FSI Capabilities for the CESE and Chemistry Solvers in LS-DYNA®

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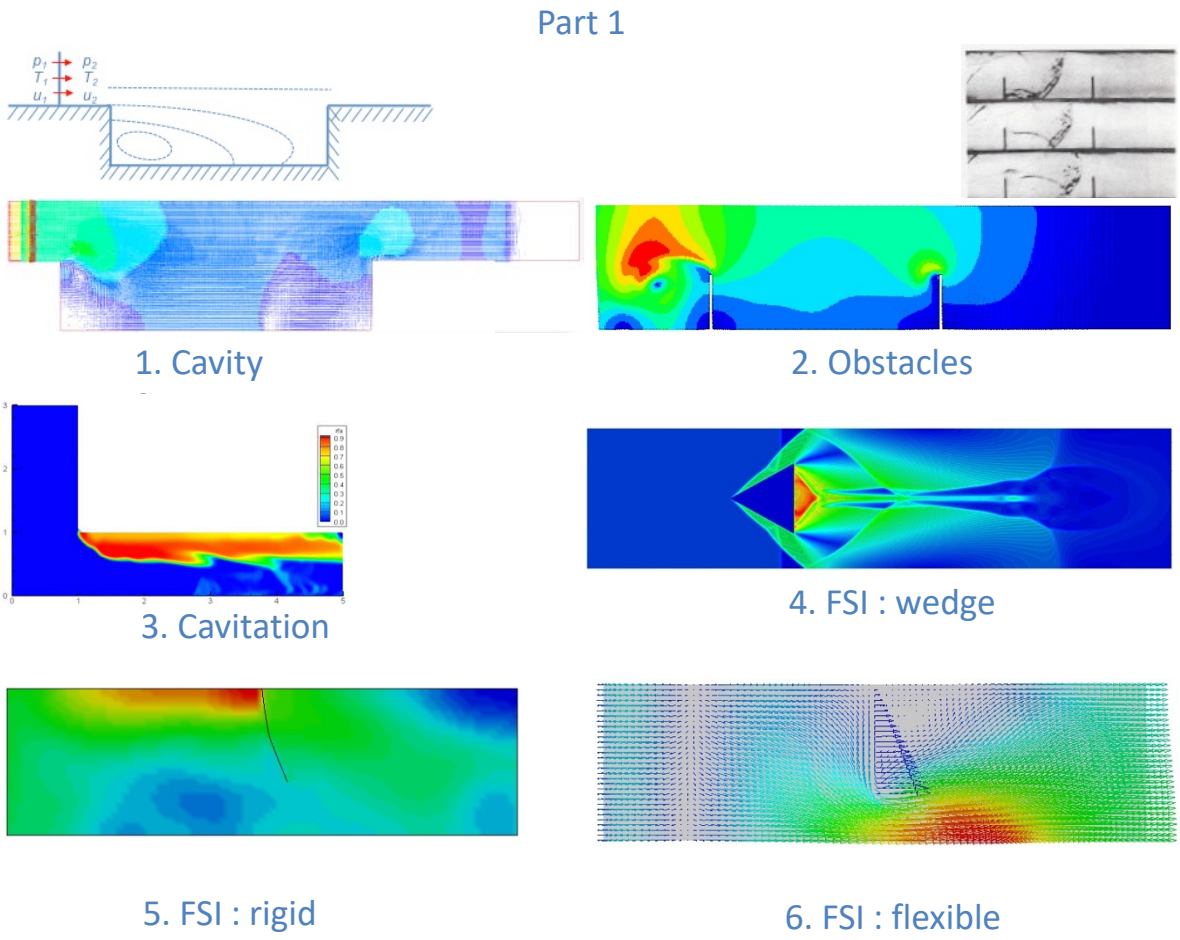
Abstract

Recently, we have developed a new class in the area of compressible flow, gaseous explosion, and FSI for users to assist from the fundamental problems to very complex high level FSI problems by using CESE and Chemistry solvers in LS-DYNA. In this presentation, we will give a step-by-step explanation about the main goal of the class, overviews of the compressible and chemical kinetics theories,the current capabilities of solvers, and the comprehensive 10 exercise problems which consist of two parts: i) the first part covers the compressible flows, cavitation, FSI, and FSI with multi body dynamics problems, and the second part desisgined the basic concepts of chemical kinetics, closed adiabatic spatially homogeneous premixed reactors, the detonating flows, and the deformation and failures of sturctures in the nuclear containment by H_2 explosions. Each exercise problem consists of the problem descriptions, modeling methods, illustrative step by step keyword construction through animation movies, program run and the post processing. It is strongly believed that upon completing the course, users can easily not only develop the keyword files of their own models, but also achieve enough knowledge for the compressible flows, gaseous explosion with the realistic chemistry and also fluid structure interaction problems.

Introduction

This course provides for users to assist from the fundamental concepts to high level FSI applications with CESE Compressible and Chemistry solvers in LS-DYNA. In the coure, the main goal is to provide the comprehensive and step by step learning approaches with 10 exercises. The course consists of two parts: the part 1 covers the compressible flows, cavitation, FSI, and FSI with multi body dynamics problems, and part2 covers the basic concepts of chemical kinetics, closed adiabatic spatially homogeneous premixed reactors, the detonating flows, and the deformation and failures of sturctures in the nuclear containment by H_2 explosions. Each exercise consists of the problem descriptions, modeling methods, step by step keyword construction through animation movies, running the program, and the post processing. Upon completing the course, users can easily construct not only the keywords for their own models, but also grep enough information for the compressible flows, gaseous explosion with the realistic chemistry and also fluid structure interaction problems.

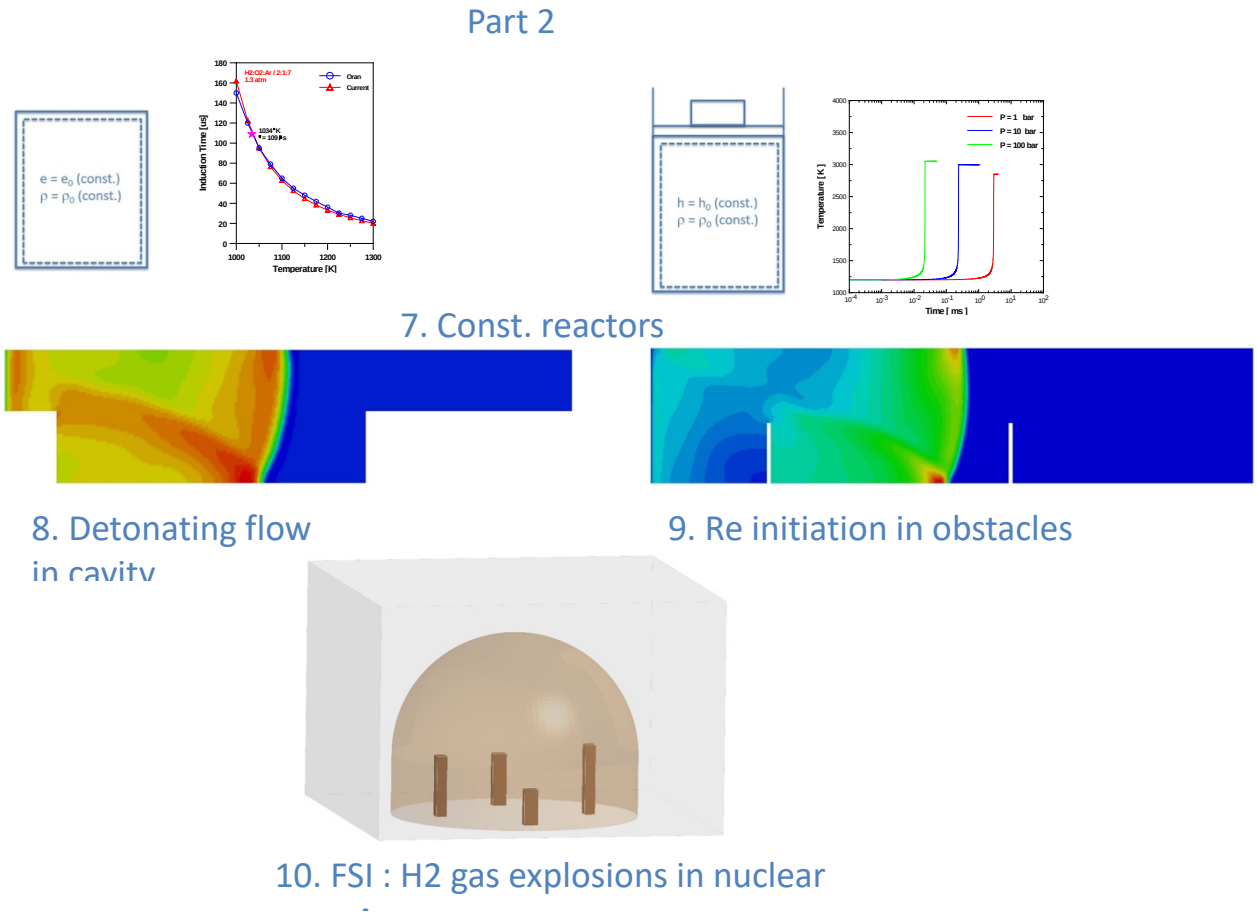
Part 1 Compressible flows and FSIs



Part 1: Compressible Flows and FSIs

- Introduction to CESE compressible solver
- Shock moving, diffraction, and reflections in cavity and obstacle chamber
- Cavitation flow
- Moving wedge confronting shock waves
- Rigid and flexible pendulums in the flows

Part 2 Compressible flows and FSI



Part 2: Chemically Reactive Flow and FSI

- Introduction to CHEMISTRY solver
- Basic concepts of the chemical kinetics
- Closed adiabatic spatially homogeneous premixed reactors
- Detonating flows and reinitiation

Deformation and failures of sturctures by gaseous explosions.

References

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