

# Min Project on ANSYS ICEMCFD

## Multiblock Mesh Generation for Compressor Outlet Pipe



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This mini project deals with meshing of piping between two screw compressors outlet and oil separator inlet. Multiblock hexahedral mesh needs to be created for complete geometry. After completing this mini project you will be comfortable in multiblock structured meshing for simple geometries. The end goal of the project is not to generate mesh for any specific flow rates, but to create a blocking structure such that it could be used for any flow conditions later. The focus is on creating a blocking structure rather than create a mesh.

## 1 Prerequisites

The main pre-requisite for this project is basic understanding of multi-block hexahedral meshing using ANSYS ICEMCFD. Before taking working on this project, make sure that you have gone through our lessons on “Structured Hexahedral meshing”.

## 2 Problem Definition

The oil has a key function in a refrigeration system because it contributes to ensure lubrication of the mobile parts of the compressor, evacuation of the heat due to frictions of the mobile parts, and air tightness between the compression stages in rotating compressors.

All the oil does not stay in the compressor crankcase and a part is brought into the refrigeration system. This happens during start-up of the compressor, due to the sudden evaporation of the refrigerant dissolved in the oil, by the piston rings in piston compressors and by its close contact with the refrigerant in rotating compressors.

The volume of oil ejected by the compressor circulates with the refrigerant and has the following effects:

- Decrease in the oil level in the crankcase, which can lead to a mechanic breakdown
- Modification of the quality, physical and thermodynamic properties of the refrigerant
- Decrease in the efficiency of exchangers (evaporators and condensers); the loss of capacity can reach 30% with rabbit tube evaporators
- Oil retention in oil traps and low speed areas. This oil may return suddenly and generates a liquid hammer (slugging)

There are many techniques used for separating the oil form refrigerant. The current project details with a piping system connecting two compressor outlets to oil separator inlet. There are many objectives for which CFD analysis could be done. One of the CFD analysis objective could be to understand the flow dynamics inside the piping and at the inlet of oil separator. A uniform flow distribution at inlet could help us design and analyse oil separator. Another objective could be to check flow dynamics and its effect on oil droplets. This would help us understand how much oil is actually getting separated from refrigerant in the connecting pipe.

The focus of this mini project is to create a blocking structure suitable for piping geometry topology. Once the blocking structure is created, that could be adapted to any flow rate conditions later. It is also expected that you create required O-Grid blocking so that boundary layer mesh could be generated.

The geometry considered for this project is shown in Figure 1.

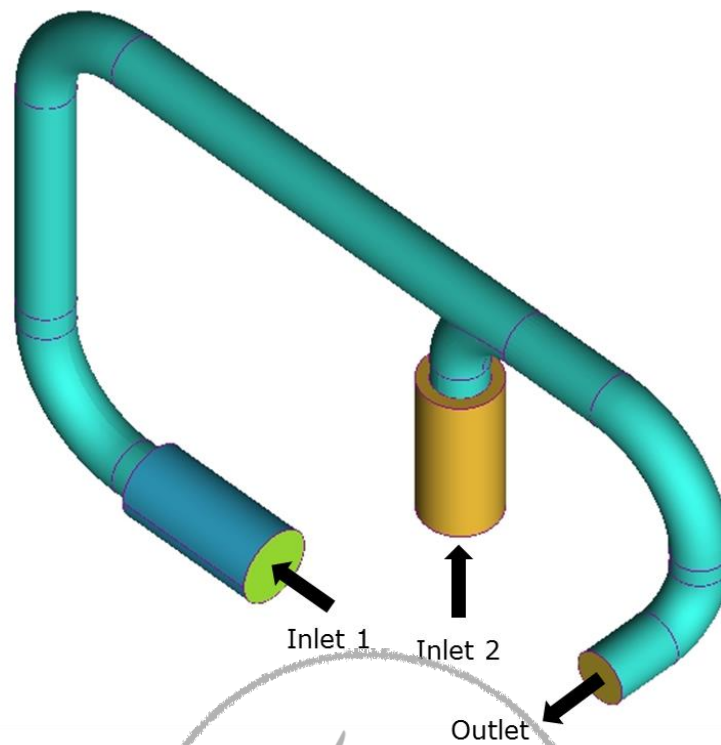


Figure 1: Screw compressor outlet pipe geometry

### 3 Sample Results

Below are few sample results provided for reference. Cross check you blocking structure and pre-mesh results with these results/images.

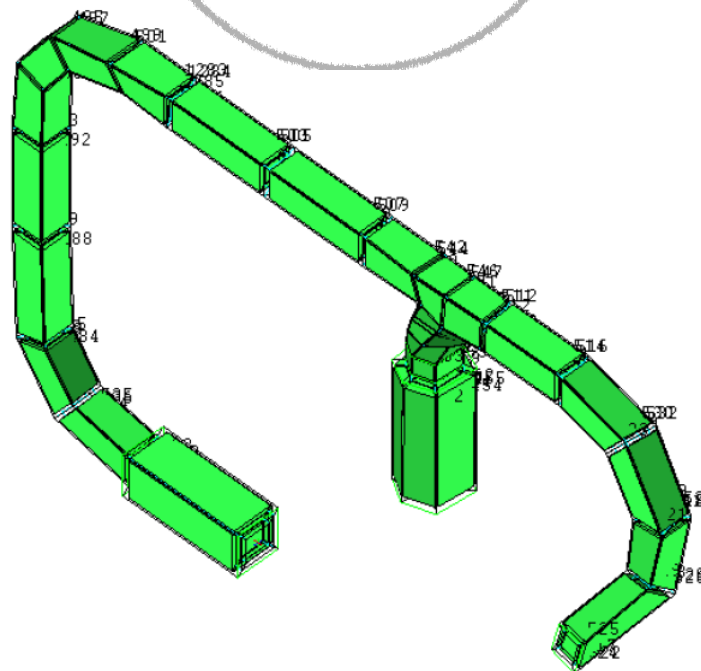


Figure 2: Blocking structure

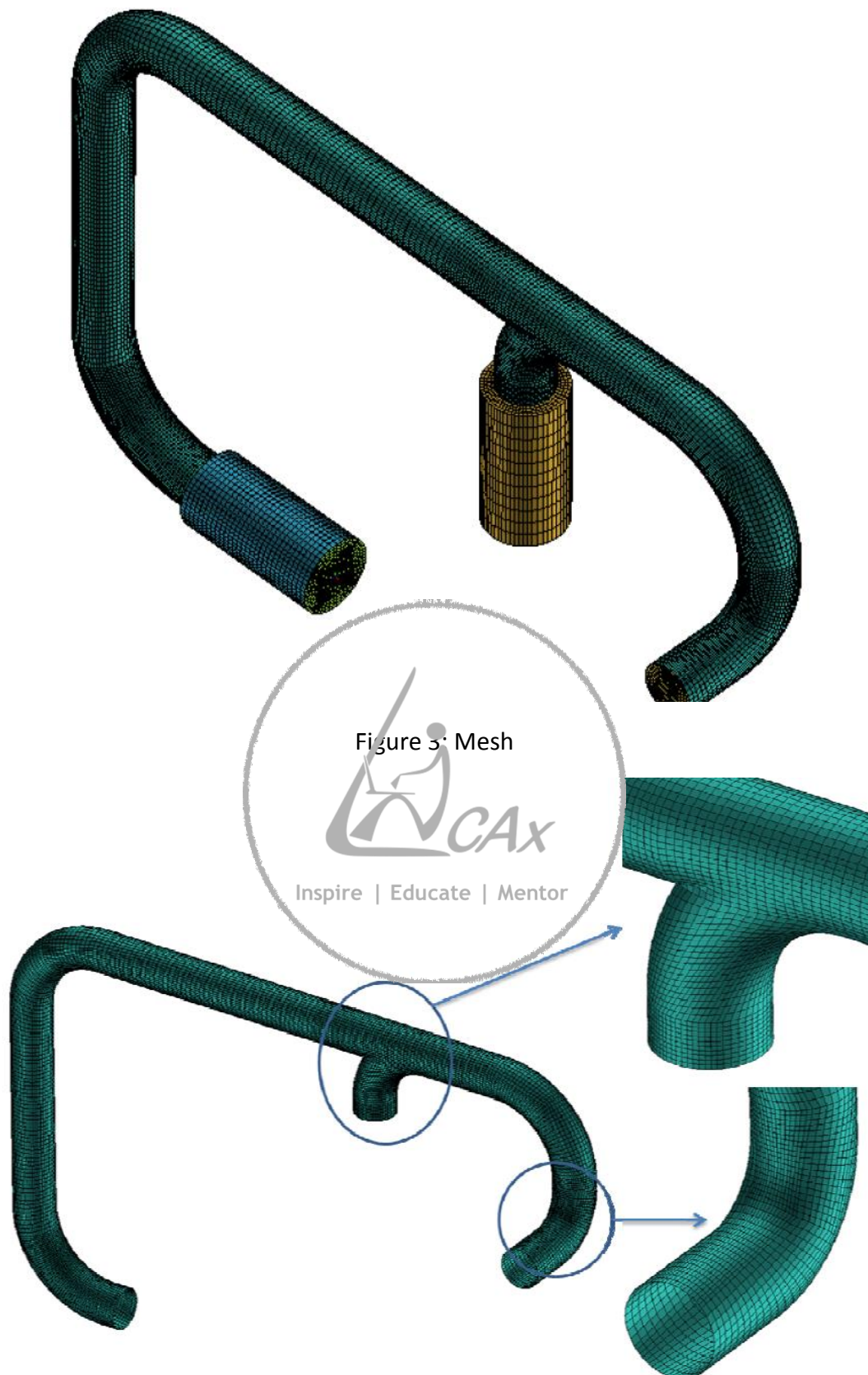


Figure 4: Mesh features

## 4 Download Input Files

Links to download all necessary inputs files are given below. They are compressed zip files. Download them in one folder and unzip the files. This would create all necessary inputs files along with PDF copy of this project details. The geometry files is given in ANSYS ICEMCFD format (tin). This file is created using ANSYS ICEMCFD 13.0 version and would not work with any lower version.

1. PDF instructions for this mini project
2. Screw compressor outlet pipe geometry files (tin)

You can also download both the files from “Shared Files” section on lesson page.

## 5 Hints

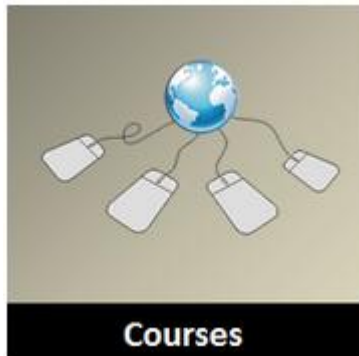
- Spend more time on deciding the block topology. Sketch the block topology in a paper roughly for two or more cut/cross section of geometry
- Use scan plane to understand the issues in the volume mesh. This will help in improving the quality of mesh

## 6 Results and Discussion

If you have any specific query about the mini project or want to share the results of this project, please post them on [course discussion forum](#).



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