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PHENOMENOLOGICAL MODEL OF LAVAL NOZZLE OF WHICH ACCOUNTS FOR THE STAGE OF ACCELERATION OF GAS TURBINE OF A GAS

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Abstract. This paper presents the development of a phenomenological model semi-physical of Laval nozzle, a device that accounts for the stage of acceleration of combustion gases in a gas turbine. This model is based on the balances of energy, momentum and continuity of the combustion gases flowing through the Laval nozzle and is carried out considering the equations governing the dynamics of the nozzle and reducing dimensionally, by discretization of a dimensional infinite system to finite dimensional in order to be workable from the perspective of the language of control theory. The operation point of which it develops such a model is similar to the conditions of operating a gas turbine General Electric 7FA in regard to pressure, temperature, speed, density and thermodynamic properties of combustion gases travel through Turbine. The phenomenological model allows constructing a control language model and simulation studies versus open-loop simulation of the Laval nozzle performed with CFD, that is, making the simulation of the dynamic model of the Laval nozzle at steady state and compared with the convergence of the simulation of the Laval nozzle held in FLUENT® to perform a stability analysis and propose alternatives for the system control.