Project Abstract for UBC Mechanical Engineering Capstone Design Course

Submitted by: Fluor Canada
Date: September 7, 2020
Project Title: CFD Simulations of Open-Channel Flows at Bends

Introduction

Fluor Canada provides engineering, procurement, fabrication and construction services for clients throughout Canada and around the world. For further information on the company, please visit https://www.fluor.com/canada .

Project Description

Flow of slurries and water through pipes and other shapes of conduits is a common practice in mineral processing plants. Often the plant layout cannot accommodate straight runs and it dictates the addition of bends to these systems. Frequently asked questions associated with the addition of these bends are: how the addition of a bend is going to affect the flow within these systems? Does the slope need to be increased due to bends? How the flow will behave at a bend as well as its upstream/downstream piping? Will it slow down significantly leading to local settling of particles? The objective of this project is to perform numerical simulations for open-channel systems to obtain a better understanding of the flow behavior at bends, and how design should be modified in case of a negative impact.

Expected Task and Outcomes

Some suggested tasks:

- Literature review and non-dimensional analysis
- Create a simulation matrix based on the established non-dimensional numbers, for varying bend angels and radii
- Perform two-phase 3D CFD simulations for open-channel system with one or multiple bends
- Post-processing of the CFD simulation results (verification with existing analytical equations and validation against available experimental results if any), and provide recommendations for industrial applications
- (Bonus: if time allows) Perform three-phase 3D simulations for open-channels systems with bends

Resources Available from the Customer

Fluor Canada has completed a number of capstone projects with UBC Mechanical Engineering and will provide mentorship/consultation with the students and feedback as required over the duration of the project.

The primary project contact is: Dr. Pirooz Darabi, PhD, PEng.
pirooz.darabi@fluor.com

Customer Requirements

To be clarified and developed further as project gets underway.