ENERGY SAVING

7.2. Application of expander-generating apparatuses in process of using the technological pressure drop at natural gas conveying

7.2.4. Application of the thermal pump for heating gas before the expander

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A flow diagram of the installation, including EGA and the thermal pump, is shown in fig.7.11. We'd like to underline that the proposed flow diagram enables the installation to operate in the autonomous mode at the only presence of a low-potential source of heat. The installation operates as follows.

High-pressure gas is supplied through a pipeline *3* to the heat-exchanger *5*, a heating environment of which is a low-boiling liquid of a loop of the thermal pump apparatus (TPA), fed by compressor *6* to the heat exchanger, which is rotated by a power drive *7*. The low-boiling liquid, giving the heat inside the heat exchanger *5*, is extended in the throttle valve *8*, after that it is supplied to evaporator *9*, where it is evaporated due to the low-potential heat and enters the input branch pipe of a compressor *6*. High-pressure gas, heated in the heat exchanger *5,* comes to expander *2*. After performing a mechanical operation and extending inside the expander, gas enters a low-pressure pipeline *4* for its following using, but the mechanical operation of gas, obtained in the expander *2*, is transformed into electric energy inside the power generator *1*. A part of electric energy, gained in the power generator, by electrical connection *10* is used for rotating the power drive *7* of the compressor *6*. Power excess, generated by the power generator *1*, through electrical connection *11* can be used for power supply of external customers.
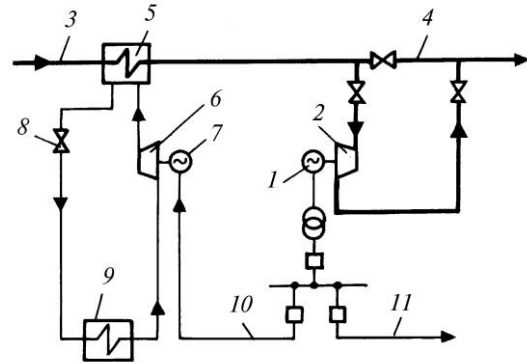

Fig. 7.11. Flow diagram of installation, including EGA and the thermal pump: *1* — generator; *2* — expander; *3, 4* — pipelines of high and low pressure; *5* — heat exchanger; *6* — TPA compressor; *7* — power drive; *8* — TPA throttle; *9* — evaporator; *10, 11* — electrical connections of EGA generation with power drive of the compressor and outer network