



INDUSTRIAL SOLUTIONS

FOOD&BEVERAGE

Rev.1219

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FOOD&BEVERAGE

Energy is getting more important day by day. According to the diminishing of energy sources food&beverage industries searching for alternative sources for increasing the productivity.

In cooking boilers, bakery ovens, liquid heat exchangers, product heaters, bottle washing machines or any other processes' energy efficiency can be 25-30% higher according to application investments with low redemption times.

In this case steam getting more important. Trapping steam and more heat usage depends on the correct steam equipment selection. Although steam traps look simple and small, their mission is very complex.

Saving more energy is related to the right chosen steam equipment and sizes. Working principles should be known well for choosing the right steam equipment for the process.

As Ayvaz, we are working for to produce best quality steam equipment in our factory in Istanbul in order to help our customers and the users to get the most efficiency from their steam systems.

We aimed to explain our audit experiences and technical knowledge to partners and introduce different type of steam applications and all related products with details in this catalogue.

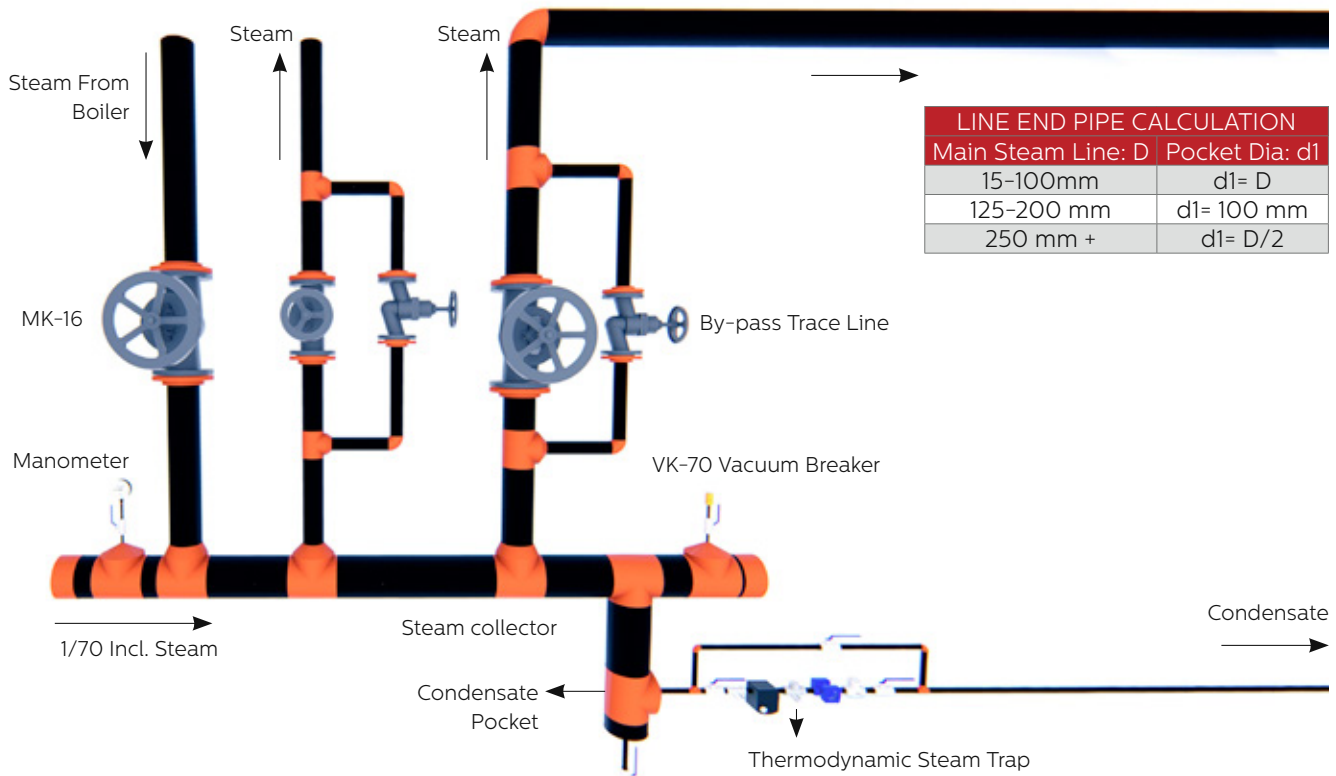


STEAM DISTRIBUTION

The system that distributes steam is called collector. Steam condensates in the collectors. The condensate is usually charged by thermodynamic steam traps from the collectors.

Steam collectors are the first stop in steam distribution. Saturated steam comes directly from boiler. MK-16 bellow seal valves are best option instead of globe valves at this installation.

Collector sizes can be calculated with $D = \sqrt{(d_1^2 + d_2^2 + d_3^2 \dots d_n^2)}$ formula. Steam trap's pocket size can be selected according to the selection table below;

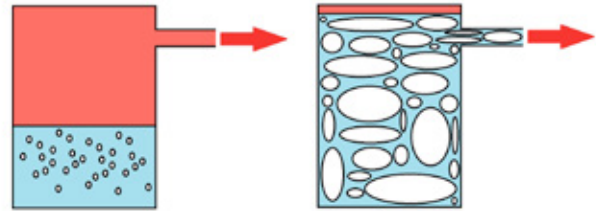


WATER DRAGGING IN STEAM LINES

In some cases hot boiler water can mix with steam and may drag to the system. This gets steam wet and may cause high water mass in system. This happens in that 3 case below;

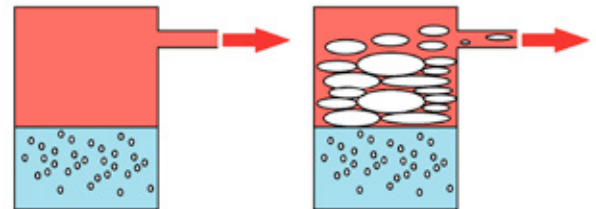
PEAK REQUESTS (PRIMING)

At the system startup, if all machines open in the same moment, boiler tank can not produce steam for request. It cause water dragging to the system and pressure loss in the steam boiler. When the pressure reduce suddenly, for balance the pressure, steam boiler start to boil and try to produce steam as fast as it can. This water steam mix drags to the system.



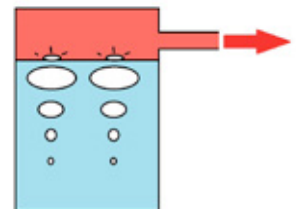
FOAMING

The components in the raw water which do not process properly process the water treatment process or the mixed condensate mixed with the condensate, cause the formation of bubbles in the cauldron. These foams fill the boiler and are dragged into the system due to the effect of steam. Foams contain water that is released when it explodes. This water damages the system.



BUBBLING

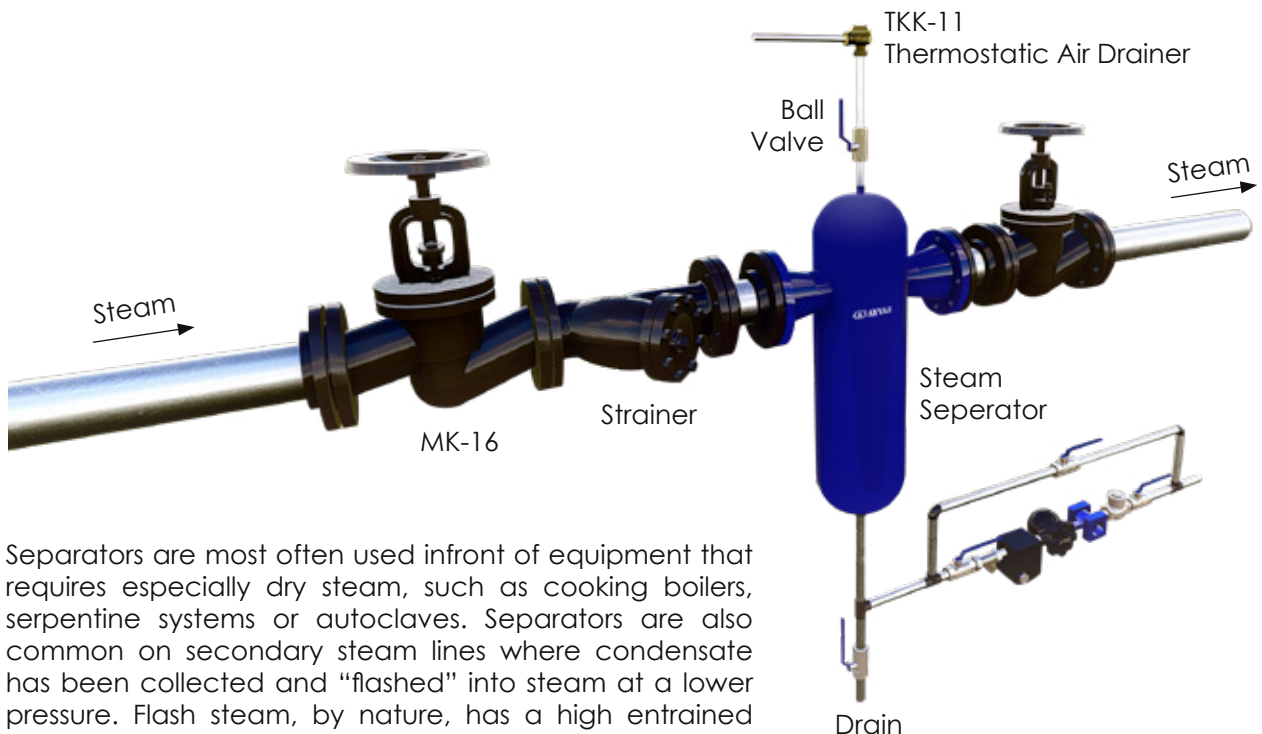
When water starts to boil on a metal heating surface, a steam bubble is formed in the water. This steam balloon rises rapidly and rises to the surface of the water. When the bubble breaks the surface of the water, some water is discharged from the surface. Discharged water continues to exist as mist at the same temperature as steam. It is usually discharged from the boiler together with the rapid flow of steam. The rest is suspended at the surface of the water since it is less dense than the density of water.



STEAM SEPARATOR SYSTEMS

In some cases, saturated steam may distribute directly with single line from boiler. That distribution may cause water draggings at system start up. To prevent that problem, separator systems must be installed directly to the steam lines.

In cases where dry and clean steam is required, branch line should be connected to the machine and process with a steam separator. This will help to collect the water at the bottom of the separator and to be discharged from the steam trap.



Separators are most often used in front of equipment that requires especially dry steam, such as cooking boilers, serpentine systems or autoclaves. Separators are also common on secondary steam lines where condensate has been collected and "flashed" into steam at a lower pressure. Flash steam, by nature, has a high entrained condensate content.

BLOWDOWN SYSTEMS

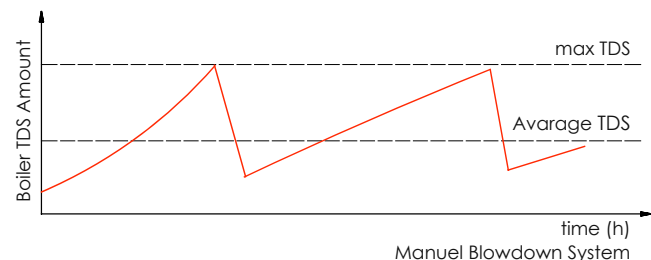
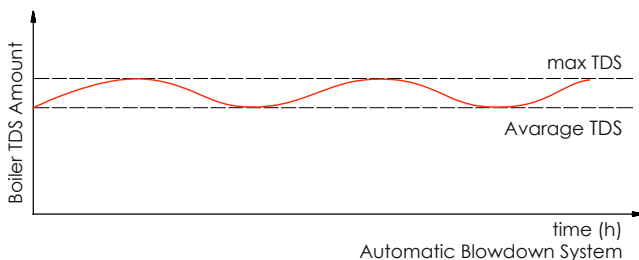
Surface blowdown and bottom blowdowns are required to ensure a continued safe transmission of the boiler. Sludge deposits are formed in the boiler and must be cleaned at regular intervals.

Sediments must be evacuated periodically to prevent the formation of the sludge layer. Bottom blowdown valves are used for this purpose. The bottom blowdown valve is opened and the pressurized boiler water is discharged from the lower zone of the boiler.

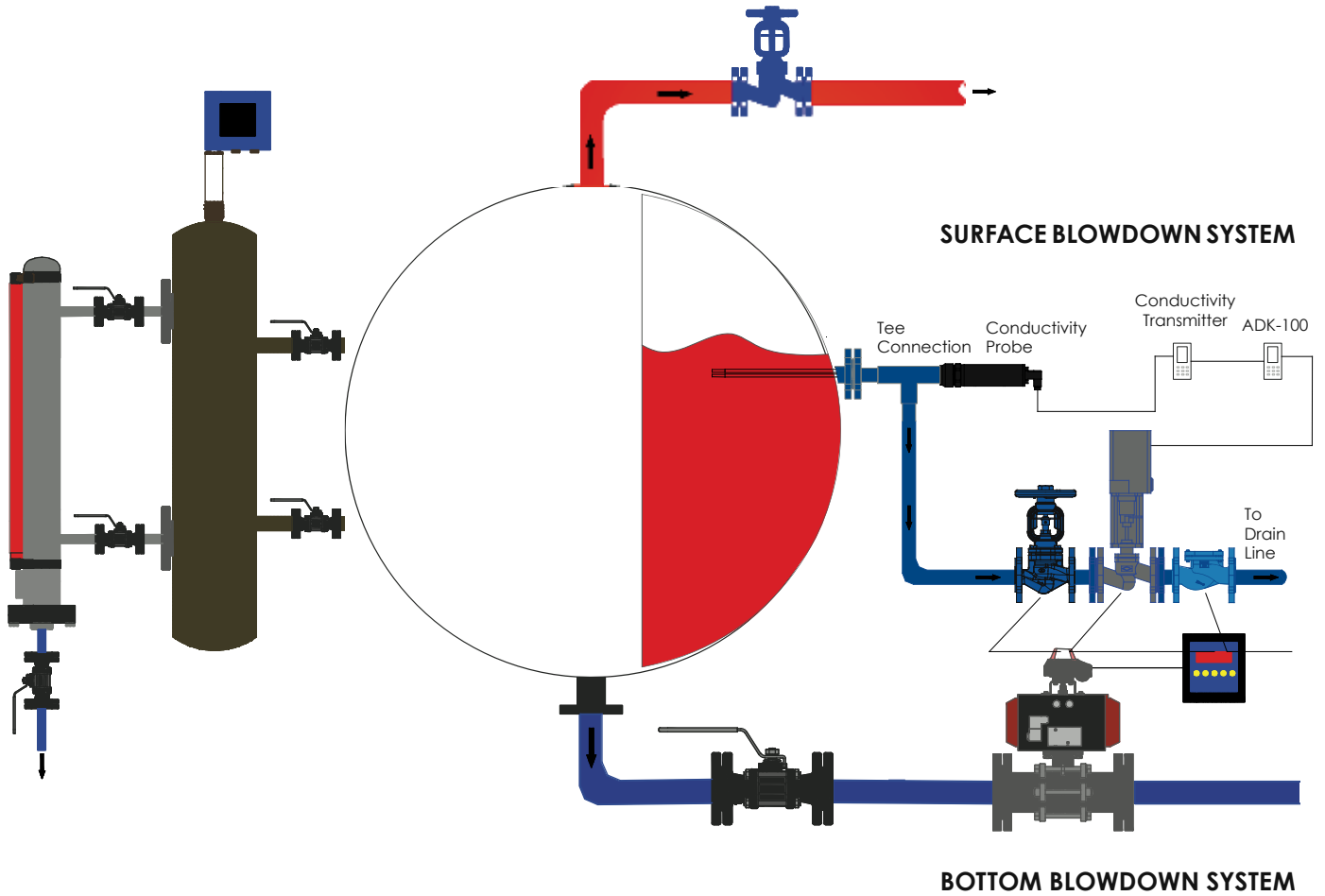
When the valve is opened, the sludge in the lower area of the boiler is effectively discharged by the high water velocity due to the pressure difference. Depending on the type of water preparation system and the dosing system, the steam boiler reaches salt and other foreign substances.

As a result of evaporation, the salinity in the boiler water increases. Salt concentration higher than the limit value causes the boiler stone, boiler corrosion and foam formation.

The foam can also reach the steam installation. Thus, the steam quality decreases and the accumulation of water forces the armatures.



APPLICATION EXAMPLE



HYGIENIC STEAM APPLICATIONS

Steam system is perfect for heat transfer application for petrochemicals, pulp mill and paper industries.

Food companies should use filtered steam at a minimum level or use hygienic steam to remove the risk of contamination.

Pure steam is the highest grade choice and is required for pharmaceutical and biotechnological applications.

Hygienically and pure steam; It is used for sterilization, vacuuming, humidification and heating processes in food, pharmaceutical, cosmetic and hospital establishments. Since steam used in these processes must meet the hygiene norms, hygienically steam generation is provided by second hygienically steam generators which are suitable for sterile steam conditions.

Steam Purity Range	Steam Application Area
Pure	Pharmaceutical Industry
	Biotechnology
Clean	Hospital
	Cosmetic
	Food & Beverage
Filtered	Food & Beverage
Plant	Hvac
	Textile
	Petrochemical

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HYGIENIC APPLICATIONS



When “Steam Cleaning” is mentioned, it is often referred to as “Hygienic Steam” rather than system steam.

This is usually divided into 4 different categories:

System Steam - FDA approved standard boiler chemicals are used in a typical conventional water treatment and inside the steam generated boiler. The tubing is standard carbon steel or even black pipe can be cast iron. All the condensate is recovered.

Filtered Steam - Steam, which is generated by conventional boiler, is filtered to remove condensate and solid particles. FDA approved chemicals used in standard boilers. If the pipe is a standard carbon steel or black iron, it must be replaced with 316 Stainless Steel. All the condensate is recovered.

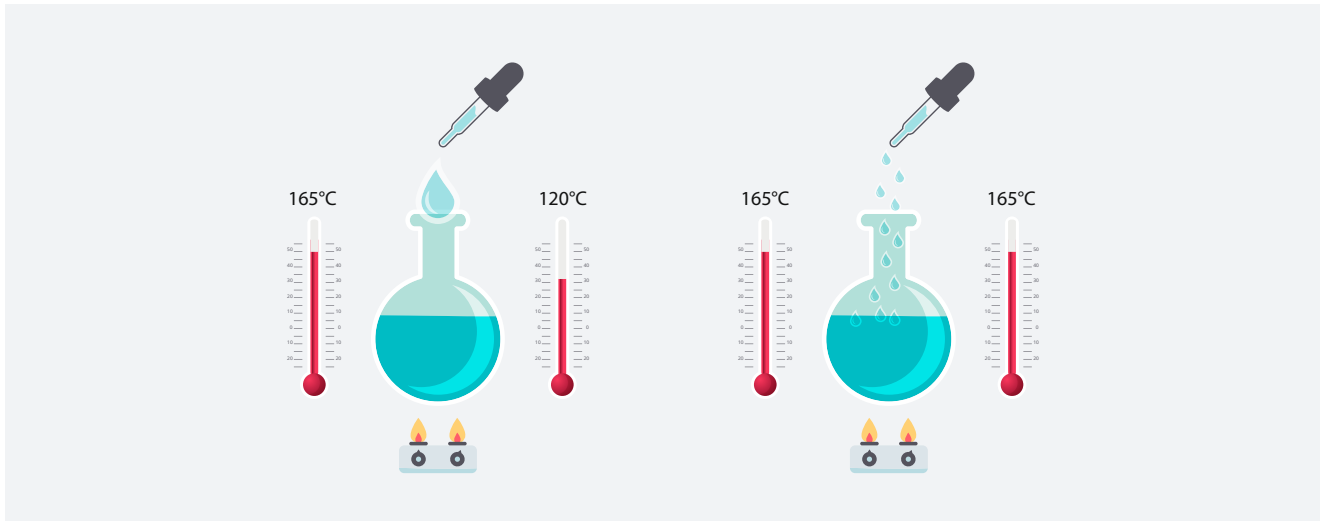
Hygienic Steam - is not include any addiction (boiler chemicals etc.) and ionized or produced by reverse osmosis systems. All materials, components and pipes are 316 L Stainless Steel. Rarely recovered condensate is typically sent to a settling tank and then it is for water purification.

Pure Water - is not include any addiction (boiler chemicals etc.) and which is production of pure water. All materials, components and pipes are 316 L Stainless Steel.

The hygienic thermostatic steam trap is designed to remove condensate from clean and pure steam applications such as CIP/SIP, sterile steam barriers, direct hygienic steam usage, reactors and process lines.



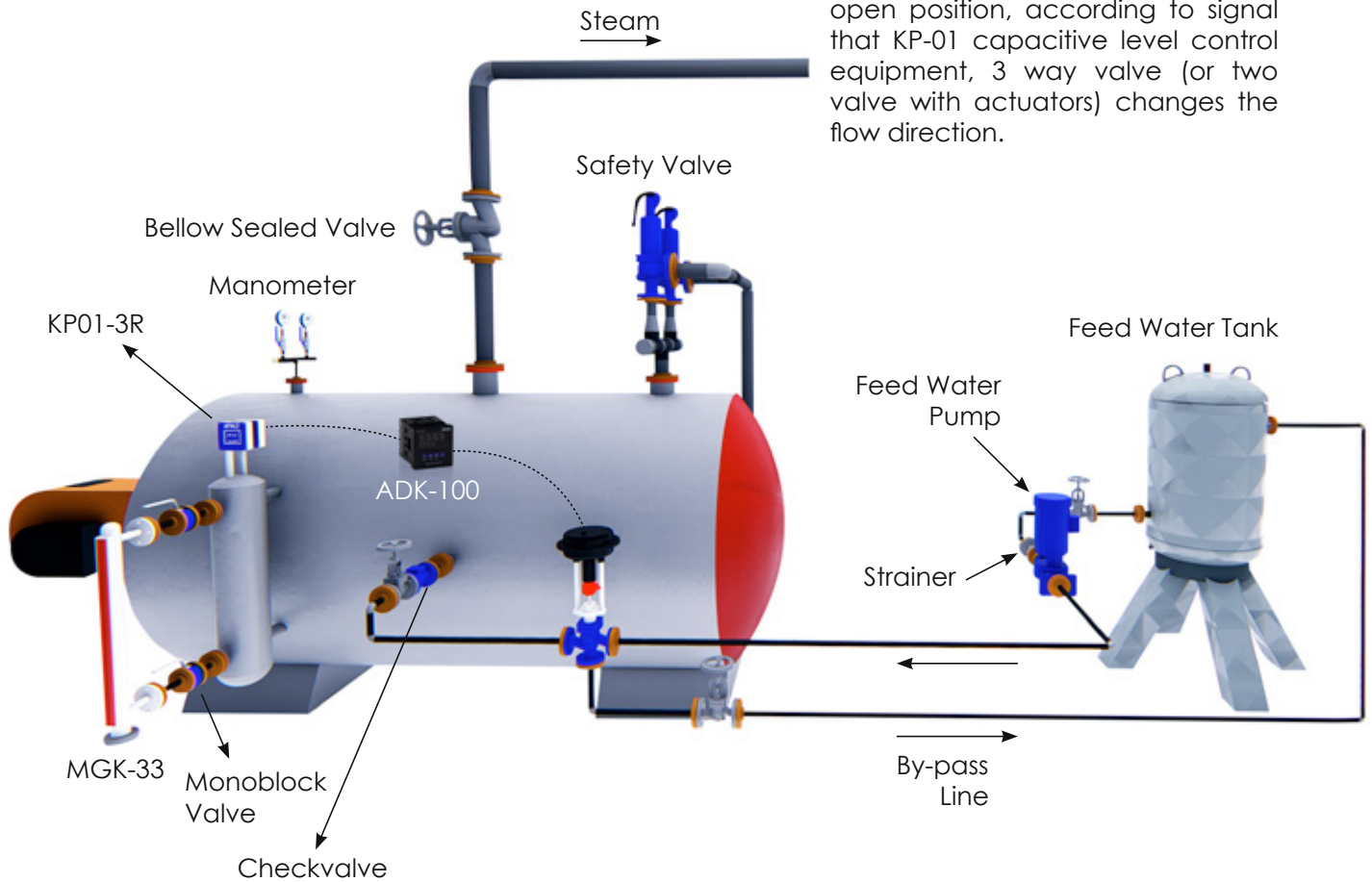
FEED WATER SYSTEMS



There are 2 general types of feed water system, such as; proportional and on-off. Main differences between proportional and on-off systems are;

- On-off systems are more economical than proportional systems.
- With proportional systems, pressure and temperature drops will be prevented.

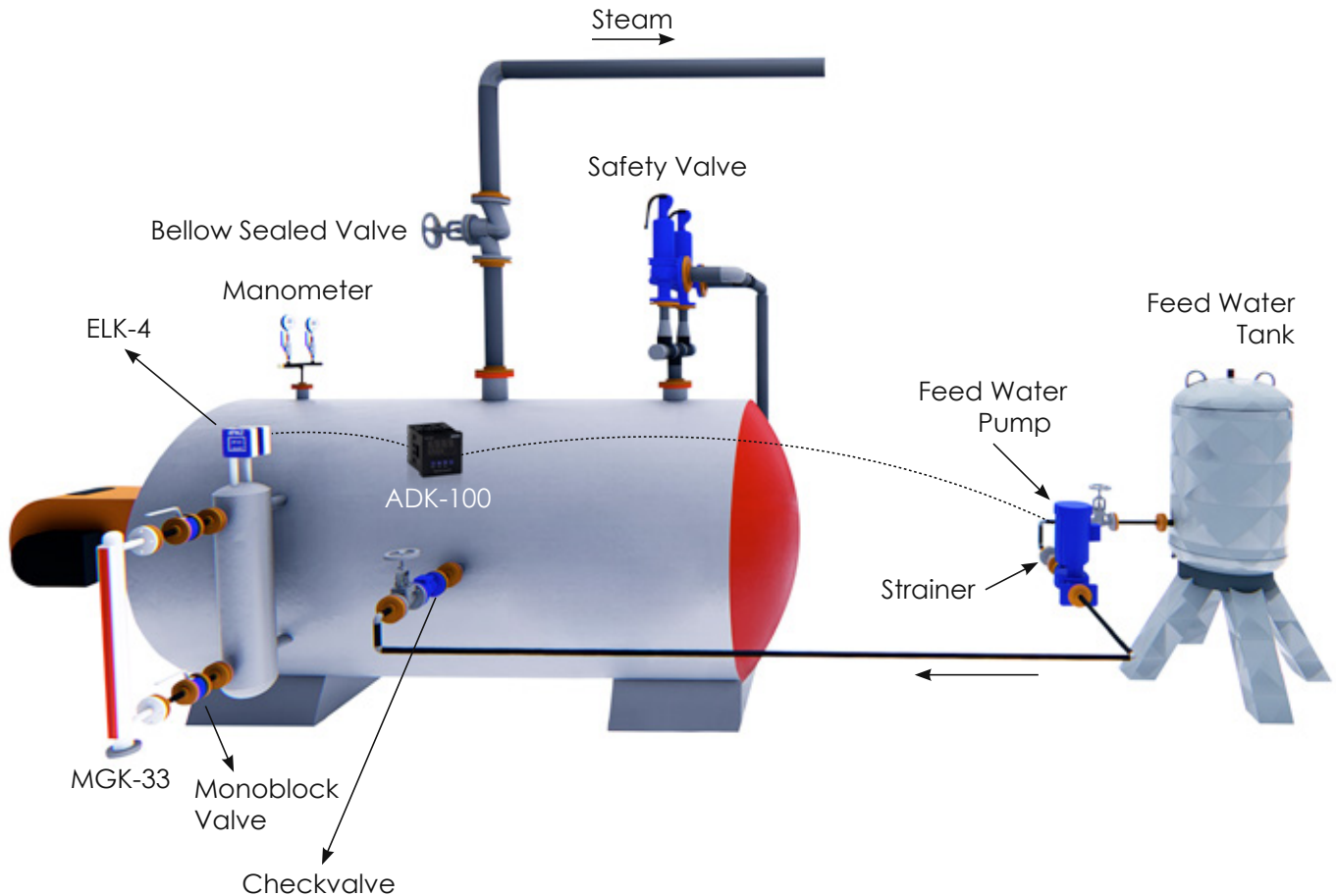
PROPORTIONAL FEED WATER SYSTEMS



Feed water pump is always in open position, according to signal that KP-01 capacitive level control equipment, 3 way valve (or two valve with actuators) changes the flow direction.

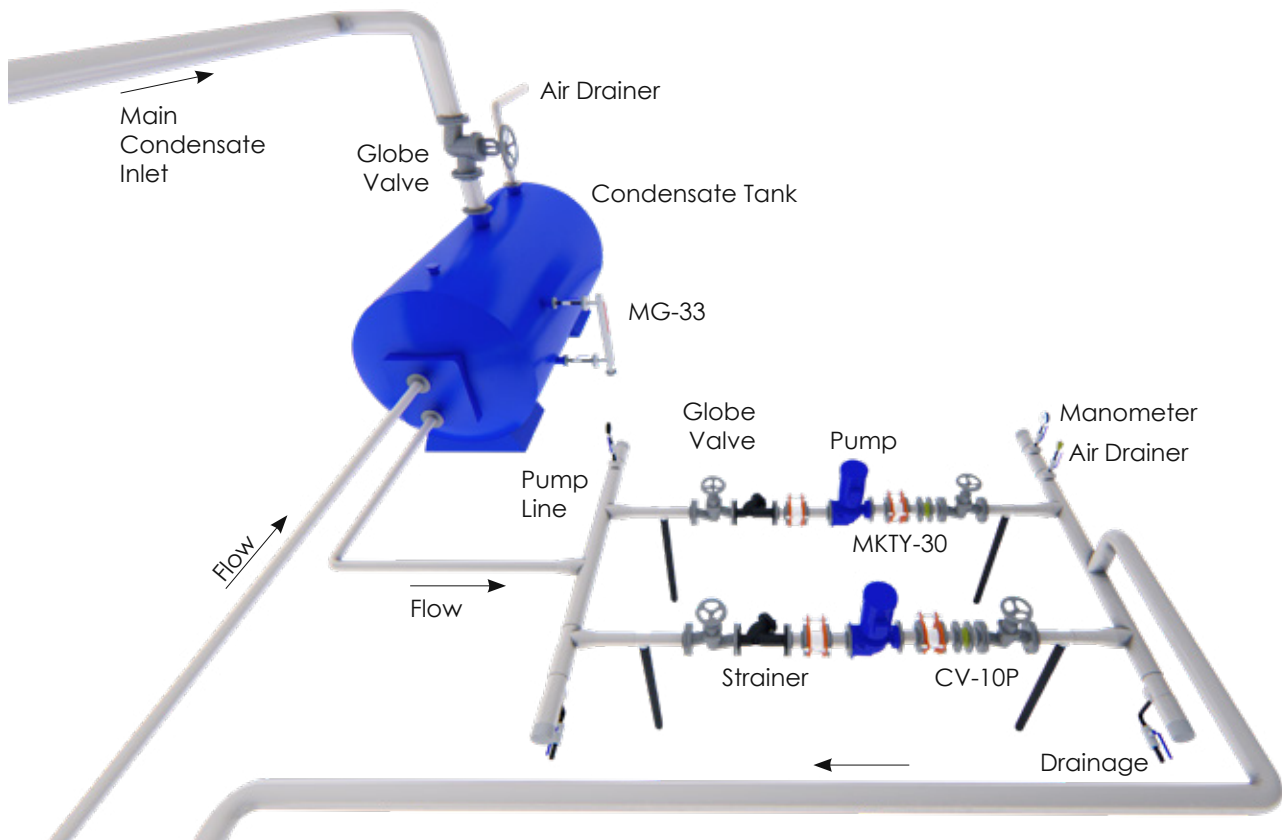
ON-OFF FEED WATER SYSTEMS

Feed water pump is opening and closing continuously, according to signal that ELK-4 probe level control equipment, control valve changes the flow direction.



CONDENSATION RECOVERY LINE

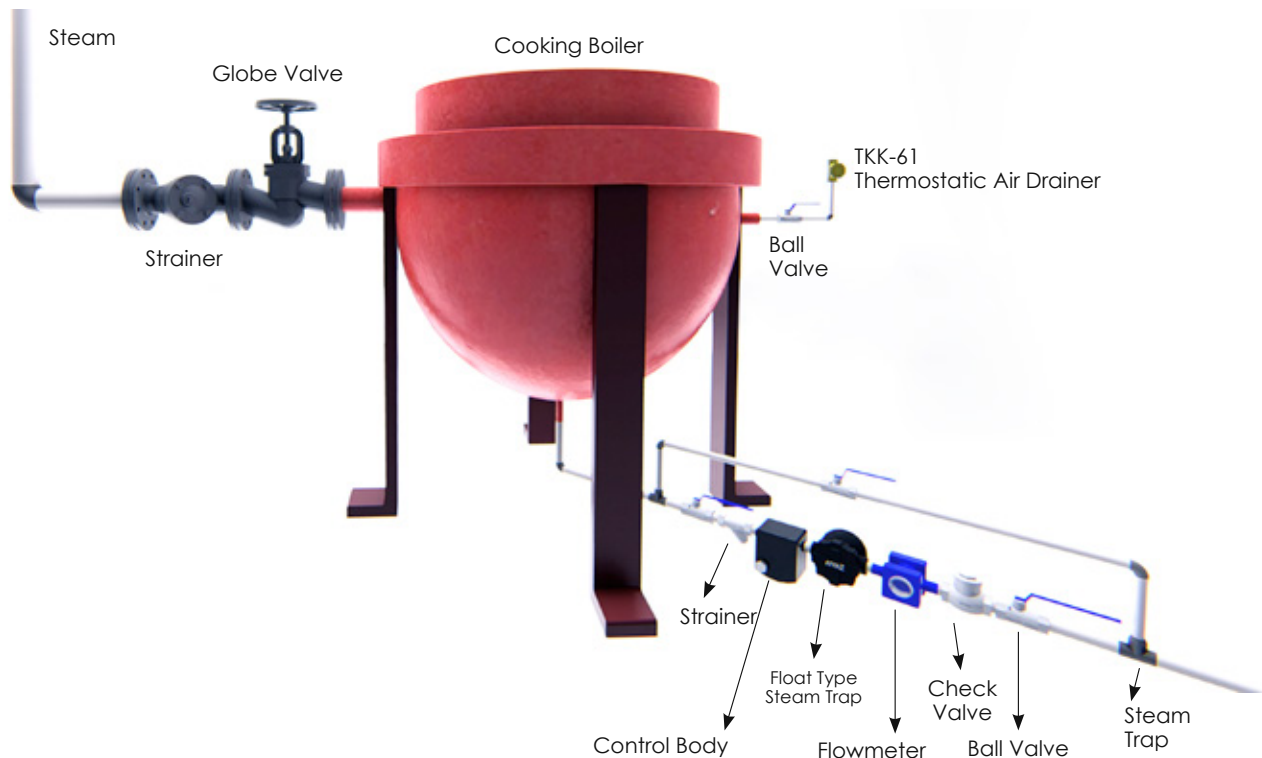
After process, saturated steam will transfer the energy and condensation will collect with steam traps to the condensate tanks. Condensate will mix with water supply in feed water tank by pumps, like the diagram below.



BOILER COOLING-HEATING CONTROL

After cooking process or during the process, when cooking boiler reaches to set temperature, control valve will reduce the steam flow and that will cause pressure drops. This pressure drops are directly connected with temperature reduces and heat losses.

Although in heat exchanger systems, many control valves are using, if the pressure is not equal or higher than the pressure after steam trap, discharging does not available. This problem is STALL. With the condensate pump system, users can prevent it.



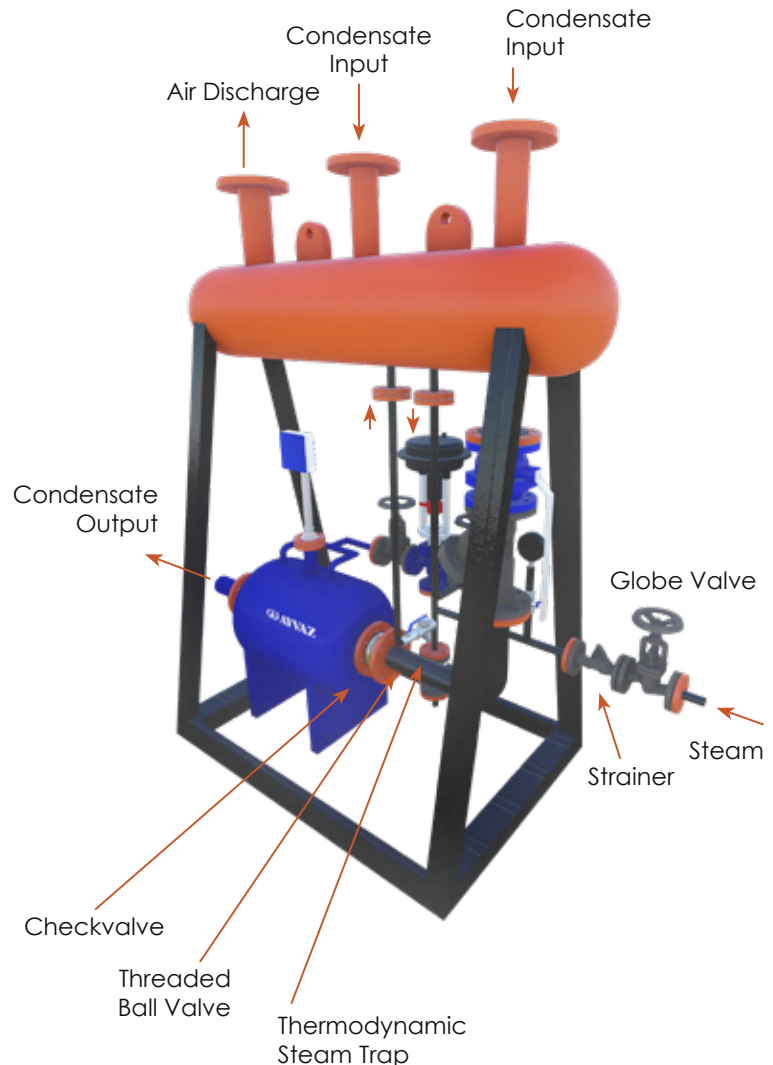
CONDENSATION AMOUNT

FOOD & BEVERAGE INDUSTRIES STANDARD MACHINE INFORMATION				STEAM CONSUMPTION (kg/h)	
Type Of Device or Process		STEAM PRESSURE (bar)	CAPACITY	CLOSED COND. SYSTEM	OPEN COND. SYSTEM
FOOD PROCESS	Milk Pasteurization	0,5	Per 1 kg of Milk	0,17	
	Pasteurization of Liquid Egg	1,5	Per 1 kg of Egg	0,12	
	Oven - Dough Room	0,5-1,0	Per 1 m of trough lenght	0,8	
	White Bread Production		Per 1 m ² of surface	1,3	
	Rye Bread Production		Per 1m ² of surface	3	
	Candy Cooking Pot	6,00	120 liter	17	20
	Candy Heater	6,0	Per 1m ² of Jacket	25	30
Chocolate Melt Process	6,0	jacketed Pot in 600 mm of Diameter	16	19	
BEVERAGE PROCESS	Bottle Washing	0,5-1,0	100 Bottles/min	136	
	Shirink Tunnel	4,0		300	
ANIMAL FEED	Bait Production	4,0-6,0	Per 1 t/h of bait	60-75	
INDUSTRIAL KITCHEN EQUIPMENT	Tea Pot	0,5	50 liter	25	
	Cooking Pot		100 liter	40	
			150 liter	50	
			200 liter	60	
			300 liter	70	
			400 liter	80	
			600 liter	100	
	Tilt Meal Pot	1,0-2,0	40 liter	25	
	Steam Jacketed Water Heater		60 liter	35	
			40 liter	8	
	Plate and Dish Warmer		230 liter	30	
			Per 10m ² of Surface	30	
	Oven		Per 1m ³ of Volume	25	
	Vegetable Steamer			14	
	Potato Steamer			14	
Oyster Steamer		7			
Clam - Lobster Steamer		14			
Dish Washer		32			
Steam Table		55			

CONDENSATE PUMP SYSTEM

Condensate comes from the input collector and goes on internal pipe and access check valve than enter in condensate pump body so tank is getting full. In tank when the condensate comes on the upper limit, ELK-2 level gauge check the conductivity and change it to electrical signal and send it to 3 way pneumatic valve for the giving contact which is on the steam line than allows it to be opened. In normally steam has more high pressure than the condensate pressure. When 3 way valve is close, system discharge condensate from the system with thermodynamic steam trap.

When the condensate pressure is smaller than the opposite pressure in condensate pump, discharge operation do not occur. Steam is occurs the condensate discharging with entering the body, which have more pressure than the opposite pressure. When the condensate limit is getting bottom limit of the tank, ELK-2 level gauge send electrical signal to 3-way pneumatic valve for close the system for entering steam. After that condens enter again and getting full tank. This operation frequency is connect between the condensate quantity. If the users want they can be follow the condensate quantity, from contoller.



FLASH STEAM RECOVERY SYSTEMS

The most important components in a cascade system are the Flash Steam Tank Systems which separate the flash vapor from the condensate where the flash and the sweep / blow steam are located. A common mistake in enterprises is called "separator". It is important that the condensate is drained effectively and not allowed to accumulate in the separators. They can be emptied with a steam trap, an electrically driven pump / level control device, or a steam-driven pump system with a lower choice of both investment costs and operating costs.

Why Flash Steam is Important?

It includes too much energy and it can be mount to different installation areas. If Flash Steam drains to the atmosphere there will be waste energy and efficiency lost.

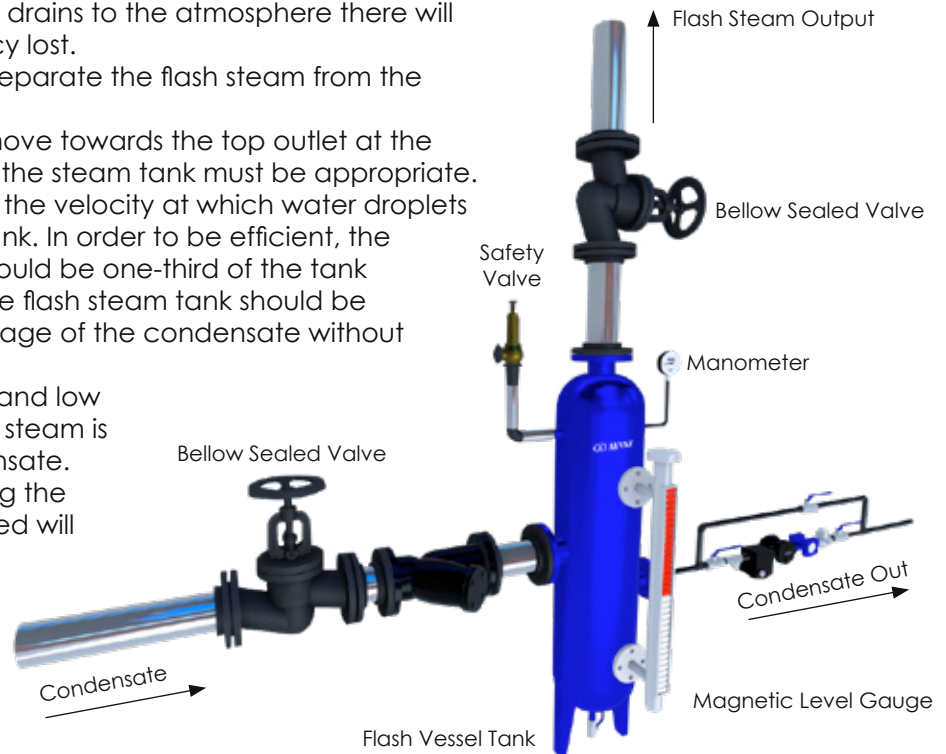
Flash Steam Tanks are used to separate the flash steam from the condensate water.

In order for the flash steam to move towards the top outlet at the correct speed, the diameter of the steam tank must be appropriate. This speed is about 3-5 m/s and the velocity at which water droplets can reach the bottom of the tank. In order to be efficient, the condensate inlet to the tank should be one-third of the tank neck below. The diameter of the flash steam tank should be a diameter that allows the passage of the condensate without coming into turbulence.

If the difference between high and low pressure is small. The amount of steam is less than the amount of condensate.

Flash steam outlet pipe selecting the diameter according to the speed will cause the tank to remain small.

In which case the tank must be selected to be two diameters larger.



HEAT EXCHANGERS

In today's conditions, where energy is getting more expensive day by day, there is no need to waste energy in industry or individual use. The budgets allocated to energy in industrial establishments have increased by 20% -40% in recent years and they are at the top of the expenses section. Taking all these points into account, the recovery of energy has become very important. Ayvaz plate heat exchangers prevent the waste of your thermal energy with wide variety of plate and gaskets suitable for each system.

Industrial facilities have many wasted heat sources such as rotten steam and hot water returning from fabric washing. At the same time, there are applications that require heat, such as domestic hot water production and office heating. With the Ayvaz plate heat exchanger you will use to transfer heat from existing heat sources to the part that needs heat, you do not waste your heat and you need to save extra heat for the heat requirement. Nowadays, the most important factor that will relax businesses is to reduce costs. Energy expenses, one of the biggest factor in expenses, are now worth the gold for everyone and cannot be ignored. A heat exchanger to be used for heat recovery with a rough calculation now pays off in 3-6 months and starts to add value to the operation in a short time.

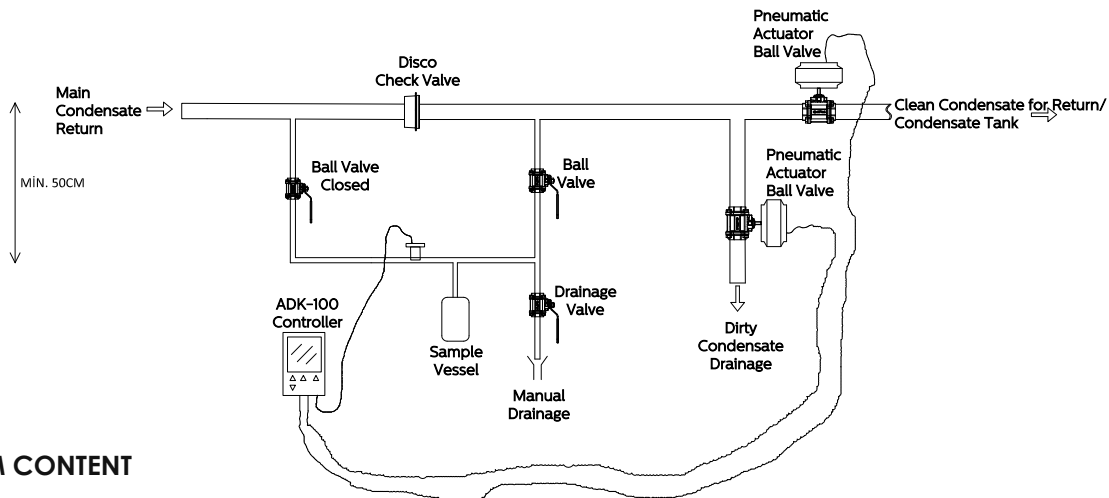


CONDENSATE POLLUTION CONTROL

This system, which is located at the entrance of the condensate tank, continuously measures the electrical conductivity of the condensate water. The conductivity measurement probe value is transmitted at the system control value. The controller compares the set conductivity value with the set value. When the set value is exceeded, the discharge valve opens and the condensate is discharged.

When the electric conductivity value is lower than the set value, the discharge valve closes and the condensate tank line is opened. It is sent to the condensate tank.

Since the electrical conductivity varies with temperature, the conductivity probe used in the system must be able to measure the conductivity at the temperature together with the conductivity so that the conductivity of the condensate at every temperature can be measured accurately.



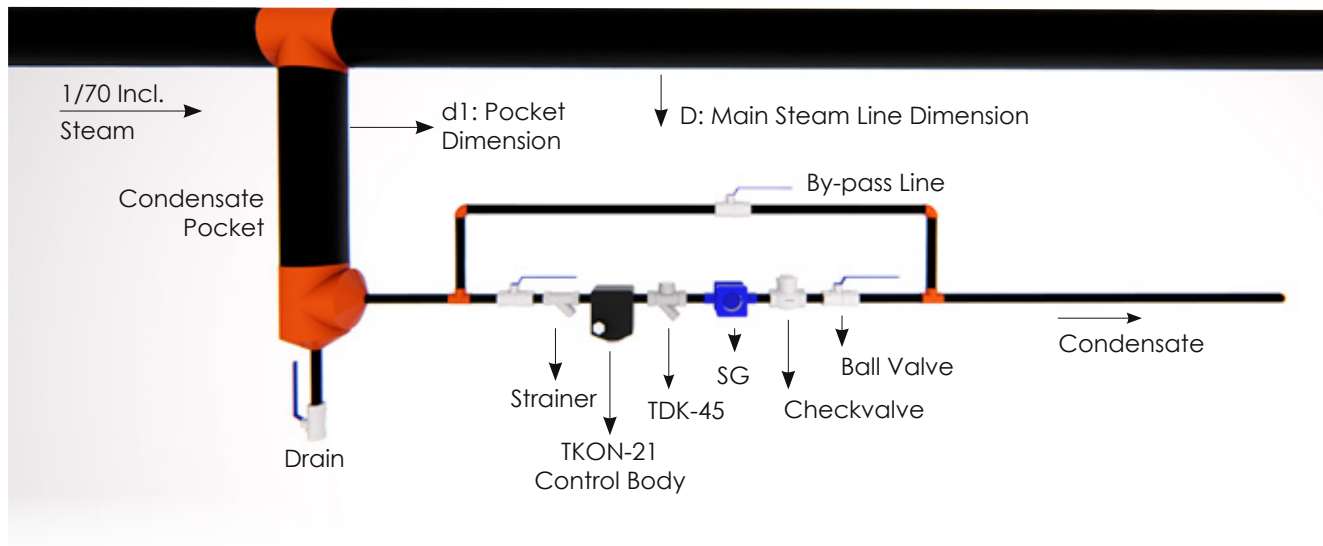
SYSTEM CONTENT

- Stainless disc checkvalve
- Double effective pneumatic actuated stainless ball valve normally open
- Double effective pneumatic actuated stainless ball valve normally closed
- Conductivity transmitter B&C electronic C3600 4-20mA (110x90x60mm)
- Conductivity sensor sensorex CS675 htic 250 PSI 200C 1" diving length
Sensor diameter 19mm cable side 3/4 ADK-100 controller
- Stainless ball valve threaded 304 quality

STEAM LINE APPLICATIONS

MAIN STEAM LINE APPLICATION

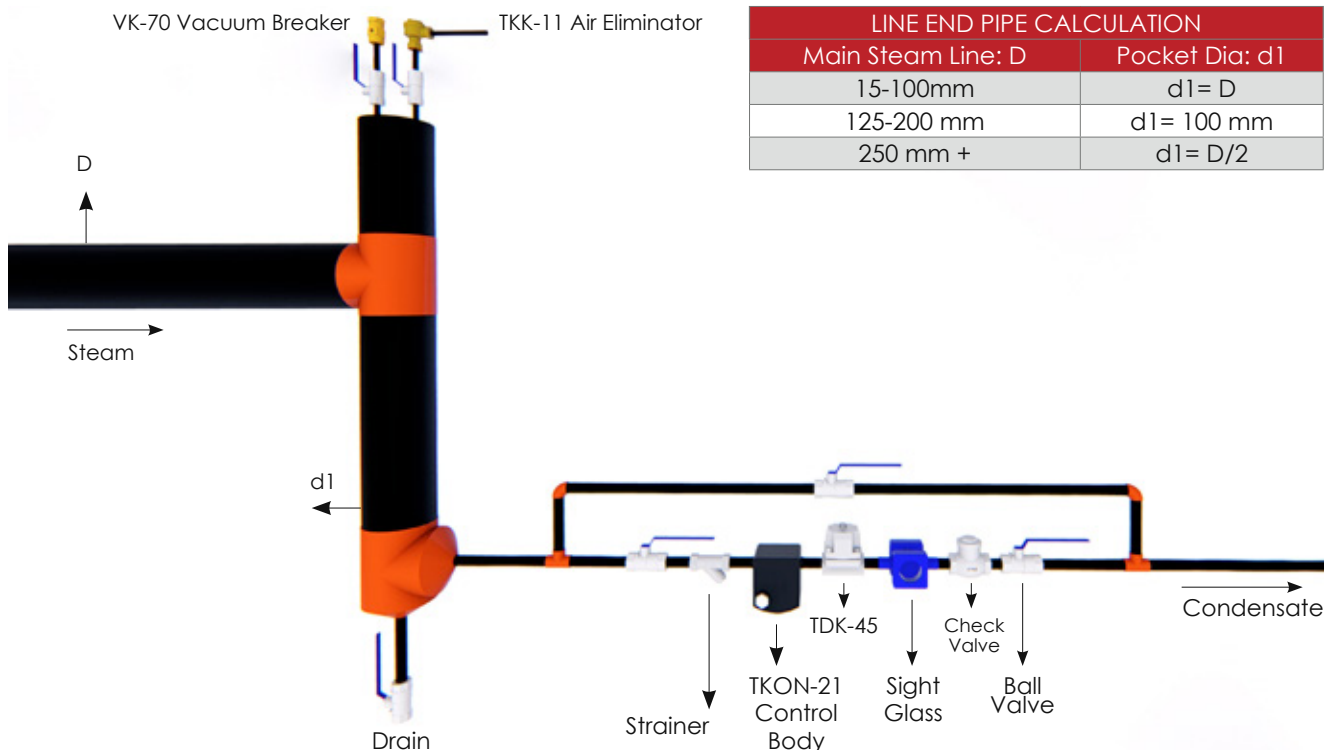
Condensate discharge unit should be placed in main steam lines in every 50 meters if the line is indoor and insulated or in every 30 meters if the line is outdoor and insulated. If any equipment like pressure reducer, pressure holder or proportional valve is installed in the line, a condensate discharge unit must be placed before these equipment.



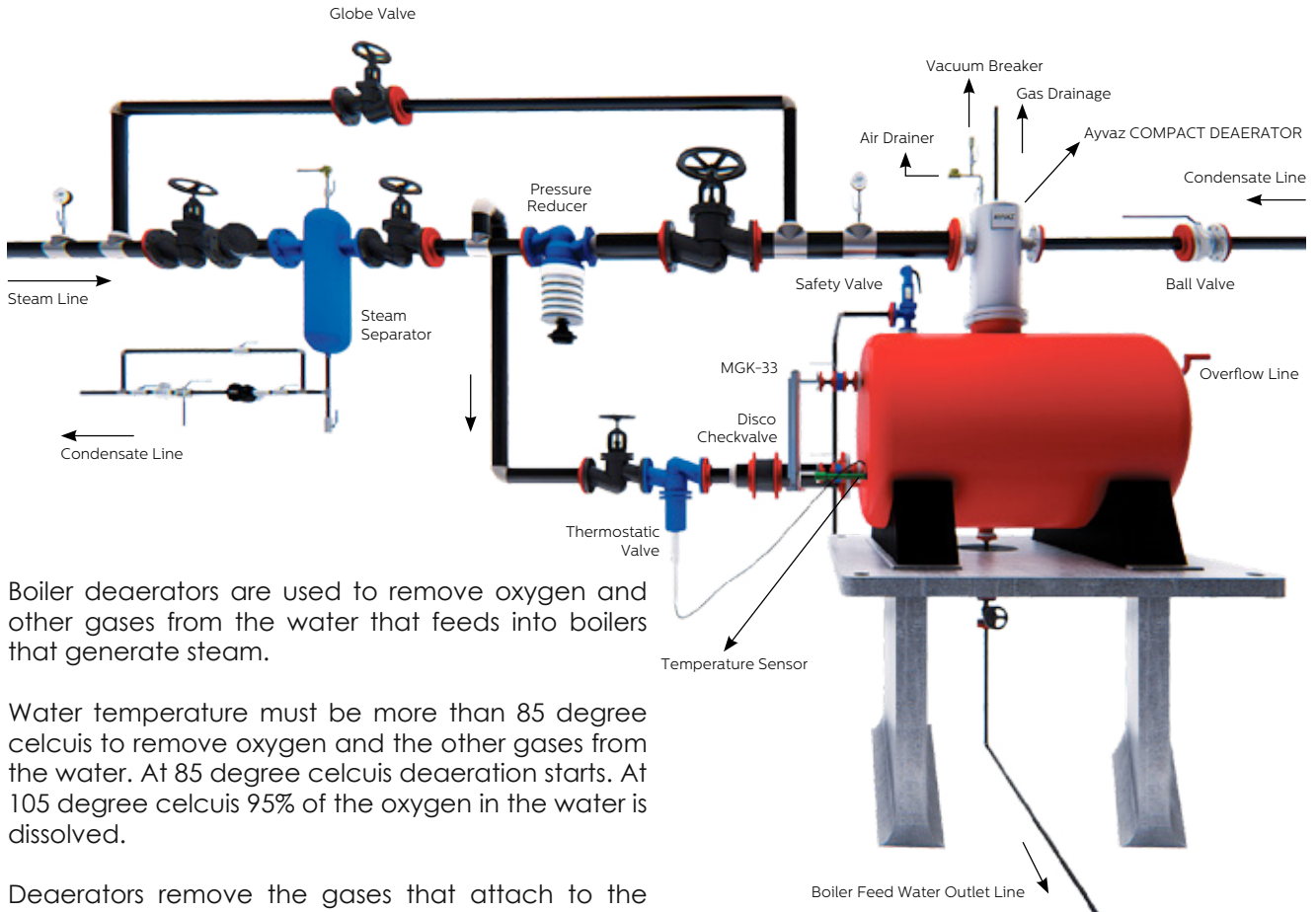
LINE END APPLICATION

If the steam systems are closed by the process, the steam will turn to condensation until it is turned on again. The volume difference will be filled with air. When the system is switched on again, the air must be evacuated to allow the steam to easily fill the line. This is only possible with "End of Line Application".

The occurred air and condensate around connection areas in the pipelines are dragged to the end of the line. If that air and condensate are not discharged, they may block the steam flow. In such cases, formed air and condensate are discharged with a line end application shown below. The steam trap kind must be thermodynamic.



DEAERATORS



Boiler deaerators are used to remove oxygen and other gases from the water that feeds into boilers that generate steam.

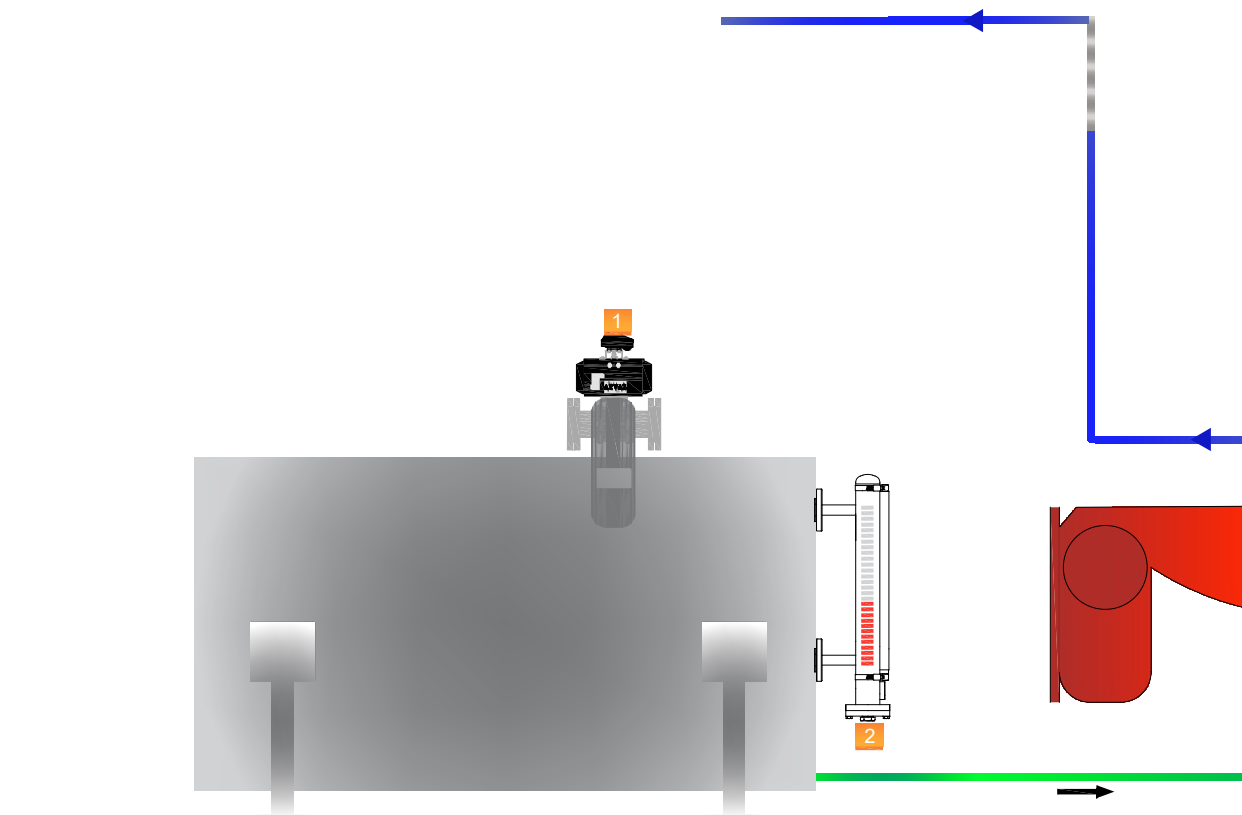
Water temperature must be more than 85 degree celcius to remove oxygen and the other gases from the water. At 85 degree celcius deaeration starts. At 105 degree celcius 95% of the oxygen in the water is dissolved.

Deaerators remove the gases that attach to the metallic components of the steam system and cause corrosion by forming oxides, or rust. Oxygen and carbon dioxide are responsible for corrosion (pitting). There are two types of boiler deaerators: Tank model or compact deaerators.

BOILER ROOM

TANK SECTION (FEED WATER,
DEAERATOR, CONDENSATE RECOVERY)

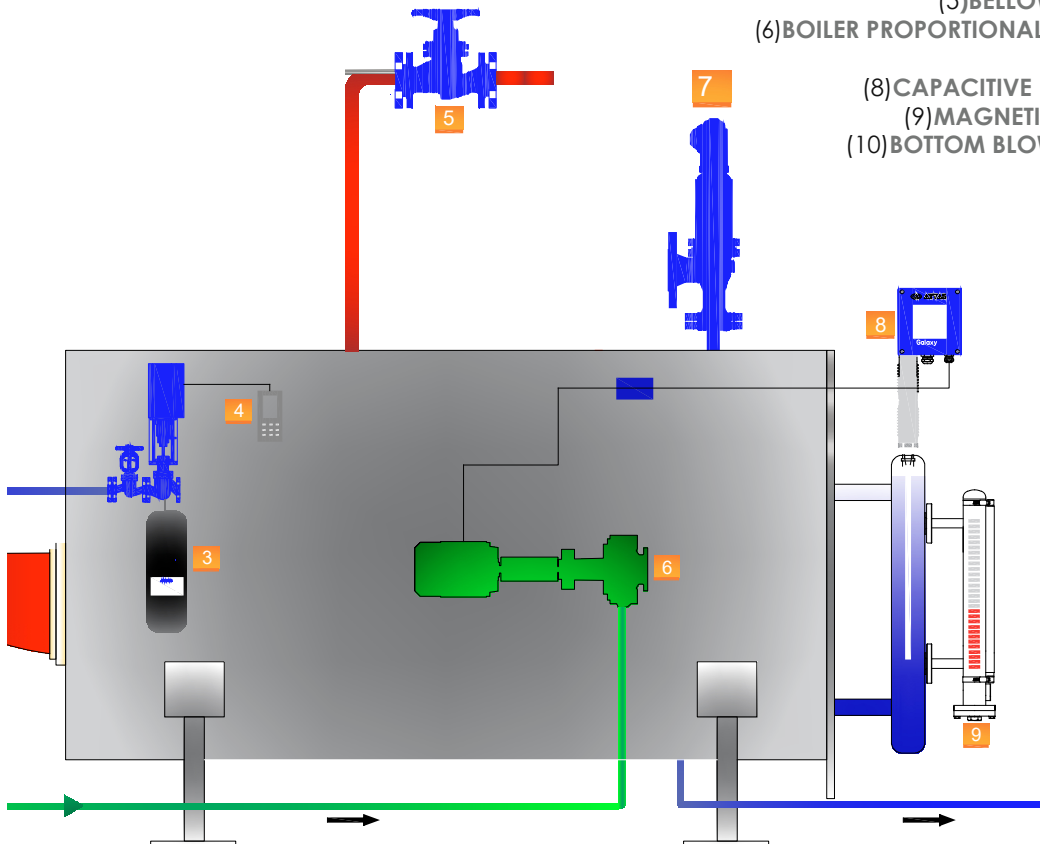
- (1) DEAERATOR ▶ ASD
- (2) MAGNETIC LEVEL GAUGE ▶ MG-33S



BOILER ROOM

BOILER

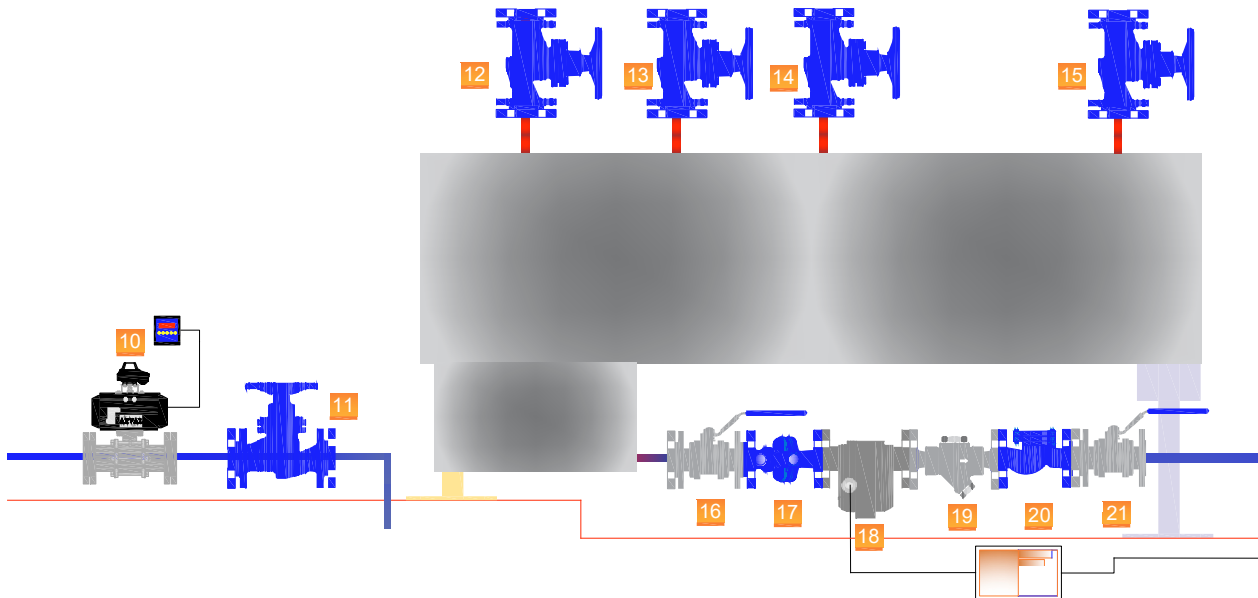
- (3) BOILER WATER SAMPLING GASKETINER ▶ NK-16
- (4) SURFACE BLOWDOWN SYSTEM ▶ YBS-10
- (5) BELLOW SEALED VALVE ▶ MK-16
- (6) BOILER PROPORTIONAL LEVEL CONTROL SYSTEM
- (7) SAFETY VALVE ▶ L9-BP
- (8) CAPACITIVE LEVEL ELECTRODE ▶ KP-01
- (9) MAGNETIC LEVEL GAUGE ▶ MG-33
- (10) BOTTOM BLOWDOWN VALVE ▶ DBV-10



BOILER ROOM

COLLECTOR (HEADER)

- (12-13-14-15) BELLOWS SEALED VALVE ▶ MK-16
- (16-21) STAINLESS STEEL BALL VALVE ▶ V3-F
- (17) STRAINERS ▶ PTY-40
- (18) STEAM TRAP CONTROLLING UNIT ▶ TKON
- (19) THERMODYNAMIC STEAM TRAP ▶ TDK-45
- (20) CHECK VALVE ▶ CLV-50



INDUSTRIAL SOLUTIONS

FOOD&BEVERAGE



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