Part 7

ENERGY SAVING

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

7.2.2. The analysis of influence of different parameters on operation of expander and estimation of EGA capacity

Agababov V.S., Koryagin A.V.; MPEI(TU)

To analyze the influence of different process parameters on expander operation, to calculate its specific work, the formula [1] can be used:

(7.9)

where k —an adiabatic indicator; R — a gas constant, kJ/(kmole·K); p_{in} and p_{out} — gas pressure at the expander inlet and outlet, accordingly, MPa; Z — a factor, considering "the reality" of gas.

From the equation (7.9) one can also see that the specific production work of the expander is directly proportional to the absolute gas temperature before it. Therefore, at gas heating only after the expander, a capacity, which can be gained at the installation, is lower, than at gas heating before the expander.

From the equation (7.9) one can also see that the expander capacity is higher with less inlet to outlet pressure ratio.

During practical calculations the power capacity of EGA can be calculated by the formula:

$$N_{EGA} = G_g (h_{g.td1} - h_{g.td2}) \eta_M \eta_{EGA}, \quad (7.10)$$

where G_g — gas consumption through the expander, kg/s; $h_{g.td1}$, $h_{g.td2}$ — enthalpy of gas at the input of the expander and at the output of it, correspondently, kJ/kg; η_M, η_{EGA} — mechanical efficiency and efficiency of EGA generator.