

Designing A Liquid-Gas Separator with Ansys Fluent

Engineering simulation is one of the best tools to develop a new product in this competitive business world. Unlike expensive and time-consuming trial/error methods, simulation enables us to understand the complete behavior of the unit. Understanding the details also helps improve the design by leveraging various perspectives. There are expensive projects that can't be prototyped and tested in a customer's plant is too risky for companies like us. That is why Revindus always relies on engineering simulation.

"With the Ansys tools we obtained through the Ansys Startup Program, we can design, change, test and optimize our liquid-gas separator without wasting valuable engineering, manufacturing and testing hours, which might take ages to have our final design."

Mustafa USLU
General Manager / Revindus – Revolutionary Industries

/ CHALLENGES

Liquid – gas separators are commonly used in various industries. For compressed air and gas compressors, the most common type is the oil-flooded screw compressor. The size of the separator tank affects the overall dimension of the package, which is why a robust and compact size is crucial for us. A commonly used design is cyclonic type for this purpose. To enhance the separation and reduce the size, we wanted to use an inlet device. Considering the numerous parameters to handle, we chose to use a simulation tool.

/ TECHNOLOGY USED

- Ansys Space Claim Design Modeler
- Ansys Meshing
- Ansys Fluent
- Ansys Results (CFD-Post)

/ ENGINEERING SOLUTION

- Single phase and multiphase flow with relevant interactions were used with Ansys Fluent Transient VOF solver, with gravity enabled to analyze the inlet device.
- A parametric study was carried out to optimize the length to diameter ratio of the tank for enhancing gravitational separation performance.
- The number, distance and angle of the guide vanes were tuned to have the best velocity distribution.
- Transient multiphase solver (VOF) with implicit body force, enabled gravity were used to analyze separation performance.

/ BENEFITS

Ansys Fluent is the most powerful engineering tool in the CFD market and this was proven with our application. Taking a trial and error approach for this project would have been expensive and wouldn't have provided our team with the deep understanding of the design.

Thanks to Fluent, we are confident in the design of our liquid-gas separator and we're able to save manufacturing and testing hours since we don't have to consider a numerous amount of variation. We optimized two main types of separators with nine design combinations each. Without Ansys, we wouldn't have been able to invest, manufacture, test and recalibrate all the combinations mentioned above.

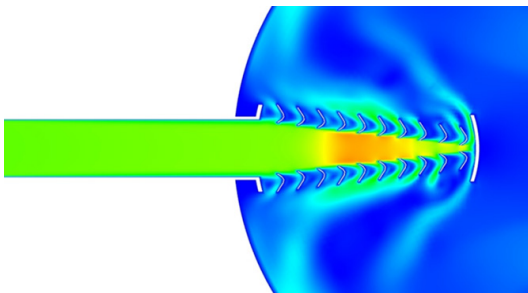


Figure 5: Velocity contour of the optimized inlet device

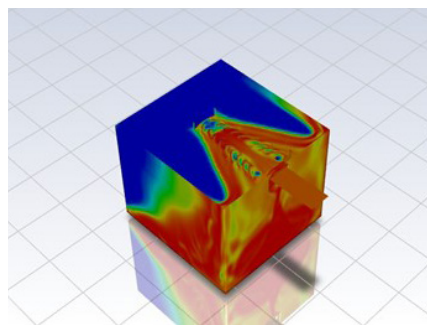


Figure 7: 3D separation of oil (cut in view)

/ COMPANY DESCRIPTION

Revindus develops and manufactures multi-discipline engineering products with state-of-art tools. Our biggest advantage is how we use our knowledge and combine it with recent technology. We have been focusing on one the hardest problems in the industry—measuring the compressed gas flow precisely with a sonic nozzle and we succeeded. Unlike traditional designers, which are common in the compressed air and gas industry, our expert engineers continue to invest in high tech designing tool knowledge to enable the best results in the market.

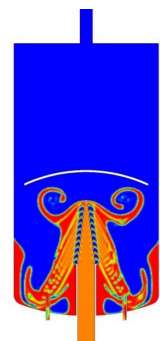


Figure 8: A captured image during separation of liquid phase with inlet device guiding effect

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