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Abstract. The technological process of petrochemical plants is accompanied by the output of thermal secondary energy resources, which are widely used in the technological cycle due to application of waste heat boilers to generate water vapour of different pressures. Most often, the preparation of feed water for the waste heat boilers is carried out using deeply demineralized water, the production of which is an expensive process. There is the partial replacement of deeply demineralized water by a condensate, which returns to the heat point of the plant in this article. The economic effect is presented.

Nowadays, at the organic synthesis enterprise, the feed water for the waste heat boilers is prepared in the deaerators of the heat point and fed to the technological sections in the amount of 44 t/h [1-4]. For its preparation, deeply demineralized water (DDW) is used in the amount of 6.2 t/h, condensate is in the amount of 35.5 t/h and water vapour is with a pressure of 1.5 kgs/cm^2 with a flow rate of 2.3 t/h. The remaining condensate returned to the heat point is supplied to the process building №2 [5-7].

DDW consumption analysis was carried out. The dynamics of DDW consumption in recent years is presented in figure 1.

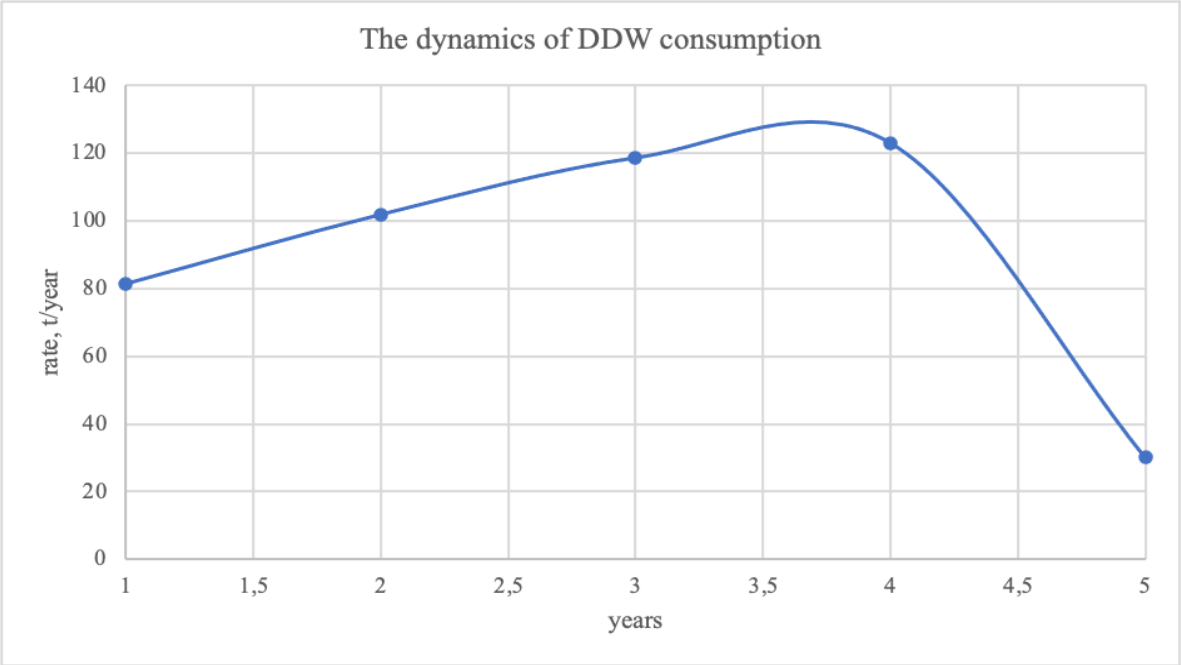

Figure 1. The dynamics of consumption of the deeply demineralized water over 5 years.

It is worth noting that 67,6% is for the main technologic mode and 32,4% is for the administrative expenses in the structure of deeply demineralized water.

Table 1 presents a comparative analysis of DDW consumption for organic production.

Table 1. Specific rate of DDW consumption per year of energy survey, t/t.

№	Product name	Actual output	Planned specific norm	Actual flow, t	Actual specific norm	% deviation
1	Organic product	9685	2.1	20315	2.098	-0.09

As the table shows, the specific rate of deeply demineralized water for organic production is slightly lower than the standard rate (0.09%) [8-10].

Besides the deeply demineralized water, there is the consumption of the partially demineralized water (PDW). PDW is used for the technology, equipment maintenance and full repair. The structure of the partially demineralized water over years is presented in the figure 2.

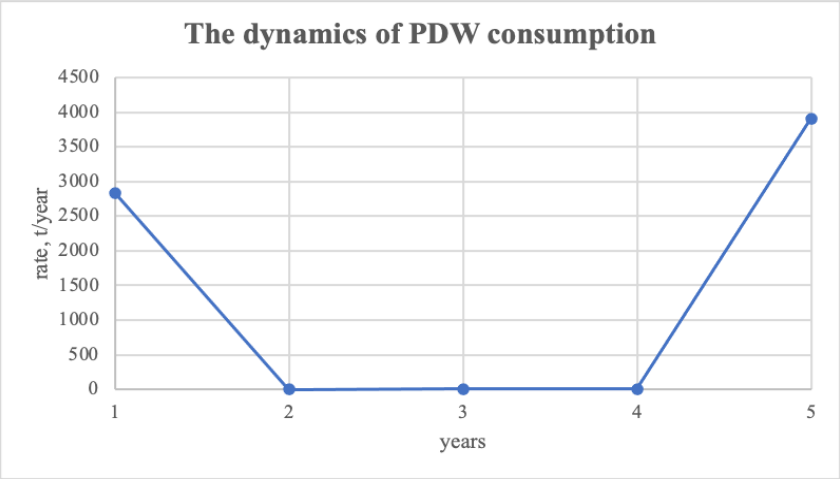

Figure 2. The dynamics of consumption of the partially demineralized water over 5 years.

The energy inspection revealed that 60,5% from the whole consumption of the partially demineralized water is used for the technology and 39,5% is for the auxiliary needs.

The analysis showed that there is a possibility to reduce the consumption of DDW by increasing the consumption of condensate by 3.5 t/h for the preparation of feed water. Taking into account current tariffs (DDW — 308 rubles/t, condensate — 96.7 rubles/t) the partial replacement of DDW by a condensate is proposed. The potential to reduce costs will be:

$$C = G_c \cdot T \cdot \Delta C, \quad (1)$$

where
G_c is the possible amount of replacement of DDW by condensate, t/h [11,12];
T is working time of boilers, h;
ΔC is the difference in the cost of DDW and condensate.

$$C = 3.5 \cdot 8040 \cdot (308 - 96.7) = 5946 \text{ thousand rubles.} \quad (2)$$

Replacing DDW by condensate allows to reduce the steam consumption for deaerator to heat deeply demineralized water to 102˚C [13,14].

Annual heat savings will be:

$$\Delta Q = G_c \cdot c \cdot (t_f - t_{DDW}) \quad (3)$$

where:
t_f is the feed water temperature, ˚C;
t_{DDW} is the DDW temperature, ˚C.

$$\Delta Q = 3.51 \cdot (102 - 45) = 0.2 \text{ Gcal/h or } 1608 \text{ Gcal/year} \quad (4)$$

Annual cost saving potential will be:

$$C_{year} = \Delta Q \cdot T \cdot C_{stream} \quad (5)$$

where:
C_{steam} is the cost of steam of 13 kgs/cm^2 from the CHP plant.

$$C_{year} = 0.2 \cdot 8040 \cdot 1500 = 2412 \text{ thousand rubles.} \quad (6)$$

The annual economic effect of the event implementation will be:

$$\sum C = C + C_{year} \quad (7)$$

$$\sum C = 946 + 2412 = 8358 \text{ thousand rubles.} \quad (8)$$

Preliminary calculations showed that the partial replacement of DDW by condensate allows to produce a significant economic effect at the level of 8.36 million rubles per year.

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