ISSUES OF PRESSURE REGULATION IN HEATING NETWORKS

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Annotation. The pressure in heating networks must vary within acceptable limits; to ensure the reliability of the heating system, the pressure in the return line is of particular importance.

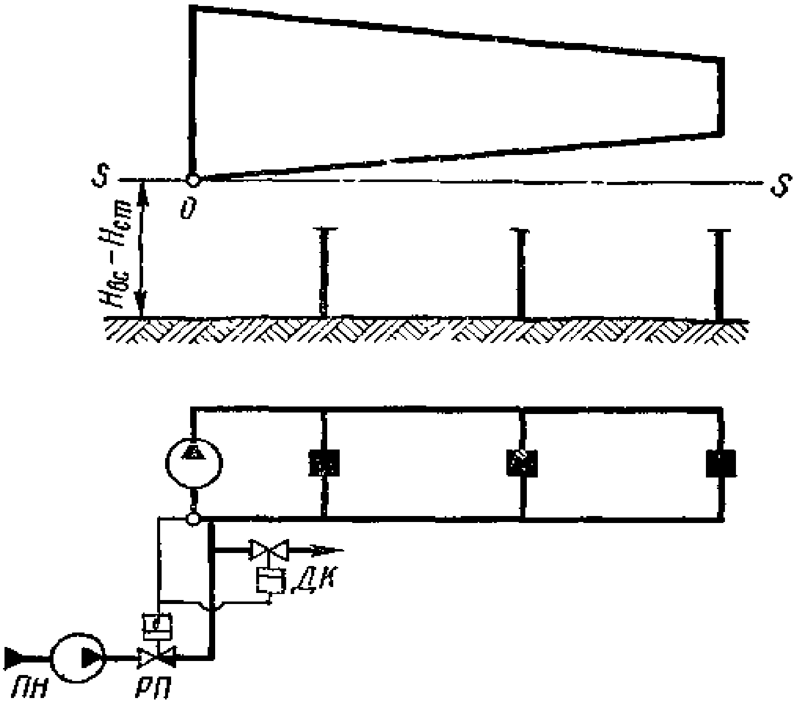
The article discusses the issues of changing pressure at pressure control points for the necessary stability of the hydraulic mode, in particular the use of control valves on the jumper of the network pump.

Key words: neutral point, network pump, main line, pressure, control valve, piezometric graph, make-up regulator.

To ensure reliable operation of the heating network and subscriber installations, it is necessary to limit the change in pressure in the system to acceptable limits. In this case, the make-up mode and the change in pressure in the return line are of particular importance.

An increase in pressure in the return pipeline can cause an unacceptable increase in pressure in heating systems connected via dependent circuits. A drop in pressure leads to the emptying of the upper points of local systems and disruption of circulation in them.

With increased pressure in the return network, the pressure in the heating system connected according to a dependent circuit increases. When the pressure in the network is low, circulation is disrupted.

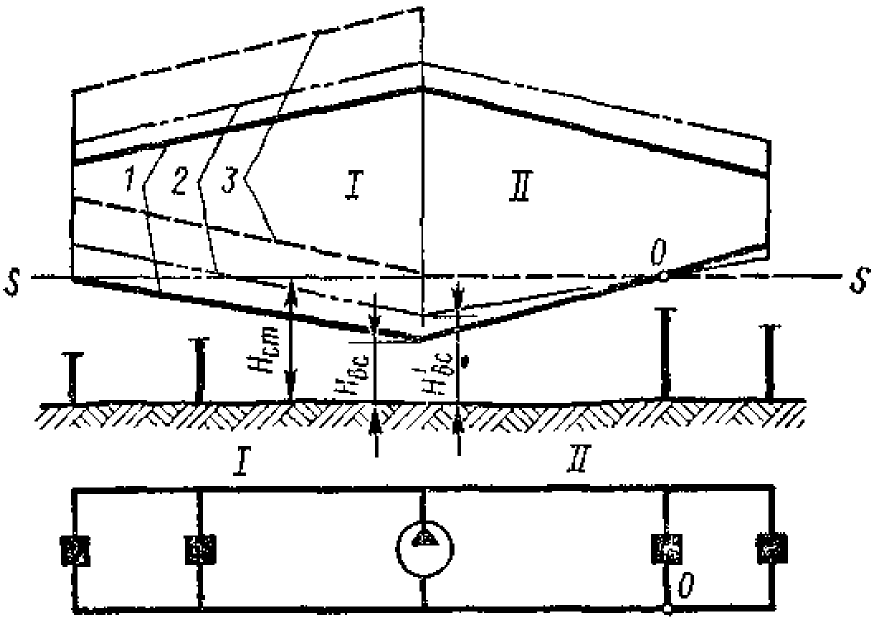


Rice.1. Piezometric graph and diagram of network recharge with a neutral point at the suction pipe of the network pump

To limit pressure fluctuations in the system at one, and in case of difficult terrain at several points, the network changes the pressure depending on the operating mode of the system. These points are called regulated pressure points. In cases where, according to the operating conditions of the system, the pressure at these points is maintained constant in both static and dynamic modes, they are called neutral. Constant pressure at the neutral point is maintained automatically by a make-up device.

In short networks, when the static pressure can be equal to the pressure at the suction pipe of the network pump, the neutral point O is installed at the suction pipe of the network pump (fig. 1). The pressure of the make-up pump, selected from the condition of filling the system with water, remains unchanged in dynamic mode, which provides the simplest circuit of the make-up device.

In branched heating networks (fig. 2), fixing a neutral point on one of the mains does not provide the necessary stability of the hydraulic regime. Let us assume that the neutral point O is fixed on the return highway of region II (graph 1). By reducing the water flow in the networks of this area, the pressure losses in the pipelines are reduced, which is at constant pressure at the point.

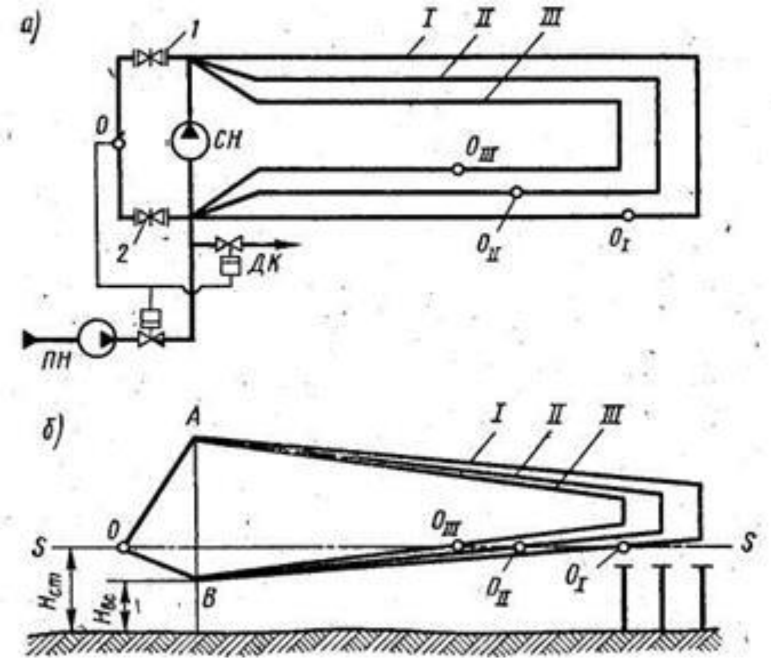


Rice. 2. Piezometric graphs of a branched network with a neutral point on one of the highways

Point O leads to an increase in pressure at the suction pipe of the network pump and to a corresponding increase in pressure in the mains of region I (graph 2). When circulation in the network of region II stops, the pressure in the suction pipe of the network pump will increase to static. This will lead to a further increase in pressure at all points of the system in region I (graph 3) and may cause accidents in subscriber systems.

Therefore, the neutral point should not be placed on any of the operating highways. The neutral point must be secured to a specially made jumper at the network pump. During operation of the pump, water circulates in the jumper. The pressure drop in the jumper is equal to the pressure drop in the network (fig. 3, a). The pressure at the neutral point is used as an impulse to regulate the amount of recharge.

When the pressure in the system drops and the pressure at point O decreases, the opening of the make-up regulator РП increases and the water supply by the make-up pump increases. With increasing pressure in the network, for example, when the temperature of the network water increases, the pressure at the neutral point increases and the valve РП closes, reducing the water supply. If, after closing the valve , the pressure continues to increase, then the drain valve ДК drains part of the water, and the pressure is restored.



Rice. 3. Piezometric graph and network feeding diagram with a neutral point on the jumper of the network pump: AOB – piezometric graph of the jumper; I, II, III – piezometric graphs of regions I, II, III, respectively

The pressure in the network can be regulated using control valves 1 and 2 on the pump jumper (fig. 3, a). Thus, partial closing of valve 1 increases the pressure at the suction pipe of the network pump, which leads to an increase in pressure in the network. When valve 1 is completely closed, circulation in the jumper stops, and the pressure at the suction pipe Нвс becomes equal to the pressure at point O. The pressure in the system increases. The piezometric graph moves upward parallel to itself and occupies an extremely high position. If control valve 2 is closed (fig. 3), then the pressure at the discharge pipe of the network pump becomes equal to the pressure at the neutral point. The piezometric graph will move down to its lowest position.

In case of complex terrain with a large difference in geodetic elevations or in the case of connecting a group of high-rise buildings, it is not always possible to accept the same hydrostatic pressure value for all subscribers. Under these conditions, it is necessary to divide the system into zones with independent hydraulic mode (Fig. 4).

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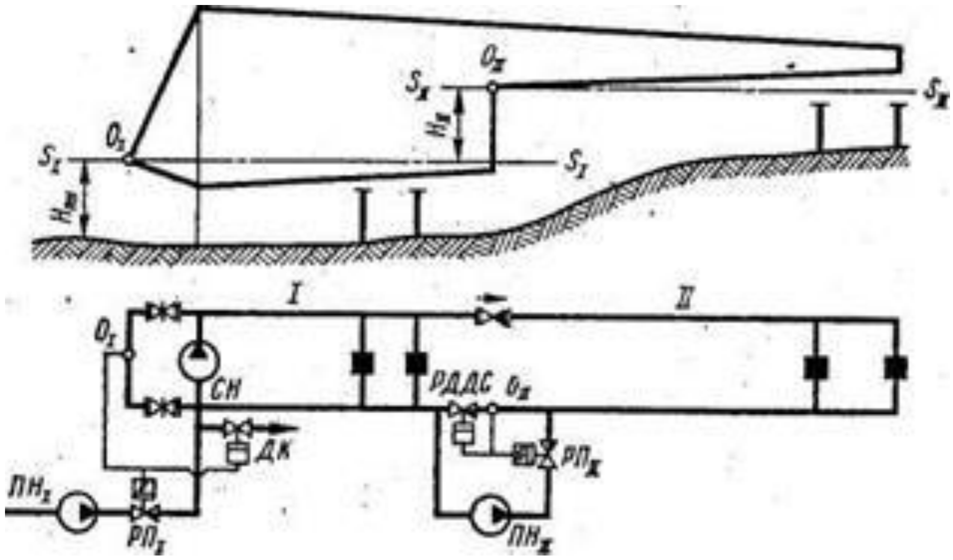

Rice. 4. Piezometric graph and diagram of a heating network with two neutral points

The main neutral point O is fixed to the jumper of the network pump CH. Static pressure S_I–S_I is maintained automatically by the make-up regulator $РП_1$ and the make-up pump $ПН_1$. An additional neutral point O_{II} is located on the return line in zone II. Constant pressure in it is maintained with the help of a pressure regulator “upstream” РДДС. If the circulation in the network stops and the pressure drops in the upper zone, the РДДС closes, and the OK check valve installed on the supply line also closes at the same time. Thanks to this, the upper zone is hydraulically isolated from the lower one. The upper zone is fed using a feed pump $ПН_{II}$ and a feed regulator $РП_{II}$ based on a pressure pulse at point O_{II}.

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