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Thermodynamic steam traps used in the wood industry

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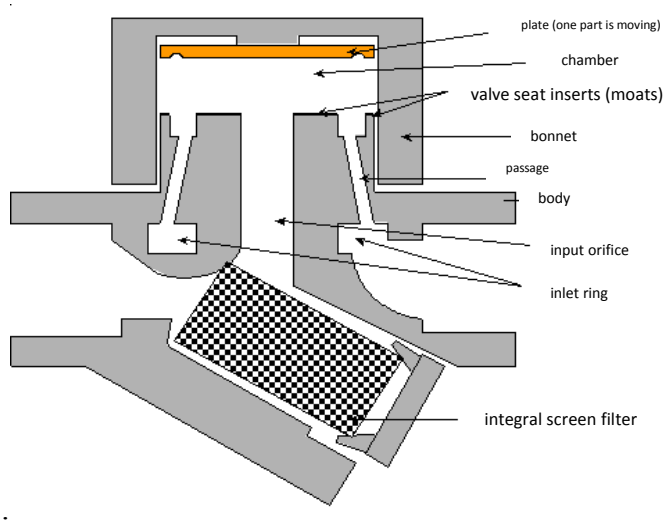
Abstract: *"Thermodynamic steam traps used in the wood industry".* We use three big families of demountable steam traps in the wood industry – mechanical steam traps with closed or open float, thermodynamic and thermostatic steam traps. In addition to these families dismountable steam traps have appeared on the market. They are produced in thermostatic and mechanical float versions. For heating devices, in which we have to deal with heat load, changing in the wide broad, which may lead to suspension of the condensate, we use pumping steam traps combining the features of float steam traps and portion pump. Using appropriate steam trap selection criteria, we are able to eliminate energy loss due to steam loss.

Keywords: water vapour, wood industry, steam trap, heat, thermal energy, thermodynamic steam traps.

Thermodynamic steam traps

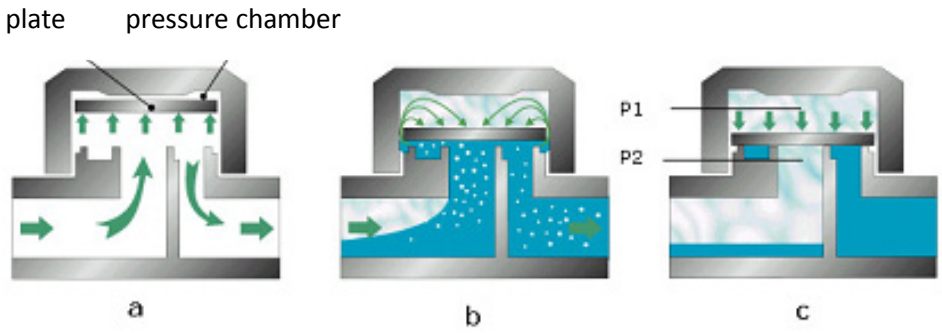
Thermodynamic steam traps are characterised by simple construction and small dimensions. Like the bell-shaped steam traps they work intermittently removing gradually liquefied condensate.



Picture 1: Construction of lamellar steam trap (Spirax Sarco)

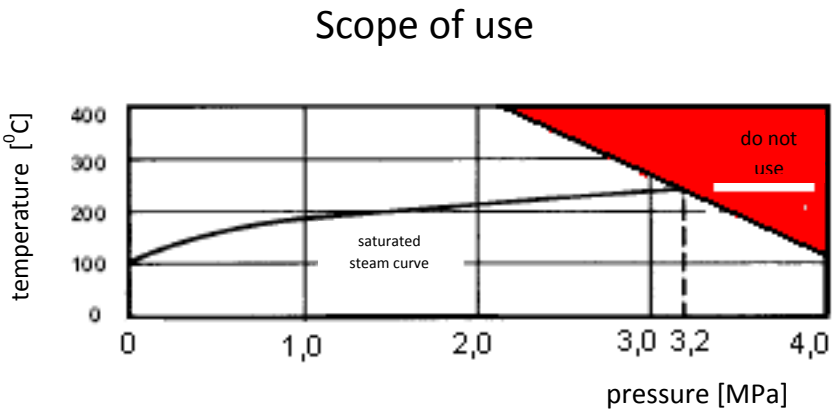
Thermodynamic steam trap consists of body, bonnet, screen filter together with clarifier, specially hardened valve seat inserts called moats or seats and the only moving part – hardened plate. The condensate pressure drop under the plate and appearance of steam make it penetrate above the plate and the movement of the plate in the direction of the moat until steam trap is completely closed. As a result of steam condensation above the plate makes the pressing power, which presses the plate to the valve seat inserts, decrease. Condensate flowing to the steam trap makes it increase, the condensate from above the plate drain though

the discharge channel. The flow of steam, movement of the plate and consecutive dehydration phases are pictured on Picture 2.



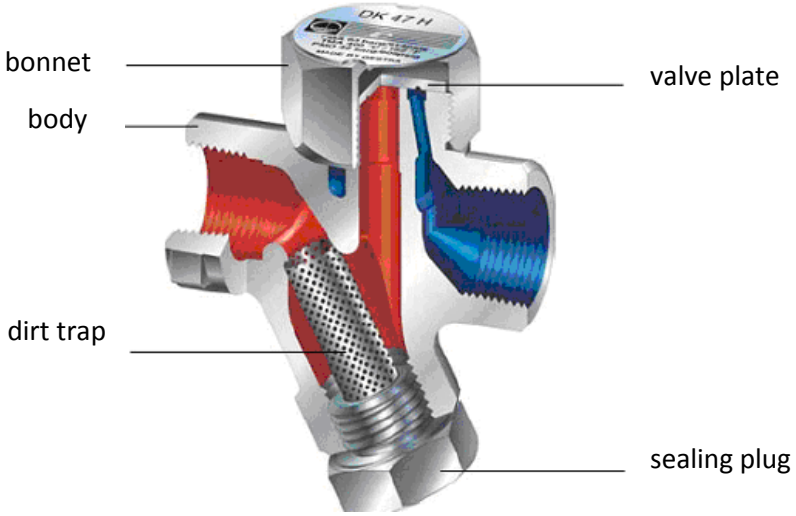
Picture 2: The principle of thermodynamic steam trap work (Gestra)

Phase 1 – dehydrator is completely open, cold condensate is discharged
Phase 2 – increasing velocity of the flow through dehydrator causes pressure drop under the plate, the pressure in the top chamber is pressing the plate against the seat
Phase 3 – pressure in the upper chamber (P1) is higher than under the plate (P2) what results in closing of the steam trap
Presented thermodynamic steam traps belong to constructional, demountable, medium-pressure groups. We use them in temperatures up to 400 [^{0}C] and pressures up to 3,2 [MPa].



Picture 3: The scope of the use of thermodynamic steam traps depending on pressure and temperature.

Thermodynamic steam traps are specifically intended for installation of a small condensate flow capacity, where the minimal differential pressure is 0,025 [MPa]. Steam traps are made of stainless steel and shall be installed on the horizontal sections of steam bus.



Picture 4: Cross-section of thermodynamic steam trap (Gestra)

Thermodynamic steam traps have many advantages. They have the widest range of operating parameters and the break-downs are easy to diagnose, take little space and they can operate in adverse weather conditions (frost-tolerant). Despite this, the manufacturers of steam traps equip thermodynamic steam traps with insulating overlay against frost and rain, what makes it difficult for the heat to penetrate from the head of the steam trap to the environment. It reduces the frequency of operating cycles of the steam trap and prolongs its lifespan. It cannot be too strong, because it isolates steam trap from the outside and, with increase in temperature, makes phase extension and water inflow into installation. Thermodynamic steam traps are particularly useful for small loads and their price is the lowest. Besides, they are resistant to water blows and easy to use. Disadvantages include the lack of effective air transfer, what is very important especially in the start-up stage and the lowest flow capacity up to 1000 [kg/h].

Summary

The purposes of the use of the steam traps are to remove the condensate from the steam space of the object, the stoppage of the fresh steam supplied for the purpose of heating and carbonisation of steam installation during normal functioning. To achieve the above-mentioned objectives a few questions from variety of disciplines need to be answered: does the technological process require a careful maintenance of parameters? Should the condensate be removed without cooling? Is it the continuous or periodical process? The answers to these questions and the knowledge of construction and operation of steam traps give you the possibility for correct choices by designing and building of steam installations dehydration in the woodworking plants. If we answer them correctly and the technical criteria for applicability will dominate the selection of the used steam traps, the clouds of steam floating over the plants will disappear and the “steaming” zlotys will be in their owners hands.

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Streszczenie: *" Odwadniacze termodynamiczne stosowane w przemyśle drzewnym"*. W przemyśle drzewnym stosujemy trzy duże rodziny odwadniaczy rozbieralnych. Zaliczamy do nich odwadniacze mechaniczne z pływakiem zamkniętym lub otwartym, odwadniacze termodynamiczne i termostatyczne. Poza wymienionymi rodzinami pojawiły się na rynku odwadniacze nierozbieralne. Produkowane są one w wersji termostatycznej oraz mechanicznej pływakowej. Do urządzeń grzewczych, w których mamy do czynienia z obciążeniem cieplnym zmieniającym się w szerokim zakresie, mogącym prowadzić do zawieszania się kondensatu stosujemy odwadniacze pompujące, łączące cechy odwadniaczy pływakowych i pompy porcjowej. Stosując właściwe kryteria doboru odwadniaczy, jesteśmy w stanie straty energii spowodowane ubytkami pary wodnej praktycznie wyeliminować.

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