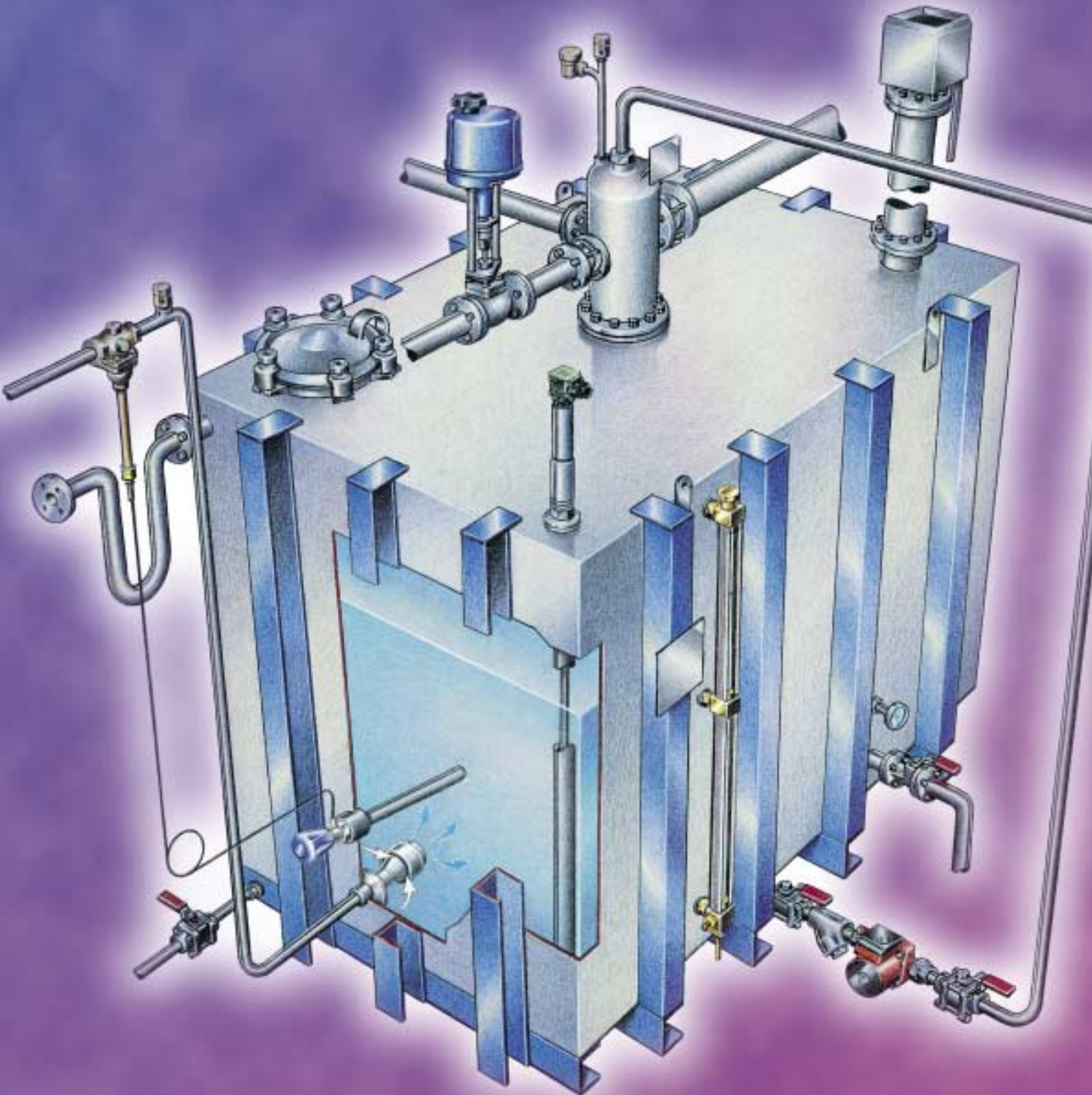


# Boiler feedtank systems



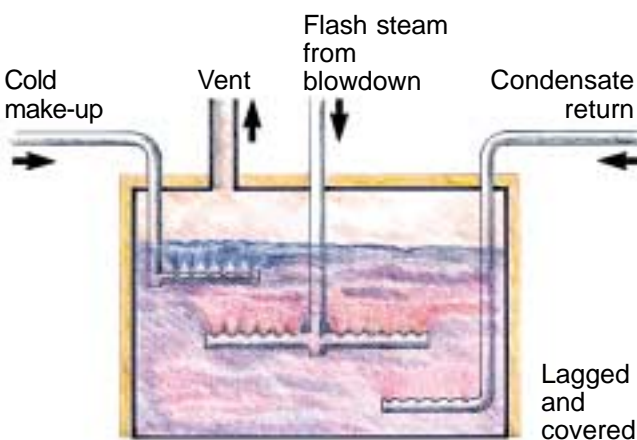
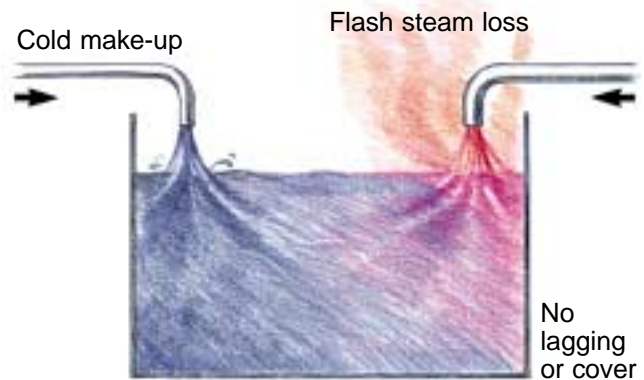
**spirax**  
**/sarco**

# What is a feedtank?

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

## At worst . . .

... make-up water and flashing condensate are fed into the tank above the water surface. Flash steam with all its heat is lost to atmosphere and the final mixture of cold make-up and remaining condensate is colder than it could be.



## At best . . .

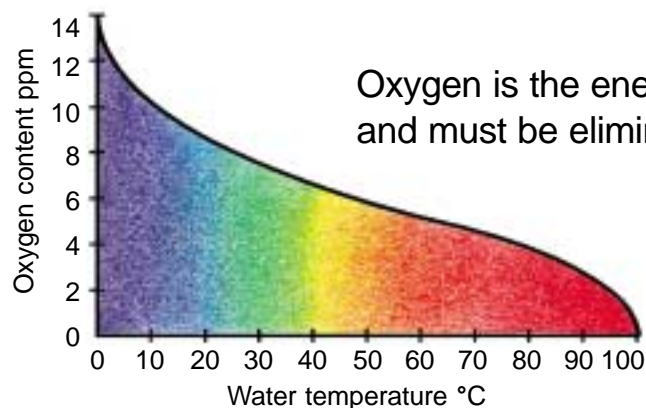
... both flows, together with blowdown flash steam are distributed through sparge pipes well below the water surface. The sparge pipes must be of stainless steel if they are to last any length of time and with the necessary supports and the manufacturing time involved they can be expensive.

## In both cases . . .

... the make-up water has to be softened and treated to prevent scale formation on the boiler heat transfer surfaces. (This subject is best left to water treatment specialists).

Cold water absorbs free oxygen and other gases that are liberated when heated. It is essential to remove the dissolved oxygen before it is released in the boiler to prevent corrosion of the boiler and steam plant.

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.

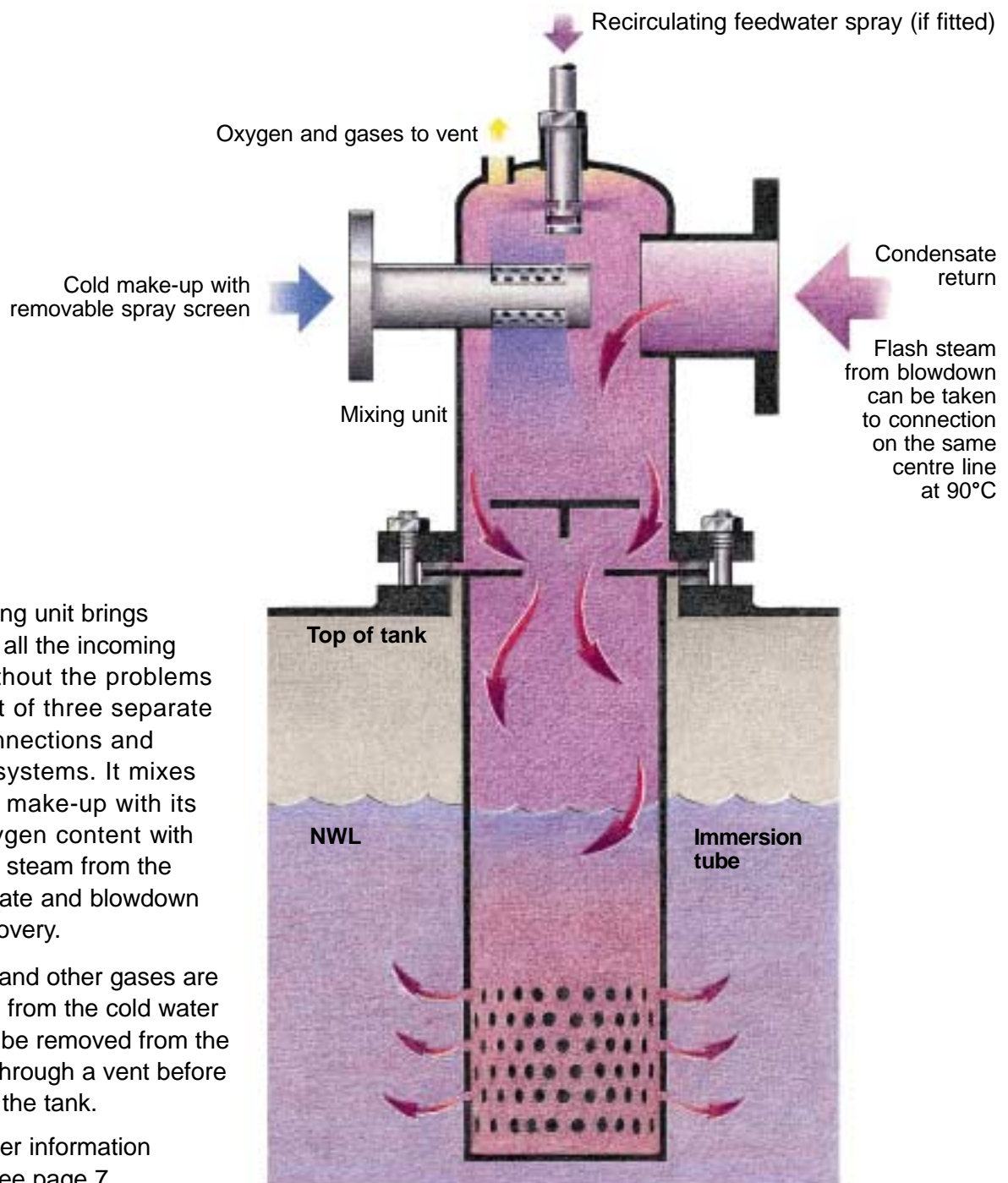


# Is there an alternative?

## The Spirax Sarco flash condensing deaerator head . . .

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.



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.

For further information please see page 7.

. . . all stainless steel construction.

# When a feedtank becomes an atmospheric

## 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

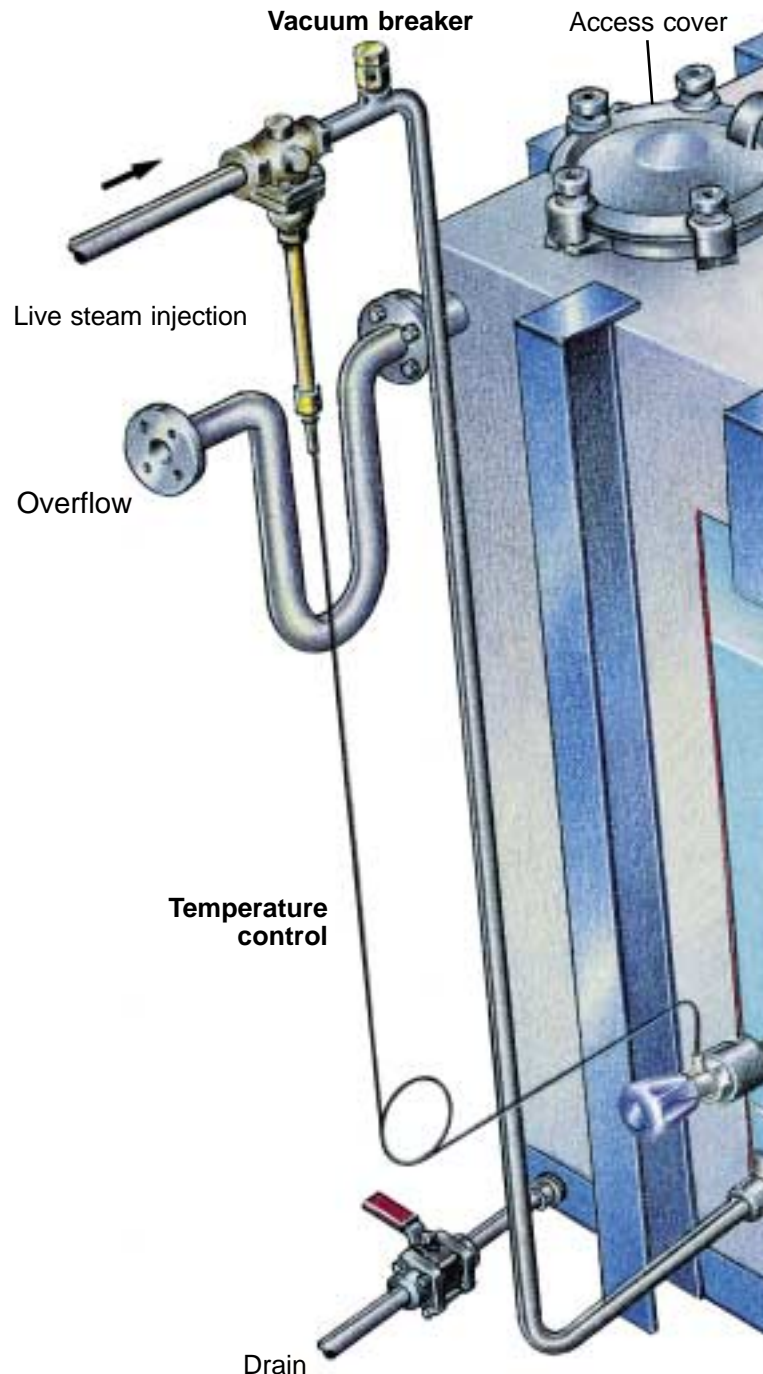
When the condensate return rate is high and the cold make-up flowrate is intermittent it is likely that valuable flash steam will be lost through the vent. To improve the thermal efficiency and reduce the possibility of temperature stratification it is often worthwhile to take feedwater and pump it to 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.

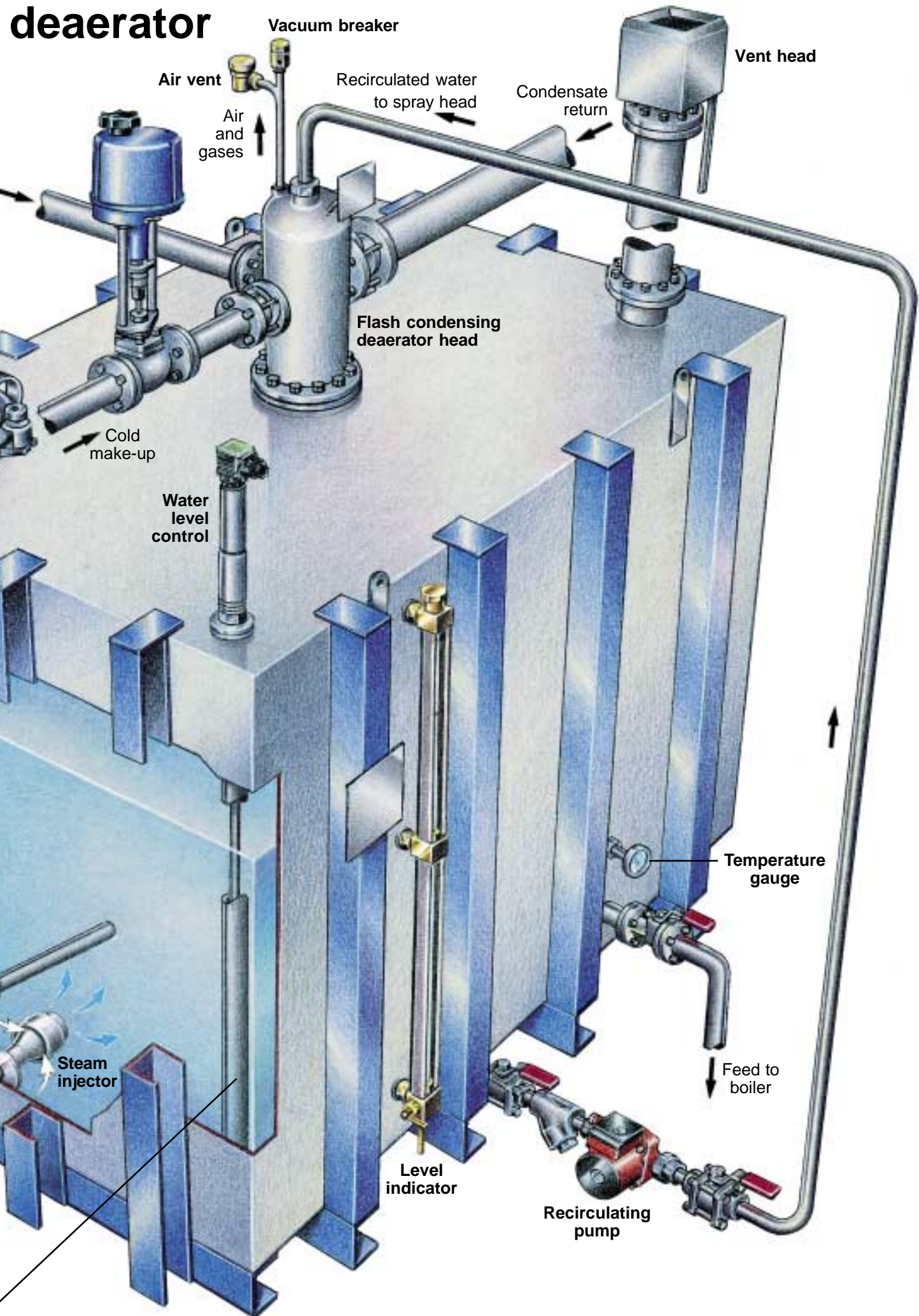
Austenitic stainless steel is used for all wetted parts.

Boiler blowdown heat recovery



Level probe protection tube

# deaerator



# 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			Nominal capacity litres	Empty weight* (approximate) kg
	H	W	L		
TM-2	1 250	1 250	1 250	1 950	530
TM-3	1 500	1 000	2 000	3 000	750
TM-4.5	1 500	1 500	2 000	4 500	990
TM-6	2 000	1 500	2 000	6 000	1 280
TM-8	2 000	2 000	2 000	8 000	1 550
TM-12	2 000	2 000	3 000	12 000	2 120
TM-16	2 000	2 000	4 000	16 000	2 660
TM-20	2 500	2 000	4 000	20 000	3 070
TM-30	2 500	2 000	6 000	30 000	4 290

\* Excluding connections.

## Materials

All wetted parts are in welded austenitic stainless steel. This material has proved to be ideal for most boiler feedtank applications and is offered as the best option available.

Even stainless steel can be adversely affected by the combination of exceptional chloride levels, high temperatures, and stress. Any possibility of this unusual condition should be discussed with your water treatment engineer.

## Stiffening

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

## Data dossier

A detailed drawing of each tank, as built, is supplied with a materials list and a hydrostatic test certificate.

## Standard conditions and fittings

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

Connections are screwed sockets BSP up to 50 mm (2") and flanged to BS 4504 PN16 for larger sizes.

All flanged connections (apart from the drain) stand off 150 mm to facilitate insulation.

## Installation

For installation details see separate literature.

# 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.

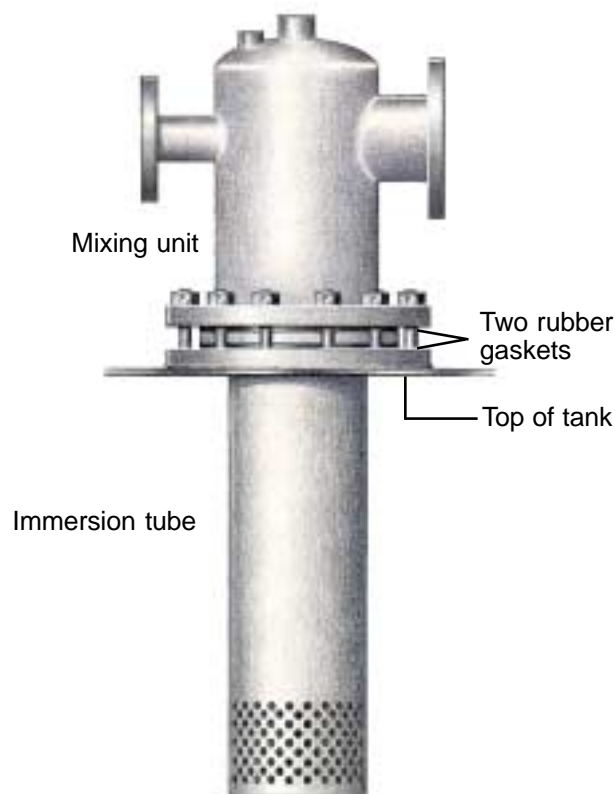
The flash condensing deaerator head is easily fitted to other tanks.

## 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 ½" 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			
		1 250	1 500	2 000	2 500
		Mixing unit / immersion tube selection			
5 000	DN150	MU150 IT-950	MU150 IT-1 200	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

\* Mounting flange to BS 4504 PN16.

### Example:

For a boiler with a total steam generation rate of 15 000 kg/h and a 2 000 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.

## Recirculating feedwater spray systems

Feedtank contents litre (kg)	Recirculating feedwater spray systems		Size BSP
	Designation	Speed setting	
< 3 000	RFS1	1	1"
3 000 to 6 000	RFS1	2	1"
6 000 to 8 000	RFS1	3	1"
8 000 to 10 000	RFS2	2	1¼"
10 000 to 30 000	RFS2	3	1¼"

The system consists of:-	Materials	
	Body	Internals
Two ball valves	Cast steel	Stainless steel
Strainer	Cast iron	Stainless steel
Pump	Cast iron	Stainless steel
Spray nozzle	Stainless steel	Stainless steel

For full details see separate literature

# Other controls and fittings

## Steam injection systems

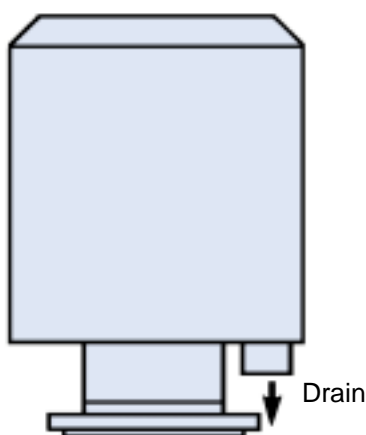
Spirax Sarco steam injectors are available in three sizes to cover most requirements. They ensure quiet but vigorous mixing of steam and feedwater to drive off the dissolved oxygen content down to approximately 2 ppm. This action minimises the amount of oxygen scavenging chemicals required. The temperature 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 the safe venting of any excess flash steam from the feedtank and the separation of any entrained condensate.



Type	Size	Connections		
		Screwed BSP/NPT	Lightweight flange to suit BS 4504 PN16 or BS 1560 Class 150	Drain BSP/ NPT
VH2S	2"	•		3/4"
VH3S	3"	•		3/4"
VH3	DN80		•	3/4"
VH4	DN100		•	1"
VH6	DN150		•	1"
VH8	DN200		•	1 1/2"
VH10	DN250		•	1 1/2"
VH12	DN300		•	2"

## Other fittings

Most other requirements for level and temperature indication, valve and other ancillaries can be met from the Spirax Sarco ranges.

## Plant design service

Spirax Sarco engineers can assist with the design of new feedwater systems, or survey old ones that need replacing or updating. Please contact us.

Some of the products may not be available in certain markets.

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