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MODELLING AND OPTIMIZATION OF THE THERMAL EQUIPMENT NETWORK OF AN INDUSTRIAL AUTOMOTIVE PAINT-SHOP

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Abstract *The energy-intensive industry is an important player in the quest to meet the ambitious plans of the European Union to reduce the consumption of fossil fuels and, consequently, the emission of greenhouse gases, mainly CO2. In that sense, energy efficiency in thermal processes in industry becomes a key point to achieve those goals. Another important measure to achieve CO2 reduction targets is the use of green hydrogen as part of the fuel burned in industrial furnaces. This work is part of the ongoing efforts under the MOSIPO project to analyse and optimize the network of thermal equipment and systems associated with an industrial automotive paint-shop greenhouse, which includes combustion, fluid flow and heat transfer processes. To that end, the thermal equipment (heat exchangers, air heaters, incinerator, fans, etc) are modelled based on integral mass, momentum and energy balances in transient regime, using up-to-date correlations for such processes. The network is constructed modelling also the conduits connecting the different equipment as well as the dampers that control the fluid flow in the different branches of the network. The model is implemented in the Modelica language, through the OpenModelica software, which enables easy and fast implementation and simulations for different working conditions. This constitutes a tool for the network optimization aiming the reduction of energy consumption, maintaining the optimal operation conditions of the paint-shop greenhouse, thus allowing the identification of the best energy efficiency measures.*