Increase of reliability and profitability of manufacture of energy on thermal power station

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In article new ways of increase of a production efficiency of energy on thermal power station are considered, results of numerical experiment are resulted.

***Index Terms*: thermal power station, network water, steam expense, the turbine.**

For Transbaikalian krai the big differences of temperatures within days and low temperatures during the heating period are characteristic. The winter of 2009 has stood out especially cold, air temperature decreased to is abnormal low 45-50 degrees. At such temperature of external air the temperature of network water returned on thermal power station is low and according to the Chita thermal power station 1 was up to standard of 60 degrees, but such low temperature is caused not only high thermal loading, but also low level of thermal isolation strongly worn out for last years. High level thermal consumption on the one hand creates high profitability of work of steam turbines, but on the other hand increase in consumption of steam network heaters conducts to increase of a temperature pressure, in them and owing to necessity of increase of pressure in central heating selection. In real conditions of operation to poor quality of network water there are adjournment in tubes of network heaters. Because of adjournment hydraulic resistance on the water party and as the temperature pressure, compelling to raise pressure in teplofication selection increases. According to SIW spent on our chair, the actual temperature pressure in network heaters in some cases reaches above 40 degrees.

In such conditions reliability of electro supply of consumers decreases. To raise pressure in selection it is necessary to reduce the area of pass of steam in a part of low pressure and consequently and condensation capacity developed by the turbine, in some cases the regulating diaphragm completely is closed also electric power development it is caused by thermal loading of the turbine.

At work central heating turbines with the low admission of steam in the condenser for maintenance reliable condensation pair in a heaters it is necessary to include a line recycled a condensate. For turbine PT-60-90 the expense in a line recirculation can reach 40 t/h the heat-carrier with temperature above 90 degrees.

Reliability and profitability the steam turbine of the block can be raised by inclusion of a water-water heater where the feed water will be the heating environment, and heated up network water before network heaters. Now as a water-water heater it is expedient to use a heater of lamellar type, thanks to the device in it practically there are no adjournment at operation in thermal networks.

The Chita thermal power station 1 carries out heating of network water under the one-stage scheme, therefore such inclusion of a heater can be regarded as the first step of heating of network water. Owing to the big temperature pressure in a network heater and a small temperature pressure in HLP and as they are connected to one selection will cause steam redistribution between heaters, but owing to bigger under heating in network heaters the given redistribution will be economic, thus there will be a decrease in quantity of steam arriving on the turbine and by calculations can make an order 3-6 t/h.

On fig. 1 the basic thermal scheme of the station is represented, allowing raising profitability of station by decrease in temperature of return network water. However the range of decrease in temperature of return network water is low because the expense of network waters much more the feed water expense. Temperature smoothing is reached as follows: fulfilled steam of the turbine condensation type, condensational in the condenser, condensation the pump goes on a

nutritious path, before the first heater of low pressure is carried out insert the pipelines, connecting a nutritious path of the turbine with central heating installation central heating turbines through a superficial water-water heater. Thus automatic control of the turbine does not vary, and is only supplemented with elements operating streams of a water-water heater. As a water-water heater it is possible to use the lamellar heat exchanger which is rather compact, even at the big thermal loadings. Increase of profitability of the turbine of condensation type it is connected with the external regeneration, the warmed-up feed water will supersede a part of steam from selection and will direct it to the condenser, thus the expense of steam on the turbine will decrease at invariable capacity. The given change approximately can be estimated from a following parity

$$\Delta D_k = -\frac{\Delta D_m \cdot H_m}{H_i} \qquad (1)$$

where ΔD_m - Steam change central heating selection, kg/s;

H_m - thermal difference to central heating selection, kdzh/kg;

H_i - thermal difference falling to the turbine, kdzh/kg.

From the given parity follows, that the expense of steam on the turbine at increase central heating selection increases. The criterion at comparison of schemes with decrease in temperature of return network water for a profitability estimation can be the warmth or fuel expense in absolute sizes. If totally on turbines the difference of expenses of warmth before change gives a positive effect, i.e. after change will decrease, economic benefit will be, the quantity of consumed fuel will decrease.

The flowing part of the turbine consists from high pressure part, part of average pressure, part of low pressure and represents group of hydraulic resistance. Each of groups of steps has certain profitability, in a general view depending on the expense and difference of pressure of steps falling to group. The biggest range of change of expenses has part of low pressure, from the ventilating expense to maximum calculated on condensed a mode. Profitability of station can be raised at replacement of streams, i.e. the superseded stream конденсационной turbines will make more works, than a stream teplofication turbines, at the expense of more competent distribution is warm it is possible to achieve a prize in profitability.

At station with cross-section communications with the various equipment, carry out work, as central heatings, and industrially-heating turbines. Initial parameters of steam in front of turbines at station with cross-section communications are identical, and design profitability high pressure part the different. Besides at operation profitability of a flowing part decreases depending on operating modes of the turbine and number of hours of an operating time. Decrease in EFFICIENCY can reach more than 1 %, depending on quality of operation. At comparison thermal difference of selections: teplofication turbines types T and regenerative the industrially-heating turbine, at большем thermal difference of central heating selection it is necessary to use the given scheme for replacement of a regenerative stream of the industrially-heating turbine.

As an example we will consider work of two turbines PT-60-90. Thus for presentation one turbine works on condensation to a cycle, and the second bears thermal and electric loading. In table 1 indicators of profitability of station before modification of the thermal scheme are presented. Considered turbines PT-60-90 of the Chita thermal power station 1 are not connected with other turbines cross-section communications since the thermal loading connected to turbines, is released in the thermal power station-1-KSK network, four other turbines serve a thermal power station-1-city network. As the given turbines have separate four coppers for a food by steam and are not connected with other turbines on steam.

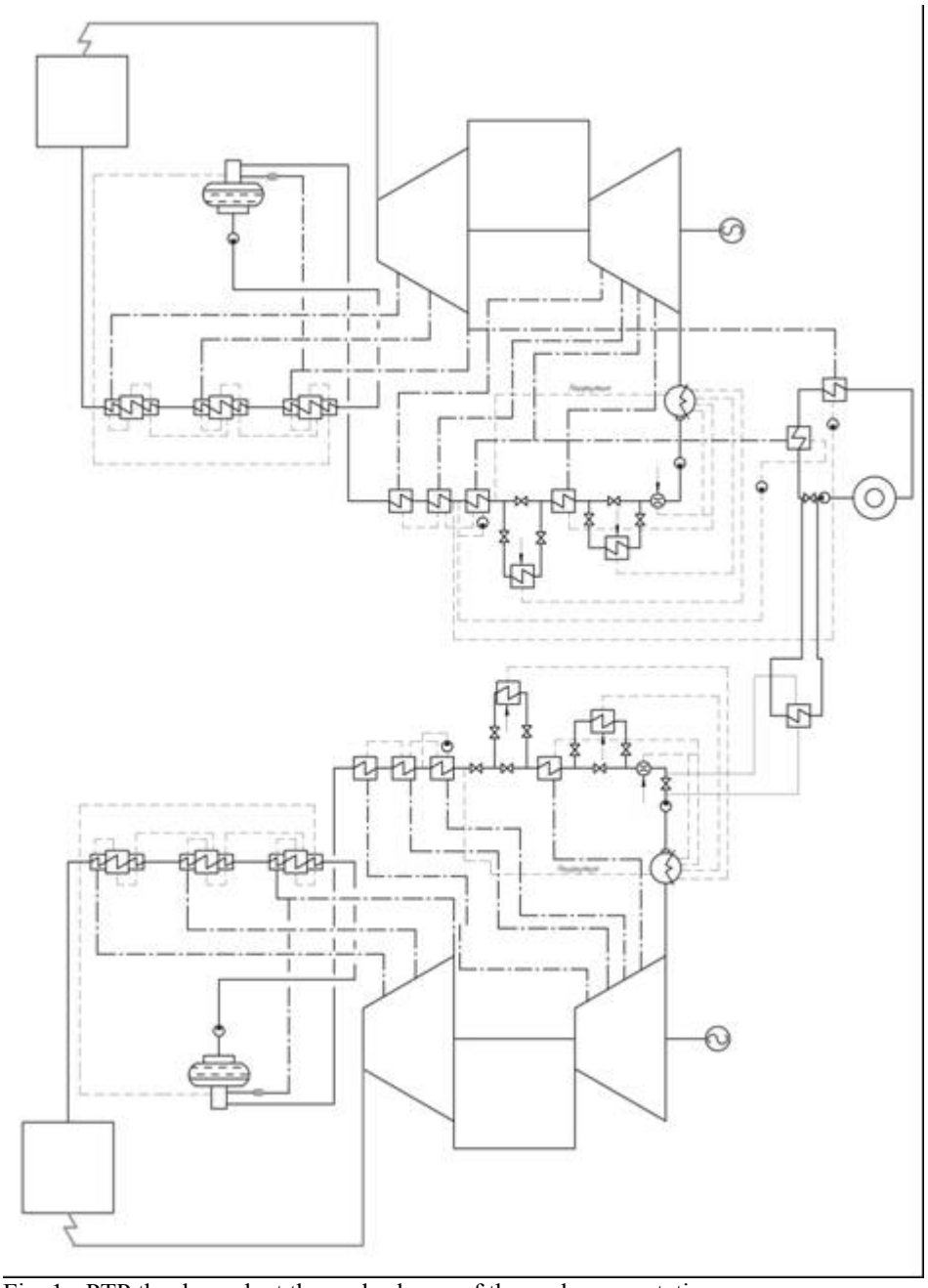

Fig. 1 - PTP the dependent thermal scheme of thermal power station

TABLE 1 - TECHNICAL AND ECONOMIC INDICATORS OF THE SCHEME

Name	Without the heat exchanger		With the heat exchanger	
Turbine mode	Condensing	Turbine heating	Condensing	Turbine heating
Capacity, MVt	50	50	50	50
Useful Released heat, MVt	0	49,14	0	49,14
Water temperature before a network heater, 0C	-	57,0	-	54
Temperature of water after network heaters, 0C	-	96,0	-	96,0
Quantity of steam on the turbine, t/h.	200,12	225,99	194,15	228,26
Quantity of fulfilled steam, t/h	147,06	96,20	154,0	92
Pressure in turbine heating system, MPa	-	0,112	-	0,112

Analyzing the received values and considering cross-section communications on steam between turbines, the conclusion is unequivocal: the scheme is economic, since totally the expense of steam on turbines has decreased, hence, and the expense of fuel on energy development to decrease.

BIOGRAPHIES

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