

Mechanical dehydrators used in wood industry

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Abstract: *Mechanical dehydrators used in wood industry.* In wood industry, there are three big groups of demountable dehydrators. They include mechanical dehydrators with closed or open floats, thermodynamic and thermostatic dehydrators. Besides the above mentioned groups, there are also non-demountable dehydrators on the market. They are produced in thermostatic version or in mechanical float version. In case of thermal devices in which there is a heat load that changes in a wide range, which may lead to the condensate' suspension, pumping dehydrators are used, as they combine the features of float dehydrators and portion pump. If we use proper criteria of dehydrators' selection, we are able to eliminate the energy losses resulting from the lacks of water vapour.

Keywords: water vapour, wood industry, dehydrator, heat, thermal energy.

MECHANICAL DEHYDRATORS (FLOAT)

Float dehydrators can be divided into dehydrators with open and closed float. The dehydrators with closed float include the float dehydrators with loose float and dehydrators in which the float is connected to the valve by the system of levers. Bleeding in these dehydrators is conducted by means of manual bleeding valve, with use of thermostatic element with built-in tube ensuring constant bleeding, or with automatic bleeding conducted by means of a flat thermostatic membrane or thermostatic bellows. In case of dehydrators with loose float, the bleeding is conducted by means of manual valve or thermostat.

FLOAT DEHYDRATORS WITH MANUAL BLEEDING VALVE

Dehydrators with manual bleeding valve constitute the simplest group of float dehydrators. Outflow of the condensate in these dehydrators is conducted by means of the closing unit started with float control, directly dependant from the amount of condensate. Dehydrator's work does not depend on the temperature of the condensate and possible pressure fluctuations. The dehydrator includes a container inside of which there is a ball float. It is connected with a suspended lever, which is supported on the second lever connected with the valve which closes and opens the condensate's outflow. In case of dehydrators with manual bleeding, mushroom or plug valves are most often used as the outflow valves.

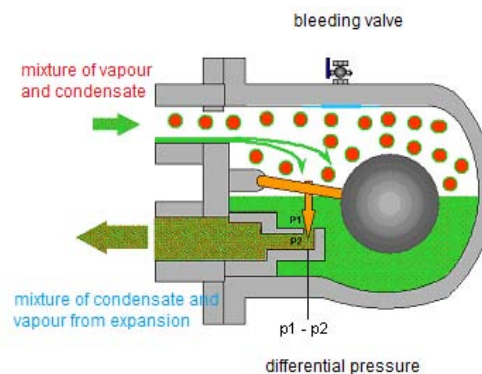


Fig. 1 Structure of float dehydrator with manual bleeding

If the dehydrator is filled with vapour, then the float is in the lower position and its weight presses, by the lever 5 suspended in point 6, the mushroom 7 (fig. 1) to the slot, disabling the outflow of vapour from the dehydrator. The condensate flowing into the dehydrator results in raising the float and opening the mushroom valve through which the liquid flows out. Bleeding and controlling the work of dehydrators is conducted by manual valve 9. The other elements of the discussed dehydrator were presented on figure 2 and they include: 1 – container, covers 2 and 3, ball float – 4, supporting lever – 10, and a tap used for cleaning the dehydrator– 8.

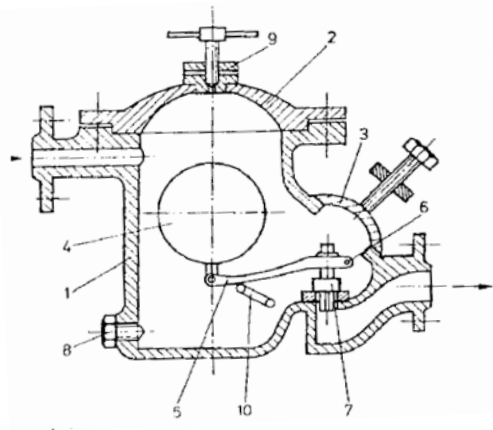


Figure 2. Float dehydrator with mushroom valve

The principle of operation of the dehydrator with plug valve is the same as in case of the mushroom valve. The only difference is the location of the lever, shape and structure of the outflow valve. Raising of the float by the condensate’s inflow in dehydrators with ball float results in turning the plug and outflow of the condensate.

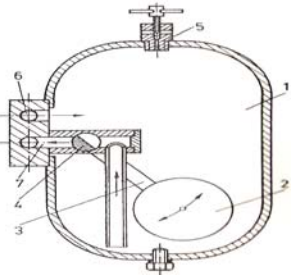


Fig. 3 Float dehydrator with plug valve

1 - Container, 2 – Float, 3 – Lever, 4 – Plug, 5 - Bleeding valve, 6 - Inflow opening, 7 - Outflow opening

FLOAT DEHYDRATORS WITH AUTOMATIC BLEEDING

Dehydrators with automatic bleeding, besides the float, include also the thermostatic element. During normal operation like the one described in the previous type, the valve controlled by the float removes the condensate maintaining its permanent level inside the dehydrator, which usually results in constant, modulated emptying of the dehydrator. The dehydrator’s capacity is defined by the size of nozzle of the valve controlled by float. The size of this nozzle influences also on the balance of forces between the float and the valve. This balance enforces a compromise between maximal flow rate and maximal working pressure on the dehydrator’s structure. For the given size of housing, dehydrator with a high flow rate is characterized by low maximal working pressure. The dehydrator’s operation, as in

case of dehydrators with manual bleeding, does not depend on the temperature of the condensate, counterpressure and possible pressure fluctuation. The float dehydrators are installed usually in such way so that the float's arm is located in horizontal plane, for the float to be able to raise and fall in accordance with the law of gravity. In case of mechanical dehydrators with automatic, independent bleeding, a ball was used in the outflow valve, which opens and closes it. Such solution enabled the use of floats with smaller diameters, which considerably decreased the dimensions of dehydrators.

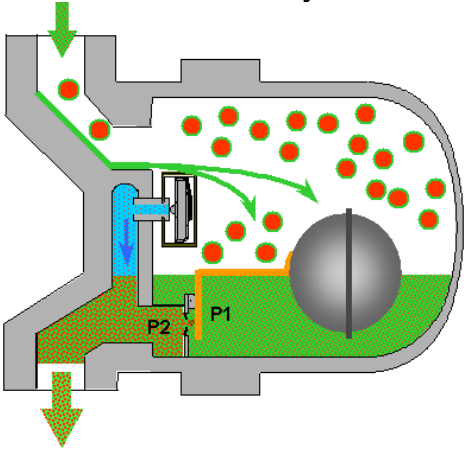


Fig. 4 Structure of float dehydrator with automatic bleeding

Automatic bleeding in these dehydrators is conducted thanks to use of thermostatic element, which makes the bleeding possible in temperatures lower than the saturation temperature, which is especially useful during start-up. Dehydrators with automatic bleeding can be divided into dehydrators with constant bleeding by means of bleeding tube or independent (discontinuous) bleeding with use of flat thermostatic membrane or bellows. The simplest dehydrator with automatic bleeding is the dehydrator with bleeding tube in which, thanks to the use of bimetal plates and bleeding tube, the condensate is constantly degased. However, currently they are used very rarely. The structure of such dehydrator was presented on figure 5.

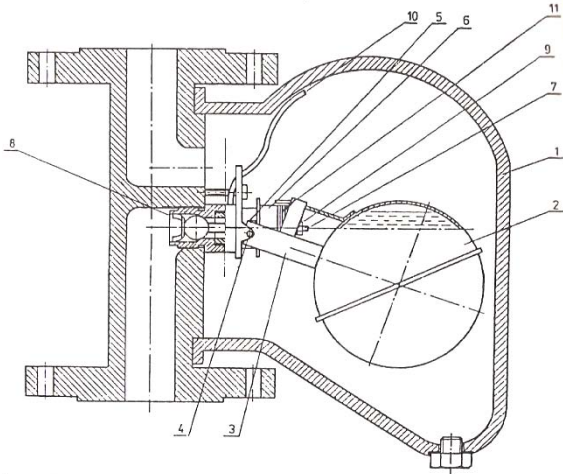


Figure 5. Float dehydrator with bleeding tube
 1 – housing, 2 – float, 3 - lever, 4 – plug, 5 - hook, 6 – busing, 7 - axis, 8 – mushroom, 9 – cap, 10 – tube, 11 - bimetal

SUMMARY

The purpose of the dehydrators' use is the removal of condensate from the vapour space of the object, maintenance of fresh vapour for heating purposes and degasing the installation during normal operation. In order to achieve the above mentioned purposes one has to answer a few questions from various fields: does the technological process require thorough maintenance of parameters? Does the condensate have to be removed without cooling? Is the process permanent or periodical? The answers to these questions and knowledge on the structure and principles of operation of the dehydrators give the possibility *to make proper choices during designing and construction of the dehydrations for vapour installations in the wood industry plants*. If we answer them correctly, then the technical criteria of application will dominate during selection of the dehydrators used there and the clouds of vapour above the plants will disappear while the „evaporating” money will go to the pockets of their owners.

REFERENCES

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Streszczenie: *Odwadniacze mechaniczne stosowane w przemyśle drzewnym*. W przemyśle drzewnym stosujemy trzy duże rodziny odwadniaczy rozbielalnych. Zaliczamy do nich odwadniacze mechaniczne z pływakiem zamkniętym lub otwartym, odwadniacze termodynamiczne i termostatyczne. Poza wymienionymi rodzinami pojawiły się na rynku odwadniacze nierozbielalne. 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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