Model Species Transport in a Static Mixer

Reacting Flows – Homework 6

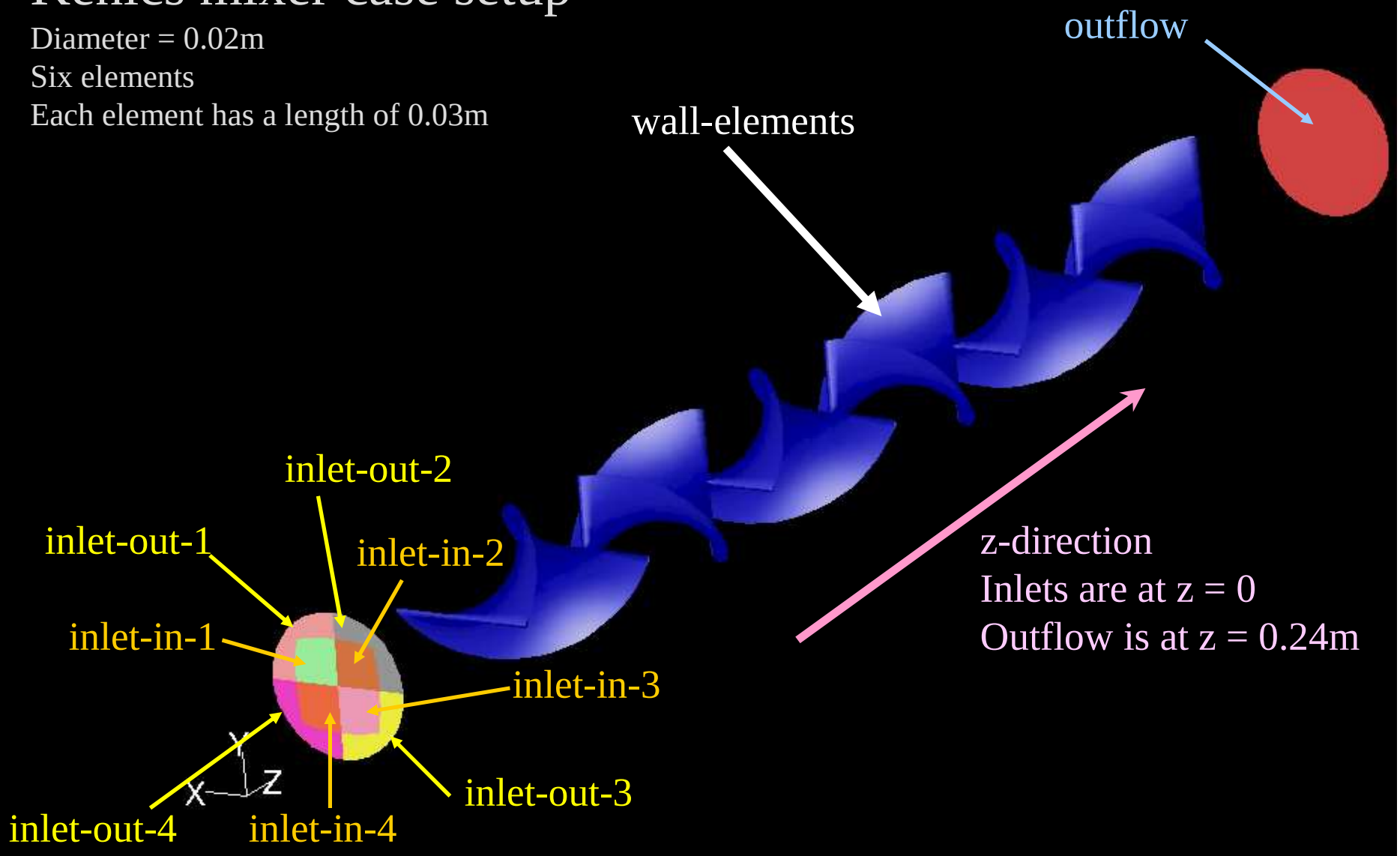
Instructor: André Bakker

Species mixing in a Kenics mixer

- Laminar mixing in a Kenics static mixer.
- File: “kenics.cas.gz”
- Geometry and setup is shown in the next slide.
- Assignment:
  - Calculate the mixing of two non-reacting species with the same properties for at least three different inlet distributions. The inlet distribution can be varied by changing the boundary conditions for the 8 inlets shown in the next slide.
  - Evaluate the results and report.
- Advanced assignment:
  - Define a simple one-step reaction for the species.
  - Evaluate the conversion at the outlet for different inlet distributions.

Kenics mixer case setup

Diameter = 0.02m
Six elements
Each element has a length of 0.03m



Grid

FLUENT 6.2 (3d, segregated, spe, lam)

Model setup tips

- The case kenics.cas.gz is already set up with a species model defined.
- There are two species with the same physical properties. They are named “red” and “blue”.
- To set the mass fraction of a species at an inlet, go to the appropriate boundary conditions panel.
  - Specify the inlet mass fraction of “blue”.
  - The mass fraction of “red” is then automatically specified as 1 – mass_fraction_blue.
- You can vary the Reynolds number of the flow by either varying the viscosity or the inlet velocity.
  - The viscosity is set in the Materials panel, as the viscosity for the “mixture template.”
  - The diameter of the pipe is 0.02m.
  - The density of the species is 1000 kg/m^3.
- If you like, you can specify different velocities at the inlets and see how that affects the results.
- To visualize species mass fractions at different planes along the length of the pipe, create iso-surfaces of constant z-coordinate. The first element starts at z=0.03 and the last one ends at z=0.21. Each element is 0.03m long.
- To create a plane with regular spaced sample points, review the screenshots in the Lecture 8.