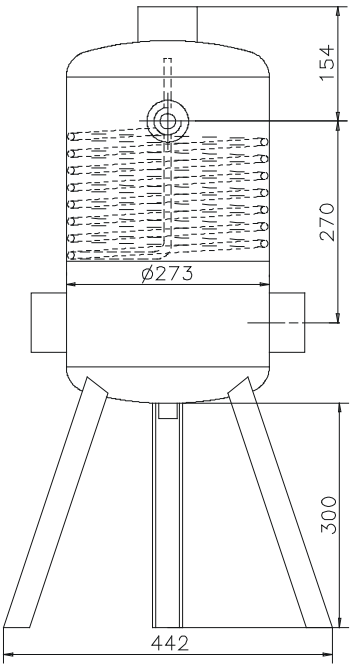
Armstrong MTS

Armstrong Thermo-Syphon Mixer Condensate Cooler

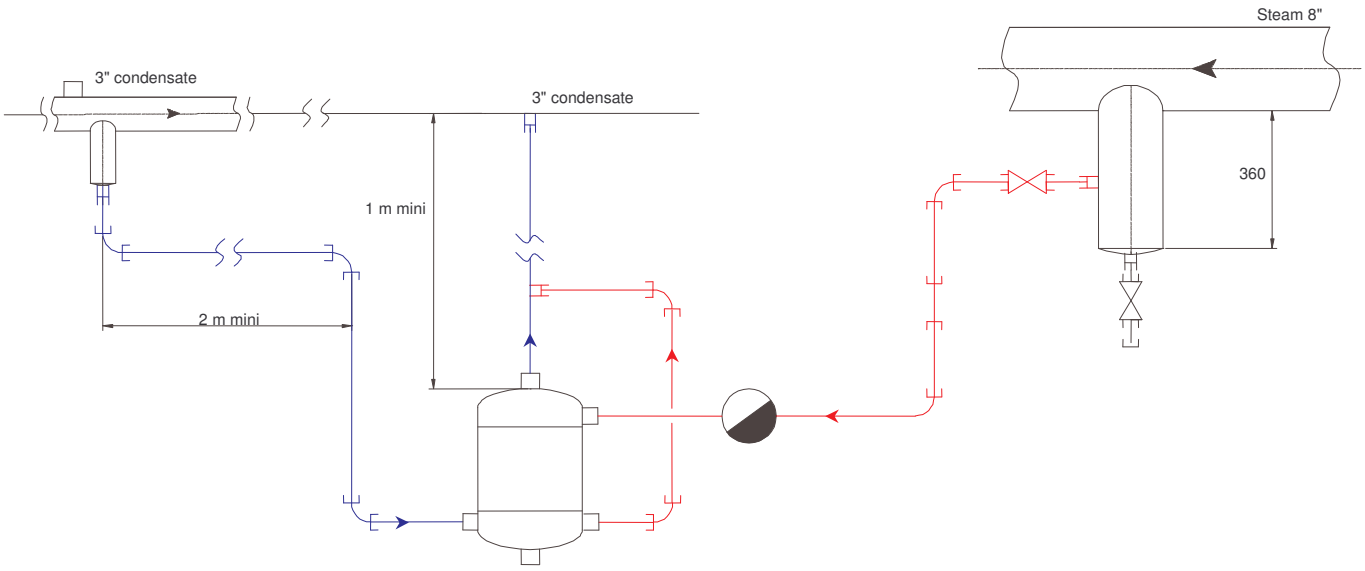
MTS-300: 300 kg/h
MTS-500L: 500 kg/h

PMA 20 barg – TMA 250 °C



Armstrong®
Intelligent System Solutions™
STEAM • AIR • HOT WATER

I. Product Description



- The problem of slapping condensate returns

Direct re-injection of saturated condensates into the condensate return can result to more or less violent slapping. What causes these slapping? Coming from the steam line (higher pressure), condensate flows through the steam trap and arrives in a part of the steam system which is at lower pressure. The pressure drop causes a temperature drop and consequently a lost of sensible heat.

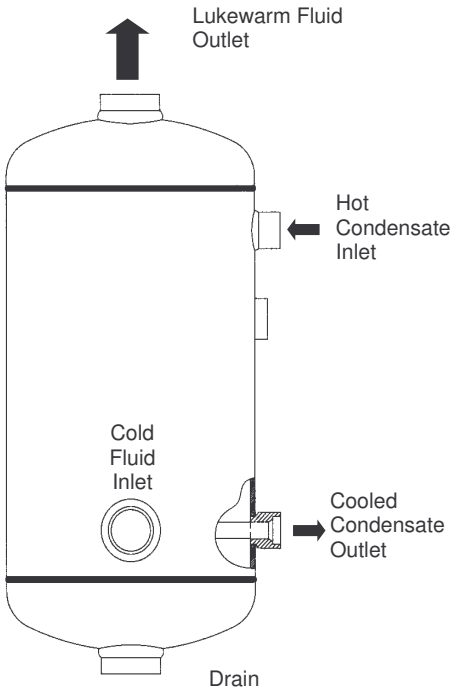
But, as Mr. Lavoisier already said in the 18th century: «Nothing is lost, nothing is created, all is transformed», and thus a part of the condensate will vaporize using this sensible heat which is transformed in latent heat (flash steam).This means that at the outlet of a steam trap, even well regulated, we will have a volume of steam bigger than the one of condensate.

The sudden cooling of this flash steam when re-injected into cold liquid causes implosion (same as in “cavitation” phenomenon) and thus slapping: steam condenses instantaneously and the vacuum created by this sudden change of volume is immediately filled by the water present in the condensate return line.

That is why, in order to avoid slapping in the condensate return, it is more efficient to slowly cool down the condensate and let the flash steam gently condenses. From this deduction is born the Armstrong MTS (Thermo-Siphon Mixer).

- What is the MTS made of?

The Thermo-siphon Mixer is made of a carbon steel tank in which flows the cold fluid. Into this tank is installed a stainless steel coil in which flows the hot condensate that intends to be cooled down by thermal exchange with the cold fluid.



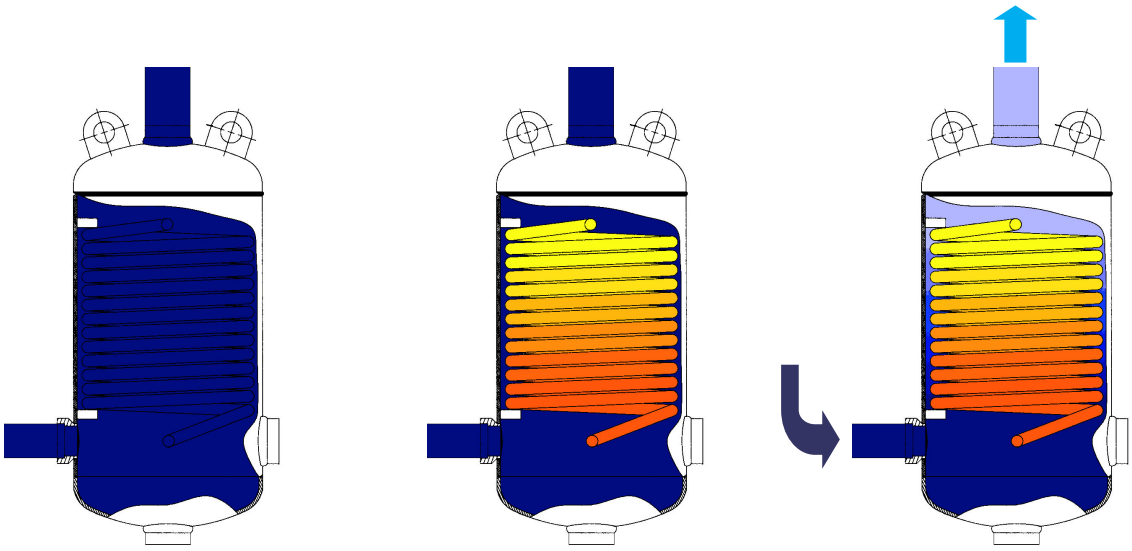
- How does it work?

The hot condensate that has to be cooled enters by the top of the coil and is cooled down by flowing into the coil. Meanwhile, the bubbles of flash steam contained into the condensate are getting smaller and smaller as the temperature is going down. Those bubbles finally disappear before the injection into the lukewarm fluid in such a way that the slapping previously mentioned is avoided.

The cold fluid inlet, the tank and the lukewarm fluid outlet constitute the thermo-siphon loop.

The differential temperature between the cold fluid entering the MTS through the bottom and the lukewarm fluid going out of the MTS through the top creates a differential pressure which keeps the fluid flowing into the thermo-siphon loop.

More easily, the motive force can be defined as the force which keeps the fluid circulating by the differential weight between the inlet cold water column and the outlet warmed water column (lighter). The flow speed will keep increasing until the sum of all the resistances (friction losses) equals the motive force. Those friction losses are proportional to the pipe length and to the equivalent length of all the parts installed (elbow, valves,etc).



1. System waiting for hot condensate to arrive
2. Arriving of the condensate which cools down by flowing down into the coil
3. By heat transfer with the hot condensate, the cold fluid gets warmer and the thermo-siphon loop start circulating.

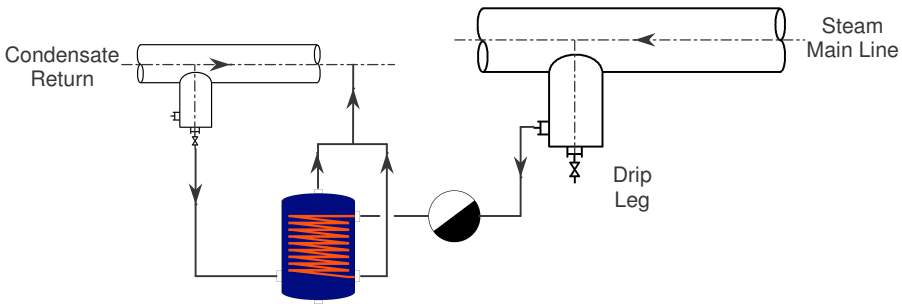
Moreover, the higher the temperature of the hot condensate, the more the fluid will be warmed up. The outlet water column will then be lighter and the flow speed will increase. The condensate will then give the same amount of energy to a bigger volume of fluid. Therefore, the temperature of the lukewarm fluid will go down and consequently the flow speed will do the same, until reaching a balance point.

That is why we may say that this system is self regulating (for operating conditions into the operating range for which the system is designed).

II. Typical Applications

- Injection of saturated condensate into a condensate return line

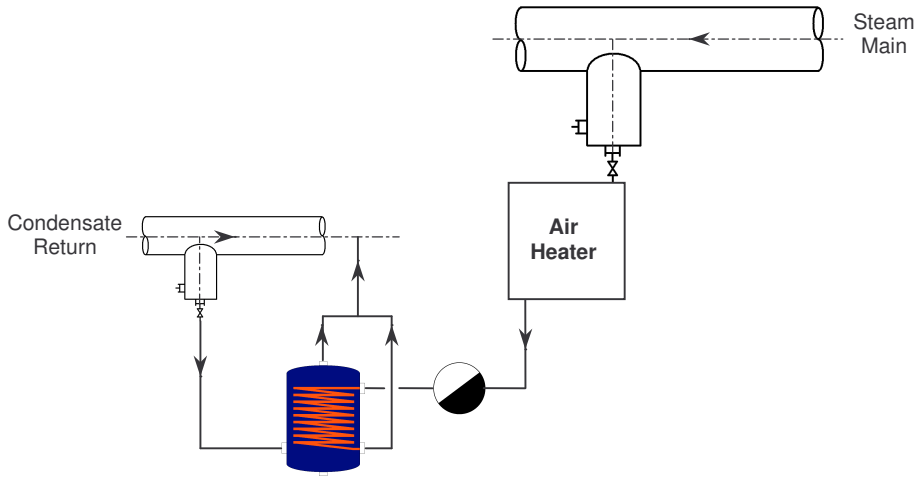
This is the typical application for which the MTS has been developed, for industries such as Refineries, Steel Facrtories and District Heating. Those types of sites have very long non-insulated condensate return lines into which the condensate temperature can sometimes drop down to 60°C. Parallel to those are there steam lines at 180°C, which are regularly drained. The condensate collected into those drip legs is re-injected into the condensate return line, thus creating slapping.



The MTS allows cooling down the saturated condensate before the injection in the condensate return and without using any other water contribution.

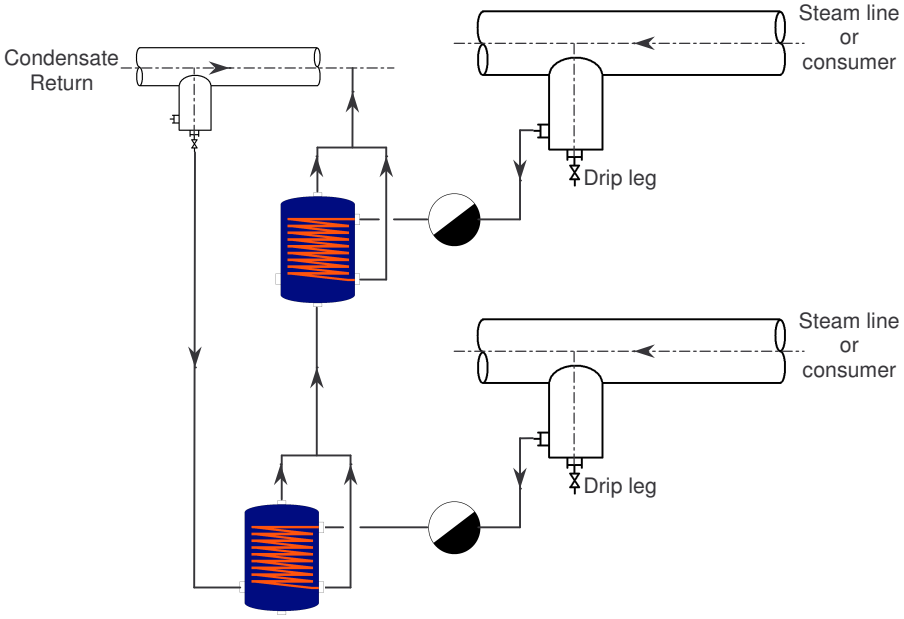
- Application with only one consumer

In the case of an unique small user, for example an air-heater, it is possible to use the MTS to cool down the condensate before sending it to the condensate return line which is at a lower temperature. This allows avoiding the slapping happening when saturated condensate is sent back into the colder condensate return line.



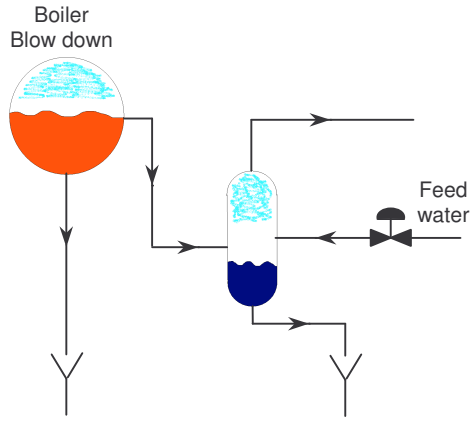
- Application with several MTS in series

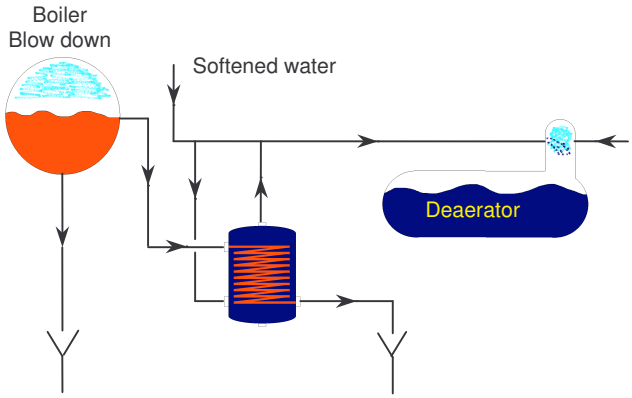
In the case that one MTS only is not sufficient to cool down the desired amount of condensate, or if more than one consumer are sending back the condensate to the same injection point, it is possible to use two MTS in series in order to double the capacity.



- Flash Tank for Boiler Blowdown

The aim of this installation is to cool down into a flash tank the boiler blow down hot water before sending it to the sewer. This hot water cooling is made by injecting feed water into the condensate.



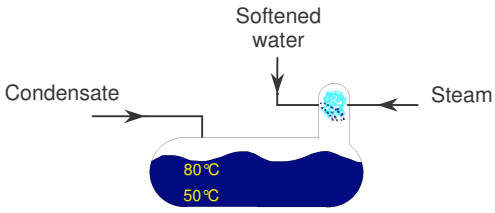


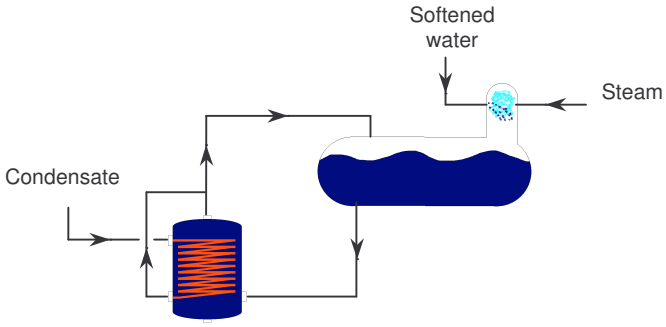
The MTS allows cooling down the condensate while preheating the softened water used in a deaerator. This leads to some savings on steam and feed water costs.

(only for MTS-500 and bigger)

- Equalizing Temperature into a Feed Water Tank

Into a standard feed water tank, there is always a gradient of temperature between the water on the top of the tank (where the hot water is injected) and the water on the bottom of the tank (which is sent back to the boiler).





The MTS allows to reheat and to make circulating the colder water present into the bottom of the tank. For doing this, the MTS uses the condensate from the return line. Instead of sending it directly to the top of the tank, this one is used to create the thermo-siphon in the MTS.