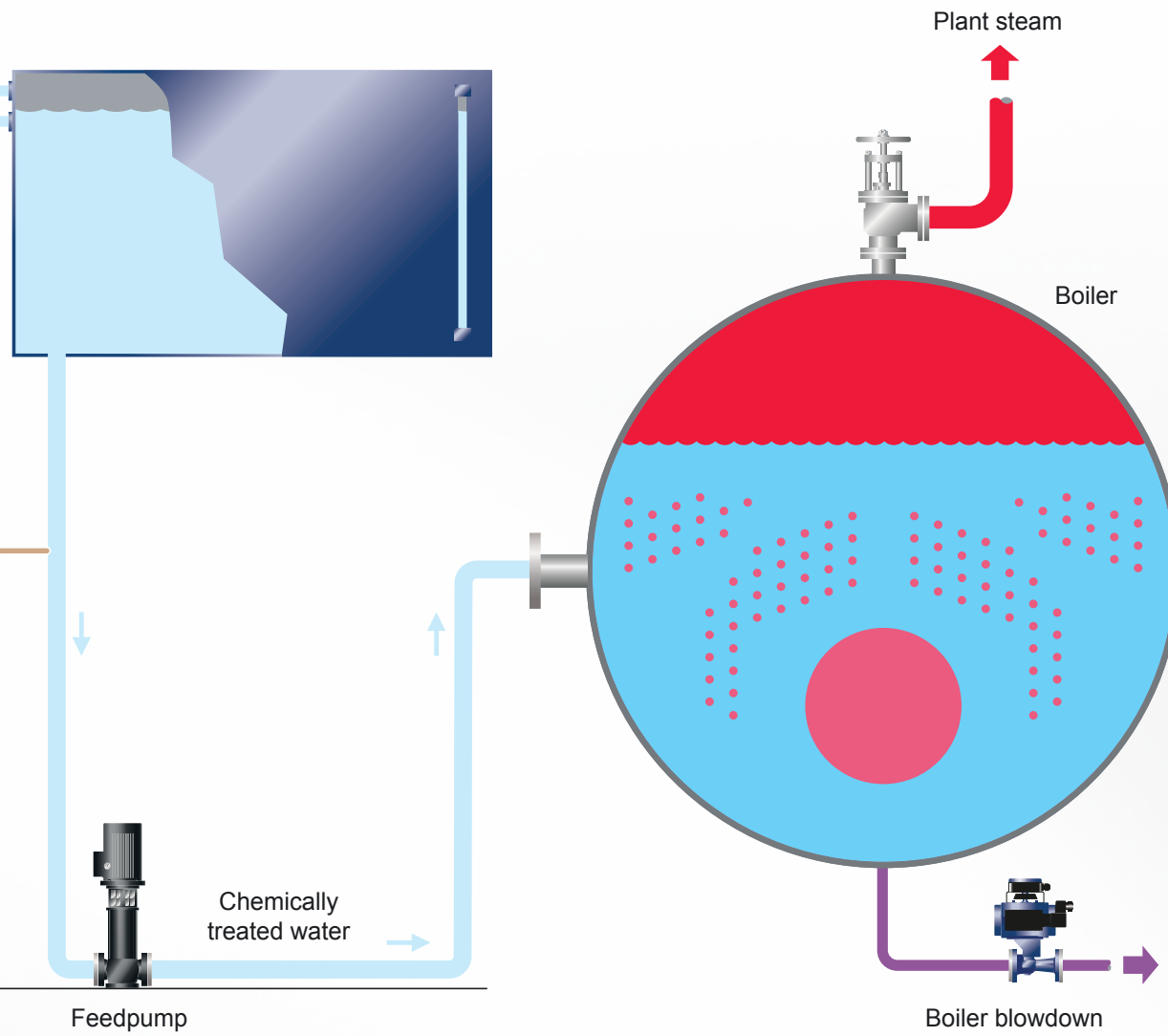


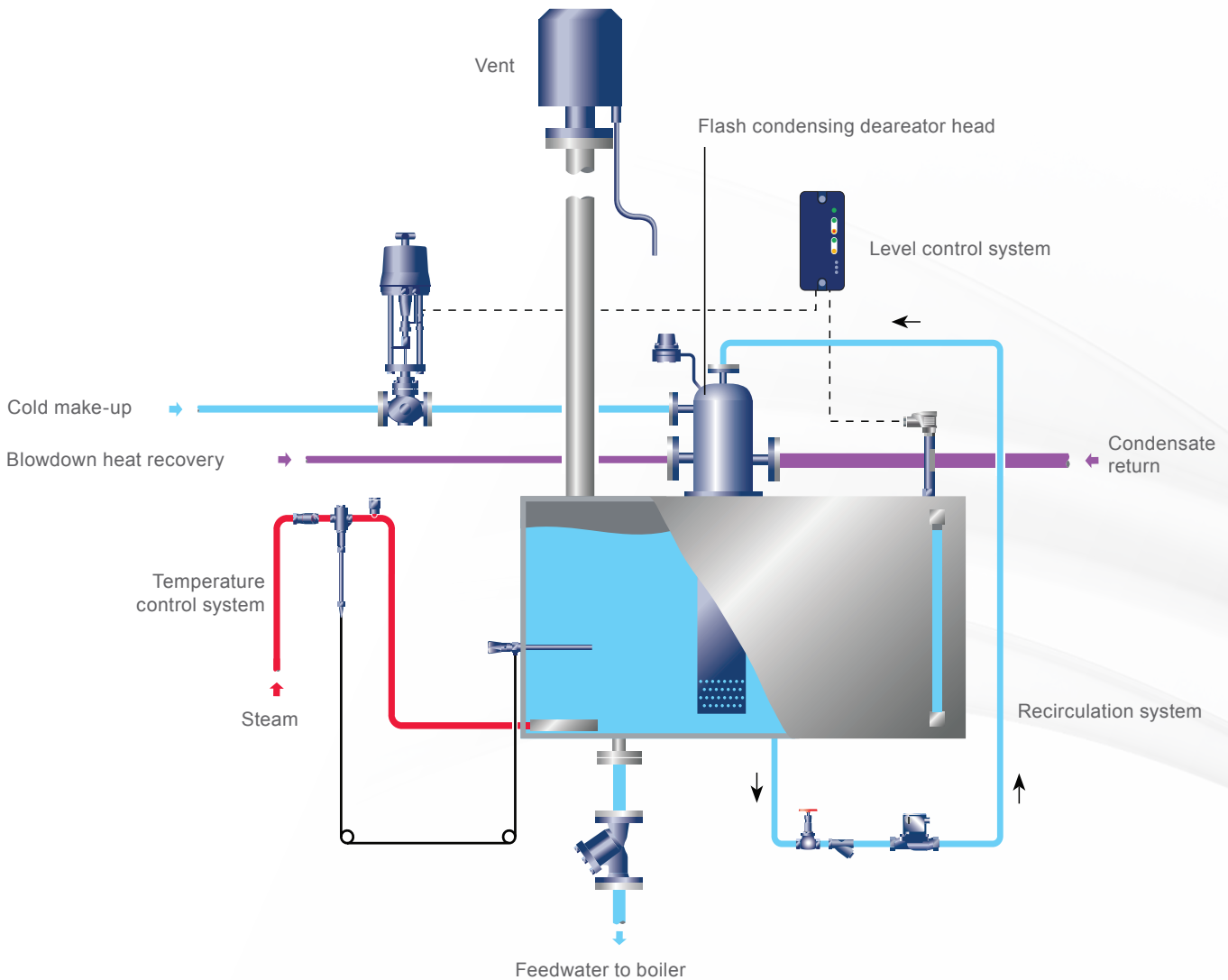
Fig. 3.11.1 Water temperature versus oxygen content

Oxygen in feedwater can be 'driven off' by heating and 'absorbed' by chemical treatment. By heating the feedwater typically to 85°C to remove the bulk of the oxygen the amount of scavenging chemicals required can be reduced by up to 75%. This can additionally improve the boiler efficiency by reducing the blowdown requirements.

Spirax Sarco – The complete Feed Water Tank Solution

On larger boiler plants pressurised deaerators are sometimes installed and live steam is used to bring the feedwater up to above 100°C to 'drive off' the oxygen. This action is normally enhanced by the steam 'scrubbing' the feedwater. Freed oxygen and other gases are vented with some live steam to atmosphere.

Pressure deaerators have to be treated as pressure vessels and with the necessary controls and safety devices they become expensive. As with most things there is a compromise - Spirax Sarco have developed a unit for fitting to any feedtank to drive off as much oxygen as possible at atmospheric pressure.

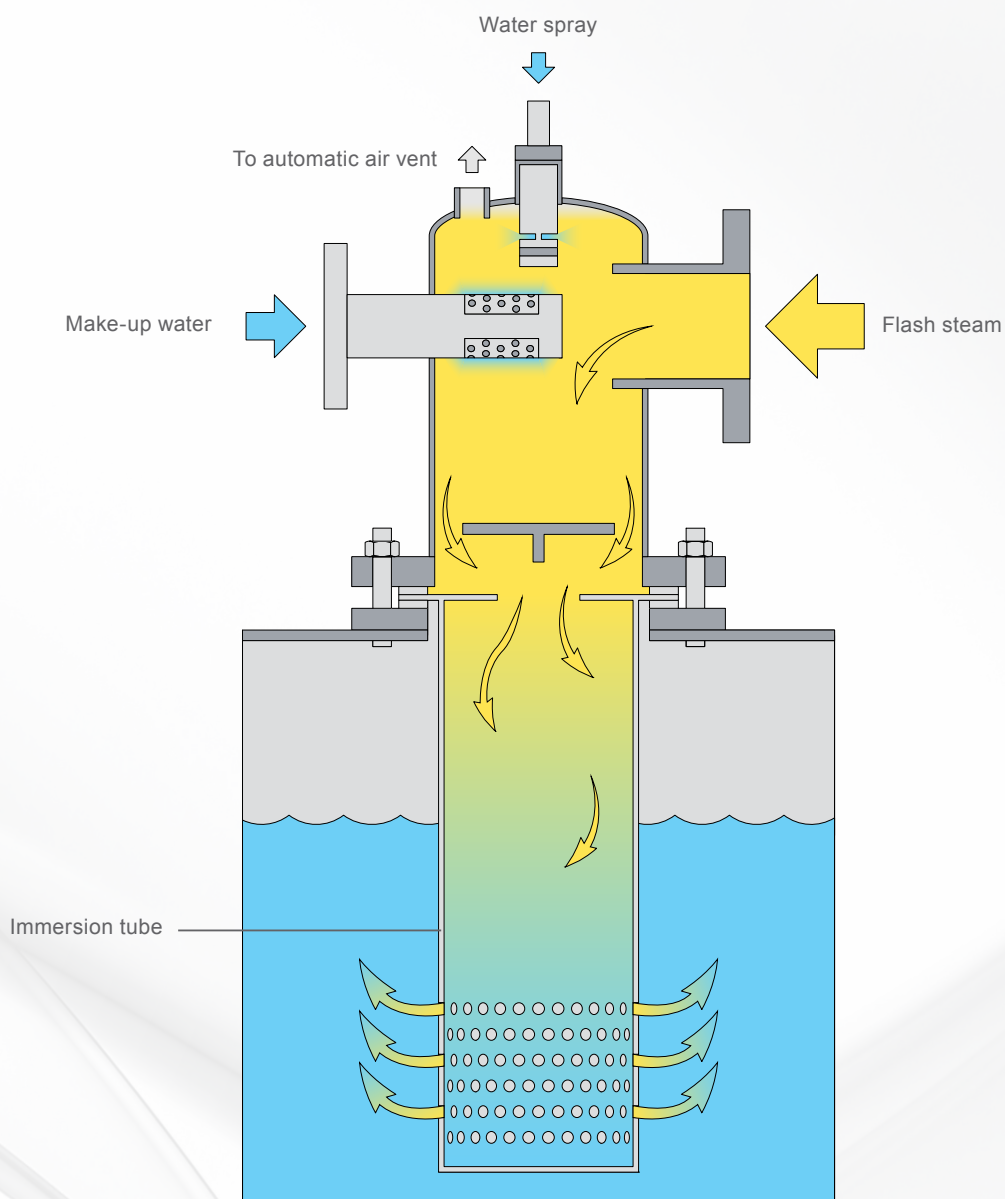


Boiler feedtank

Spirax Sarco Flash Condensing Deaerator Head

The mixing unit brings together all the incoming flows without the problems and cost of three separate tank connections and sparge systems. It mixes the cold make-up with its high oxygen content with the flash steam from the condensate and blowdown heat recovery.

Oxygen and other gases are liberated from the cold water and can be removed from the system through a vent before entering the tank.



Atmospheric deaerator

When a feedtank becomes an atmospheric deaerator

Spirax Sarco can supply the complete package:-

- Stainless steel feedtank.
- Flash condensing deaerator head.
- Steam injection system.
- All the necessary controls and fittings to create an atmospheric deaerator system.

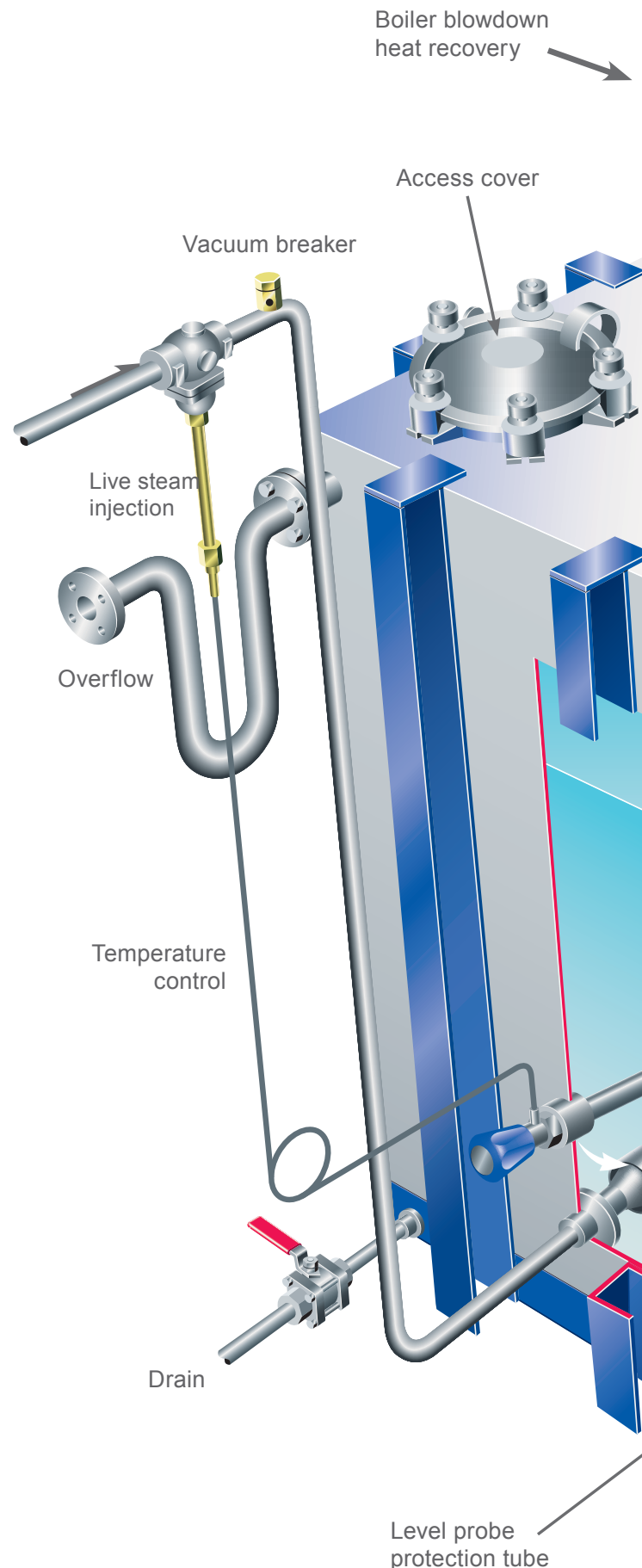
Recirculating feedwater spray systems

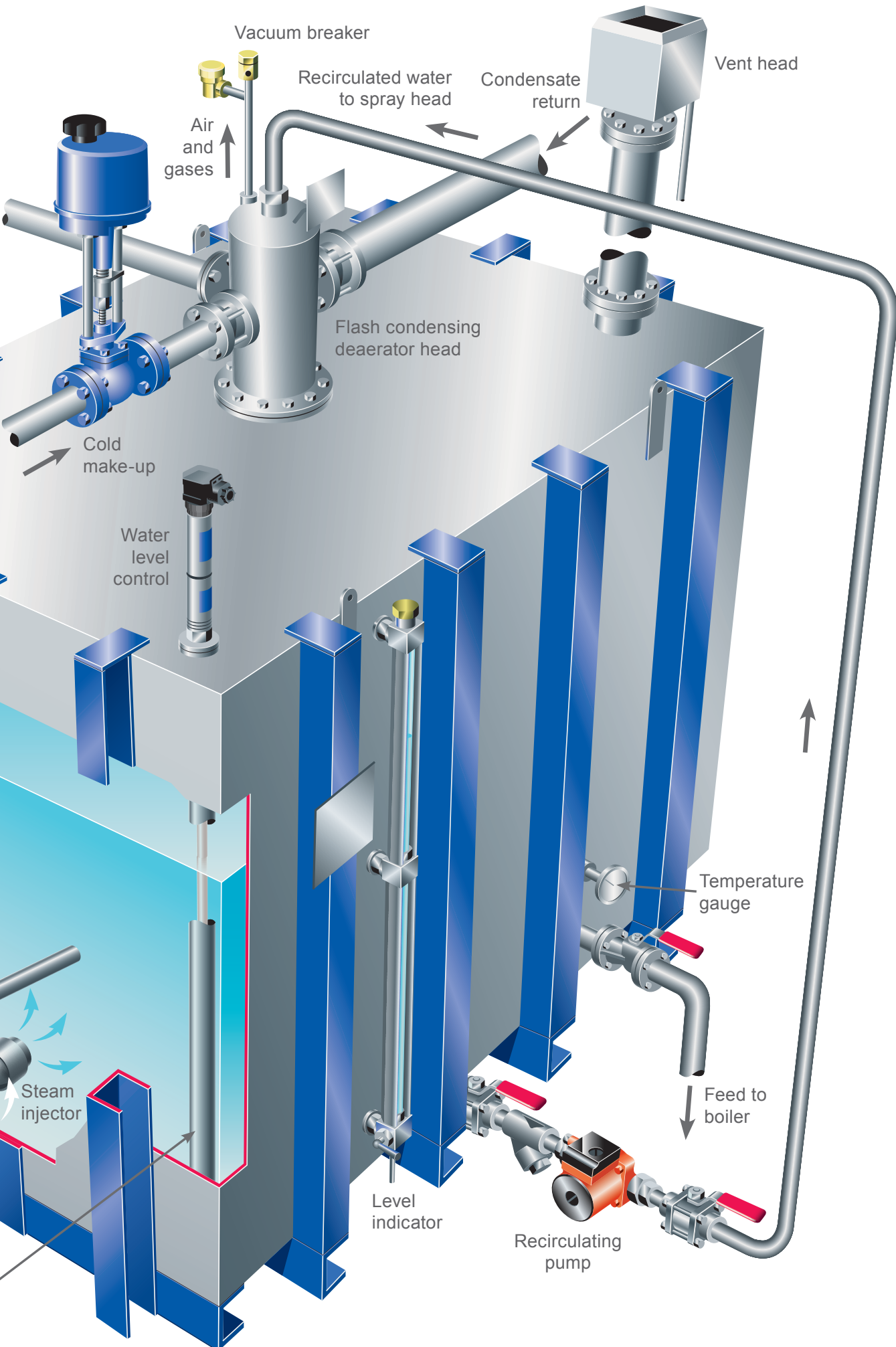
When the condensate return rate is high and the cold make-up flowrate is intermittent it is likely that valuable flash steam will be lost through the vent. To improve the thermal efficiency and reduce the possibility of temperature stratification it is often worthwhile to take feedwater and pump it to a spray nozzle fitted in the top of the mixing unit. Approximately 20% of the feedtank content can be circulated per hour to provide considerable additional flash condensing capacity. Only a low power pump is required.

User benefits

- Dissolved oxygen entering the boiler is kept as low as possible.
- The oxygen content of the feedwater is further reduced by thermal deaeration.
- Chemical dosing costs are kept to a minimum.
- High and steady feedwater temperature to the boiler.
- Long life and minimal attention.
- Maximum use of the heat in the condensate return and from blowdown heat recovery.

Austenitic stainless steel is used for all wetted parts





The feedtank range

The table below shows the standard range of feedtanks based on metric plate sizes and indicates the internal dimensions and the total nominal capacity.

The working capacity will be reduced depending on the working level and control system chosen. The empty weights are typical and can be used together with the nominal capacity in kg (litre) to give a total weight to be used for support calculation purposes.

Tank Type	Internal dimensions mm			Normal capacity litres	Empty weight* (approximate) kg
	H	W	L		
TM-2	1250	1250	1250	1950	530
TM-3	1500	1000	2000	3000	750
TM-4.5	1500	1500	2000	4500	990
TM-6	2000	1500	2000	6000	1280
TM-8	2000	2000	2000	8000	1550
TM-12	2000	2000	3000	12,000	2120
TM-16	2000	2000	4000	16,000	2660
TM-20	2500	2000	4000	20,000	3070
TM-30	2500	2000	6000	30,000	4290

* Excluding connections.

Materials

Typical tanks are constructed from plate austenitic stainless steels (304 SS)

Tank materials should be considered in relation to the feed waters chloride ion content and tank temperatures. Stress corrosion of tanks can occur with waters concentrated in chloride salts in solution and elevated temperatures combined with concentrations of oxygen and tensile stress.

If these conditions are a concern please contact a Spirax Sarco specialist to consider alternative materials specific to your installation.

Stiffening

Carbon steel tank stiffeners are used externally on all tank sides and bases (TM-2 has no tank stiffeners).

Data dossier

Please discuss with your Spirax Sarco consultant your specific data dossier needs prior to order.

Standard conditions and fittings

An access cover and lifting eyes are fitted as standard. All other connections and fittings to suit requirements.

Screwed connections (BSP) available up to DN50 (50mm / 2") and flanged EN 1092-1 / AS4331.1 PN16 / ASME 150 for larger sizes.

The flash condensing deaerator head

A flash condensing deaerator head consists of three parts, the mixing unit with a PN16 or Class 150 mounting flange, the immersion tube with a plate top flange, and two gaskets. The plate flange is sandwiched between the mixing unit and a mating flange welded to the top of the Spirax Sarco feedtank to act as a stiffener. All parts are manufactured from weldable austenitic stainless steel and held in place with stainless steel nuts and studs.

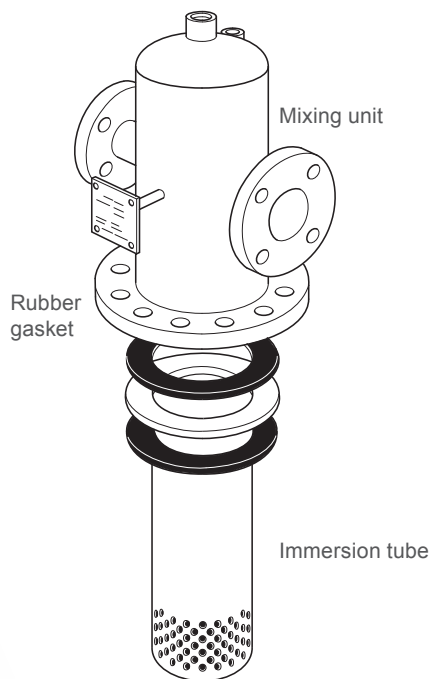
The flash condensing deaerator head is easily fitted to other tanks.

Deaerator head selection

We recommend that selection of a deaerator head is carried out in consultation with your local Spirax Sarco Engineer.

Mixing units are selected to suit the boiler total steam generation rate. Immersion tubes (fully described in separate literature) are selected to suit the diameter of the deaerator head and to be slightly shorter than the depth of the tank. Two gaskets are selected to suit the mixing unit diameter and flanges. Mounting flanges are specified as either PN16 or Class 150.

A 1/2" BSP AV13 air vent and VB14 vacuum breaker should be fitted to the top of the head.



Total steam generation rate kg/h	Mixing unit size	Tank depth			
		1250	1500	2000	2500
		Mixing unit / immersion tube selection			
5000	DN150	MU150 IT-950	MU150 IT-1200	MU150 IT-1600	
10,000	DN200	MU200 IT-950	MU200 IT-1200	MU200 IT-1600	MU200 IT-2100
20,000	DN250		MU250 IT-1200	MU250 IT-1600	MU250 IT-2100
30,000	DN300		MU300 IT-1200	MU300 IT-1600	MU300 IT-2100
50,000	DN400		MU400 IT-1200	MU400 IT-1600	MU400 IT-2100

Example:

For a boiler with a total steam generation rate of 15 000 kg/h and a 2000 mm deep feedtank flanged BS 4504 PN16,

Selection would be:

MU250 mixing unit (DN250), an IT-1600 immersion tube, and 2 off 250 mm gaskets.

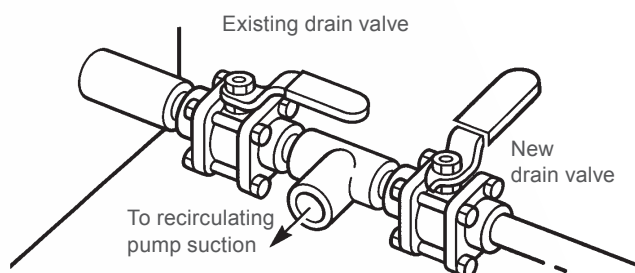
Ordering designation:

1 off MU 250 PN16; 1 off IT 250-1 600 PN16; 2 off 250 mm gaskets PN16.

* Mounting flange to BS 4504 PN16.

Recirculating feedwater spray systems

Feedtank contents litre (kg)	Recirculating feedwater spray systems		Size BSP
	Designation	Speed setting	
< 3000	RFS1	1	1"
3000 to 6000	RFS1	2	1"
6000 to 8000	RFS1	3	1"
8000 to 10,000	RFS2	2	1 1/4"
10,000 to 30,000	RFS2	3	1 1/4"



Steam Injection Systems

Spirax Sarco steam injectors are available in three sizes to cover most requirements. They ensure quiet but vigorous mixing of steam and feedwater to drive off the dissolved oxygen content down to approximately 2 ppm. This action minimises the amount of Oxygen scavenging chemicals required. The temperature of the feedwater is maintained at a high steady level for smooth boiler operation.



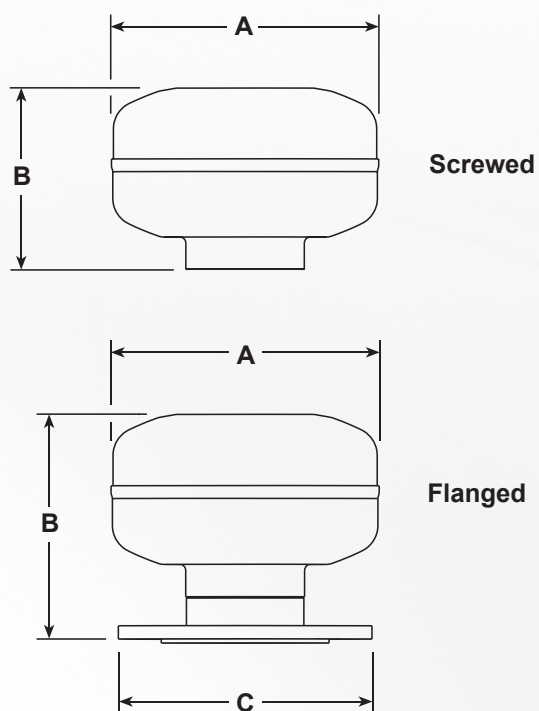
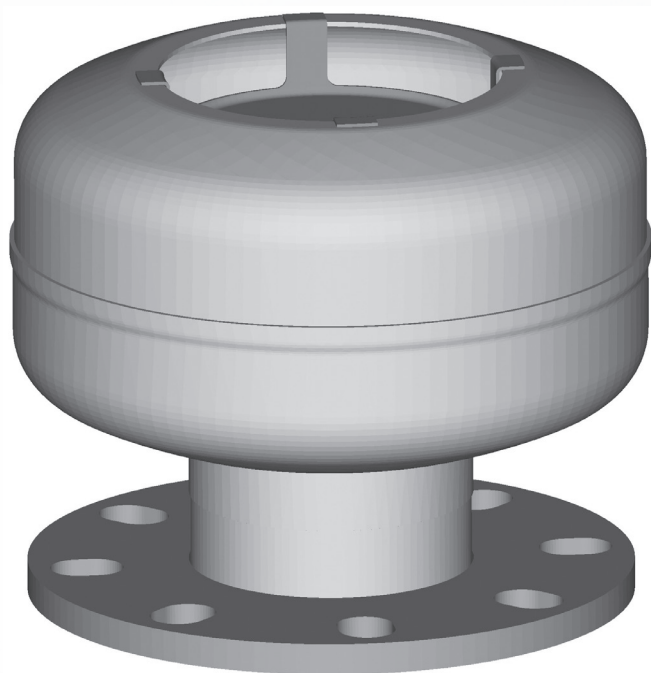
Feedtank level controls

The design and operation of water softening plant calls for full flowrate and never a trickle. The flow is therefore normally controlled by switching a pump or valve on and off. This may suit the softener but is not ideal for a number of reasons. Heat from boiler blowdown is not so easily recovered, flash steam in the condensate return is more difficult to condense and it is difficult to achieve an even feedwater temperature. Ideally an intermediate softened water storage tank should be used and the flow from it to the main feedtank controlled smoothly using a Spirax Sarco modulating control valve system.

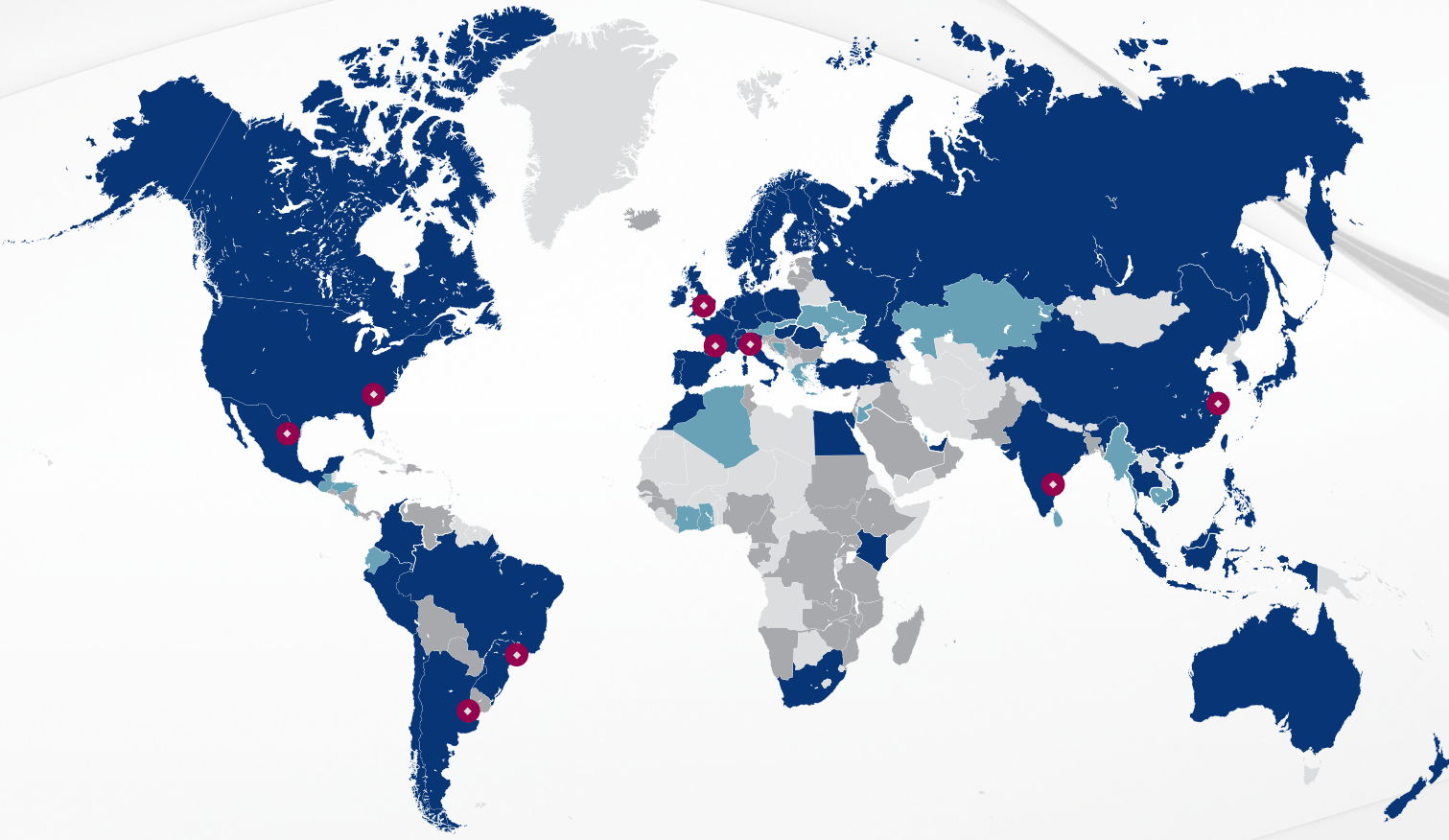


Vent heads

The Spirax Sarco stainless steel vent head is designed to 'fit and forget'. It will ensure venting of any excess flash steam from the feedtank and the separation of any entrained condensate.




Description	Size	Inlet connection	A	B	C	Weight
VHT2	DN50 2"	Screwed BSP	203	137	-	2.08
		Screwed NPT	203	137	-	2.08
VHT3	DN80 3"	Screwed BSP	203	145	-	2.70
		Screwed NPT	203	145	-	2.70
		Flanged EN 1092 PN16 or ASME 150	203	173	192	3.65
VHT4	DN100 4"	Flanged EN 1092 PN16 or ASME 150	304	237	224	6.31
VHT6	DN150 6"	Flanged EN 1092 PN16 or ASME 150	403	302.5	280	10.76
VHT8	DN200 8"	Flanged EN 1092 PN16 or ASME 150	403	314	334	12.28
VHT10	DN250 10"	Flanged EN 1092 PN16 or ASME 150	503	372.5	406	19.17
VHT12	DN300 12"	Flanged EN 1092 PN16 or ASME 150	503	343.5	483	22.29




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