

Thermomechanical Behaviour of Various Pressurized Installations Subjected to Thermal Load Due to the Combustion of Metal Particles

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Abstract : In the gas industry, contamination of equipment by metal particles is one of the feared phenomena. Indeed, particles inside equipment can be driven by the gas flow and accumulate in places where the velocity is low. As they constitute a potential ignition hazard, particular attention is paid to the presence of particles in the oxygen industry. Indeed, the heat release from ignited particles may damage the equipment and even result in a loss of integrity. The objective of this work is to support the development of new design criteria. Studying the thermomechanical behavior of this equipment, thanks to numerical simulations, allows us to test the influence of various operating parameters (oxygen pressure, wall thickness, initial operating temperature, nature of the metal, etc.). Therefore, in this study, we propose a numerical model that describes the thermomechanical behavior of various pressurized installations heated locally by the combustion of small particles. This model takes into account the geometric and material nonlinearity and has been validated by the comparison of simulation results with experimental measurements obtained by a new device developed in this work.

Keywords : ignition, oxygen, numerical simulation, thermomechanical behaviour

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