


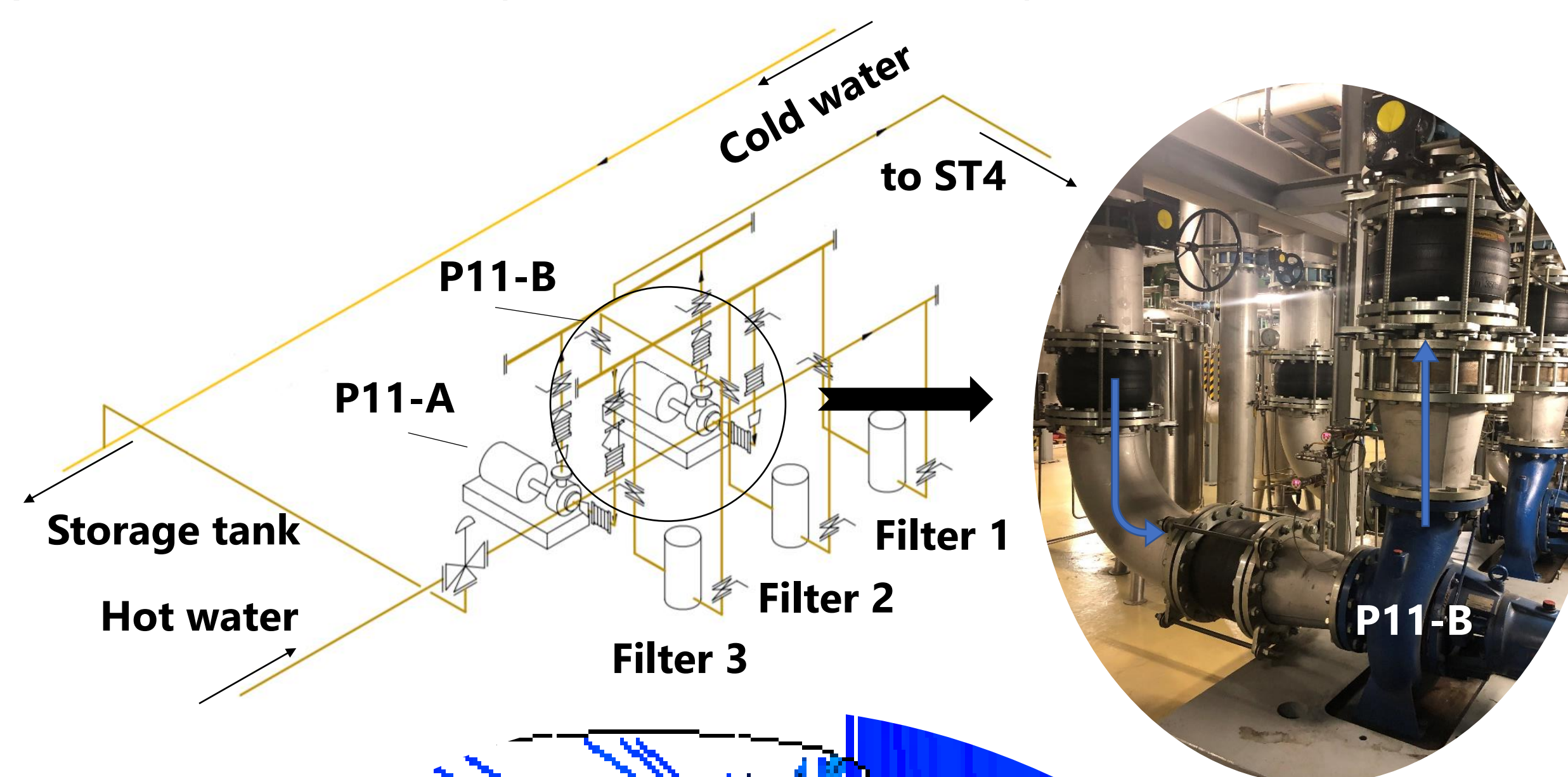
# Bad aspiration zone dimensioning has induced high velocities, low pressure and vortices: **perfect combination for cavitation.**

## CFD Predictions of Water Flow Through Impellers of the ALBA Centrifugal Pumps and Their Aspiration Zone. An Investigation of Fluid Dynamics Effects on Cavitation Problems

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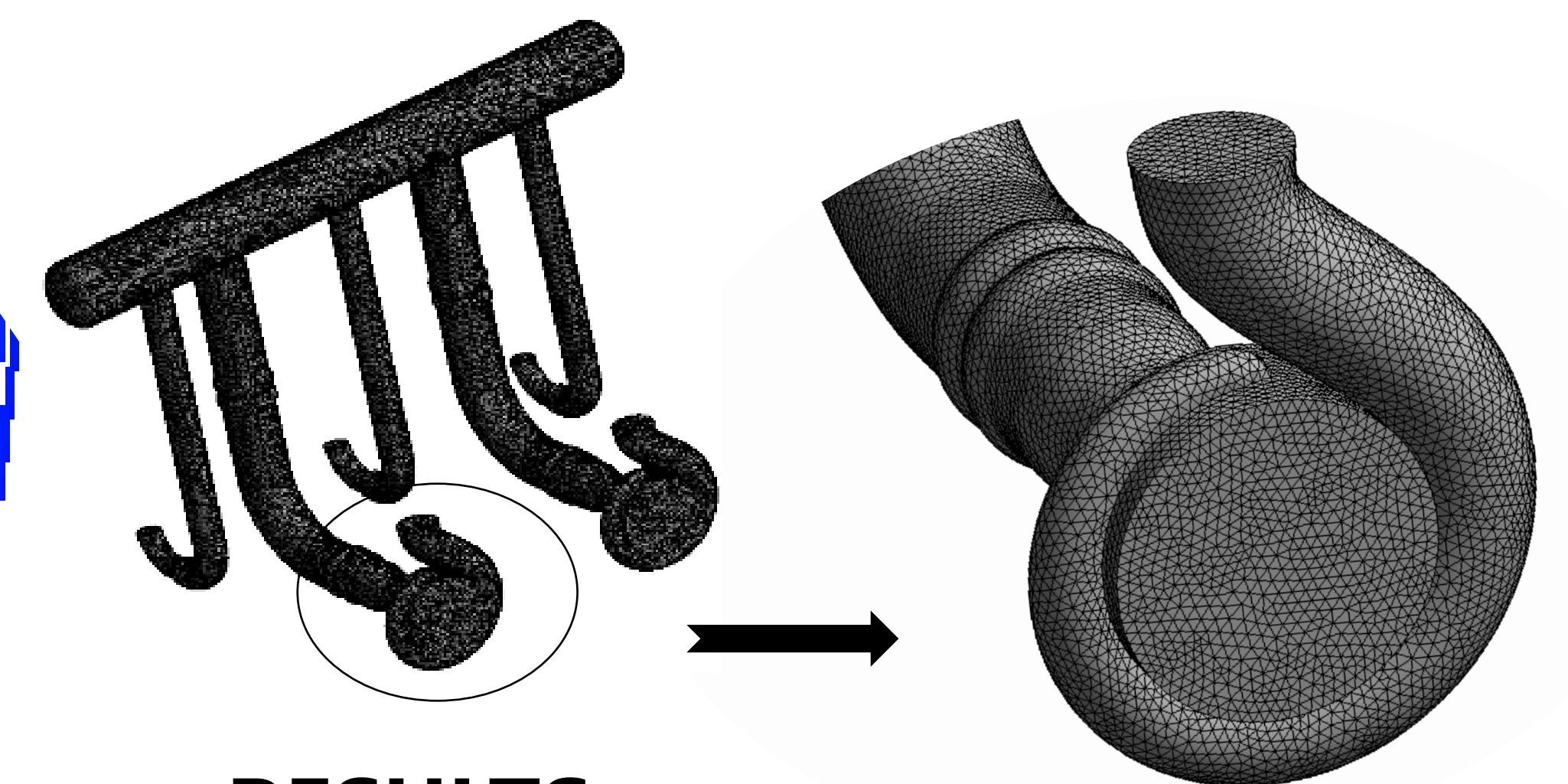
### INTRODUCTION

- General thermal stability problems prevent correct performance of ALBA system.
- ✓ Irregularities in cold water supply (external plant).
- ✓ Thermohydraulic system operating on design conditions cavitates.
- Investigation around the aspiration zone at the main pumping system (P11) to understand the causes of cavitation.



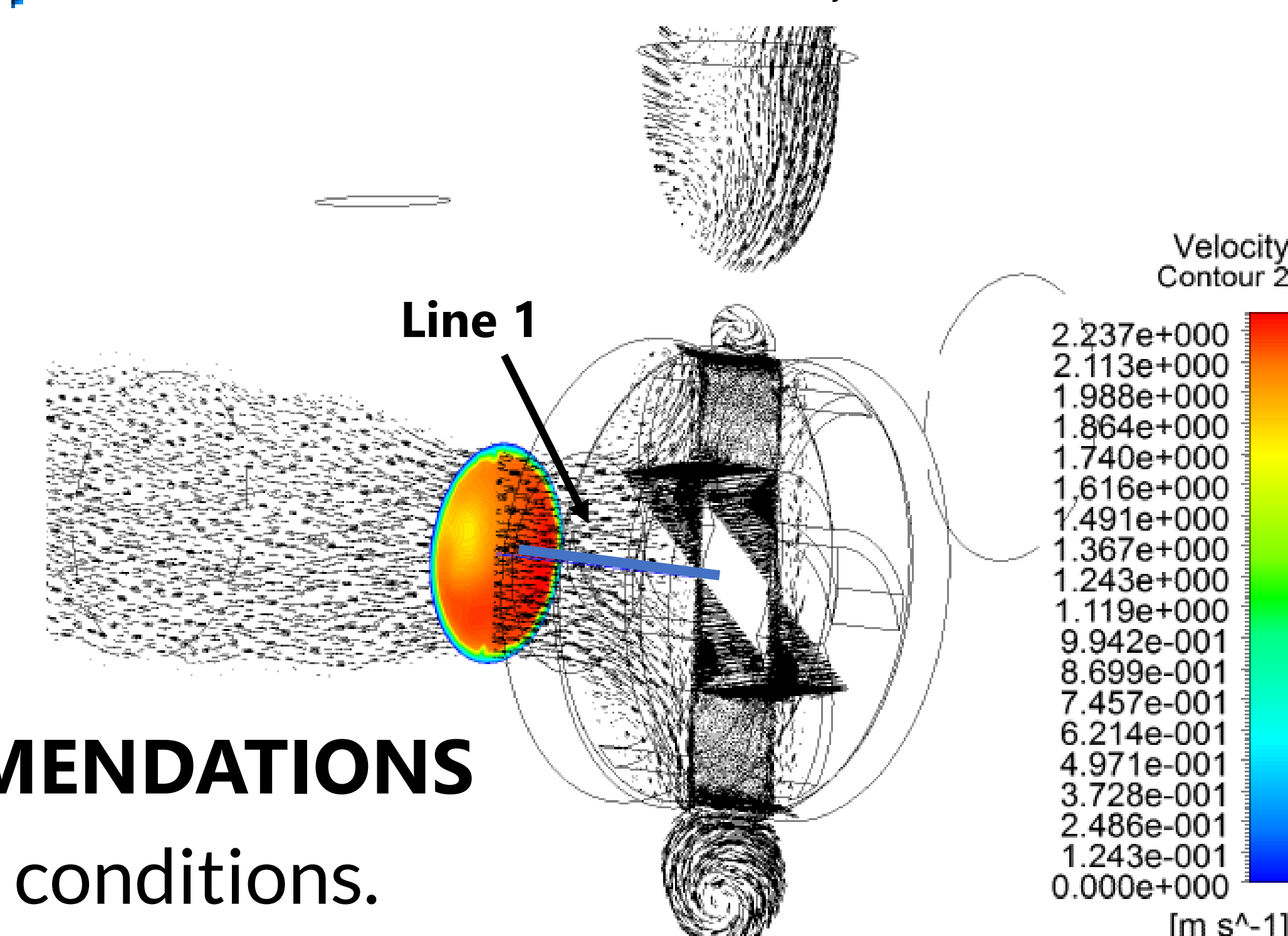
### CFD MODEL

- Uniform and non-uniform conditions for inlet flow.
- Water at 23°C, steady, isothermal and no-slip walls.
- Turbulence models: k-ε, k-ω and k-ω SST.
- Moving mesh with impeller.
- 3.5 M elements considered.



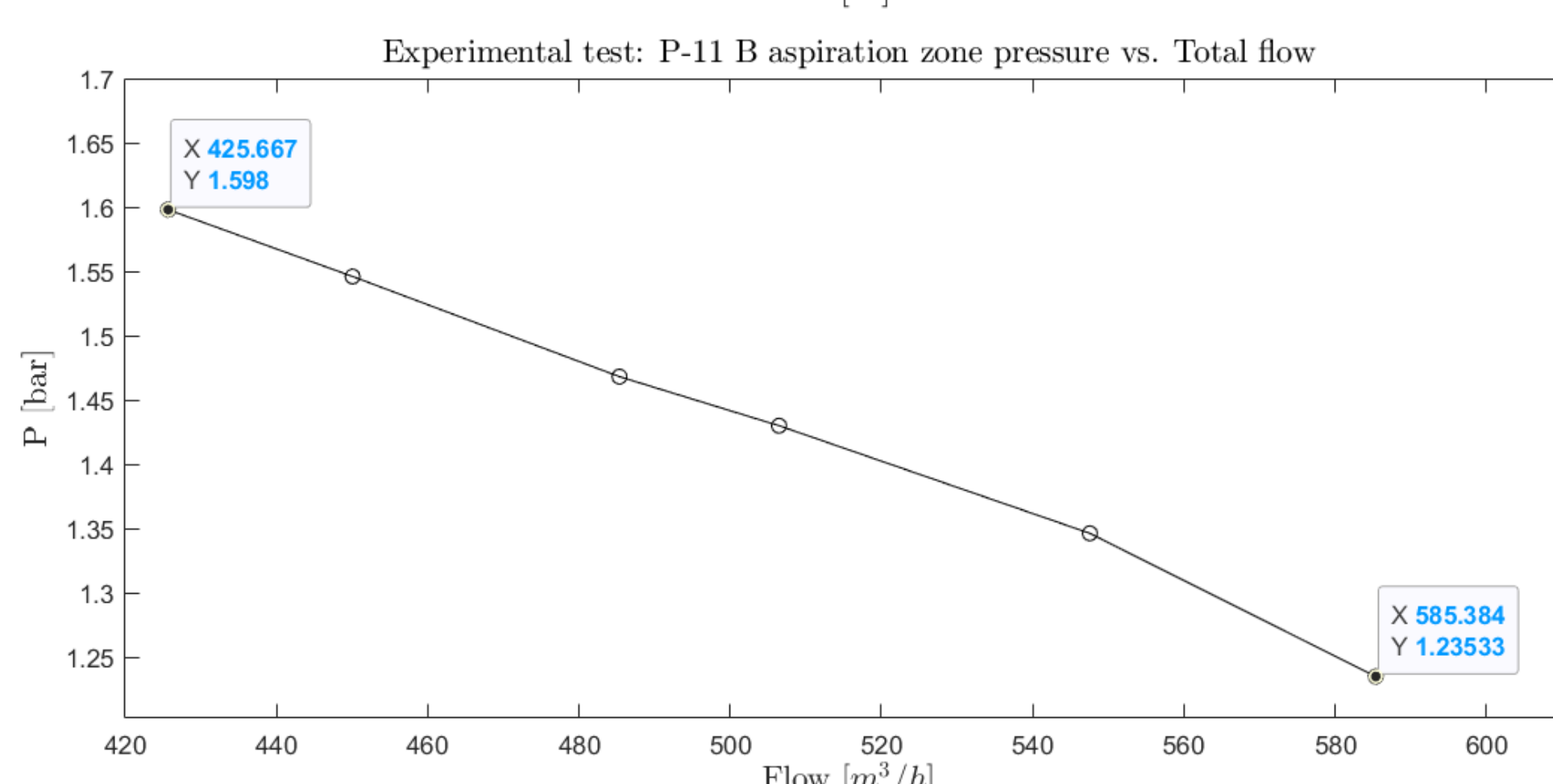
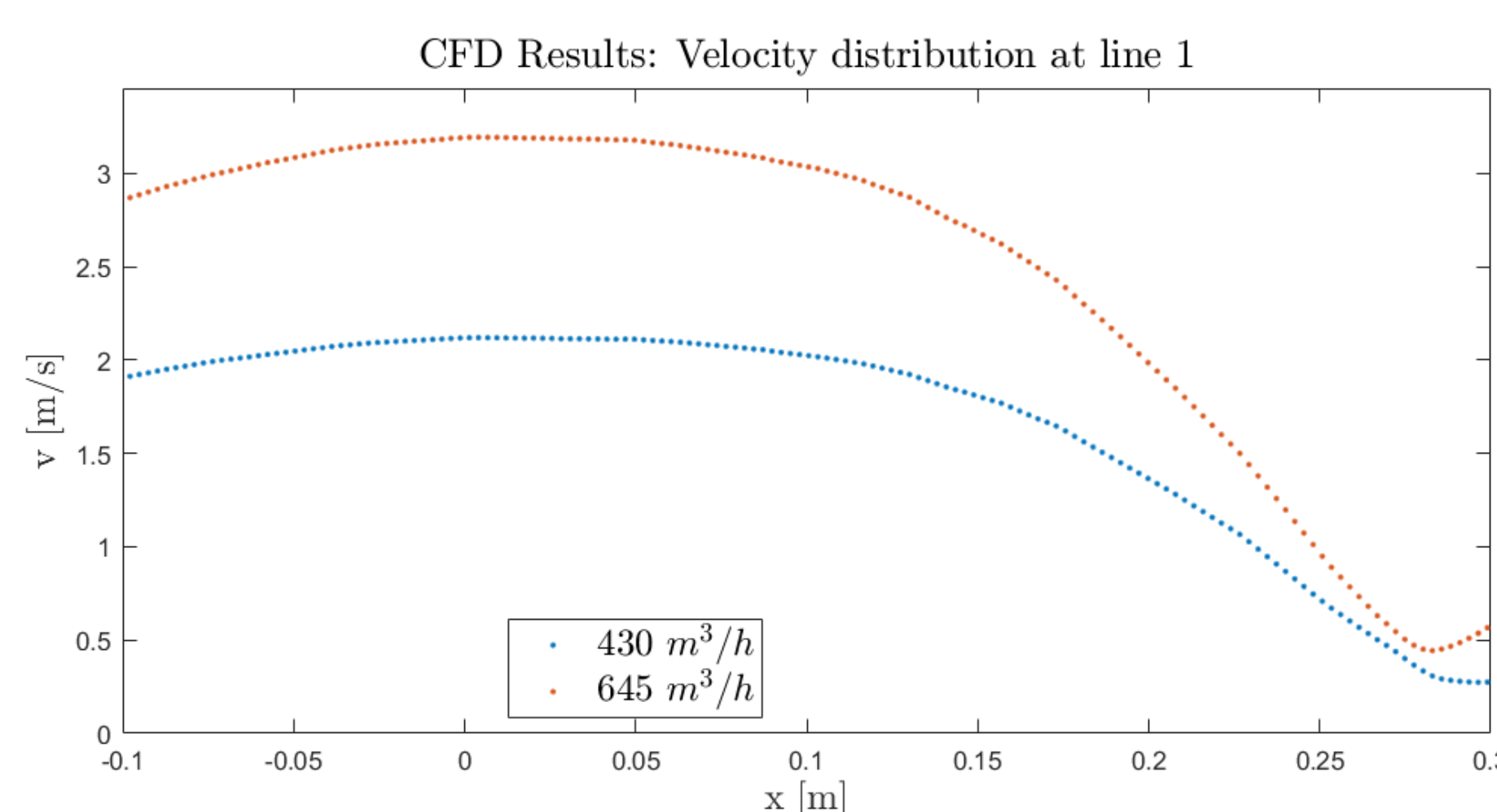
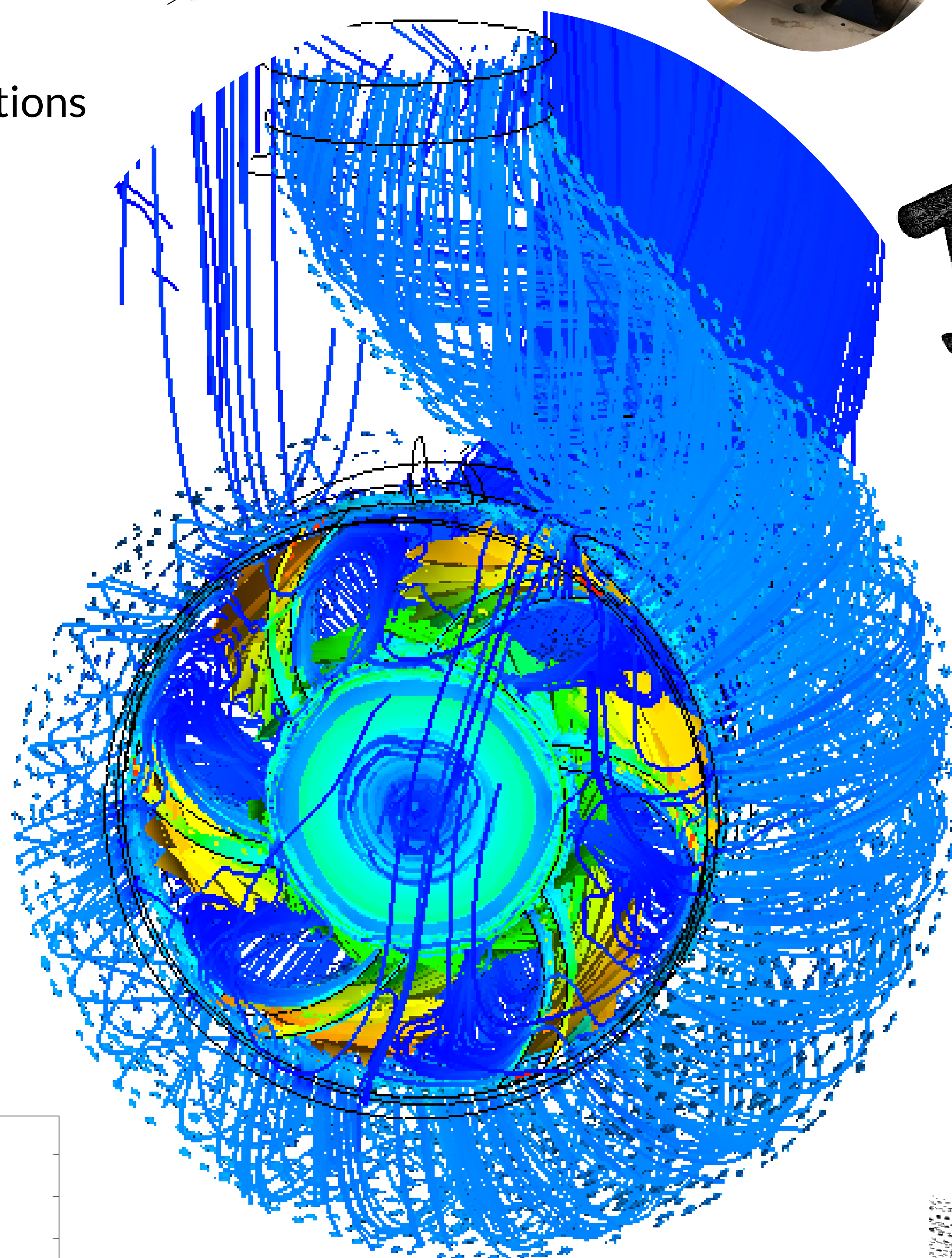
### RESULTS

- High velocities in suction region, especially for nominal conditions.
- Pressure uniformly distributed along aspiration zone.
- Non-compliance with NPSH according to experimental test, based on increasing the flow rate from 430 to 585 m<sup>3</sup>/h.



### ENCOUNTERED PROBLEMS

- Reduced flow rate in P11 pump.
- Foreign bodies possibly trapped.
- Rigid tubes transmit vibrations.
- Manifold with non-uniform oscillatory distribution.



### CONCLUSIONS AND RECOMMENDATIONS

- Velocities do not meet design conditions.
- NPSH over manufacturer's limitation.
- CFD results confirm gauge reading is representative.
- ✓ Must redesign manifold.
- ✓ Change pumps or add third to distribute the flow.