ABSTRACT

The author intends to give herewith an overview of several possibilities for electricity and heat peak-load generation with gas turbine based units. Both thermal and economic aspects are continuously considered.

It is outlined how the operational costs and therefore the economic aspects change for a gas turbine unit that operates under a high starting number per year.

Based upon the results of the calculations as well as theoretical and empirical considerations is demonstrated that the supplementary fired condensing gas-steam combined cycle produces electrical peak power at a higher efficiency and with lower specific costs than a gas turbine unit of similar power range.

Data and guidelines are announced regarding the proper choosing of different design parameters of such plants, as well as what the realistic expectable power reserve is. Moreover, it is proven that beside the end temperature of the supplementary firing the starting temperature, i.e. the burners' placement in the HRSG has a determinant role as well.

The analysis of supplementary fired back pressure combined cycles demonstrated the thermal and operational advantages of these compared with the with unfired HRSG CC plants in case of widely varying heat demands. The overall efficiency of the plant is found to be increasing for the back pressure case. The detailed economic evaluation is found to be in full conformity with the operational conclusions.

The operational and economic advantages of the peak power plants using compressed air energy storage are demonstrated, based upon the calculations that were carried out with the different possible layouts of this technology. It is also made an economic comparison among all the previously presented plant types.

The author investigated the limits of applicability of the one dimensional codes for the indirect problem of process optimisation. It was found a direct coherency between the nature of the model and the dispersion of the results. Furthermore, is found that there is a correlation between the tolerance for the object function regarding the single parameters and the dispersion of this parameter, and that the tolerance of the object function regarding other parameter has no influence upon the dispersion of this.