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## **OPTIMIZATION OF A MIXED CYCLE GAS TURBINE TITAN 130S TYPE OPERATING UNDER PARTIAL LOADS**

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### **Abstract**

The paper presents several aspects regarding the optimization of the operation for a mixed cycle gas turbine, Titan 130S type, installed at S.C. CET S.A. Bacău, during the warm season. The optimization entails the partial loads operation and has been done using the multicriterial analysis, taking into consideration the operation restrictions required for this type of gas turbine. The criteria that regard this analysis are: thermal energy requirements, the global efficiency in high cogeneration, the electric energy price, the emission level of NO<sub>x</sub> and CO<sub>2</sub>. These criteria have been applied on several operating conditions of gas turbine. As a result of this analysis has been chosen the optimum operating regimen that corresponds to a predefined forecast period.

These operating conditions took into account the need to provide the necessary heat forecast thermal energy to provide hot water for domestic and non-domestic clients from Bacău city during summer by energy and financial efficiency conditions with a low level of pollutant emissions. Two operating restrictions were considered for the gas turbine: the first one is a technical type and the second one regards the admissible level for NO<sub>x</sub> emissions. The technical restrictions refer to maximum number of turbine start-ups in this case daily number of start-ups and annual number of start-ups for this type of turbine being limited. This limitation is due to the equipment's wear during the turbine start-up drive and exceeding the allowed number of start-ups leads to premature wearing and to the growth of the maintenance expenses. The restrictions regarding the NO<sub>x</sub> emissions level derive from the installation of a SoLoNO<sub>x</sub> combustion system for this type of turbine. The SoLoNO<sub>x</sub> combustion system ensures a low level of NO<sub>x</sub> emissions and the considered restriction is due to this type of combustion start-up operation at loads higher than 60% of this type of gas turbine rated power. This system uses powerful swirl injectors, which produce an intense circulating area for the mix-fuel in the combustion chamber with low oxygen level so as the combustion takes place at a low temperature blocking the formation of thermal NO<sub>x</sub>.

*Key words:* electric efficiency, financial efficiency, global efficiency, specific CO<sub>2</sub> emission

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