

STUDY OF FAST TRANSIENT EFFECTS IN THE TRANSPORTATION OF SUPER-CRITICAL AND TWO-PHASE CO₂

Leonardo C. RUSPINI*, Maria FERNANDINO, Carlos A. DORAO

NTNU Department of Energy and Process Engineering, 7491 Trondheim, NORWAY

e-mail: leonardo.c.ruspini0@ntnu.no

Keywords: transient simulation, CO₂, two-phase flow, super-critical.

ABSTRACT

The fast transient simulation of two-phase and super-critical fluids is a highly challenging topic due to the different scales of space and time involved during the occurrence of shock waves phenomenon and also due to the important changes in fluid properties. Applications such as transportation of CO₂ between the point of capture and the point of storage, super-critical CO₂ pulse cleaning process and the usage of super-critical CO₂ in closed cycles for energy generation are just some examples where this kind of phenomena take place.

In this work the implementation of a high-order solver is described. The evolution of shock waves in two-phase and super-critical systems is fully described by several numerical examples. Finally the influence of shock waves in two-phase CO₂ systems is analysed, regarding the safety operation conditions of industrial applications.