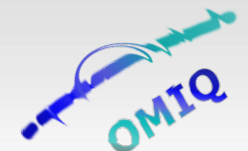


# OMIQ srl

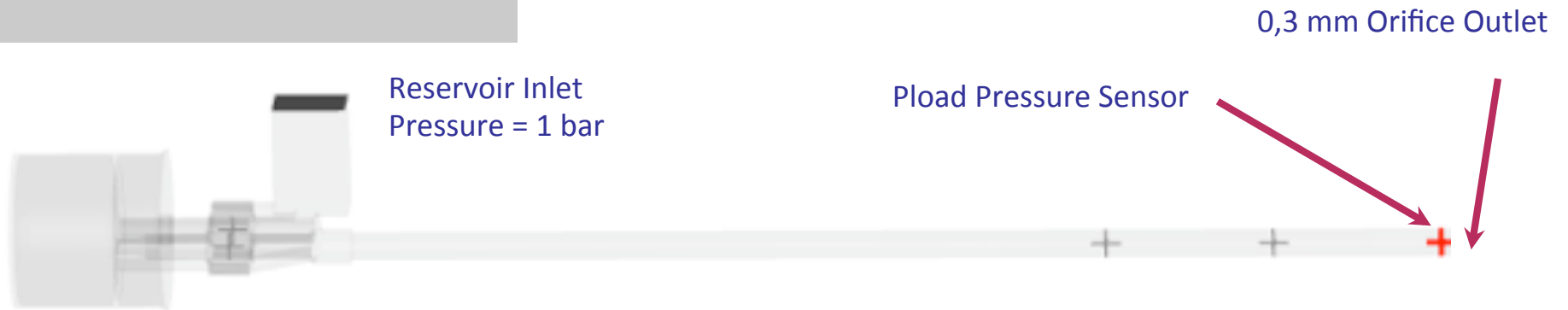
Ingegneria di componenti e sistemi industriali



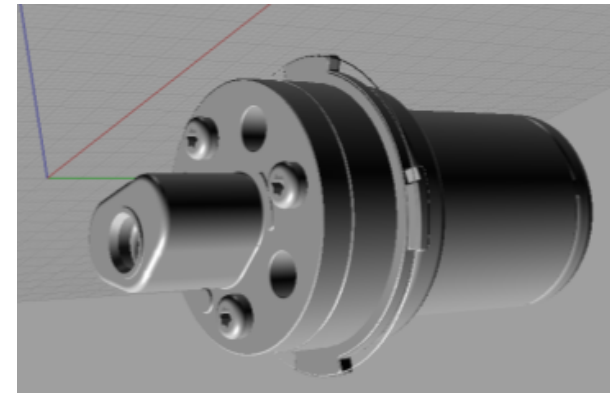
*Dosing Pump Tolerance Analysis  
using PumpLinx*



# Computational Model

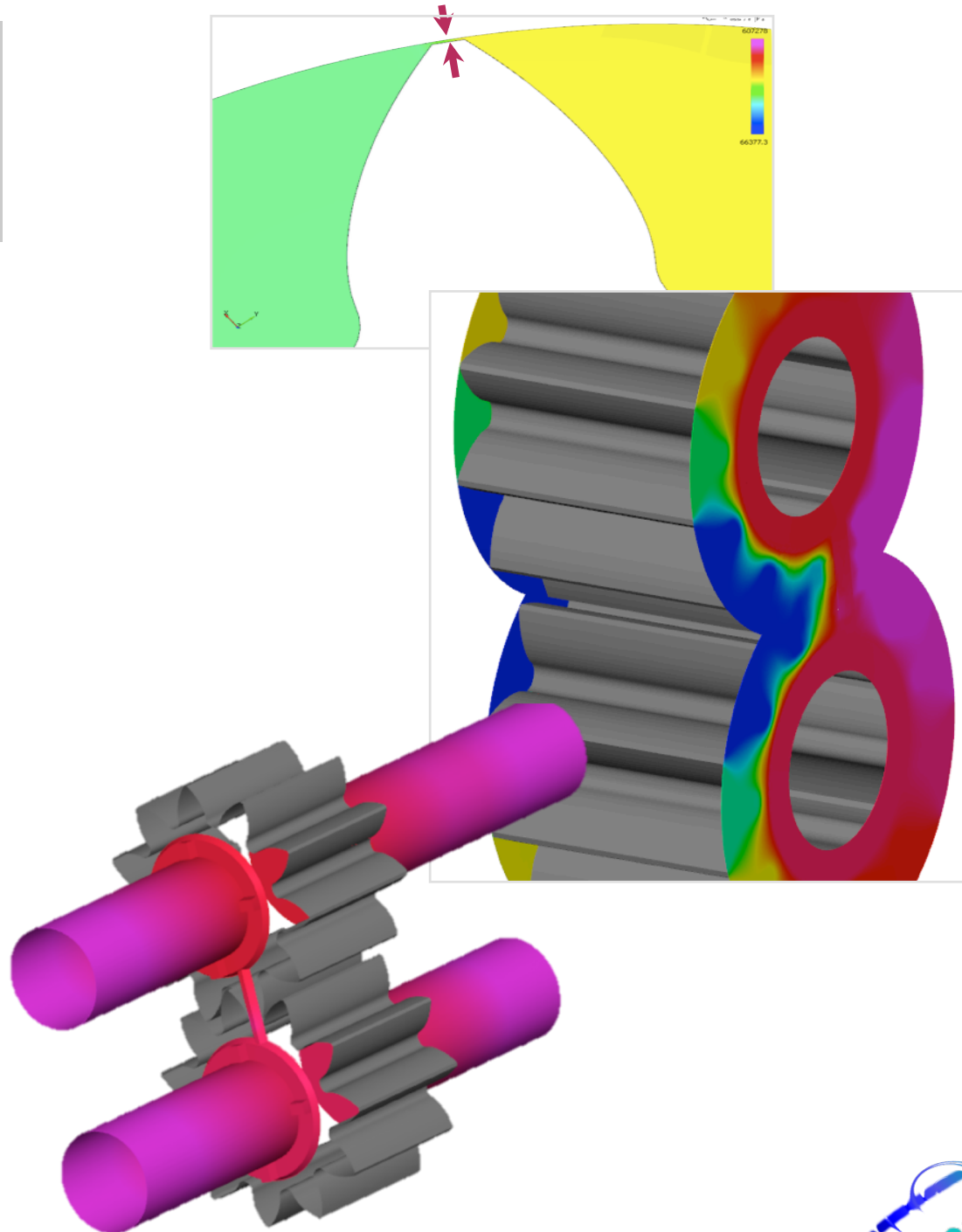


- Model set-up:
  - Pump Speed: 1350 rpm
  - Inlet Reservoir Pressure: 1 bar
  - Outlet Orifice Diameter: 0,3 mm
- CFD model monitored output for each configuration:
  - Average Pressure before the Orifice
  - Average Volumetric Flowrate at the Orifice
- Additional available output for each configuration:
  - Flow ripple  $[(q(t))]$  at the Orifice
  - Pressure ripple  $[p(t)]$  before the Orifice
  - Pressure/Velocity distribution in the domain
  - Required Power and Torque



# Tolerances definitions

- **Gear Radial Tolerance** (Radial Gap) is defined as the radial difference between the tooth radius and the gears housing radius. It is assumed to be the same for every gear tooth.
- **Gear Axial Tolerance** (Axial Gap) is defined as the axial space available between the gears and the pump housing. It is assumed to be equally distributed on each side of the gears.
- **Gear-Shaft Bushing Tolerance** (Bush Gap) is defined as the radial difference between the gear shaft and its bushing. It is assumed to be the same for each of the four bushings



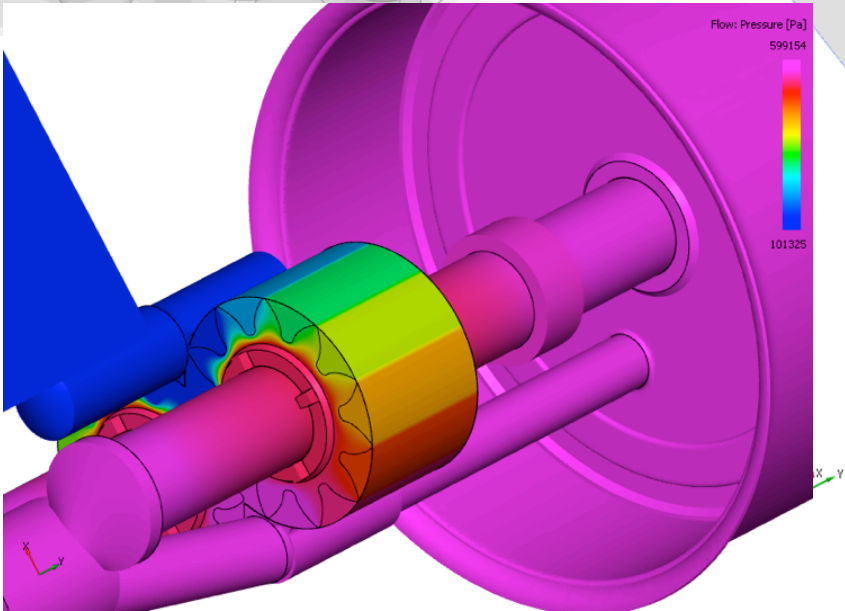
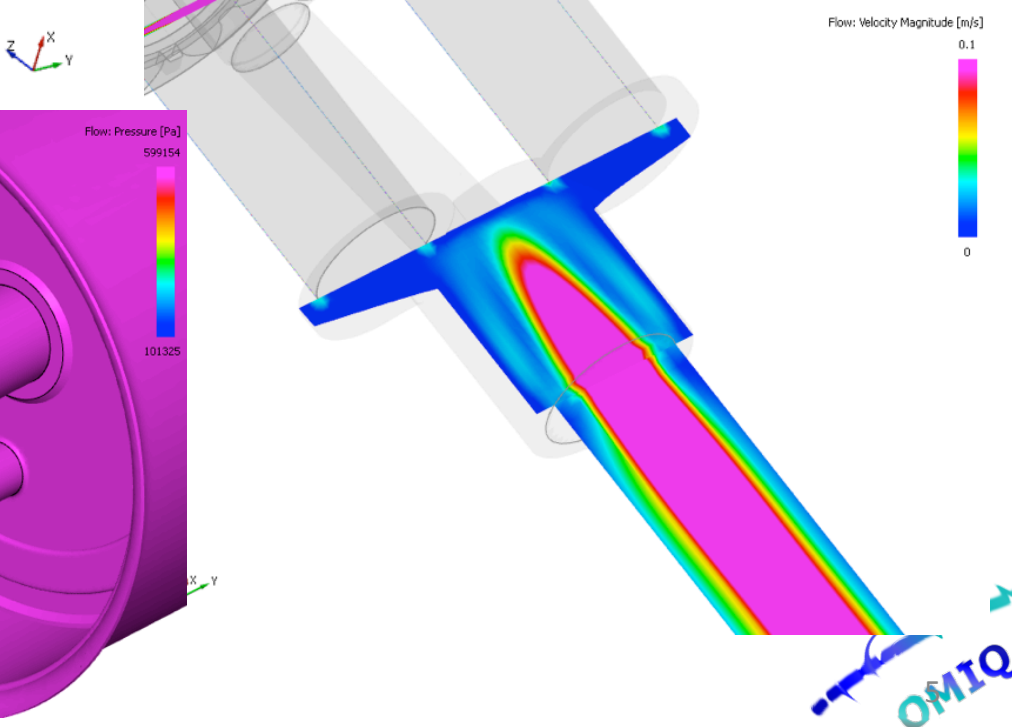
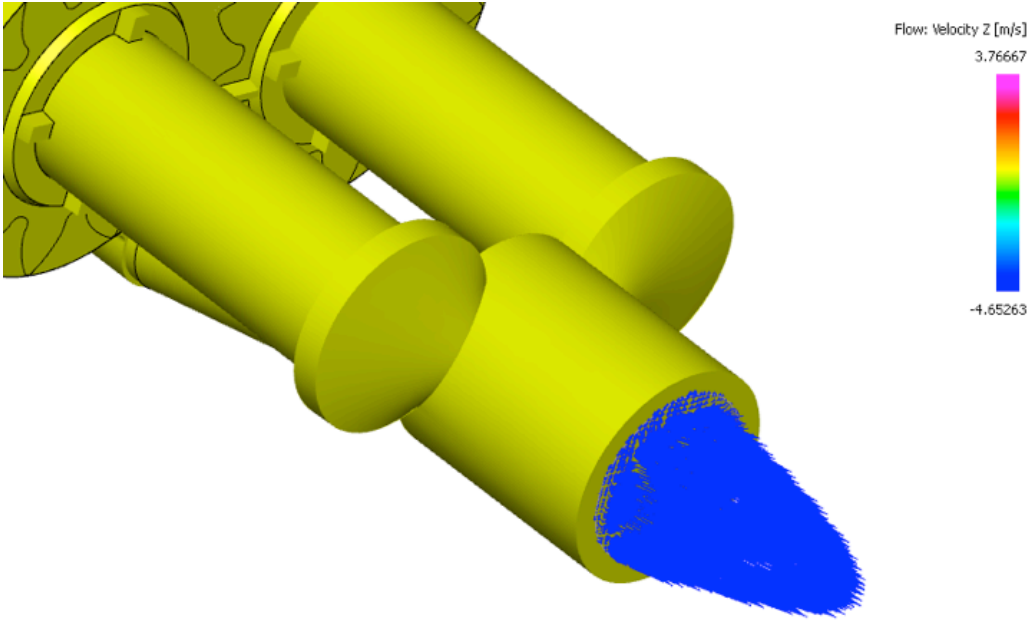
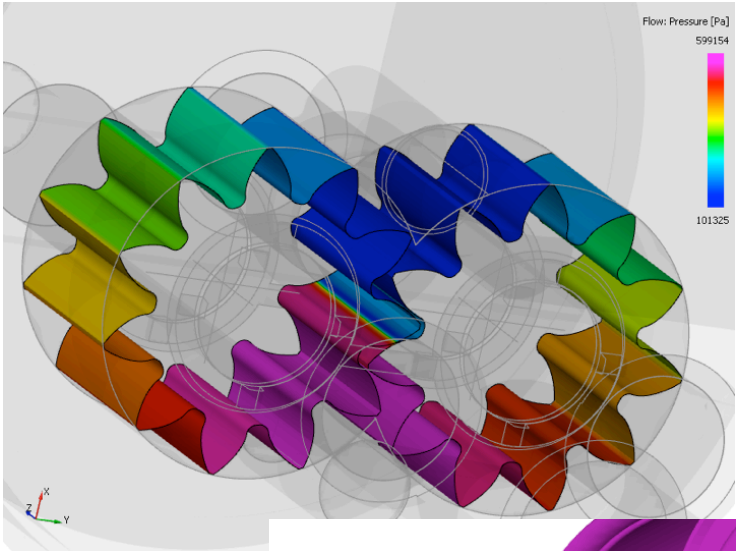
## DOE Definition

factor name	factor reference	Nominal gap value (microns)	Min gap value (microns)	Max gap value (microns)	Windows gap length (mm)	Gap number inside the pump	Nominal theoretical area (mm <sup>2</sup> )
<b>Axial gap</b>	A	25,500	20,000	31,000	11,86	1	0,30
<b>Radial gap</b>	B	22,500	15,000	30,000	14,04	2	0,63
<b>Bush gap</b>	C	14,500	5,000	24,000	9,04	4	0,52

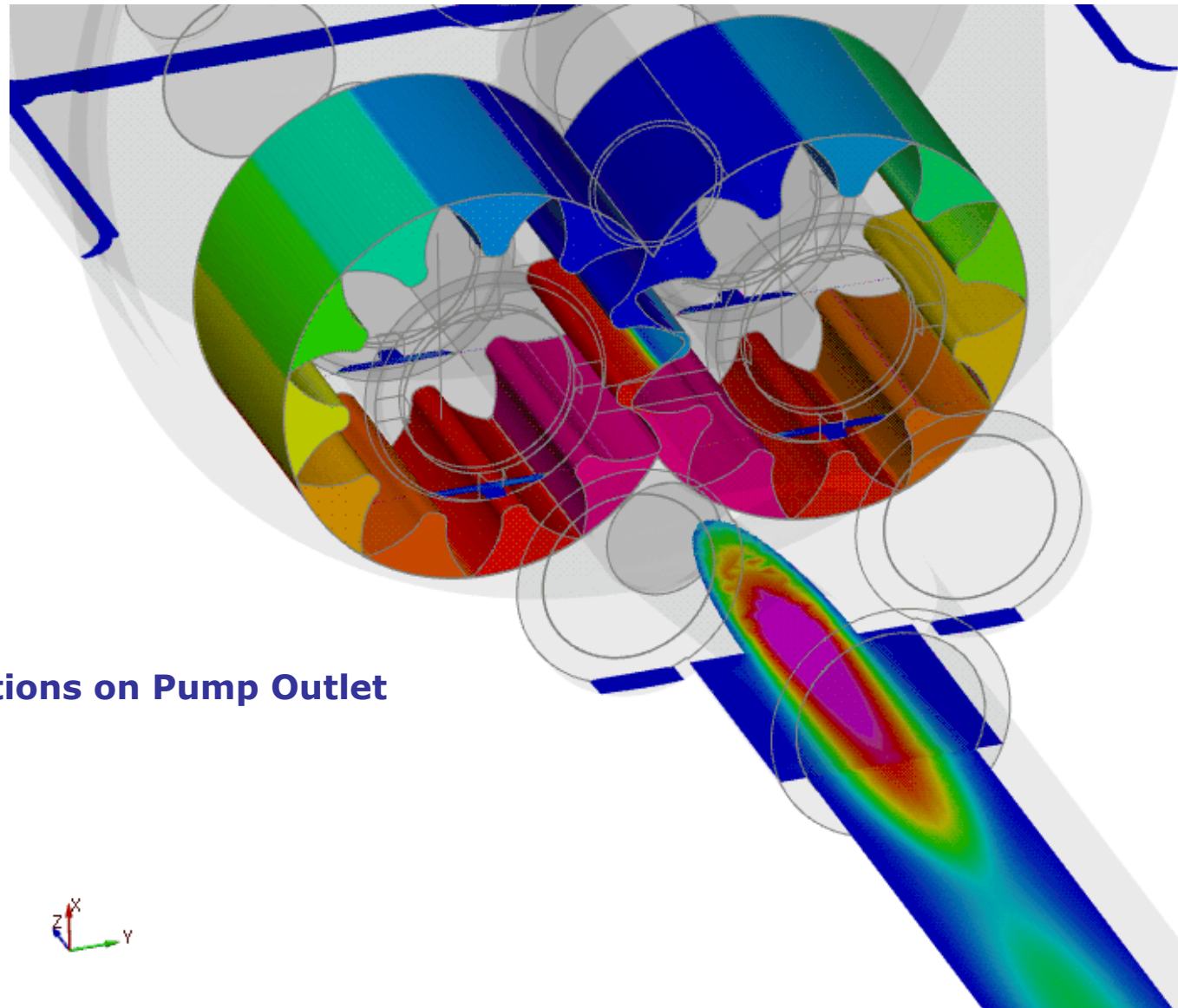
DOE : Central Composite Designs				
<ID>	Axial_gap	Radial_gap	Bush_gap	microns
0	20,00	15,00	5,00	
1	20,00	30,00	5,00	
2	20,00	15,00	24,00	
3	20,00	30,00	24,00	
4	31,00	15,00	5,00	
5	31,00	30,00	5,00	
6	31,00	15,00	24,00	
7	<b>31,00</b>	<b>30,00</b>	<b>24,00</b>	
8	20,00	22,50	14,50	
9	31,00	22,50	14,50	
10	25,50	22,50	5,00	
11	25,50	22,50	24,00	
12	25,50	15,00	14,50	
13	25,50	30,00	14,50	
14	25,50	22,50	14,50	Actual Lay-Out (nominal)
15	25,50	22,50	14,50	No bush_gap channel



# FlowField Results



## Results

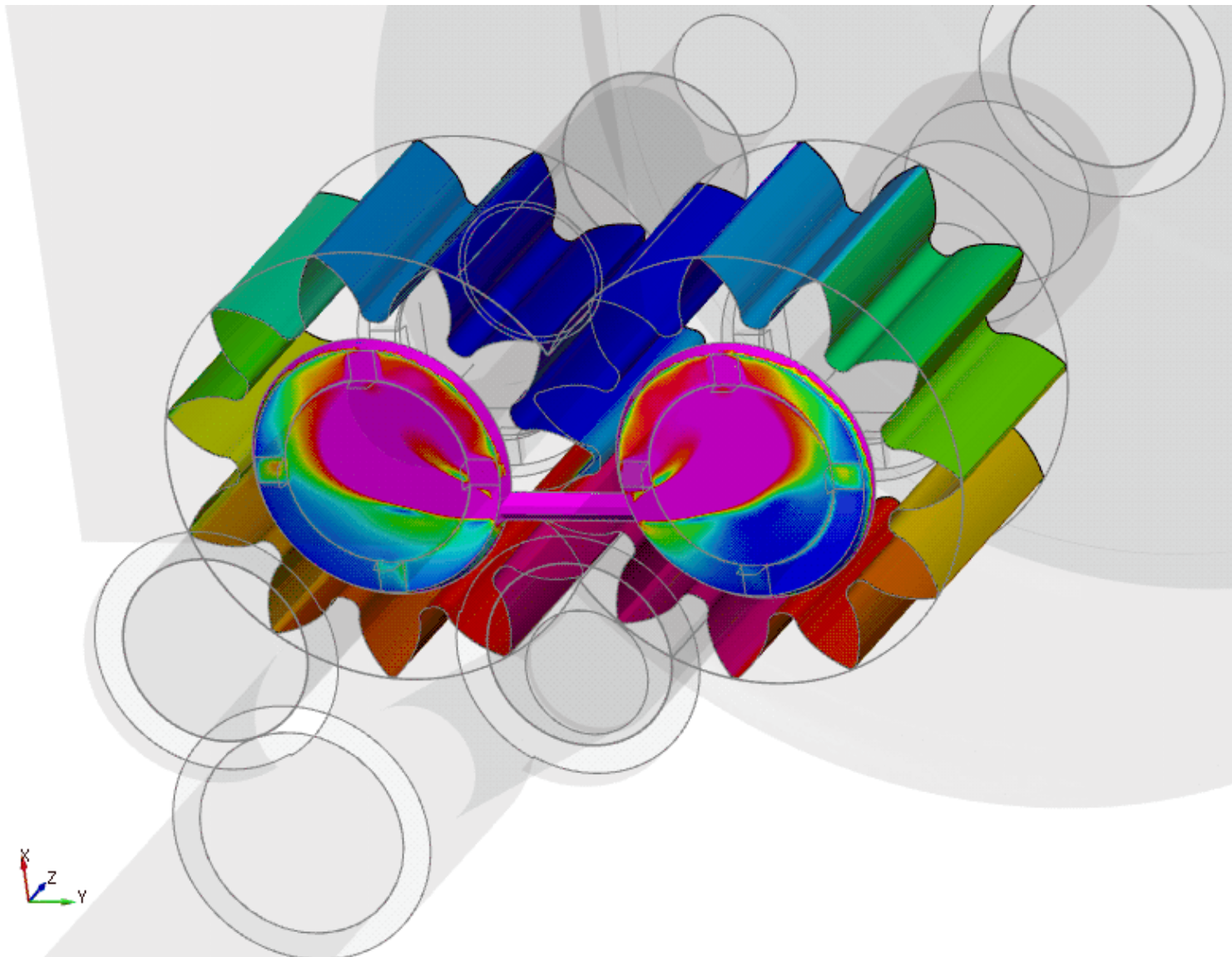


**Velocity pulsations on Pump Outlet**



## Results

Velocity magnitude pulsations in the axial gap, output side



# DOE Results

**Radial Gap** is the factor that mostly affects the pump performance

**Bush Gap** does not influence the pump performance

