

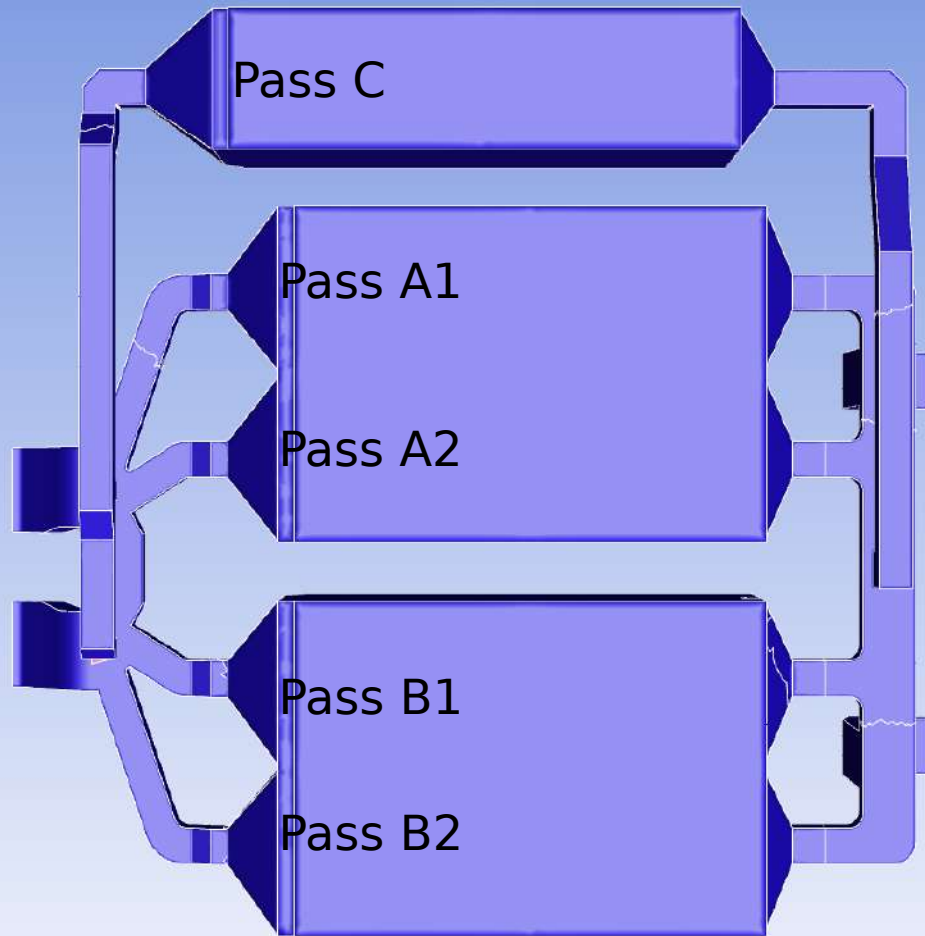


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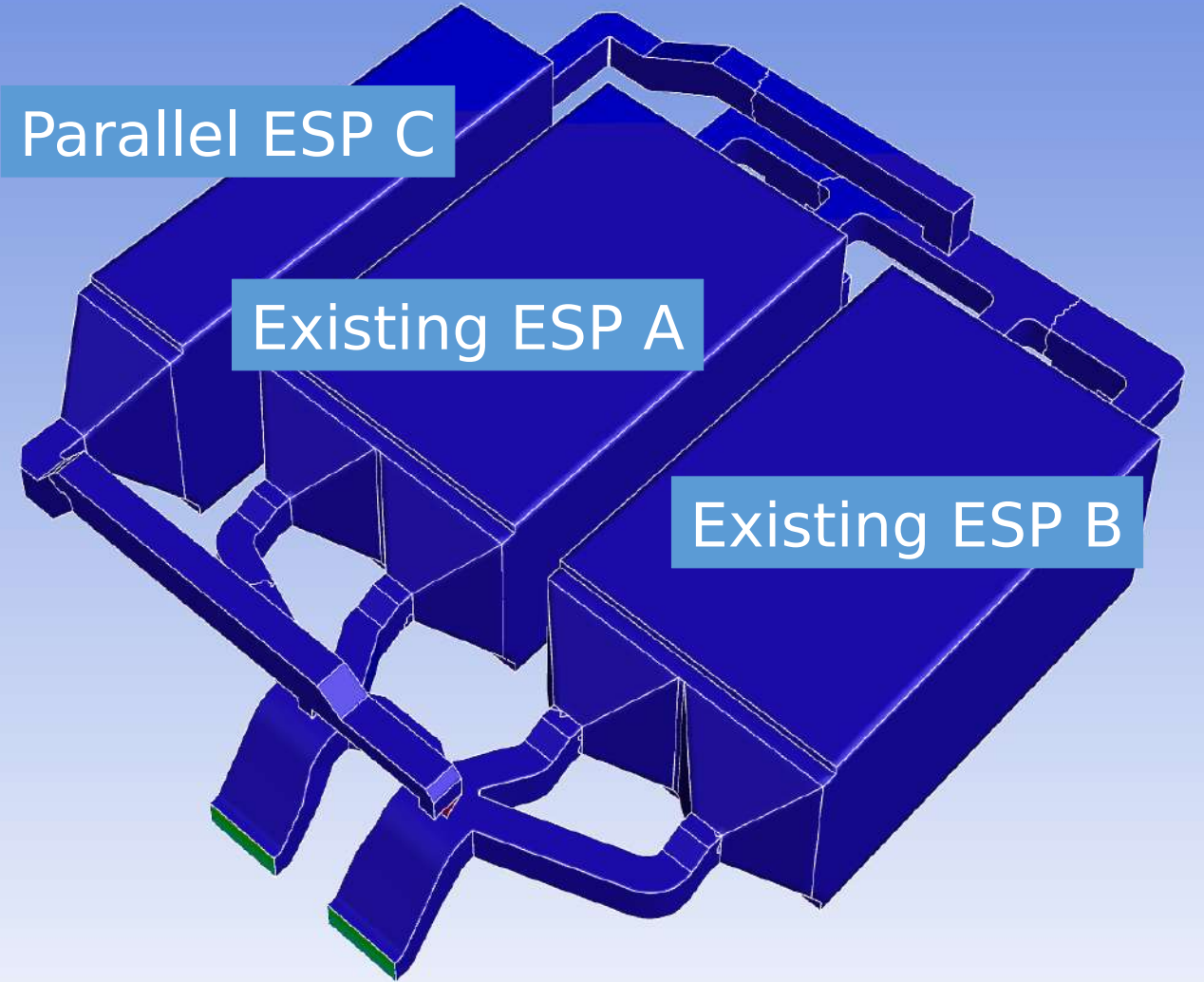
# Control Damper Position For equal Flow Distribution among ESP's

**(200 MW Boiler)**

# CFD Models

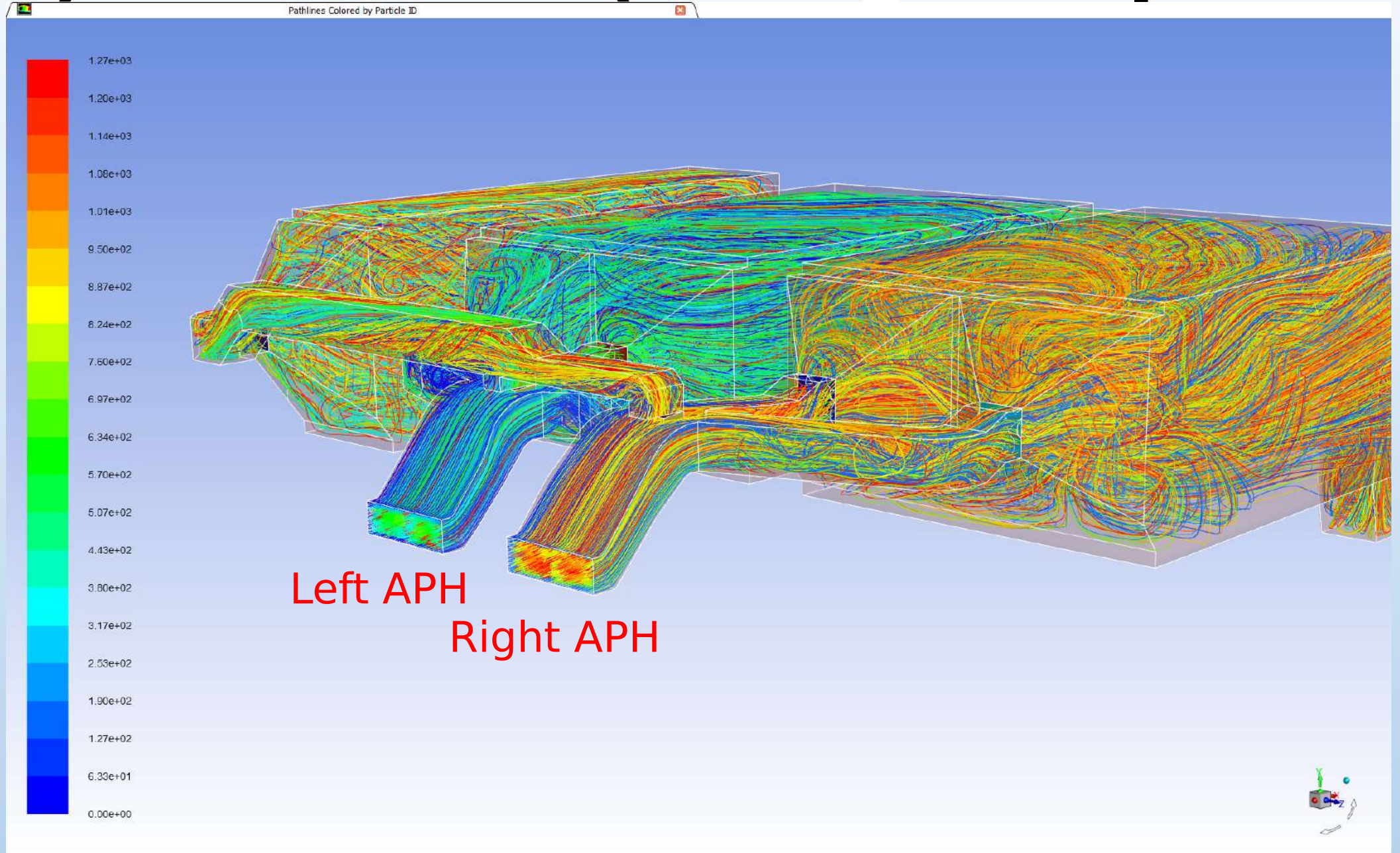


**Plan View**



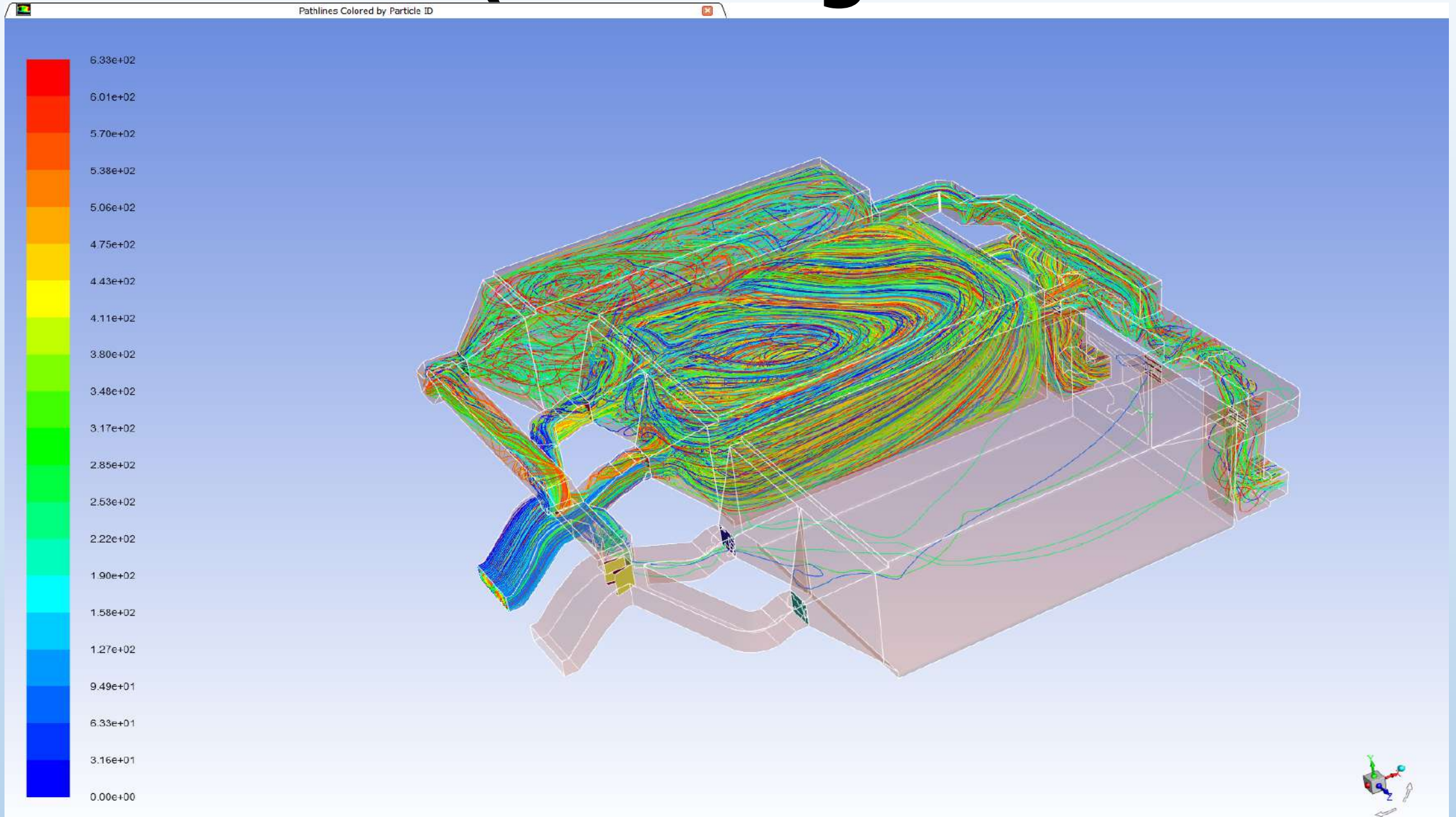
**Isometric View**

# a) Path Lines (with guide plates)

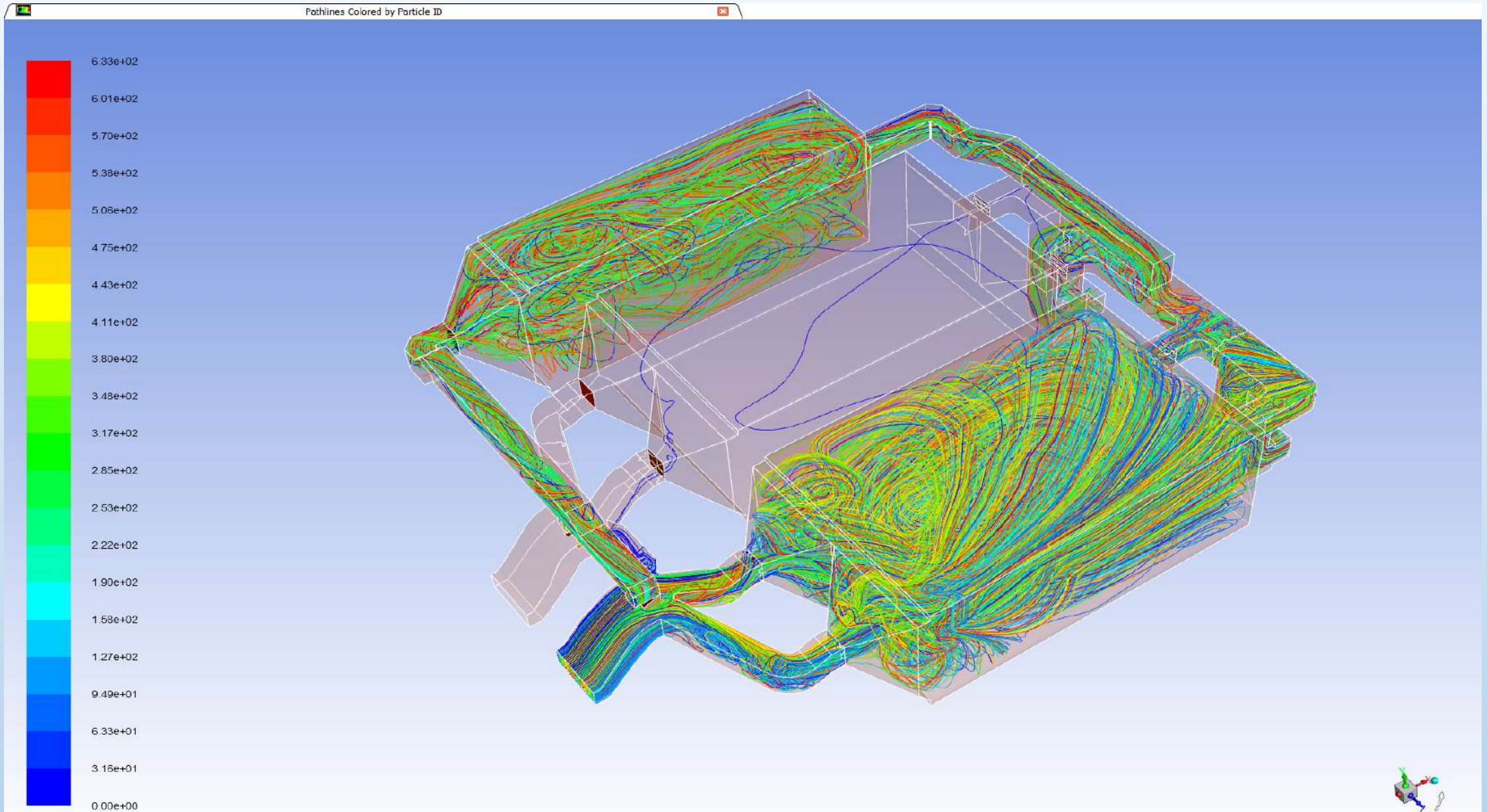




# b) Path Lines (With Right APH Isolated)



# c) Path Lines (with Left APH Isolated)



# CFD Results

Case A – All 5 ESP's are in Operation

Isolation of one ESP and  
Remaining Four ESP's are in Operation

Case B – Isolation of New ESP

Case C – Isolation of ESP A1 Pass

Case D – Isolation of ESP A2 Pass

Case E – Isolation of ESP B1 Pass

Case F – Isolation of ESP B2 Pass

# CFD Results

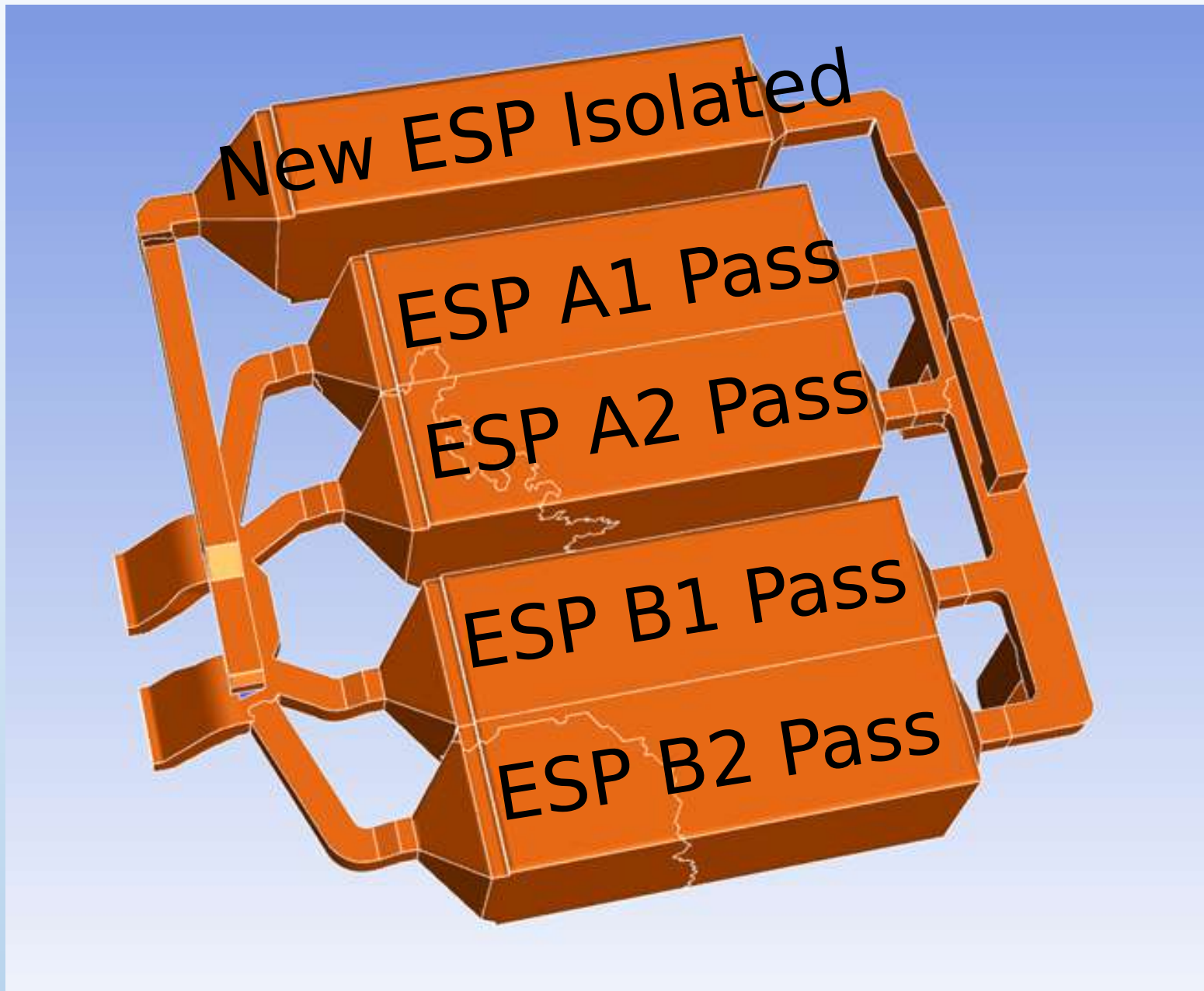
Case A - All 5 ESP's are in Operation

# CFD Results

Isolation of one ESP and  
Remaining Four ESP's are in Operation

Case B – Isolation of New ESP





Volumetric Flow Rate	(m3/s)
aph_left_inlet	211.22057
aph_right_inlet	218.72983
id_fan_inlet	-429.99015
pass_a1	-106.97327
pass_a2	-112.34531
pass_b1	-101.68626
pass_b2	-108.76291
pass_c	0
Net	-429.8075



# Flow Distribution Pattern

	<b>Location</b>	<b>Flow Required</b>	<b>Flow Achieved</b>	<b>% of Deviation</b>
<b>Pass -A1</b>	<b>Inlet</b>	107.5	106.97	-0.49
<b>Pass -A2</b>	<b>Inlet</b>	107.5	112.35	+4.51
<b>Pass -B1</b>	<b>Inlet</b>	107.5	101.69	-5.40
<b>Pass -B2</b>	<b>Inlet</b>	107.5	108.76	+1.17

	<b>Location</b>	<b>Flow Required</b>	<b>Flow Achieved</b>	<b>% of Deviation</b>
<b>New ESP</b>	<b>Inlet</b>			ISOLATED

**Damper to be closed for Pass A1 = 50.0 %**

**Damper to be closed for Pass A2 = 50.0 %**

**Damper to be closed for Pass B1 = 50.0 %**

**Damper to be closed for Pass B2 = 50.0 %**

**Damper to be closed for New ESP = 0 %**

**CFD Study conducted  
for ID Fan Isolation case**



# CFD Results

Case G - All 5 ESP's are in Operation  
with Isolation of Left side ID Fan A

Volumetric Flow Rate	(m3/s)
aph_left_inlet	209.79301
aph_right_inlet	220.20601
left_id_fan_inlet	0
pass_a1	-85.14600
pass_a2	-89.39351
pass_b1	-79.67555
pass_b2	-84.85540
pass_c	-90.87629
right_id_fan_inlet	-430.00000
Net	-429.95000

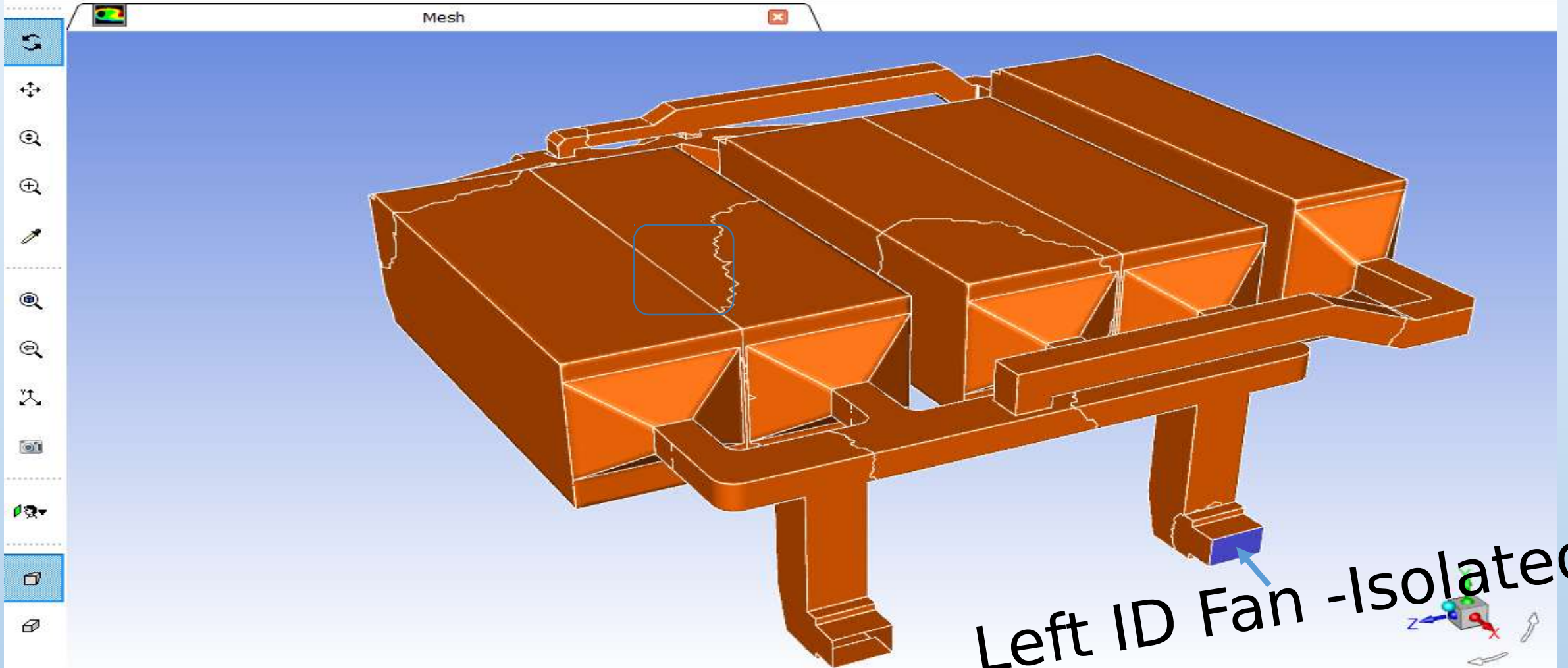
As per design condition, Total Flow rate (All ESP) = 430 m3/s

Required Volumetric flow rate through NEW Parallel ESP = 100 m3/s

Required Volumetric flow rate through Existing ESP A = 165 m3/s

Required Volumetric flow rate through Existing ESP B = 165 m3/s

Average Flow through Each Pass A1/A2/B1/B2 = 82.5 m3/s





# Flow Distribution Pattern

	Location	Flow Required	Flow Achieved	% of Deviation
Pass -A1	Inlet	82.5	85.15	+3.21
Pass -A2	Inlet	82.5	89.39	+8.35
Pass -B1	Inlet	82.5	79.68	-3.42
Pass -B2	Inlet	82.5	84.86	+2.86

	Location	Flow Required	Flow Achieved	% of Deviation
New ESP	Inlet	100	90.88	-9.12

## Isolation of Left ID Fan A

**Damper to be closed for Pass A1 = 50.0 %**

**Damper to be closed for Pass A2 = 50.0 %**

**Damper to be closed for Pass B1 = 62.5 %**

**Damper to be closed for Pass B2 = 62.5 %**

**Damper to be closed for New ESP = 0 %**



# **CFD Results**

## **Damper position- Comparison chart**

# CFD Results

## Damper position-Comparison chart

	Location	Damper position - Case A - No Isolation	Damper position - Case B-Isolation of New ESP	Damper position - Case C -Isolation of Pass A1	Damper position - Case D - Isolation of Pass A2	Damper position - Case E - Isolation of Pass B1	Damper position - Case F - Isolation of Pass B2
Pass - A1	Outlet	37.5 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed
Pass - A2	Outlet	75 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed
Pass - B1	Outlet	75 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed
Pass - B2	Outlet	37.5 % Closed	50 % Closed	50% Closed	50 % Closed	50 % Closed	50 % Closed

# 1) Highlights of the comparison chart

	Location	Damper position - Case A - No Isolation	Damper position - Case B-Isolation of New ESP	Damper position - Case C -Isolation of Pass A1	Damper position - Case D - Isolation of Pass A2	Damper position - Case E - Isolation of Pass B1	Damper position - Case F - Isolation of Pass B2
Pass - A1	Outlet		50 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed
Pass - A2	Outlet		50 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed
Pass - B1	Outlet		50 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed
Pass - B2	Outlet		50 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed
New ESP - Pass C	Outlet	<b>All are 50 % Closed for case B - F</b>					

# 3) Highlights of the comparison chart

	Location	Damper position - Case A - No Isolation	Damper position - Case B-Isolation of New ESP	Damper position - Case C -Isolation of Pass A1	Damper position - Case D - Isolation of Pass A2	Damper position - Case E - Isolation of Pass B1	Damper position - Case F - Isolation of Pass B2
Pass - A1	Outlet	37.5 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed
Pass - A2	Outlet	75 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed
Pass - B1	Outlet	75 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed	50 % Closed
Pass - B2	Outlet	37.5 % Closed	50 % Closed	50% Closed	50 % Closed	50 % Closed	50 % Closed
New ESP -	Outlet	Fully opened	Fully opened	Fully opened	Fully opened	Fully opened	Fully

**Fully Opened For all the Cases**