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ABSTRACT

The subject of the doctoral thesis is the optimization of the glass production process in the context of reducing energy consumption and emissions to the environment. The first part of the doctoral thesis presents the glass production process, with a breakdown into each individual department, to increase the public awareness of how complex the process was to be optimized during the implementation doctorate. The glassworks under analysis, where the doctoral student was conducting the research for the doctoral thesis works in the implementation doctorate program, is also presented. The first part of the work ends with a review of existing or innovative optimization methods in heavy industry, including the glass industry. This review served as a knowledge and experience base to support decisions on undertaking individual optimization initiatives.

The second part of the work contains a description of the implemented optimization solutions in the analyzed glassworks. During the implementation doctorate conducted in the glassworks, many works related to conducting activities aimed at optimizing the glass production process were performed. It started with basic solutions, such as the implementation of the Energy Media Management System, modernization of lighting or replacing fan motor control, requiring small investment outlays, less involvement of specialized employees in the glass melting process, and the smallest effect of reducing media consumption and emissions to the environment. Then moving on to much more strategic solutions, interfering with the glass melting process and involving many departments and employees of the glassworks, such as replacing by cullet traditional raw materials contained in the glass set directed to the melting of glass mass and implementing a waste heat recovery system. These two optimization solutions have the greatest impact on achieving a reduction in energy consumption and limiting pollution emissions. The implemented waste heat recovery solution based on recovery boilers, economizers, steam turbine, and radial compressor was described in detail. Energy balances of

the installed heat recovery block were performed. Energy savings for the glassworks were calculated.

The doctoral dissertation was concluded with an ecological and economic analysis of all implemented solutions to verify the effect of the performed optimizations and a discussion and conclusions.