ECS25
EUROPEAN COATING SYMPOSIUM A CORUÑA

Getting Started with OpenFOAM: Fundamentals and Practical Coating Applications

Session 3: Hands-On Coating Case Study

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Outline

14:00 – 15:00	**Session 1**: Introduction to OpenFOAM and Simulation Fundamentals
15:00 – 15:30	**Session 2a**: Geometry, Mesh Generation, and Case Setup in OpenFOAM
15:30 – 16:00	Coffee-Break
16:00 – 16:30	**Session 2**: Geometry, Mesh Generation, and Case Setup in OpenFOAM
16:30 – 17:30	**Session 3**: Hands-On Coating Case Study

interFOAM solver

Two-phase Flow (Volume of Fluid - VoF)

- **Continuity**

$$\frac{\partial \rho}{\partial t} + \nabla \bullet \left(\rho \mathbf{U} \right) = 0$$

- **Momentum**

$$\frac{\partial \left(\rho \mathbf{U} \right)}{\partial t} + \nabla \bullet \left(\rho \mathbf{U} \mathbf{U} \right) + \nabla \bullet \left(p \mathbf{I} \right) + \nabla \bullet \boldsymbol{\tau} + F_g = 0$$

- **Phase**

$$\frac{\partial \alpha}{\partial t} + \nabla \bullet \left(\alpha \mathbf{U} \right) + \nabla \bullet \left(\alpha \left(1 - \alpha \right) \mathbf{U}_r \right) = 0$$

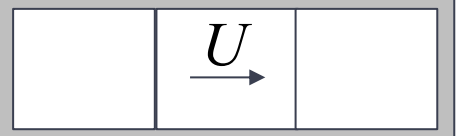
$$\begin{cases} \alpha = 1 \text{ - water} \\ \alpha = 0 \text{ - air} \end{cases}$$

- **Properties**

$$\phi = \alpha \phi_l + \left(1 - \alpha \right) \phi_g$$

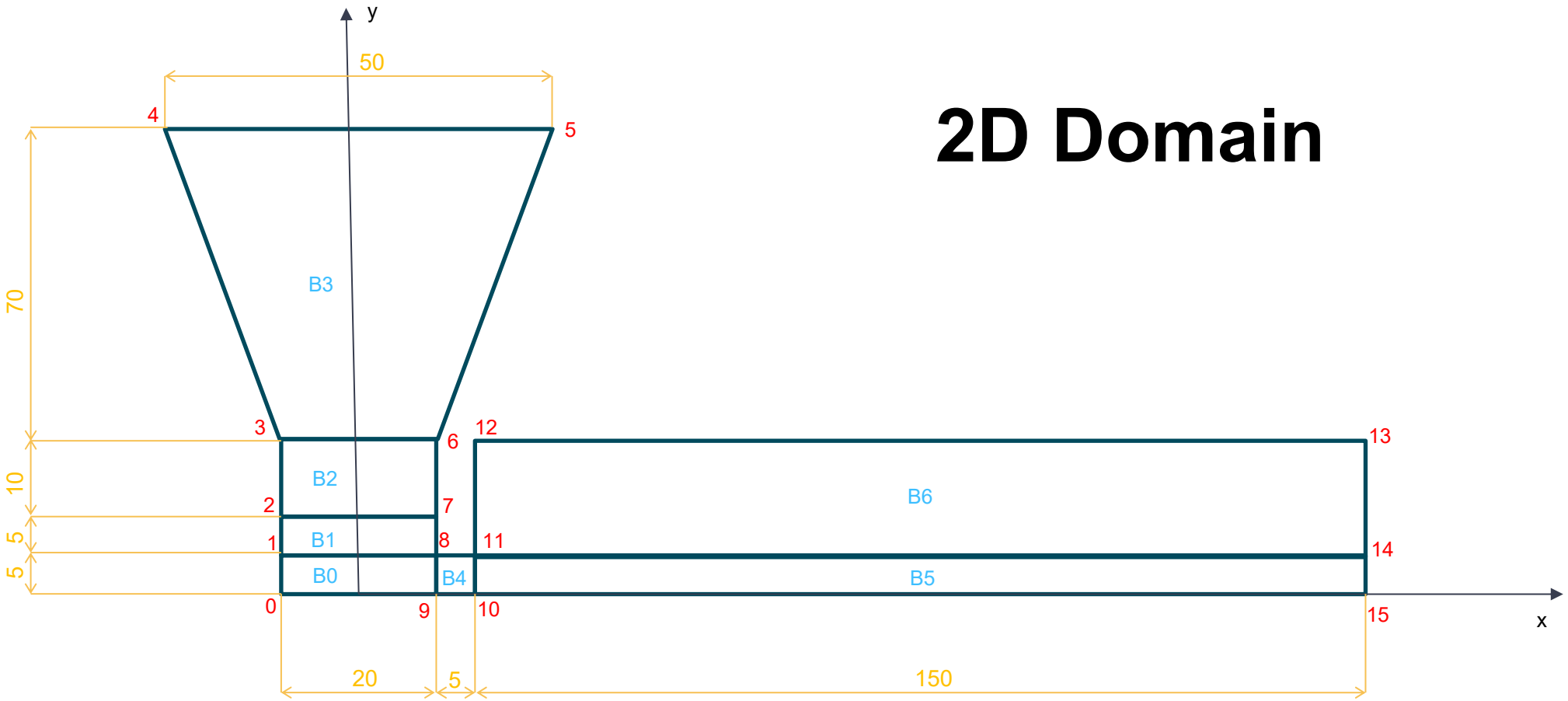
Courant Number

$$C_o = \frac{U \Delta t}{\delta x}$$



Stability $\Rightarrow$ $C_o < 1$

Case 3 - Geometry



2D Domain

Points
Blocks

Case 3 – Phase 1

1. Change to the case folder
2. Open VSCode
3. Check the case files
4. Run blockMesh
5. Check the Mesh
6. Change blockMeshDict to get a mesh like this:

Case 3 – Phase 2

1. Use Allrun script to run the case
2. Check the results…
3. Investigate de files to identify and correct the origin of the observed problem

Case 3 – Phase 3

1. Study the effect of some problem parameters
   - Fluid Viscosity and density
   - Roller Velocity