Liquid distributor design optimization for Oil Processing Industry

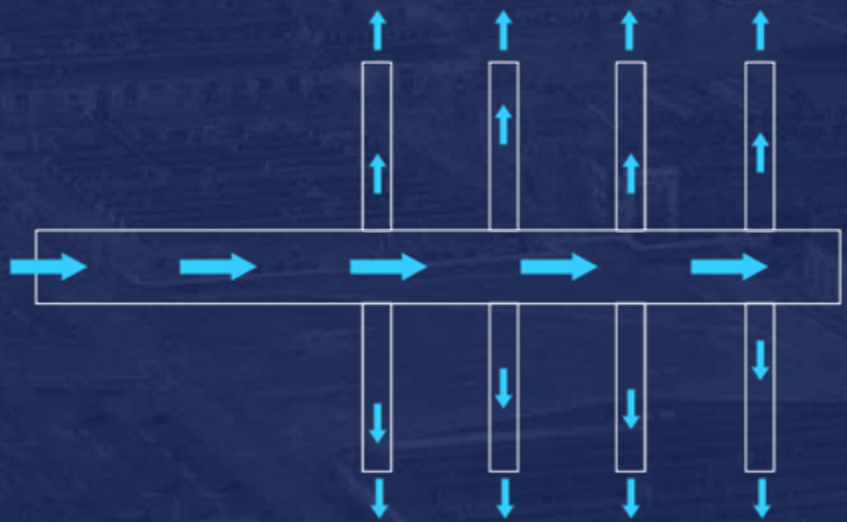
Liquid - water

Symmetry design:
(1 inlet tube and 8 outlet tubes)

Software being used:

CATIA V5	ANSYS ICEM CFD	FLUENT	IOSO NM
Geometry Parameterization	Mesh Construction	CFD Solver	Optimization

Liquid distributor design optimization for Oil Processing Industry



Purpose: One outlet tube has constant diameter 20

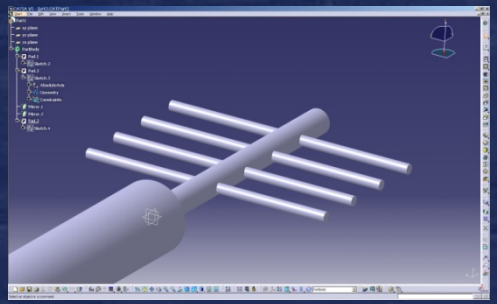
Other outlet tube diameters to be determined to ensure equal mass outflows from all tubes

Problem features:

3 independent variables – outlet tube diameters (from 20 to 40)

3 objectives (outflow differences between variable diameter tubes and constant diameter tube)

Liquid distributor design optimization for Oil Processing Industry

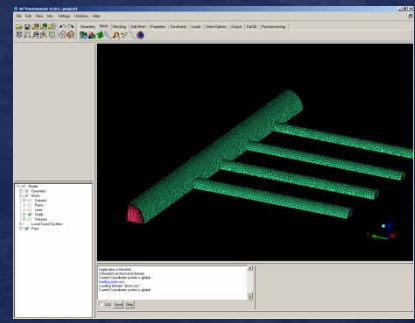


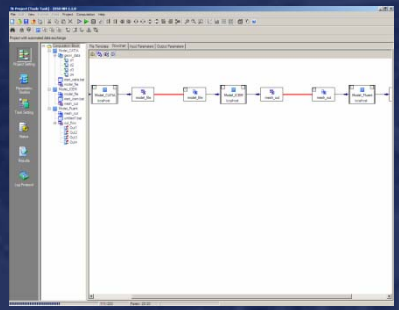
Geometry Parameterization

CATIA V5

Mesh Construction

ANSYS ICEM CFD



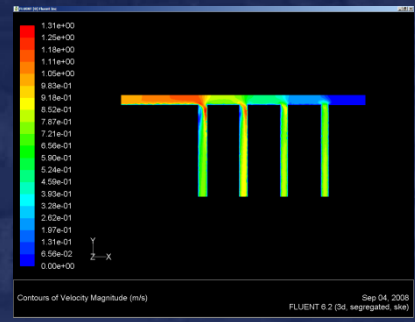


IOSO NM

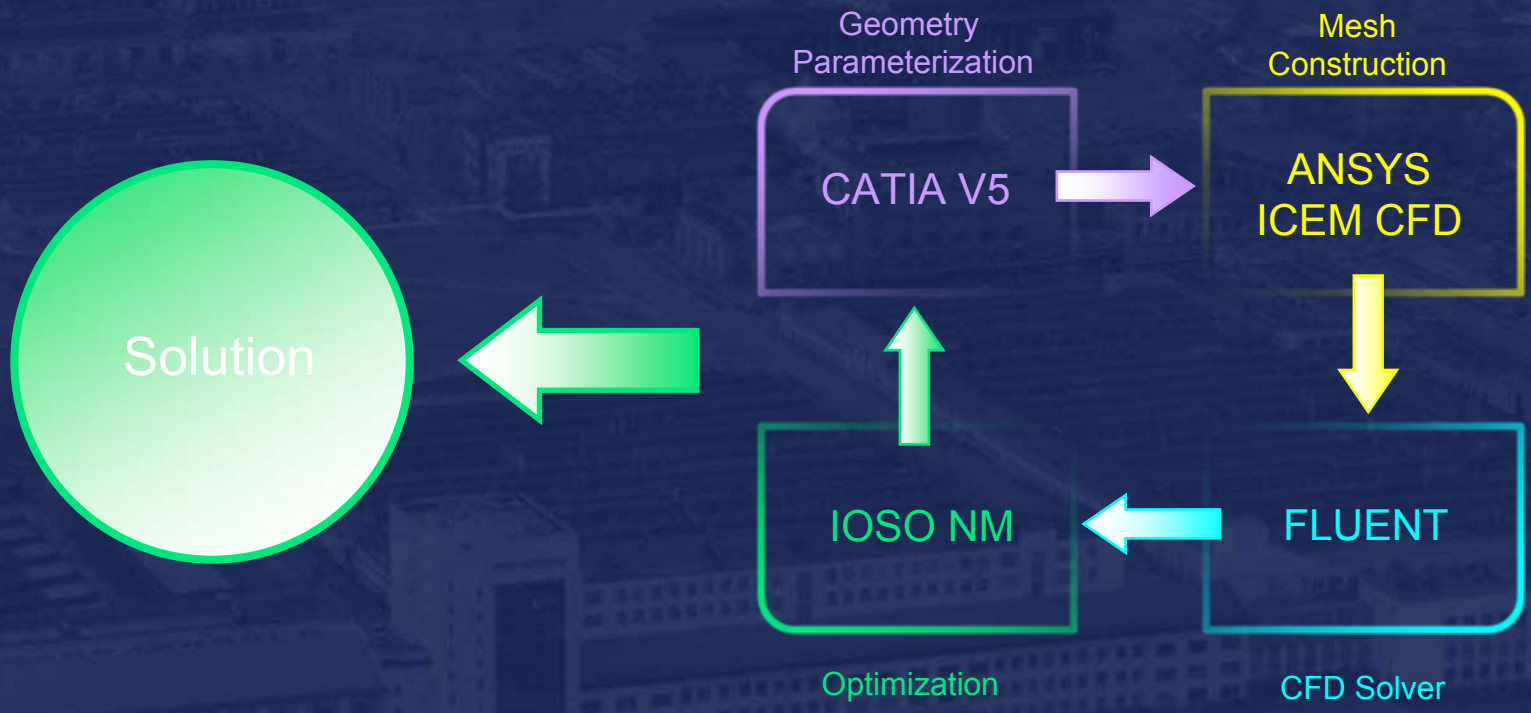
Optimization

FLUENT

CFD Solver



Liquid distributor design optimization for Oil Processing Industry



Liquid distributor design optimization for Oil Processing Industry

Results

Initial

№	Diameter	Mass flow
1	20	0,39
2	20	0,45
3	20	0,52
4	20	0,55

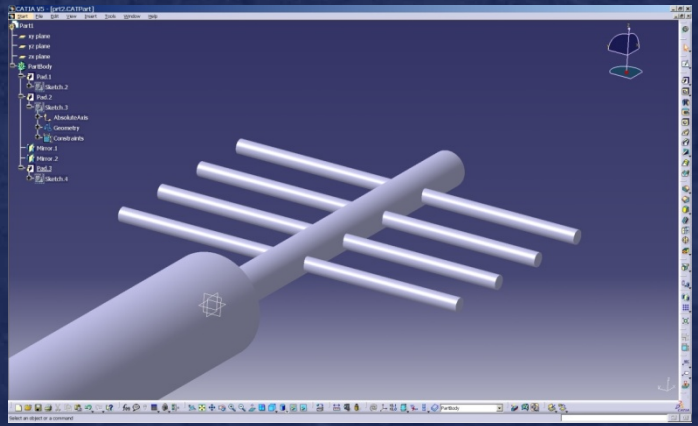
Optimized

№	Diameter	Mass flow
1	30	0,49
2	23	0,49
3	21	0,47
4	20	0,46

Liquid distributor design optimization for Oil Processing Industry

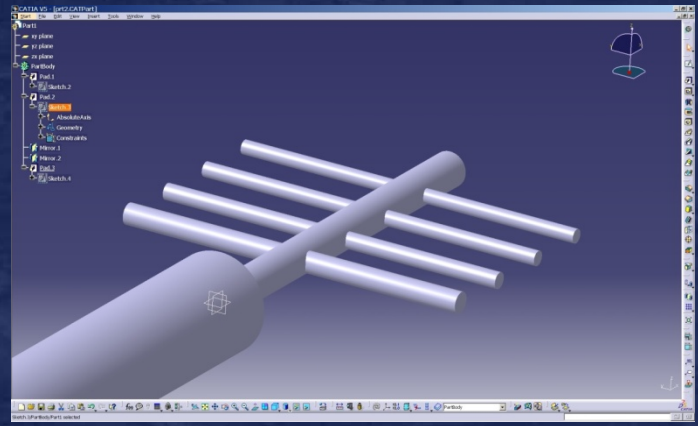
Results

Initial



№	Diameter	Mass flow
1	20	0,39
2	20	0,45
3	20	0,52
4	20	0,55

Optimized

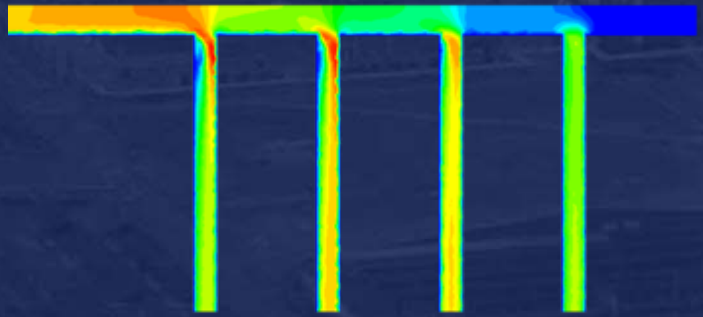


№	Diameter	Mass flow
1	30	0,49
2	23	0,49
3	21	0,47
4	20	0,46

Liquid distributor design optimization for Oil Processing Industry

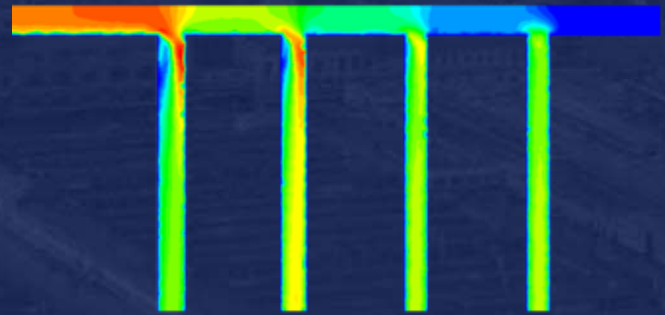
Velocity magnitude plots (FLUENT)

Initial



№	Diameter	Mass flow
1	20	0,39
2	20	0,45
3	20	0,52
4	20	0,55

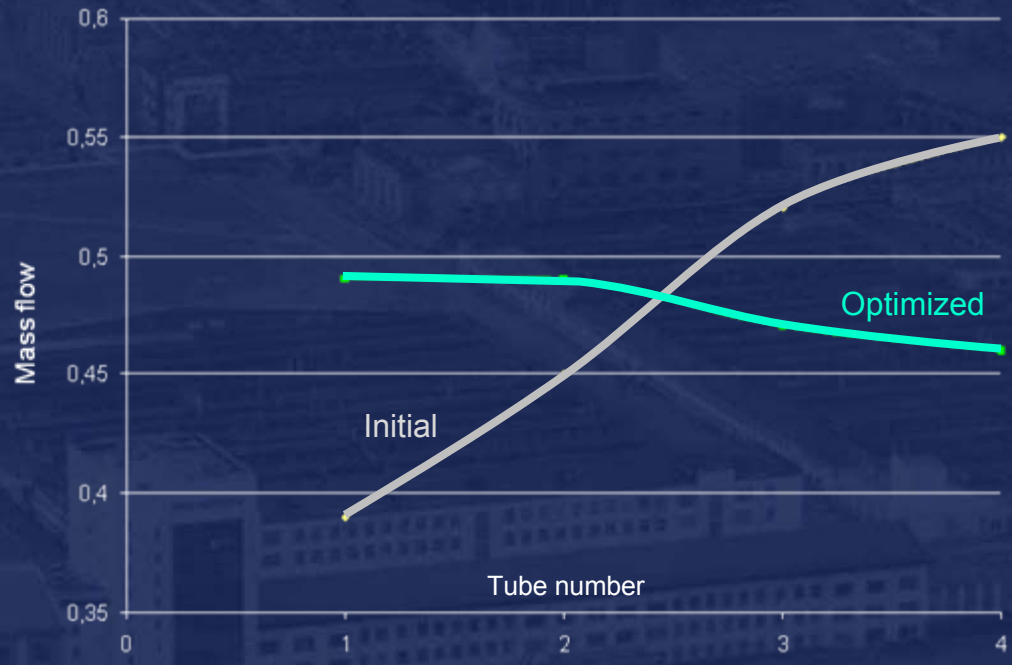
Optimized



№	Diameter	Mass flow
1	30	0,49
2	23	0,49
3	21	0,47
4	20	0,46

Liquid distributor design optimization for Oil Processing Industry

Conclusions



Liquid Distributor geometrical parameters have been optimized to satisfy uniform criteria distribution of outlet mass flows