

IAF SPACE PROPULSION SYMPOSIUM (C4)
Interactive Presentations - IAF SPACE PROPULSION SYMPOSIUM (IP)

Author: Mr. Robson Hahn
DLR (German Aerospace Center), Germany, robson.dossantoshahn@dlr.de

Mr. Ivens Hoffmann
DLR (German Aerospace Center), Germany, ivens.hoffmann@dlr.de
Dr. Jan Deeken
DLR (German Aerospace Center), Germany, jan.deeken@dlr.de
Dr. Michael Oswald
DLR (German Aerospace Center), Germany, michael.oschwald@dlr.de
Dr. Stefan Schlechtriem
DLR (German Aerospace Center), Germany, stefan.schlechtriem@dlr.de

TRANSIENT MODEL OF API INJECTOR USING ECOSIMPRO FOR EXPANDER BLEED ENGINE
APPLICATION

Abstract

API injector system has been investigated in DLR Lampoldshausen for the last decade and has been proved to be a reliable design for LOx/LH2 engines. The concept of porous injection system is based on the injection of the entire fuel mass flow through a porous face plate in contrast to injection systems which use a porous face plate only for cooling purpose (e.g. RL-10). In opposite of the standard coaxial or swirl injector, the pressure drop in function of mass flow rate is heavily influenced by the fluid viscosity and its density as well as the media matrix, resulting in a particular behavior according to the porous media characteristics. This feature allows operating at low pressure drop, making this injection system suitable for broad range of throttling. Thus, the transient and off-design conditions for such design combination must be carefully evaluated in order to precisely predict the ignition corridor and the engine dynamics during operation conditions. In this work will be presented the transient model of an API injector using EcoSimPro with ESPSS library and the system evaluation in different design conditions as well as the model validation using an already known design from in house test subject and an insight of future application of such design applied in in the LUMEN expander bleed demonstration engine.