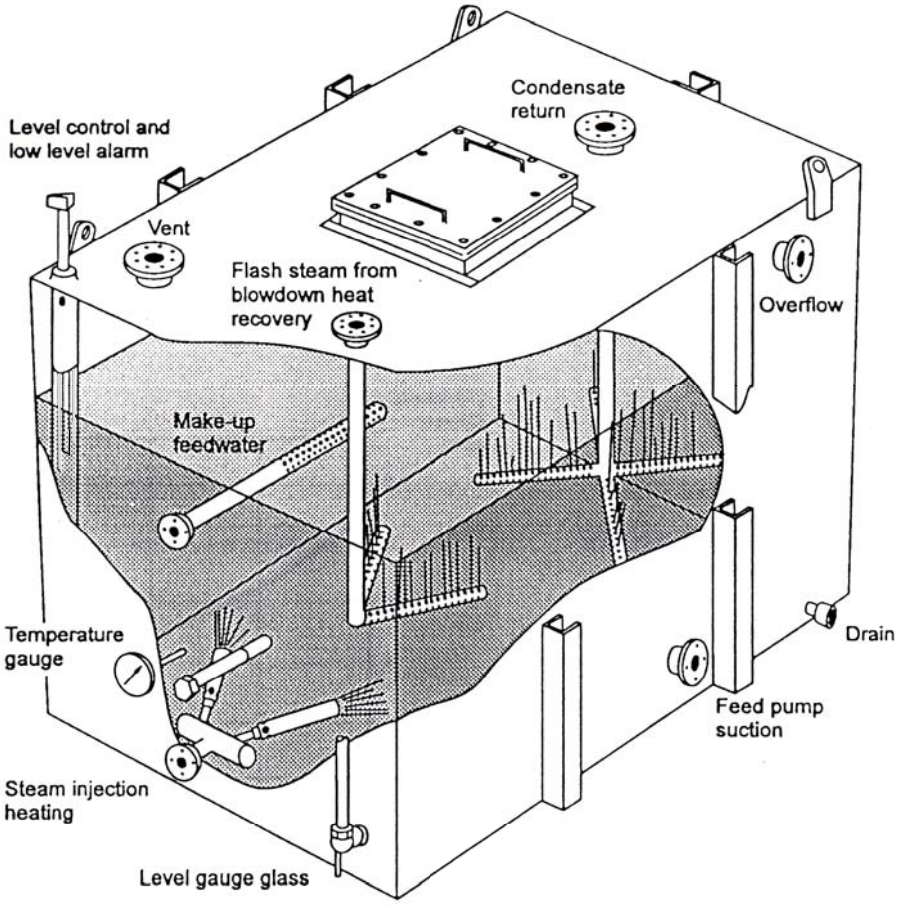
FEEDTANK FOR STEAM BOILERS

9100 - 7010

Semi-Deaerator type SDT

Typical layout



RTK Semi-Deaerator is a deaerating feedtank for heating and reducing the oxygen content of boiler feedwater.

It conditions the boiler feedwater in a complete packaged unit which includes:-

- distribution of condensate return via sparge pipes,
- control & deaeration of the make-up feedwater,
- boiler blown flash steam heat recovery,
- feedwater heating and temperature control,
- adequate storage of boiler feedwater.

The Semi-Deaerator is designed as a unit for the purpose of:-

- avoiding the wasteful plume of steam often seen venting from the boiler feed tank,
- saving a substantial proportion of oxygen scavenging chemicals by efficient partial deaeration of the feed water,
- solving the common problem of feed tank corrosion often experienced in boiler houses, by the use of stainless steel material for the tank and all internal pipework and fittings.
- providing vigorous mixing and circulation of the feedwater within the tank, minimising temperature stratification and cold spots often experienced in single deaerating head dome design.
- efficient conditioning of the boiler feed water by low noise direct steam injection system providing mechanical deaeration to remove the bulk of dissolved oxygen the feed water..

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RTK CONTROL SYSTEMS
A division of CIRCOR

FEEDTANK FOR STEAM BOILERS

9100 - 7020

Semi-Deaerator type SDT

Deaeration stages

The Semi-Deaerator conditions the boiler feedwater in three stages:-

- Upper zone distribution
  The make up cold water is distributed at low velocity just below the water surface.
- Intermediate zone heating
  As the cold water drops slowly in the tank it meets the rising steam bubbles from the flash steam in the condensate return and from the blowdown heat recovery. The flash steam is condensed, the make up water is heated and dissolved oxygen is driven off.
- Lower zone scrubbing
  The already hot water now reaches the steam injection stage where live steam is injected vigorously into the water. The scrubbing action of the steam removes the oxygen leaving a low oxygen concentration. The heat and water contents of the steam are of course recovered with the feedwater.

Importance of removing Oxygen in boiler feedwater

If oxygen is allowed to remain in boiler feedwater it causes boiler and condensate line corrosion. Traditionally the dissolved oxygen is removed by chemical dosing, most often with Sodium Sulphite, but this can prove expensive.

The Semi-Deaerator uses mechanical deaeration to remove the bulk of the oxygen, typically down to 0.2 parts per million (ppm) if the feed water in the tank is maintained at 90 -95°C.. This dramatically reduces the cost of chemical dosing.

The remaining oxygen will be removed by chemical dosing.

Automatic Level Control

The standard semi-deaerator system comes complete with connection and internal protection tube for RTK level transducer type NI1331, which provides continuous level signal output in the form of a 4-20 mA signal. This signal is used by an RTK level controller to either provide an On-Off valve level control or a Modulating level control for the tank. Generally an On-Off control of level between two points, which ensures proper operation of the water softener by preventing trickle flow and avoiding 'hardness slip'. The cold make-up water is distributed inside the semi-deaerator through sparge pipes to ensure steady conditions in the tank.

The controller will also have provision for low and high water level alarms. Control valves can be supplied to suit any applications.

Tank sizes

Standard tank sizes are tabulated below. The quantity of feedwater storage required depends on the boiler plant steam generation rating, the proportion of condensate return and whether other water storage facilities are available on site.

Generally the minimum amount of storage would allow the boiler plant to run without any make-up water for between ½ and 1 hour. For very large storage requirements, it is suggested that a cold softened water storage tank is installed at ground level, with a pumped supply to the elevated Semi-Deaerator. In this case the level control can be of the Modulating type instead of the On-Off system.

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Condensate return

Condensate return often contains flash steam, and this needs to be handled properly. Otherwise the expensive heat and water content in the flash steam will be lost to the atmosphere. In the design of the Semi-Deaerator, the condensate is returned via a properly sized distribution system to ensure that all the heat can be reused in the boiler. Besides this, it also ensures that the returning condensate does not pick up oxygen from the atmosphere.

By doing so, the fuel savings can be as much as 5% of the total fuel costs.

Blowdown heat recovery

Heat from the boiler continuous blowdown system can be recovered in the Semi-Deaerator to save more fuel costs.

This could be achieved by piping the continuous blowdown line to a properly sized flash vessel. The high pressure continuous blowdown water flashes in the flash vessel, the flash steam is then piped to the Semi-Deaerator, and via the built-in standard distribution system the flash steam is diffused safely below the water line of the tank. The heat and water content of the flash steam is therefore recovered.

The heat from the residual blowdown water in the flash vessel can also be recovered by installing a purpose built heat exchanger, whereby the cold make-up water can be passed through one side of the heat exchanger to pick the heat for the blowdown.

Construction details of the tank

The tank is of all welded construction typically from a 1/4" thick plate supplied complete with lifting eyes and bolted manhole.
External vertical stiffeners of steel channel are provided where necessary to support the tank sides, but the base requires supporting on a solid floor or on structural steelwork.

Standard sizes, capacities and weights.

SDT type	External Dimensions, mm			Nominal Capacity		Weight approx. (kg)	
	H	W	L	Gal.	Litres	Empty	Full
444	1440	1235	1235	400	1815	500	2315
446	1440	1385	1845	600	2720	700	3420
448	1440	1385	2455	800	3630	925	4555
466	1440	1995	1995	900	4085	1000	5085
468	1440	1995	2605	1200	5445	1250	6695
646	2050	1440	2050	900	4085	1150	5235
648	2050	1440	2660	1200	5445	1350	6765
666	2050	2050	2050	1350	6125	1450	7575
668	2050	2050	2660	1800	8165	1700	9865
688	2050	2660	2660	2400	10890	2000	12890
868	2660	2100	2710	2400	10890	2250	13140
888	2660	2710	2710	3200	14520	2650	17170
8812	2660	2710	3930	4800	21780	3400	25180
8816	2660	2710	5150	6400	29040	4200	33240

Standard connections

- Vent
- Drain
- Make-up Feed*
- Blowdown Flash Steam
- Steam Injection
- Temperature Gauge connection
- Level Gauge Connection
- Overflow
- Feed Suction
- Condensate Return*
- Temperature Feeler connection
- Level Control c/w protection

(* *with internal sparge pipes)*

Additional or special connections are available at extra cost.
Connection sizes up to 50mm (2") are BSP screwed sockets (except condensate return & blowdown flash steam). Sizes above 50mm are flanged BS4504 PN16

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