

Increase of the energy plant efficiency in special conditions of its operation

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Development of the arrangements for decrease of the internal combustion engines (ICE) power plant exploitation for consumer in conditions of market relationships in Russian economics is actual task. This fact forces ICE manufacturers to decrease cost of available products during its realization and production for expansion of the manufacturing and selling area.

To solve this problem, modernized system of air supply (MSAS) is suggested. This system considers steam injection in turbo-compressor which provides increase of its power and also increase air supply in ICE cylinders. Turbo-compressor power is increased by working fluid flow rate increase in the form of steam-gas mixture. Temperature of the steam-gas mixture is decreased because steam has lower temperature than exhaust gas. Further, increase of the air flow rate through ICE causes decrease of the specific fuel consumption and temperature of the exhaust gases which in turn increases durability of entire power plant.

Another way to increase the power plant efficiency is high-temperature refrigeration (HTR). Application of HTR during ICE exploitation gives certain positive effect which is decrease of the mass-dimensional characteristics to 8-20%, which is important for power plants of transport vehicles and for their placement as a drive for different equipment.

HTR system equipment is not complicated but this regime promotes increase temperature of the sleeve assembly elements. This fact can slow down application of HTR because every degree increment of the refrigeration liquid temperature causes the increase of the sleeve assembly temperature on 0.8 degree. That's why application of arrangement which provide decrease of the sleeve assembly in HTR regime is important task.

This article deals with calculation algorithm which purpose is determination of the amount of steam which can be received from the system of exhaust gases and charge it to flow area of gas turbine of the turbo-compressor as well as determination of ICE parameters changed as a result of MSAS implementation.

Calculation result of ICE parameters during its operation with modernized system of air supply shows that its economic efficiency on given level of power output is increased which causes increase of the exploitation economic efficiency of power plant and simultaneously decrease of hazard working fluids exhaust together with exhaust gases from not burned fuel. Decrease of the steam-gas mixture and increase of the air flow rate through ICE promotes decrease of the temperature of sleeve assembly elements which promotes increase of the durability of power plant in special conditions