Fatigue and Fracture Mechanics

Prof Wang's Research Group

Prof. Xin Wang

Department of Mechanical and Aerospace Engineering

Carleton University, Ottawa, Ontario, Canada, K1S 5B6

March 6, 2019

Carleton UNIVERSITY

Canada's Capital University

M&AE

Department of Mechanical & Aerospace Engineering

Professor Xin Wang

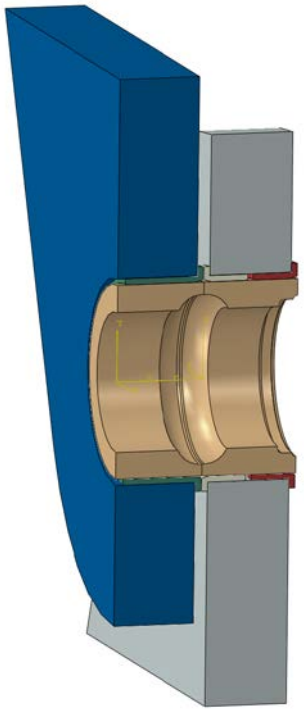
- Research expertise
  - Solid mechanics, mechanics of materials
  - Theoretical, computational and experimental fracture mechanics, and fatigue analysis
  - Advanced design methods for structural components in aircraft, nuclear pressure vessel, piping and offshore industries

Research Objectives

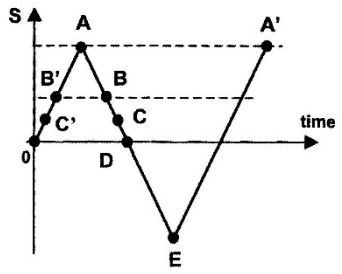
- The overall objective is to develop advanced methods for fatigue and fracture assessment of high performance engineering structures such as those in aircrafts, nuclear pressure vessels, pipelines and offshore industries
- Current research group has experience in the following research areas
  - 1) Fatigue analysis of aircraft structural components
  - 2) Computational simulations of ductile fracture in pipelines

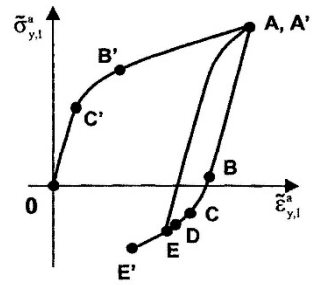
Fatigue of Aircraft Structural Components

- Fatigue life prediction of aircraft structural components – landing gear components
- Develop reliable tools to calculate fatigue life under complex loading conditions



Fuse Pin in Landing Gear

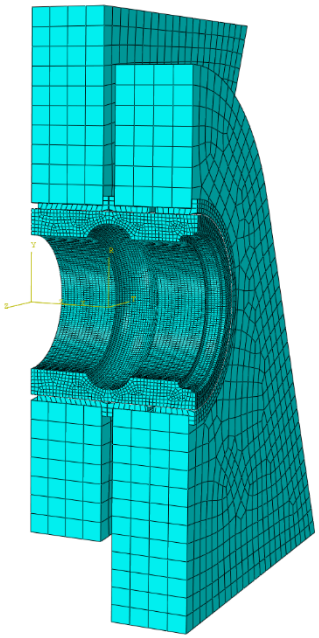




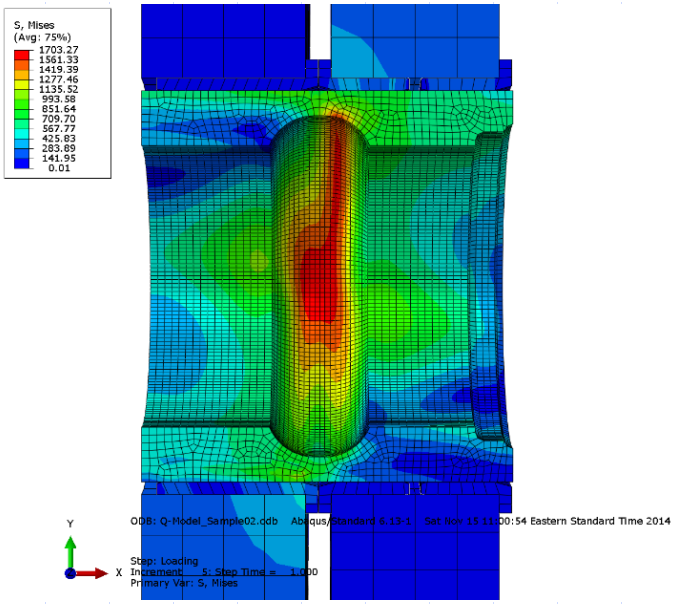
Load History

Fatigue of Aircraft Structural Components

- Collaboration with Bombardier and UTC LG Inc.
- Detailed finite element analysis
- Advanced material constitutive models, and low cycle fatigue life theories and testing



FE Simulations



Simulation of Ductile Fracture in Pipeline Steels

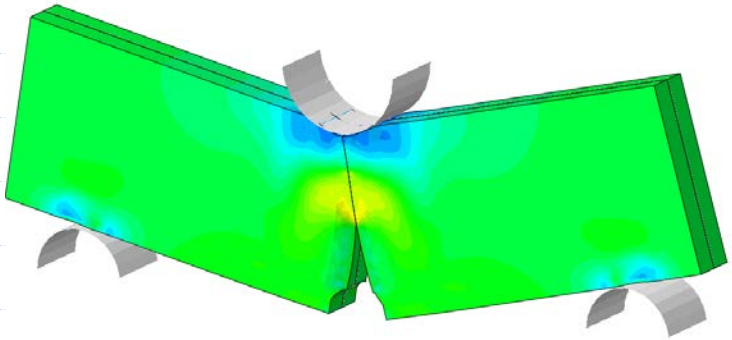
- Develop computational models to simulate ductile crack propagation in pipelines
- Collaboration with Natural Resources Canada

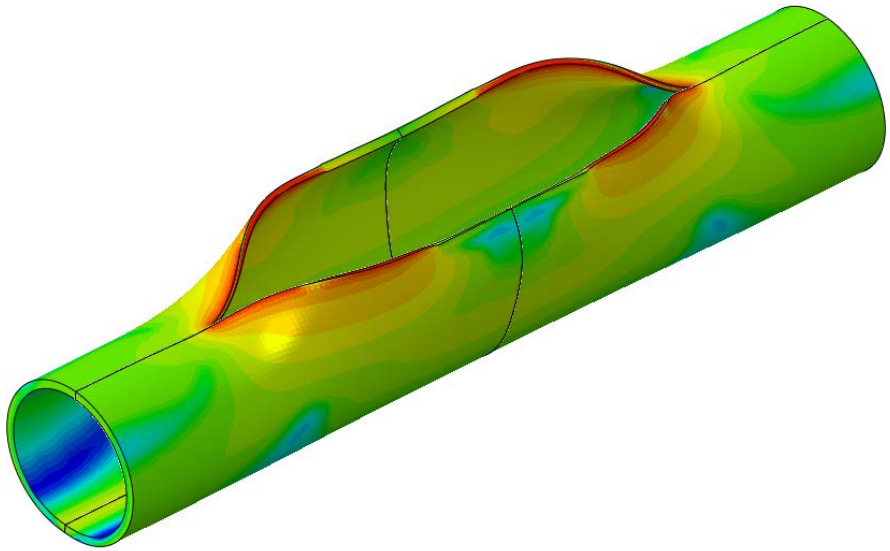
Pipeline Failure

How to prevent?

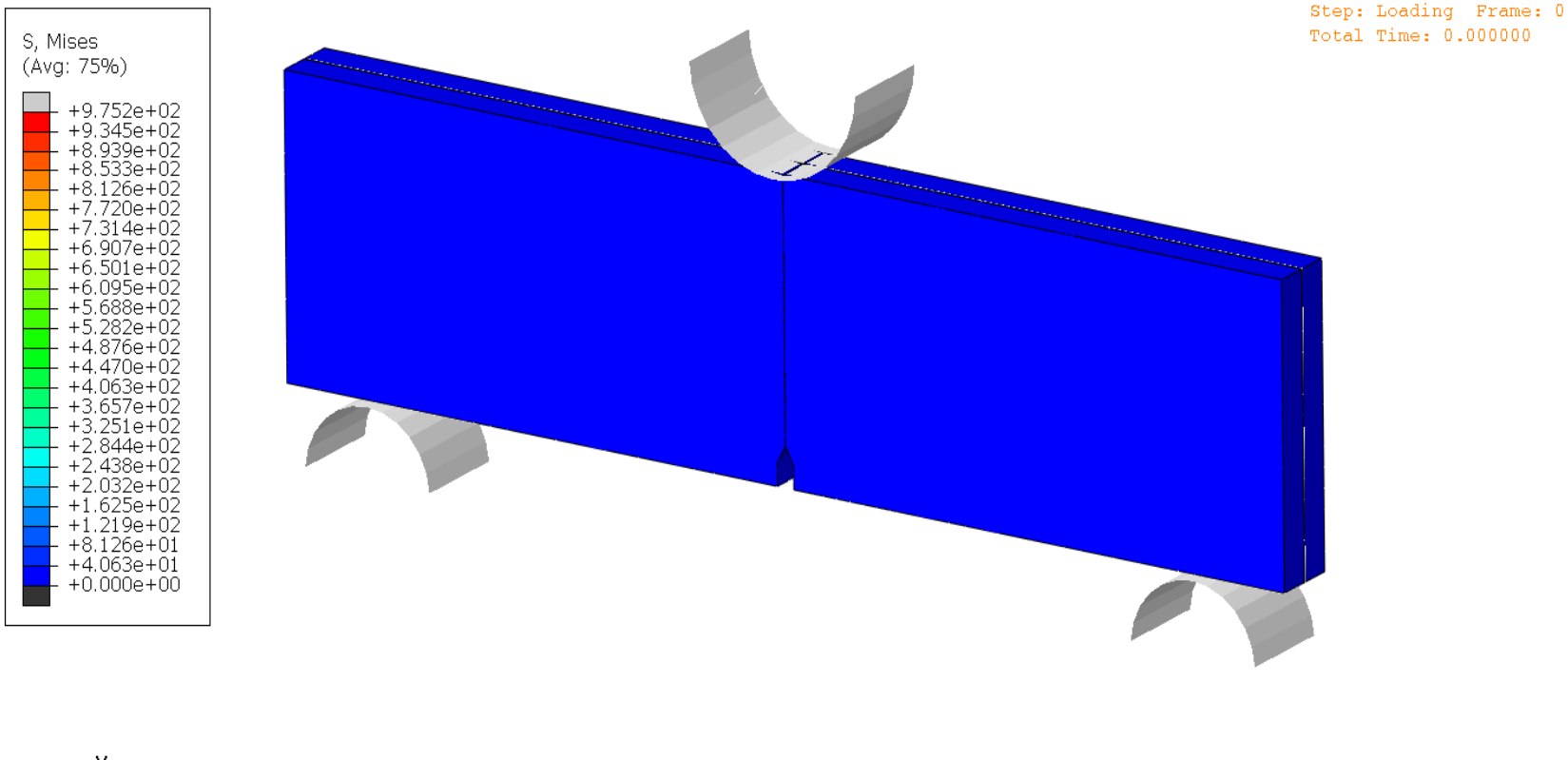
Simulation of Ductile Fracture in Pipeline Steels

- Develop ductile fracture models
- Assess and develop fracture criteria in small-scale specimens and apply to large structures
- Develop/design codes and standards for high strength, high toughness pipeline steels

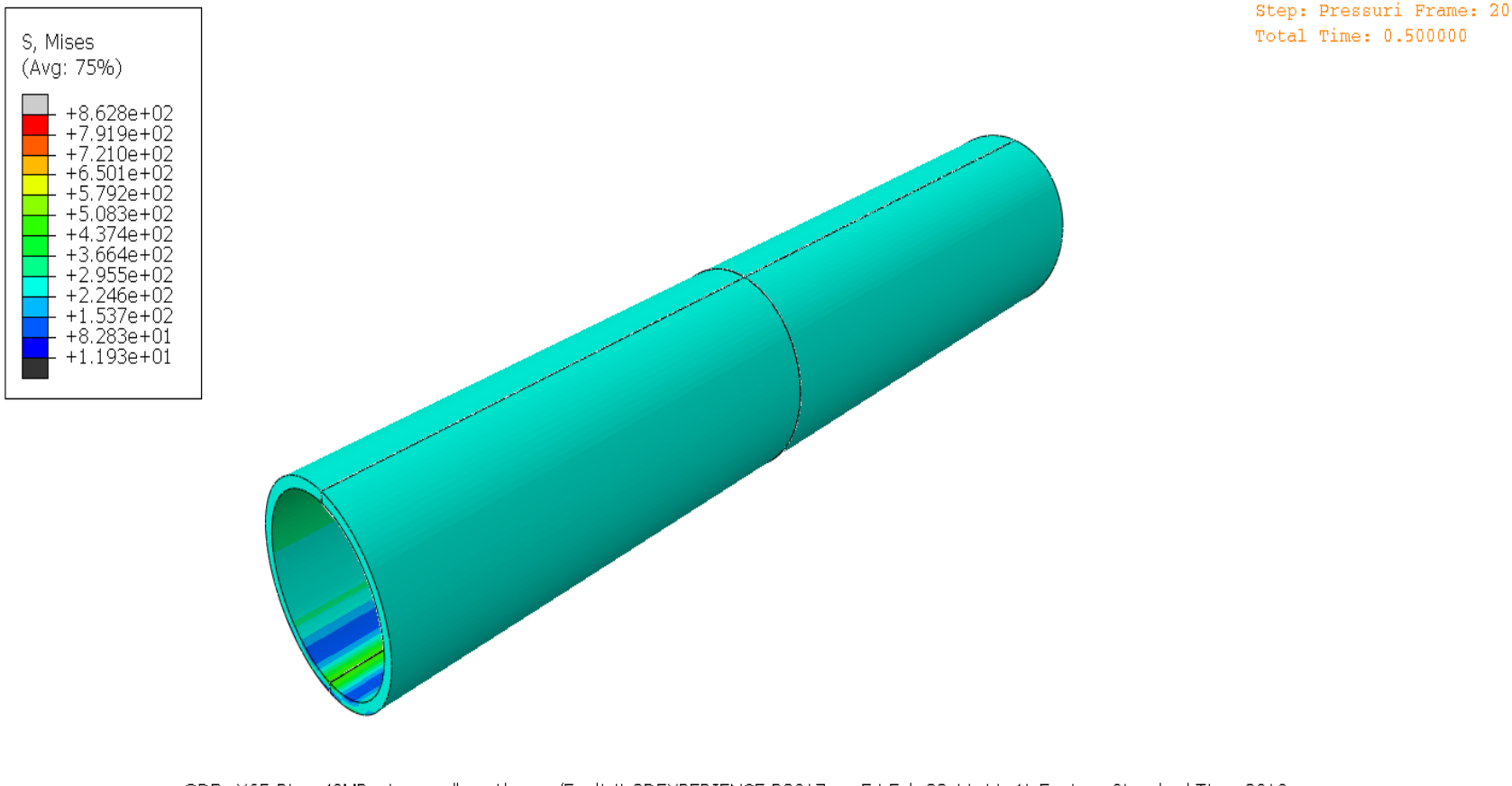




Simulation of Ductile Fracture in Pipeline Steels



Simulation of Ductile Fracture in Pipeline Steels



Current Graduate Student Opportunity

- Study/develop failure assessment tools for embedded flaws in pipelines
  - Using the finite element model approach
- Funded through collaboration with National Resources Canada
- Start Fall 2019 or Winter 2020

Thank you!

Contact:
Prof. Xin Wang, Ph.D., P. Eng.
Tel. (613)520-2600X8308
Xin.Wang@carleton.ca

Or

Mr. Chris Bassindale (current Ph.D. student)
ChrisBassindale@cmail.carleton.ca

Any inquiries are welcome!