REITZ INDIA LIMITED
Efficient Operation of Fan

REITZ INDIA LIMITED
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WINDS OF GLORY - OUR HISTORY

Reitz India Limited (RIL)

Indo-German joint venture since 1998.

Technical and financial collaboration of Konrad Reitz Ventilatoren GmbH (KRV) Germany, a leader in centrifugal technology in Europe.

25
YEARS

RIL & KRV have remained Progressive Partners in catering tailor-made precise solutions to its Customers.

The relationship of KRV & RIL is a hallmark of the flourishing Indo - German collaboration in these times.

40K
FANS

Since inception Reitz India has delivered more than 40,000 fans globally.

“At the Heart of Perfect Systems…”

M ANUFACTURING UNIT - 1

REITZ
PASHAM YLARAM FACILITY

Location:
Hyderabad, India.

Work force:
500 (Approx.)

Built up Area:
12000 Sq.m

Address:
Survey Nos. 116 & 117
Pashamylaram, Patancheru Mandal,
Hyderabad -502 309, Telangana, India.

M ANUFACTURING UNIT - 2

REITZ CHERIYAL FACILITY

Location:
Hyderabad, India.

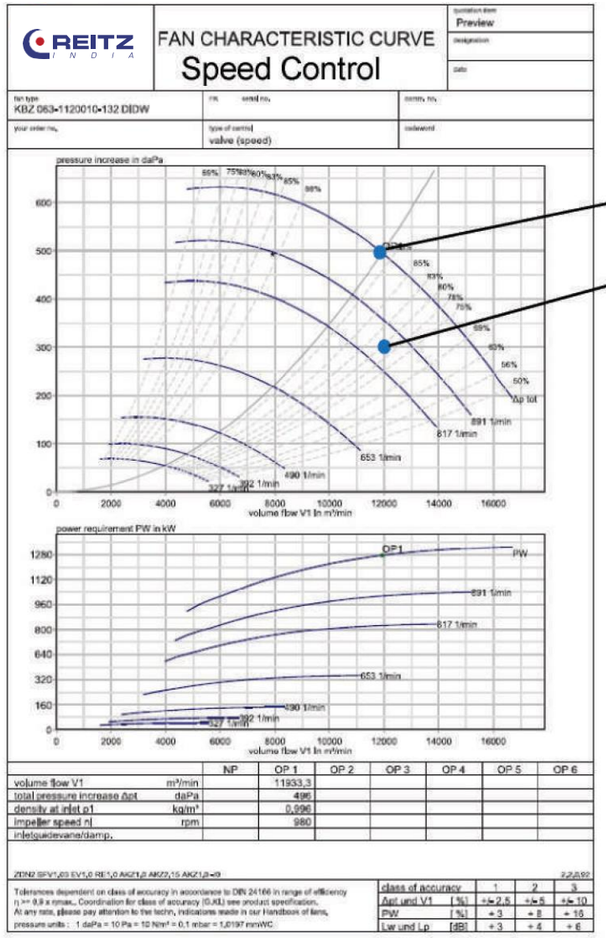
Work force:
140 (Approx.)

Built up Area:
5000 Sq.m

Address:
Survey Nos. 102 & 340
Cheriyal, Kandi Mandal,
Sangareddy -502 285, Telangana, India

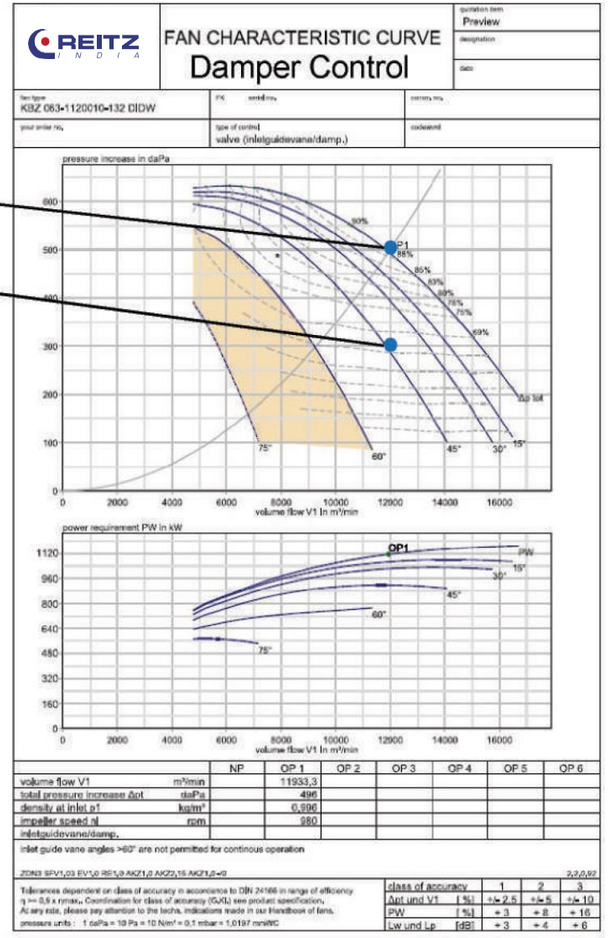
REITZ GROUP COMPANIES WORLD WIDE

Design & Actual Operating Parameters



Design

Actual



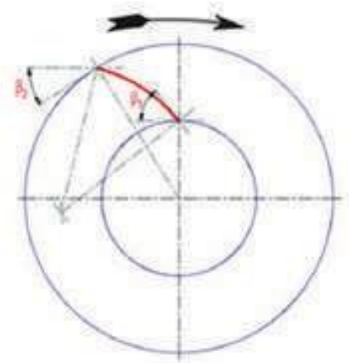
To Minimise Losses in fan accessories

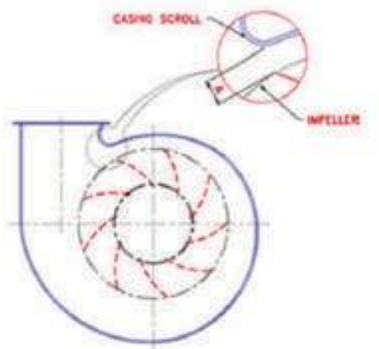
Air / Gas Velocity at fan Inlet:

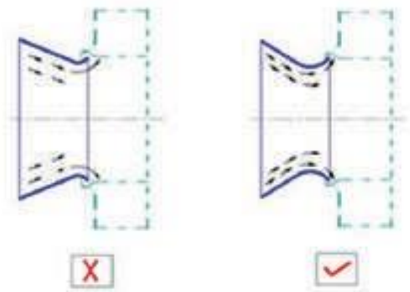
Inlet Box	- Vel : 15 ~ 30 m/s
Inlet Damper	- Vel : 15 ~ 30 m/s
Flexible Bellows	- Vel : 15 ~ 30 m/s
Inlet Silencer	- Vel : 4.5 to 6.3 m/s

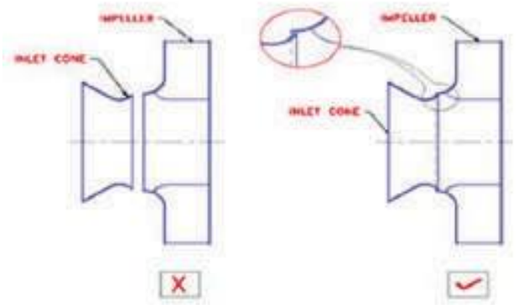
Prime Features While Designing The High Efficiency Fans For Cement Industry:

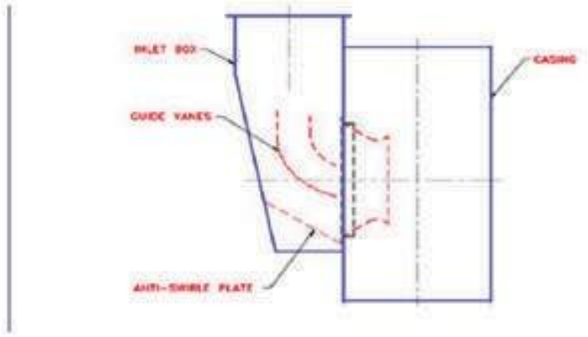
- Profile of blades
- Involute of Casing
- Profile of Inlet Cone
- Construction of Inlet Box



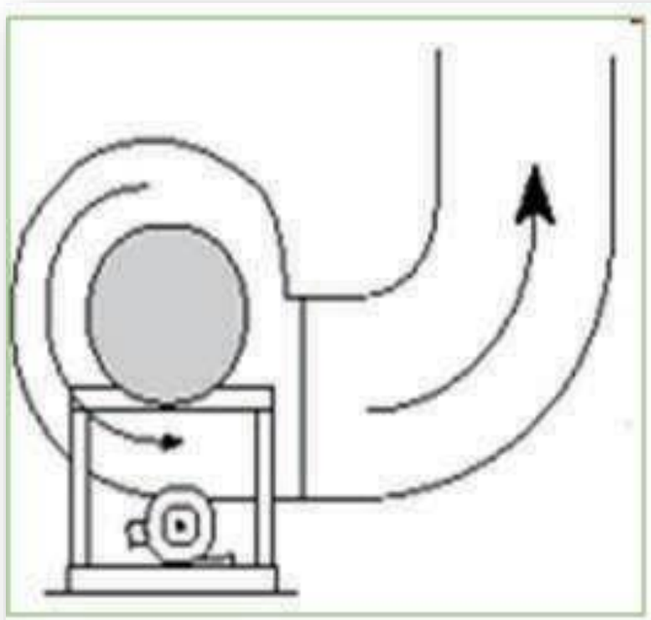


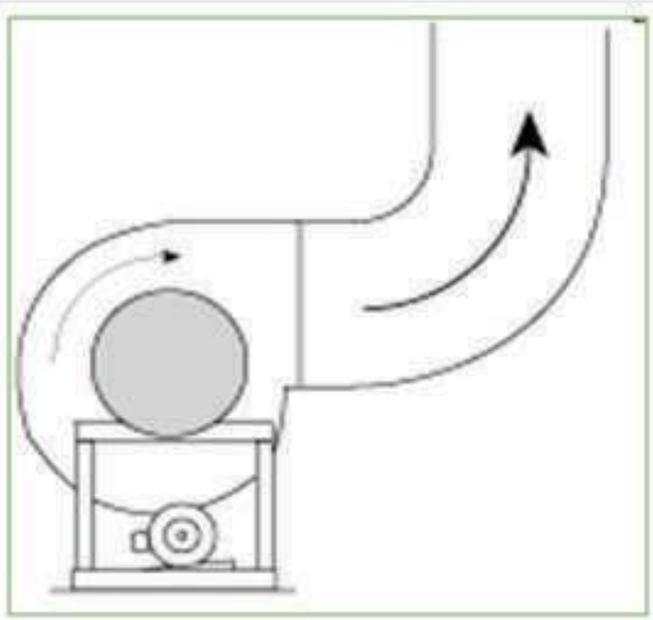






Recommended Layout

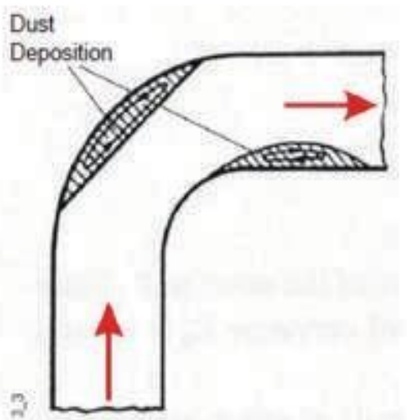




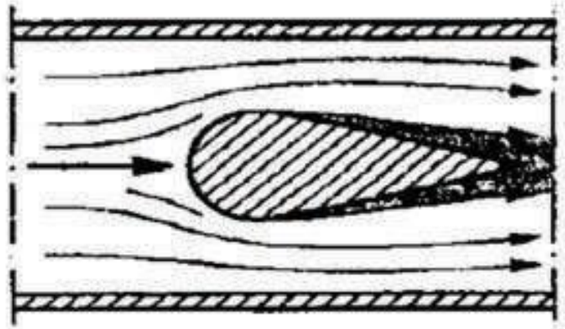
Recommended

Not Recommended

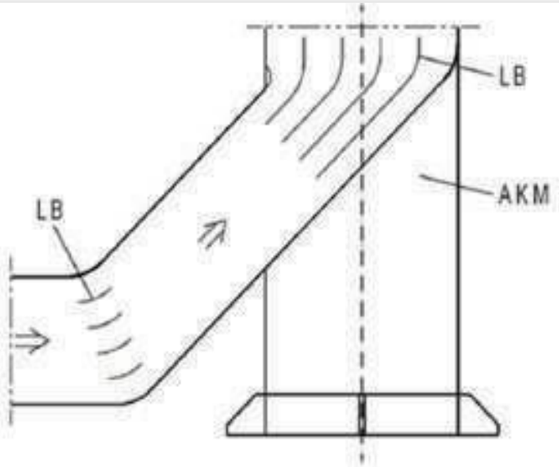
Aerodynamics Inside Ducts:



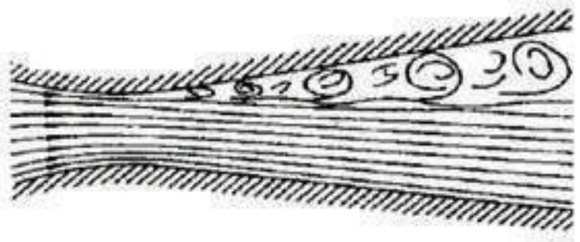
• Stalls at duct bend



• Obstacles inside duct



• Proper vent angle > 40 deg.with splitters

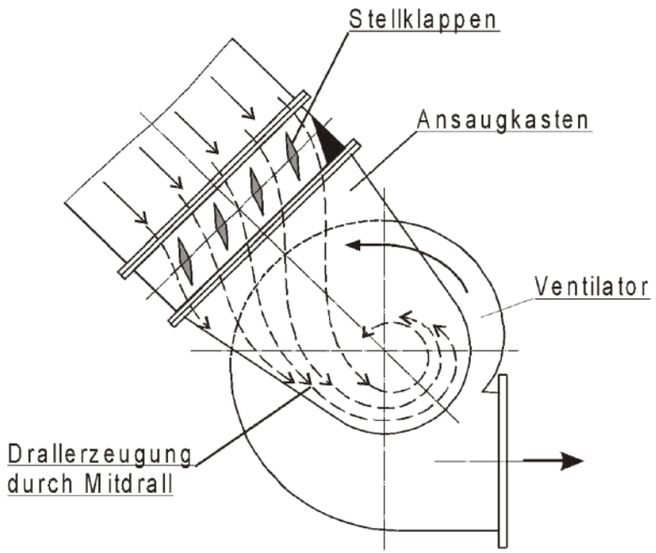


• Poor diffuser – over widened

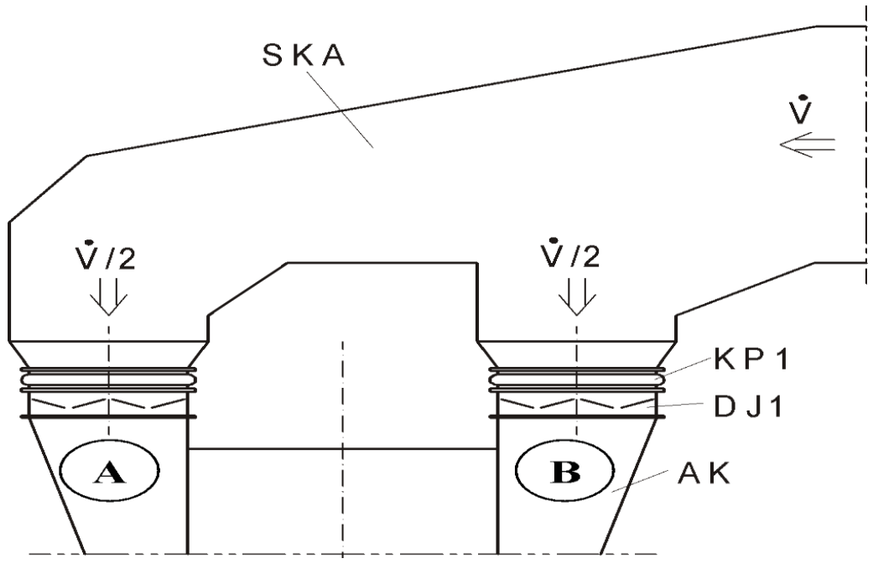
Recommended Layout :

MULTI LOUVRE INLET DAMPER (MLID):

- MLID also gives a spin forward or pre-swirl in the inlet box, which produces vortex.
- Anti-swirl plates in the inlet box cuts this vortex and thus reduces losses…

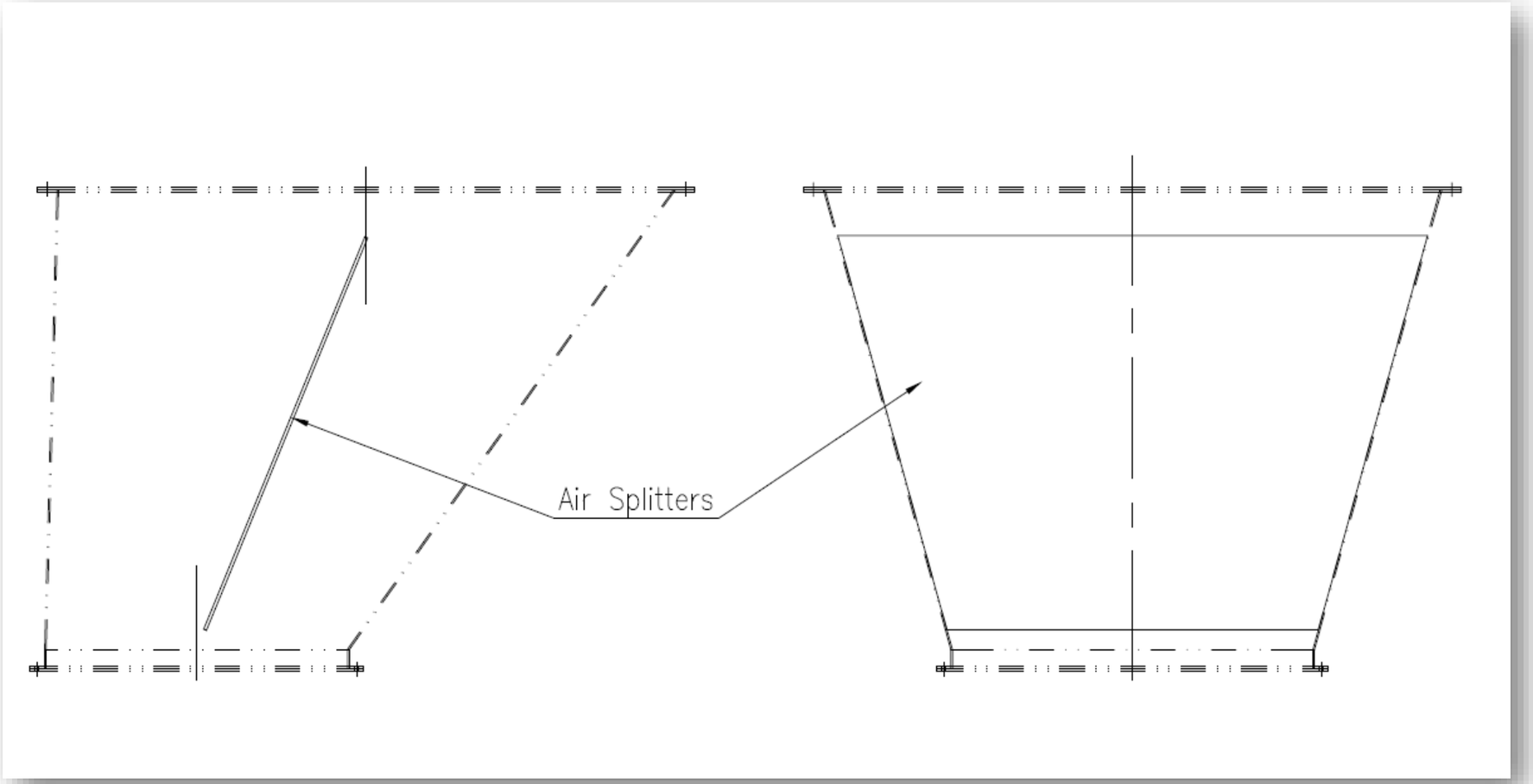


- Whirl by spin forward arrangement of MLID



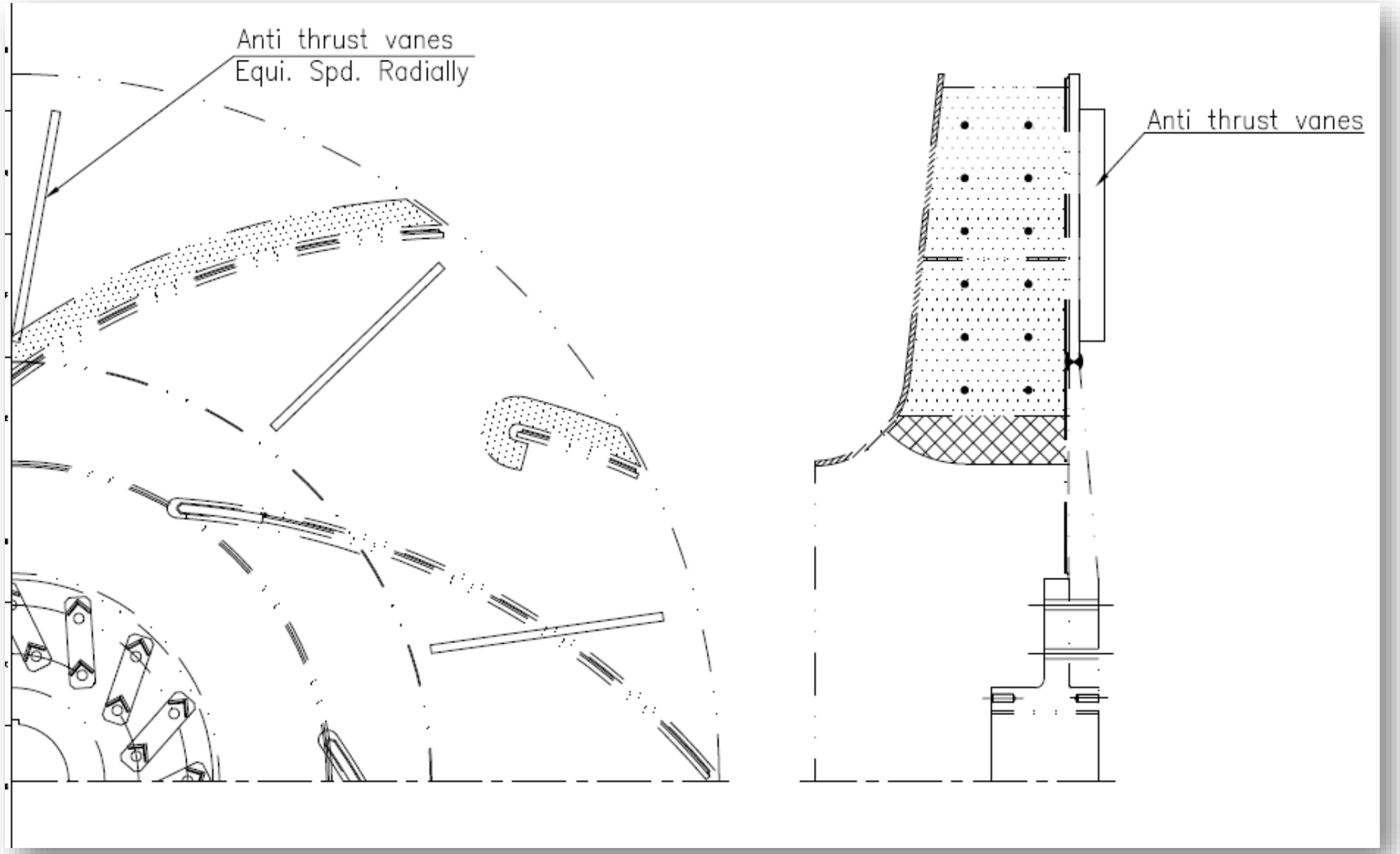
- Asymmetric inlet flow from distribution duct

Air Splitters

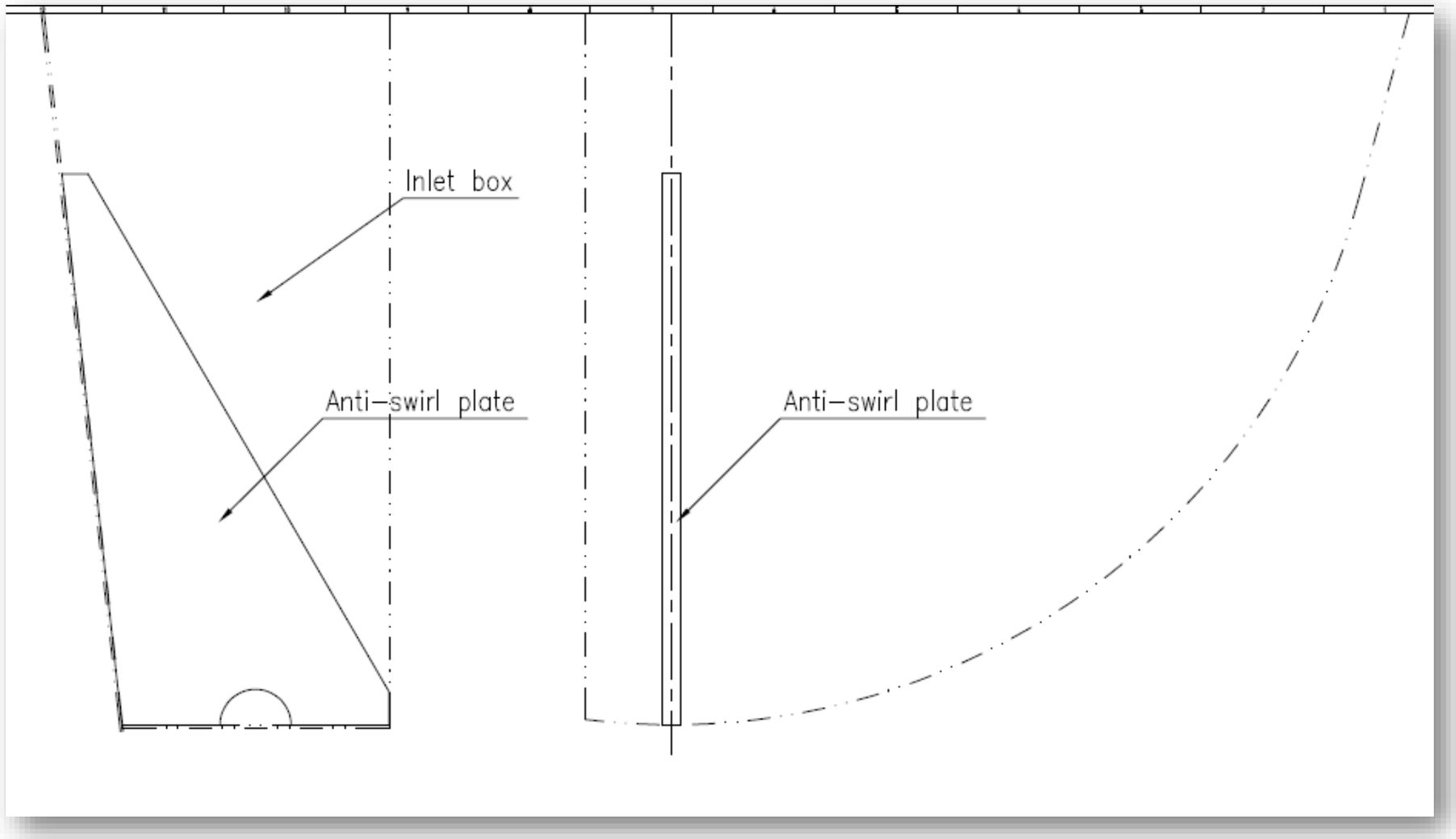


Air splitter in Duct

Anti – Thrust Vanes



Anti – Swirl Plates



Option-1
Backward curved bladed impeller:

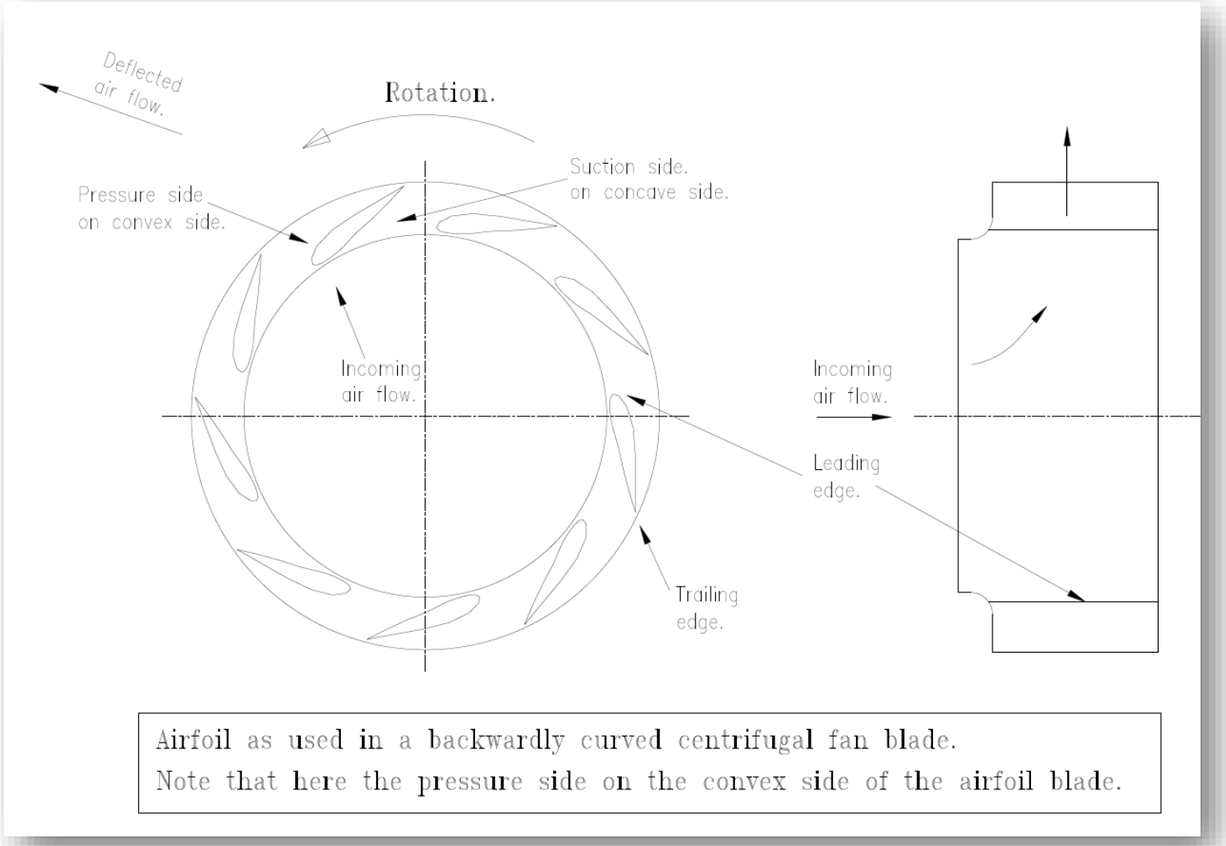
Advantages:

- The blades are having single thickness and are easy to manufacture maintaining blade angle to required level with better accuracy.
- This construction can be used for dusty application also, since wear and tear due to presence of dust in the flow can be protected by using hard faced layer on blade working surface directly and we are really not worried of blade puncture.
- The efficiency of fan can be maintained high with latest technology. You may find that efficiency of fan is even better than aerofoil bladed impeller.

Disadvantages:

- Sometimes backward curved blade cannot be made mechanically viable, if the flow rate is found to be too high and impeller is too wide. In that case, aerofoil bladed impeller is preferable for ease of construction and for mechanically viability.
- But for the present application, we can comment that backward curved bladed impeller offered by us is ideal, since flow is not very high (10,20,000 m3/hr and pressure is considerably high i.e. 130 mbar). Here, it may be added that blade outlet angle of the offered impeller is 45 deg. And also suitable for dusty application, where dust repose angle is below 35 deg (we presume for cement industry, dust repose angle is generally very near to 30 deg.) since offered impeller is having outlet angle of 45 deg.

The accumulation of dust on back of blade is ruled out and is suitable for present application.



Airfoil as used in a backwardly curved centrifugal fan blade.
Note that here the pressure side on the convex side of the airfoil blade.

Option-2
Aerofoil bladed impeller:

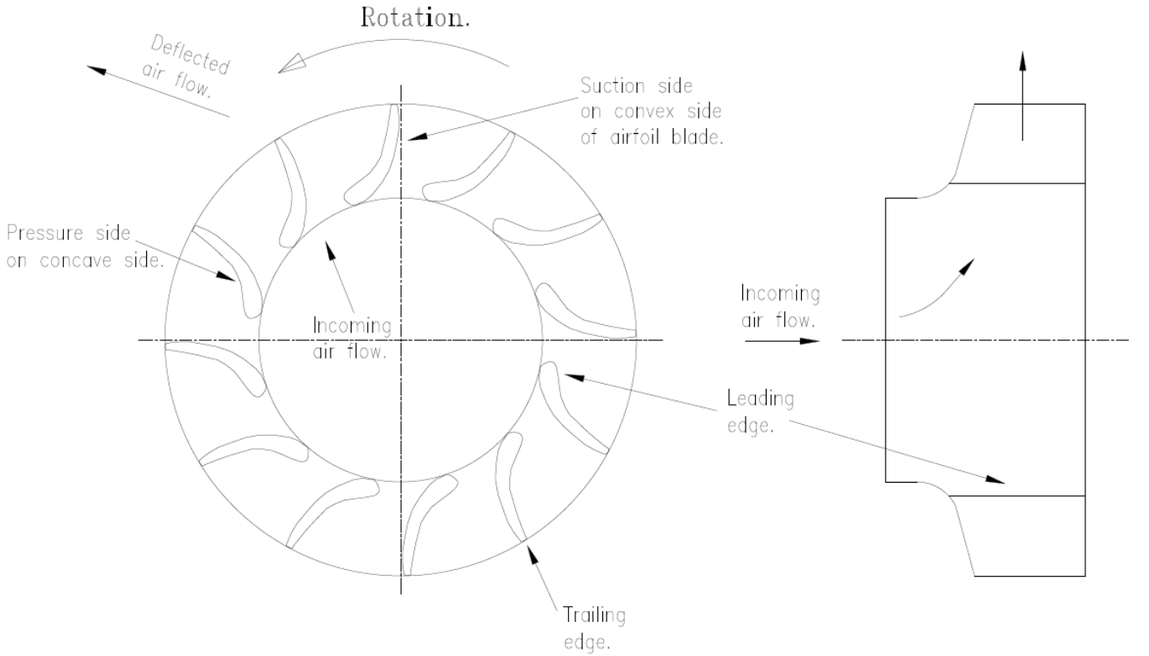
Advantages:

- There is a belief that aerofoil bladed impeller will perform with higher efficiency than the backward curved bladed impeller. But in actual, it may not be true. To avail lift force due to shape of aerofoil, it is a necessity to keep the top surface of blade on suction side and bottom surface of the blade on pressure side. But in actual, you will find that all fan manufacturers are offering blade construction in different way. The top surface is used for pressure side and bottom surface is used for suction side.
- With this construction, really we are not able to get benefit of higher efficiency, which are generally easily available for axial flow fans. Ultimately, the aerofoil blades are working like a standard backward curved bladed impeller. Only thing, due to its aerofoil construction, the impeller can be designed easily having higher flow rate, where the impeller is quite wide and bending stresses are very high.
- That means, aerofoil bladed impellers are widely used for higher flow rate and also to avoid dust accumulation at back of blades, due to almost flat surface at its back.

Disadvantages:

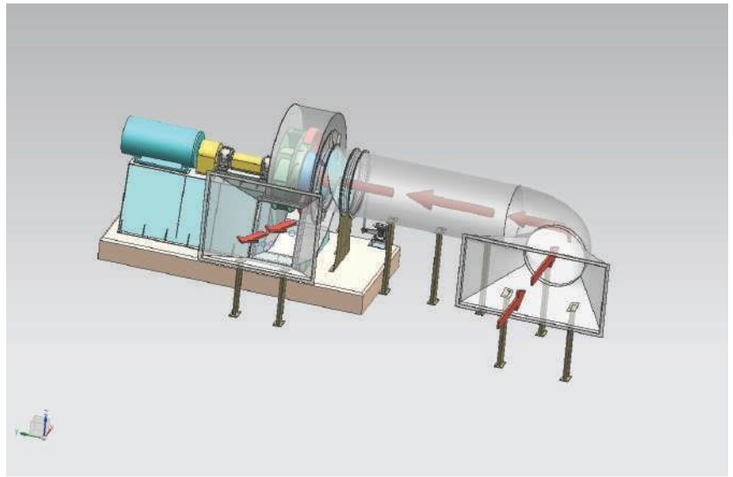
Aerofoil bladed impeller are not ideal for dusty application, due to puncture on top surface of blades can imbalance the impeller, which are not repairable.

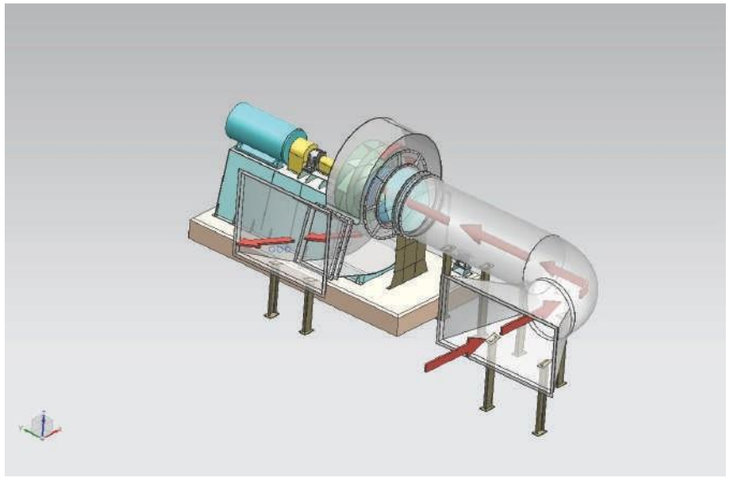
Aerofoil bladed impellers are expensive due to its construction and difficult to maintain during maintenance if any wear and tear is present in the blade surface.

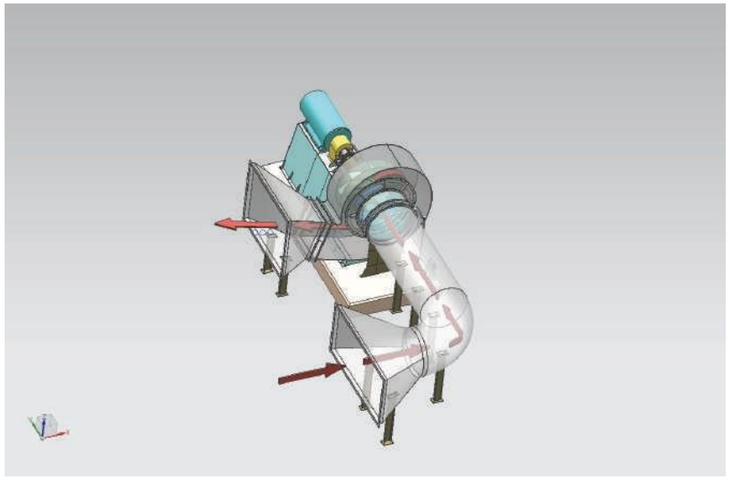


Airfoil as used in a centrifugal fan with radial-tip blades, a design that is rarely used but results in good efficiencies.

RECOMMENDED LAYOUT :







CASE STUDY
of
UTCL Clinker Grinder Plant Duct
&
Splitter Plant Design

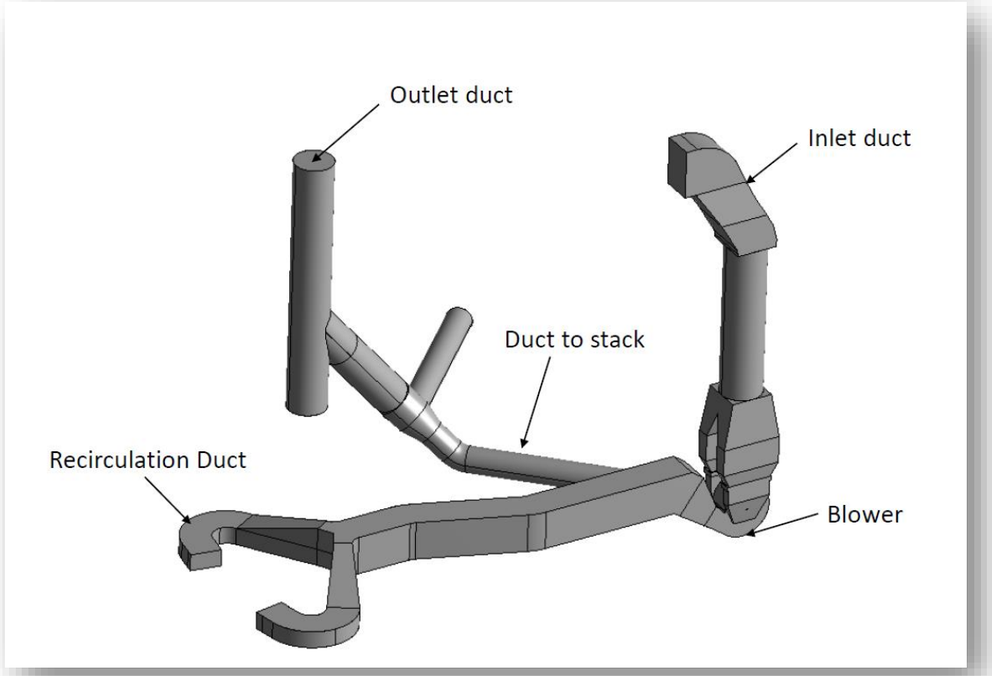
Introduction

- Reitz India Ltd. had retrofitted a fan in Line-II (bag house to mill / stack) at Kotputli Clinker Grinder plant. Reitz desire to investigate the pressure drop across the inlet & outlet ducts of the fan.
- CFD analysis of duct from Bag-house outlet to Mil inlet and Stack Inlet is carried out to visualize the flow field and estimate the pressure Loss. Also it is required to identified to critical area of recirculation region where maximum pressure loss is occurring.
- Splitter plate is design to eliminate the recirculation region and reduce the pressure loss to improve the overall fan performance.

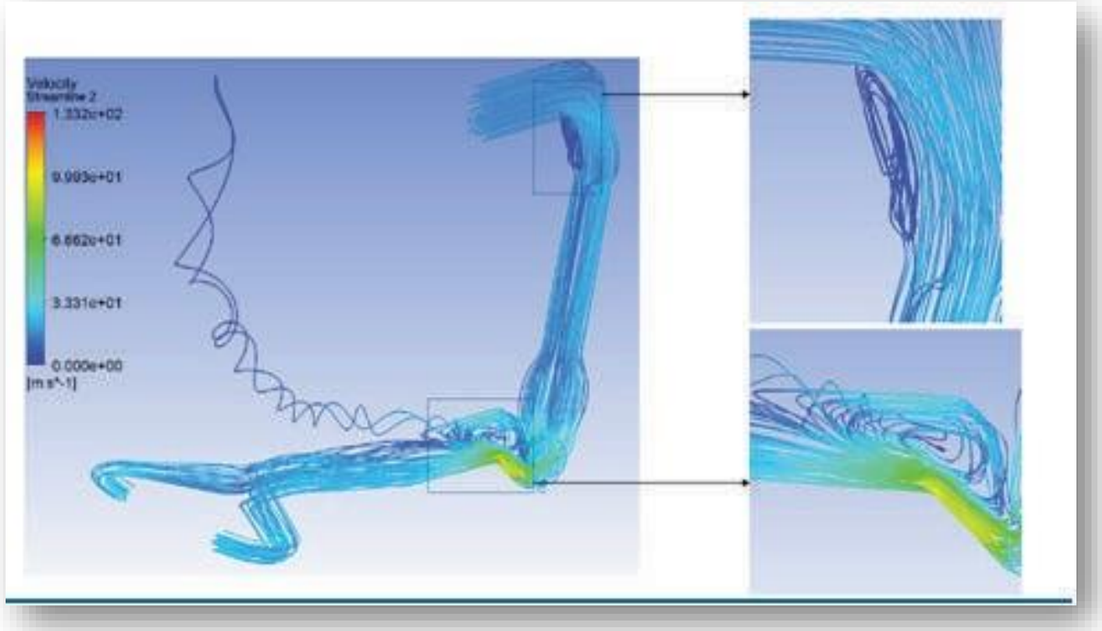
3D Geometry

3-D CAD model is generated Inlet duct
from 2-D drawing in SOLIDWORKS software.

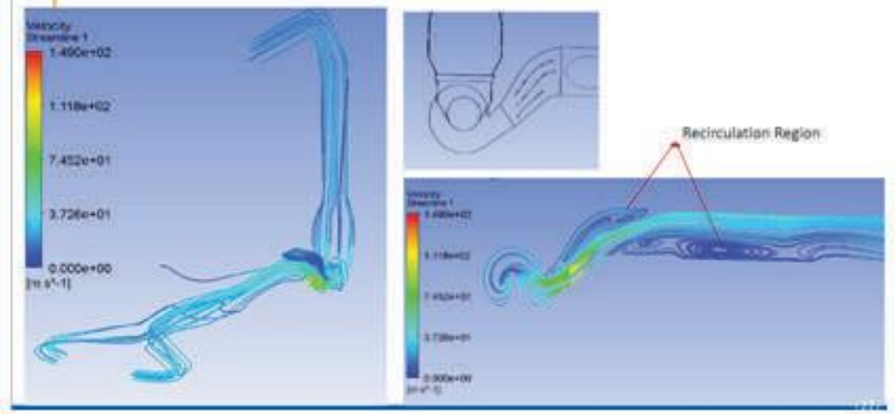
The Cad model is verified from Reitz



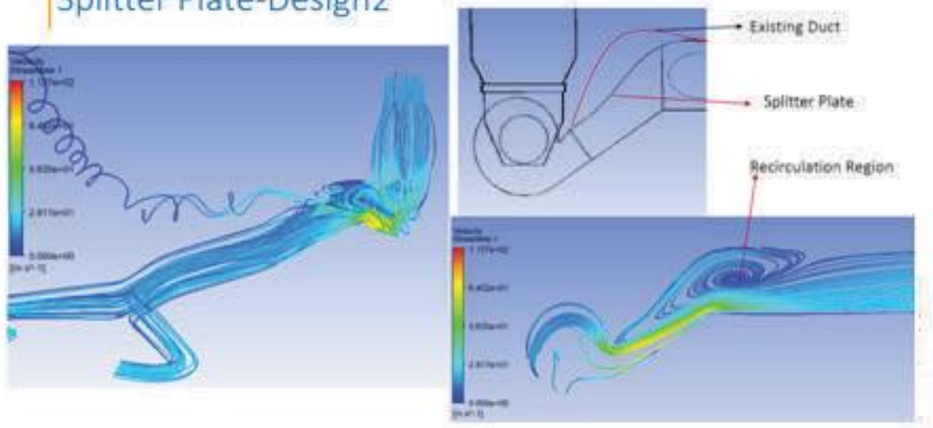
Velocity Streamline



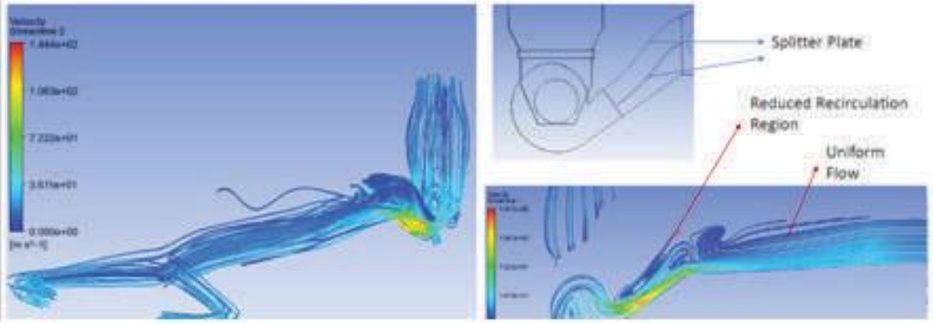
Splitter plates Design-1



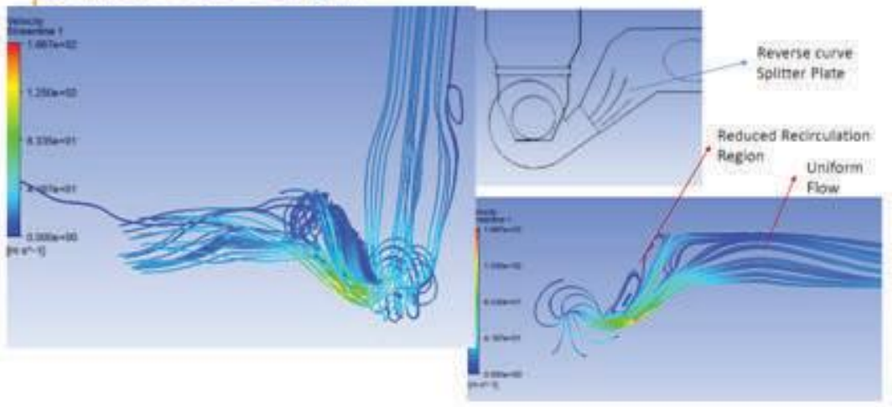
Splitter Plate-Design2



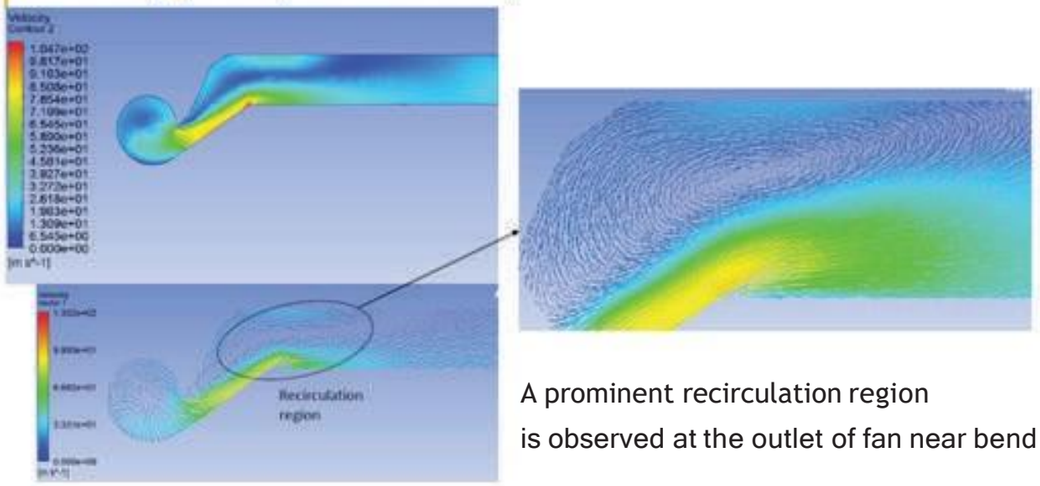
Splitter Plate-Design3



Splitter Plate-Design4

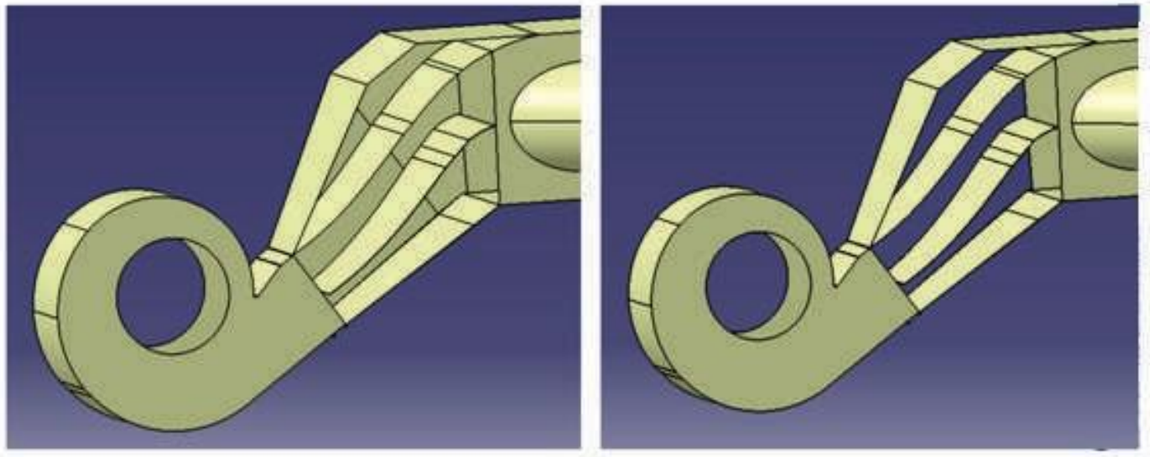


Velocity plot (Fan Outlet)

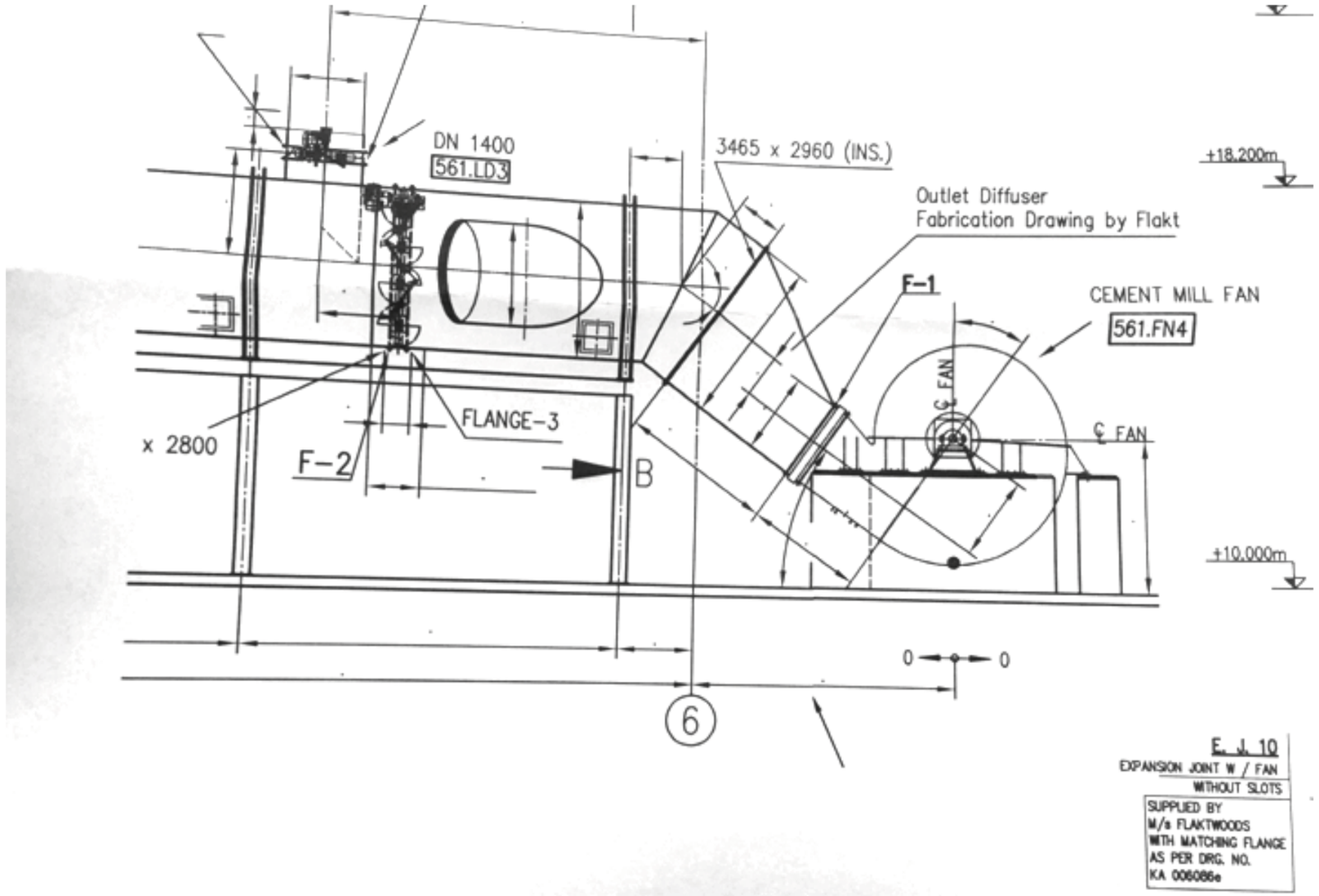


A prominent recirculation region
is observed at the outlet of fan near bend

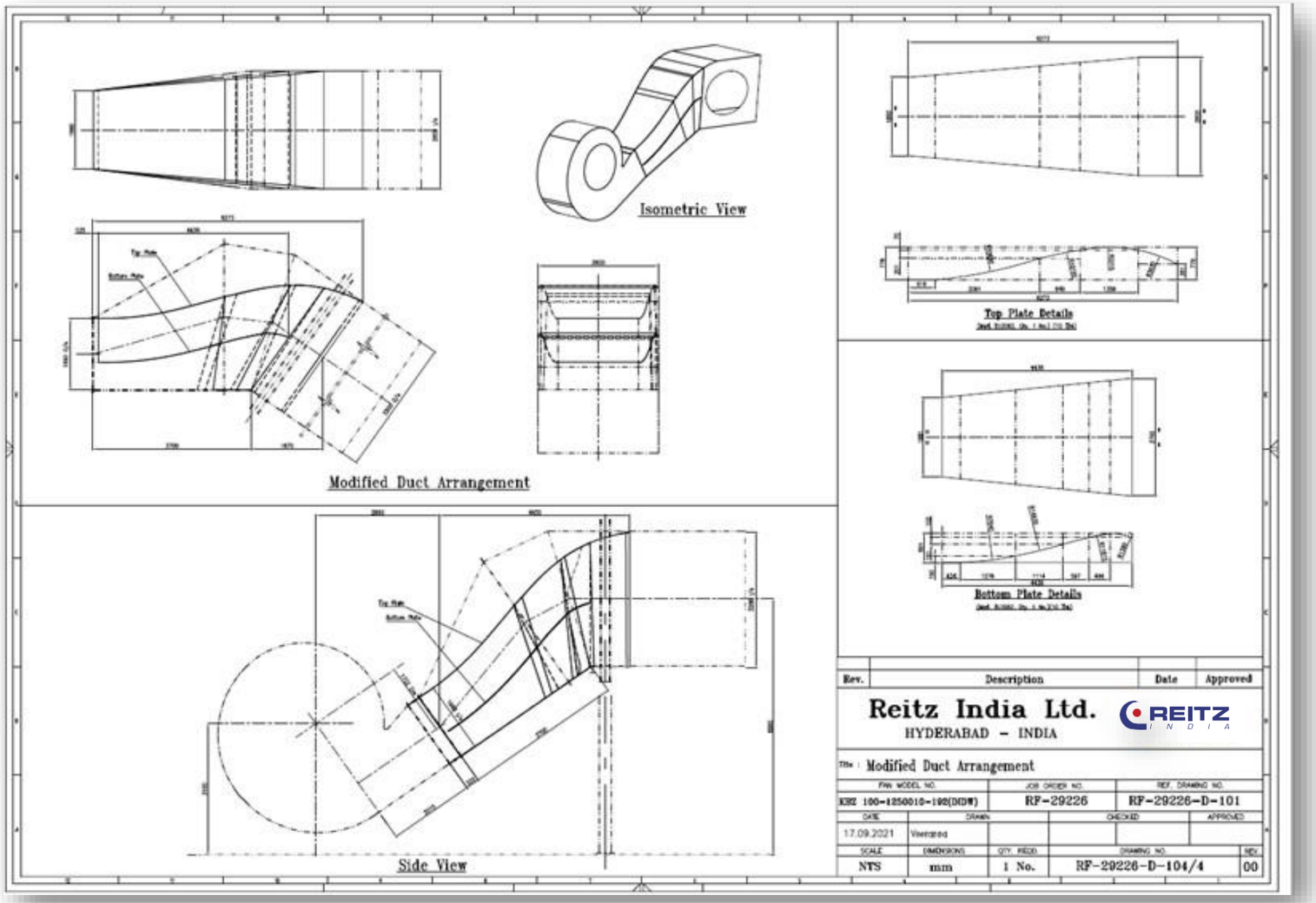
Diffuser Modification with 2 plates

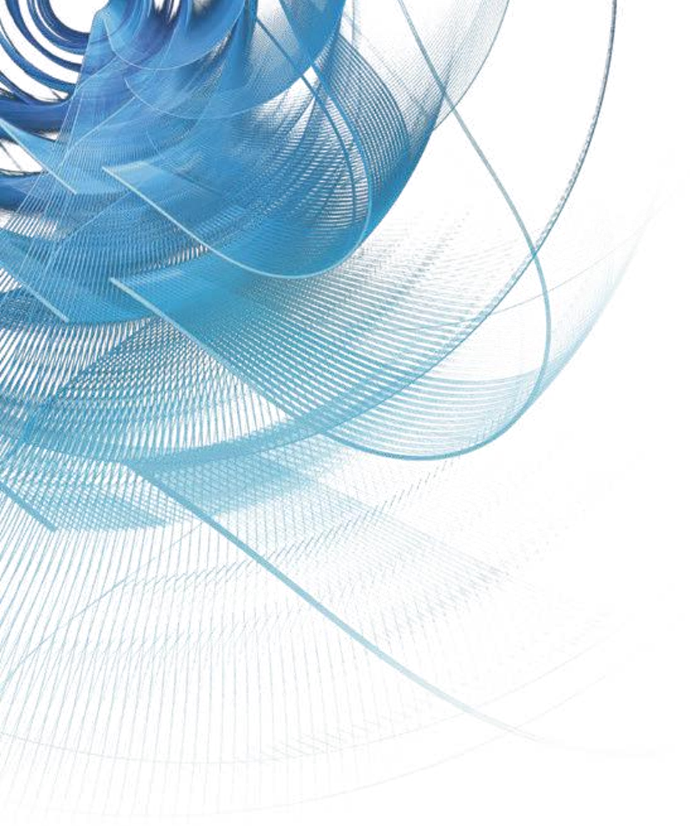


Diffuser with splitters



Modified Duct Arrangement - UTCL - Kotputli





CASE STUDY
of Fico - Cooler Fan

Input conditions

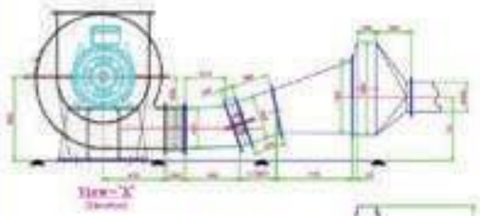
Input-From the FAN table in slide no-3

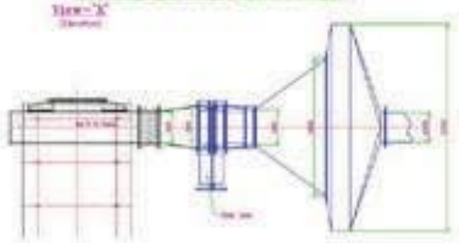
- Fluid -Air at @80° C and
- Volumetric flow at outlet of the Duct is 20592 m^3/hr
- Pressure at Inlet of the Duct 125 mbar (Relative static pressure)
- Air Density-1.04 kg/m3
- Iso-thermal conditions
- Hybrid grid used with 6-8 boundary layers and 1.2 growth rate
- Ducts are extended to establish developed flow when sufficient length was not available. This shall not affect the problem

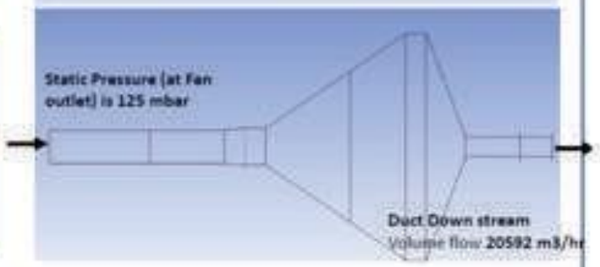
Outlet Duct Model

Air Properties			
S.no	Details	Value	Unit
1	Density	1.04	kg/m³
2	Viscosity	2.096E-05	N.s/m²

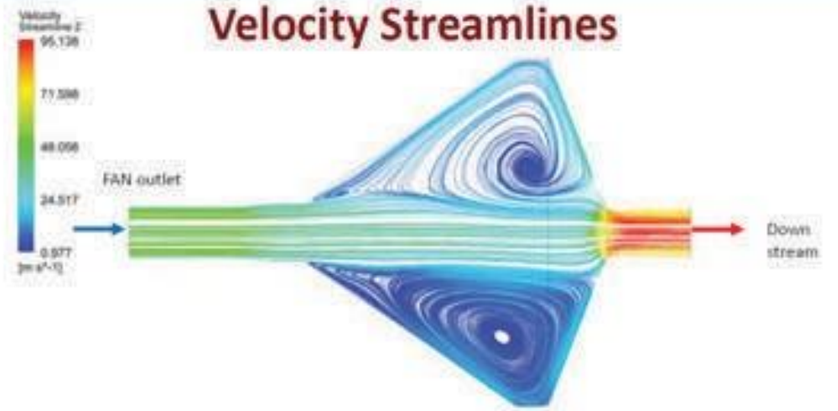
S. No.	Details	value	units
1	Fan Outlet	120	mbar
2	Downstream	20592	m3/hr

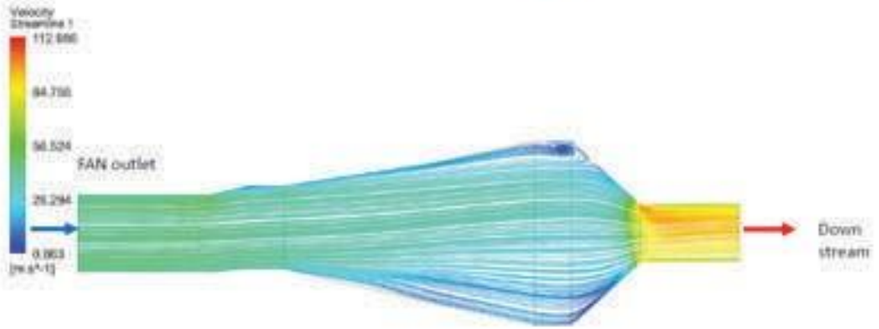




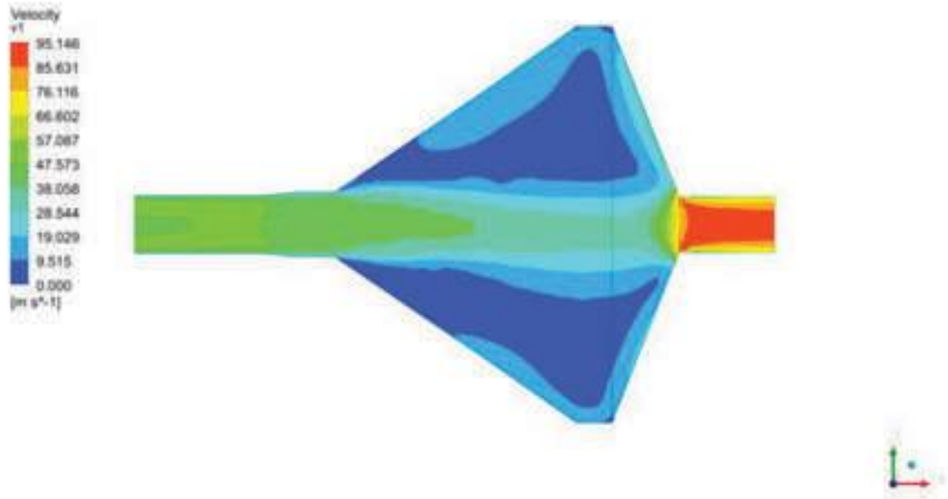


Velocity Streamlines

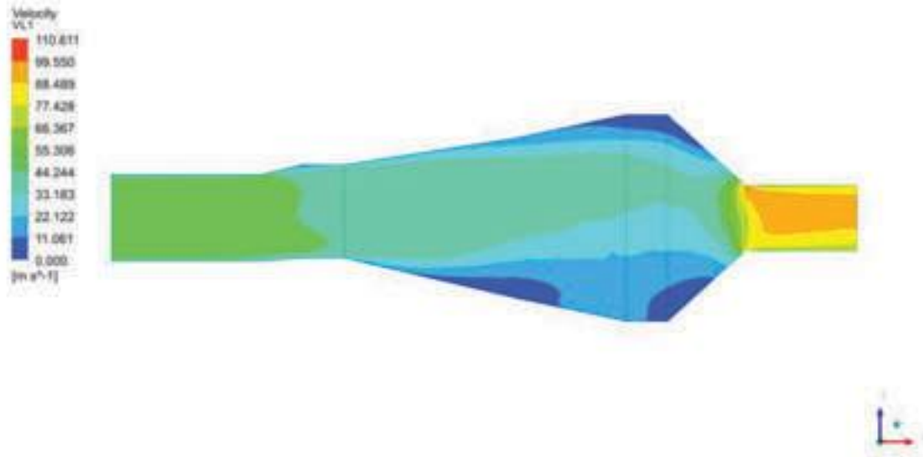




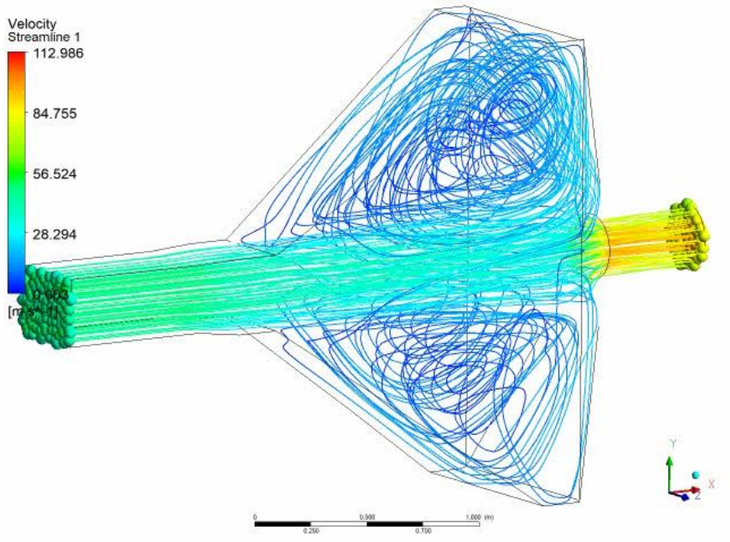
Velocity Contour Plot at XY plane



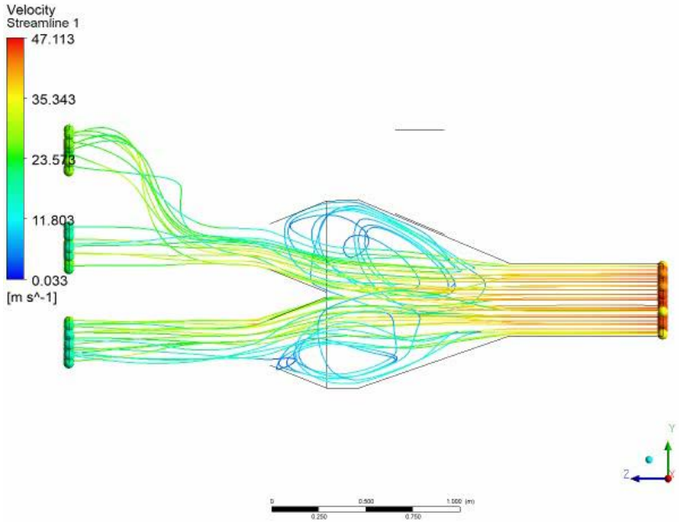
Velocity Contour Plot at XZ Plane



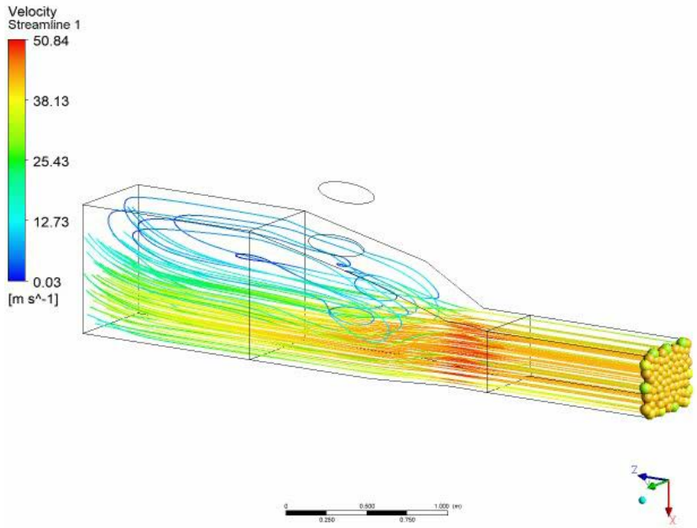
Existing outlet ducts having significant recirculation losses.



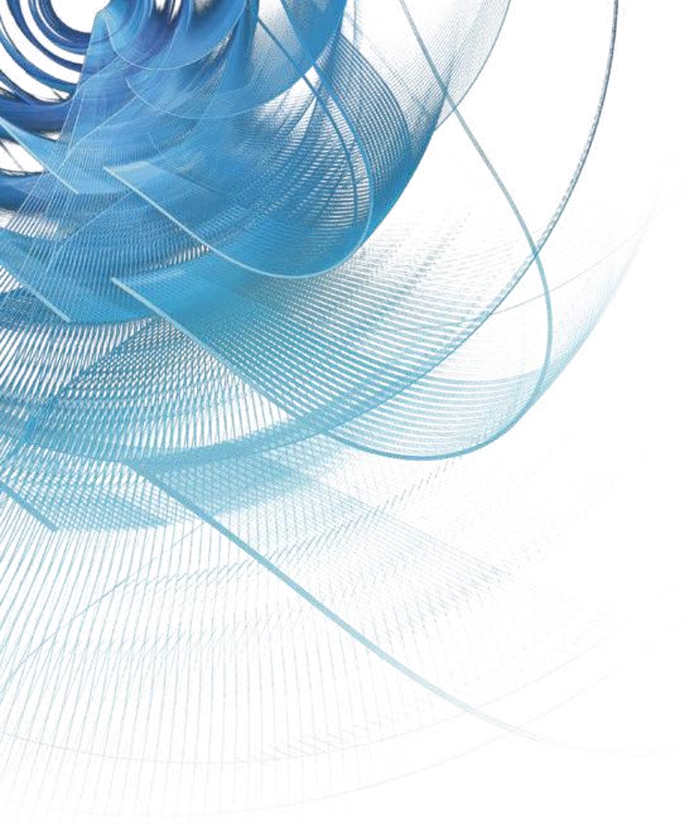
Cooler Fan - I



Cooler Fan - II



Cooler Fan - III



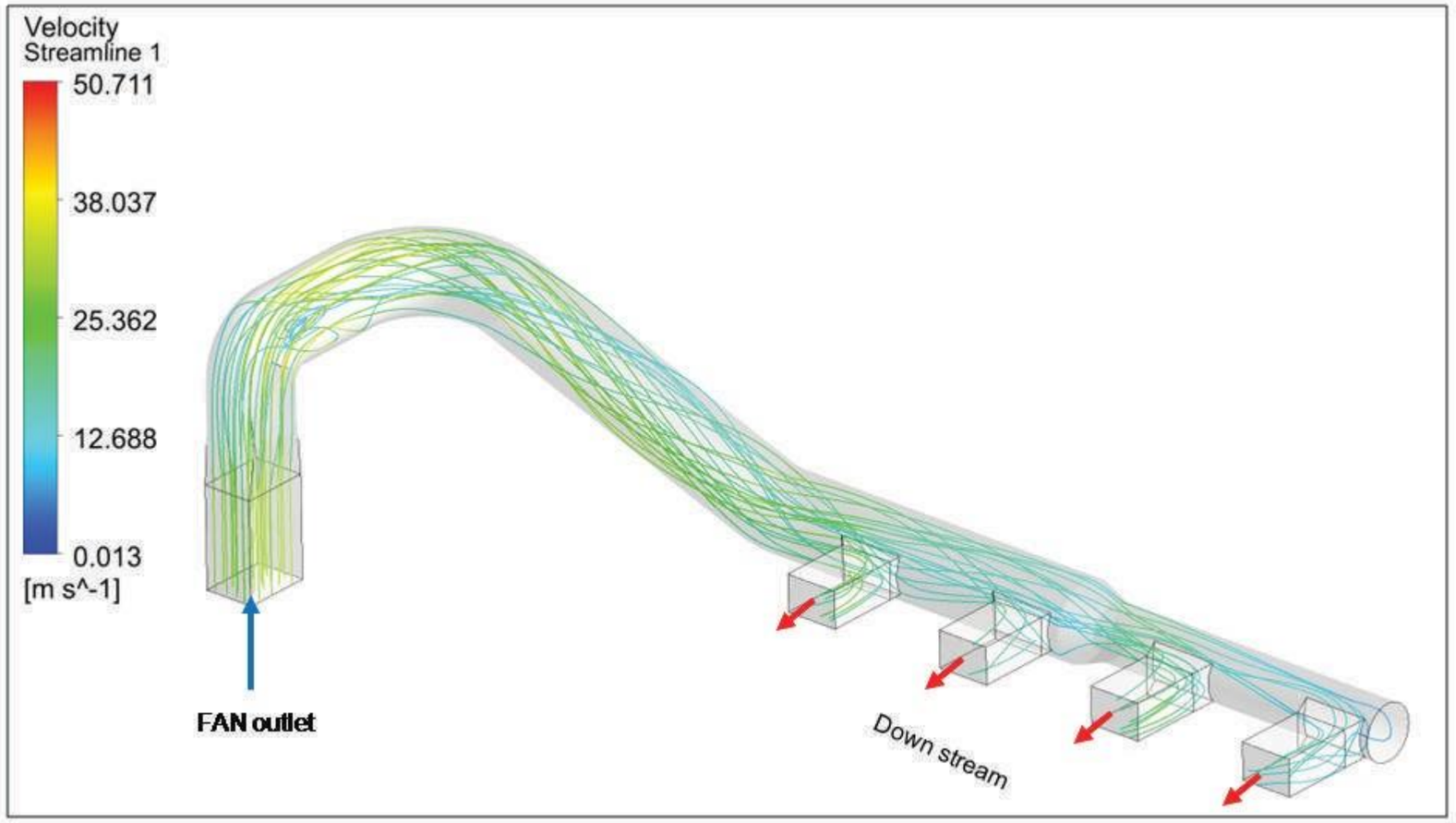
CASE STUDY
of Nikko - Cooler Fan

Input conditions

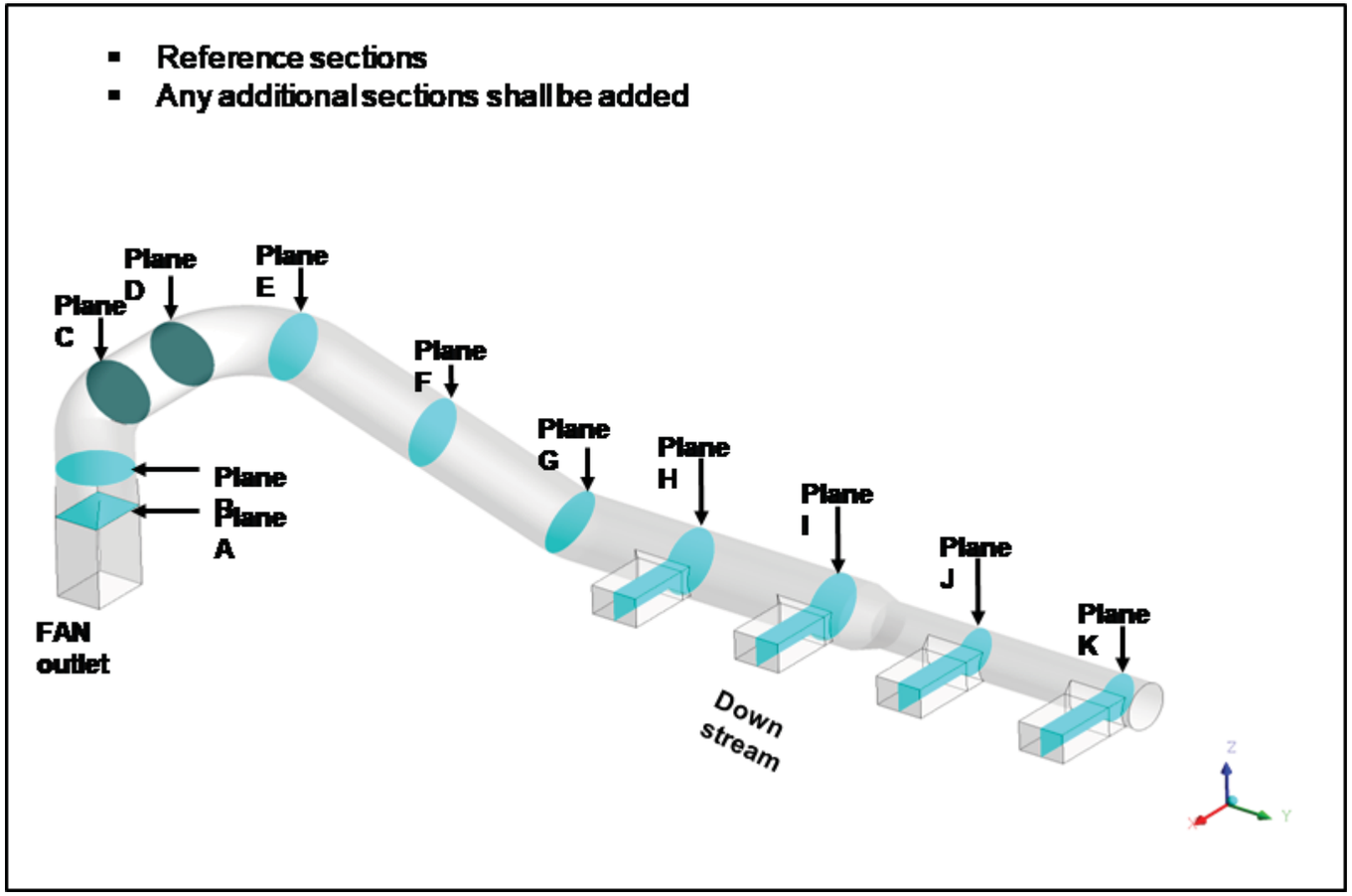
Input-From the FAN table in slide no-3

- Fluid – Air at @150o C
- Volumetric flow at outlet of the Duct is 210,000m3/hr
- Pressure at Inlet of the Duct 0.0637 bar (Relative static pressure)
- Air Density-0.898 kg/m3
- ISO-thermal conditions
- Hybrid grid used with 5-8 boundary layers and 1.2 growth rate
- Ducts are extended to establish developed flow when sufficient length was not available. This shall not affect the problem

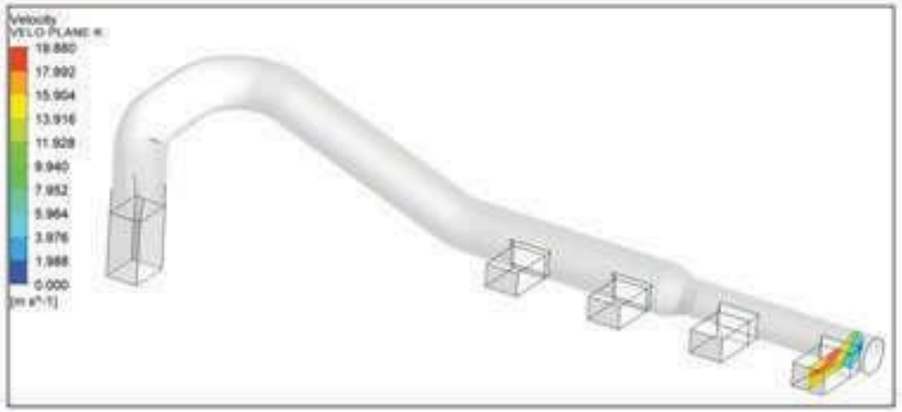
Velocity Streamlines

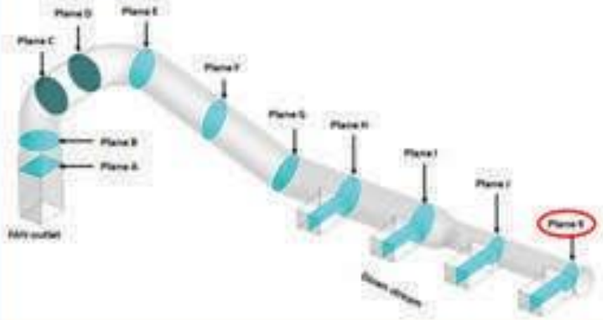


Section Detail for Pressure Plots

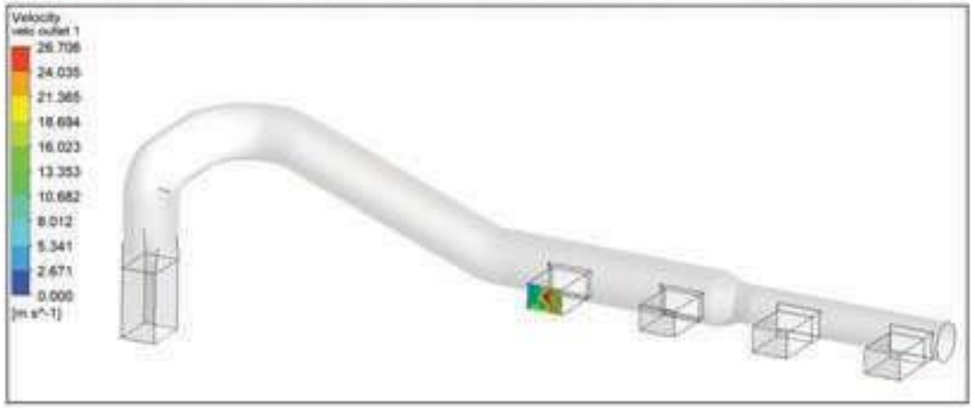


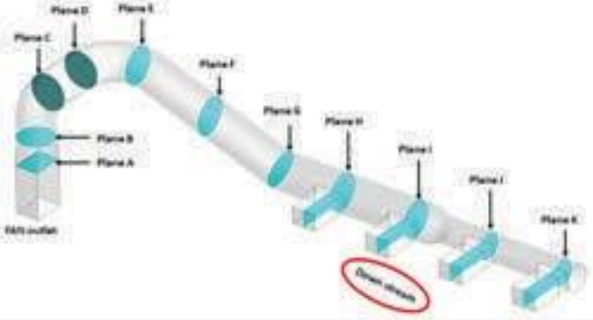
Velocity Contour Plot at Section-K



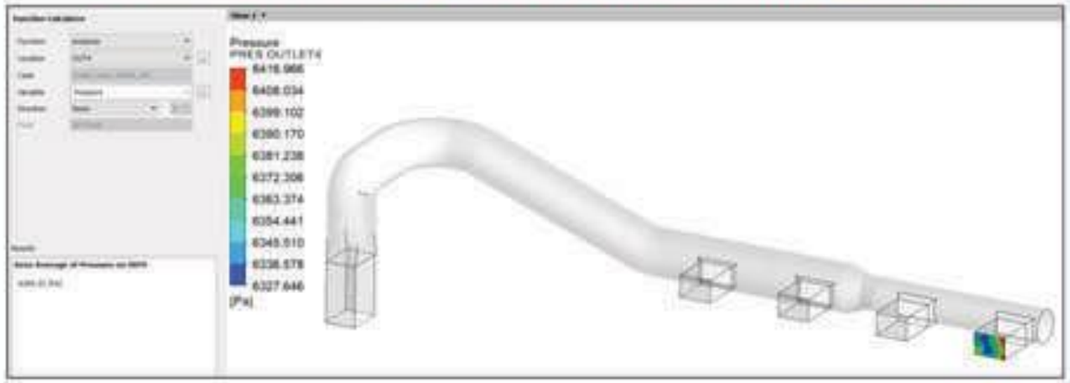


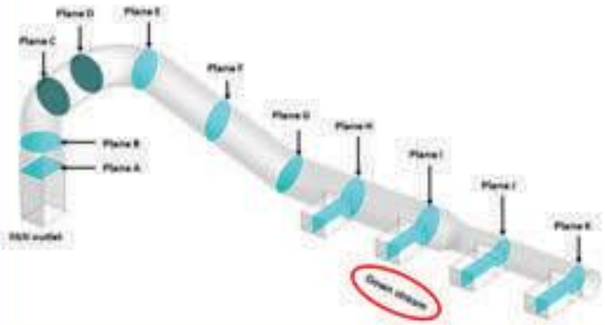
Velocity Contour Plot at Downstream (Outlet-1)



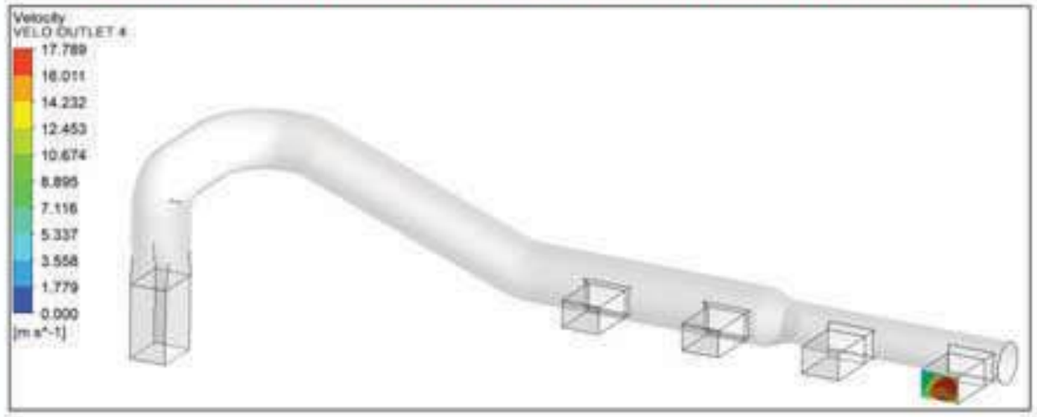


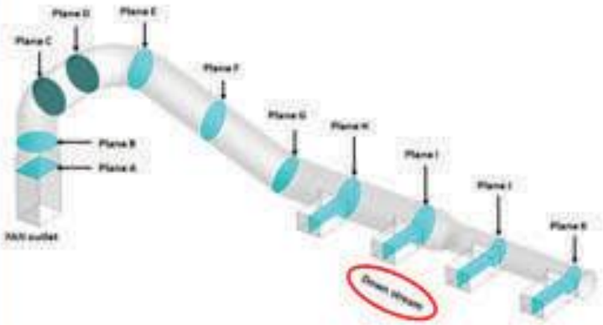
Pressure Contour Plot at Down Stream (Outlet-4)



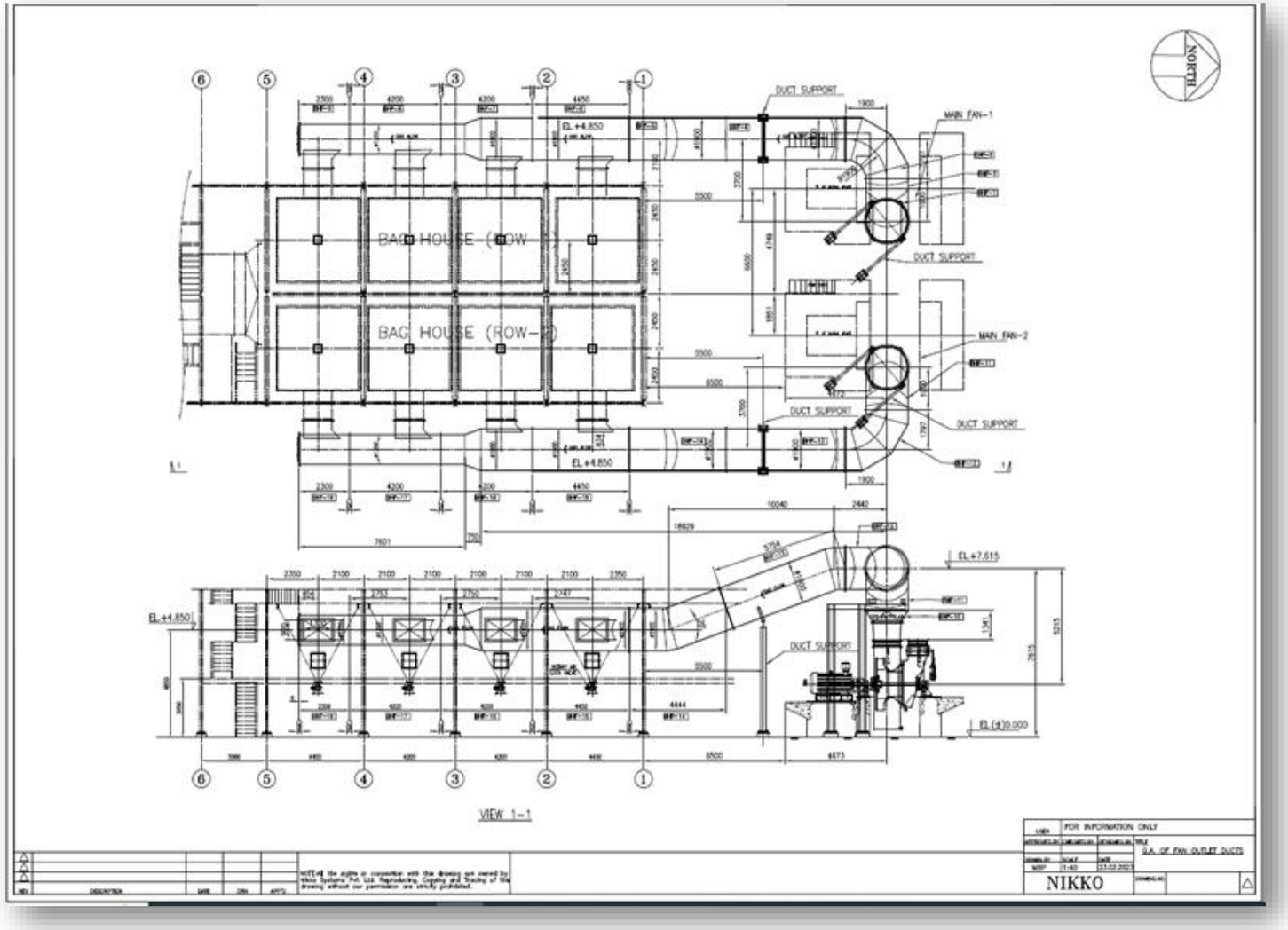


Velocity Contour Plot at Downstream (Outlet-4)

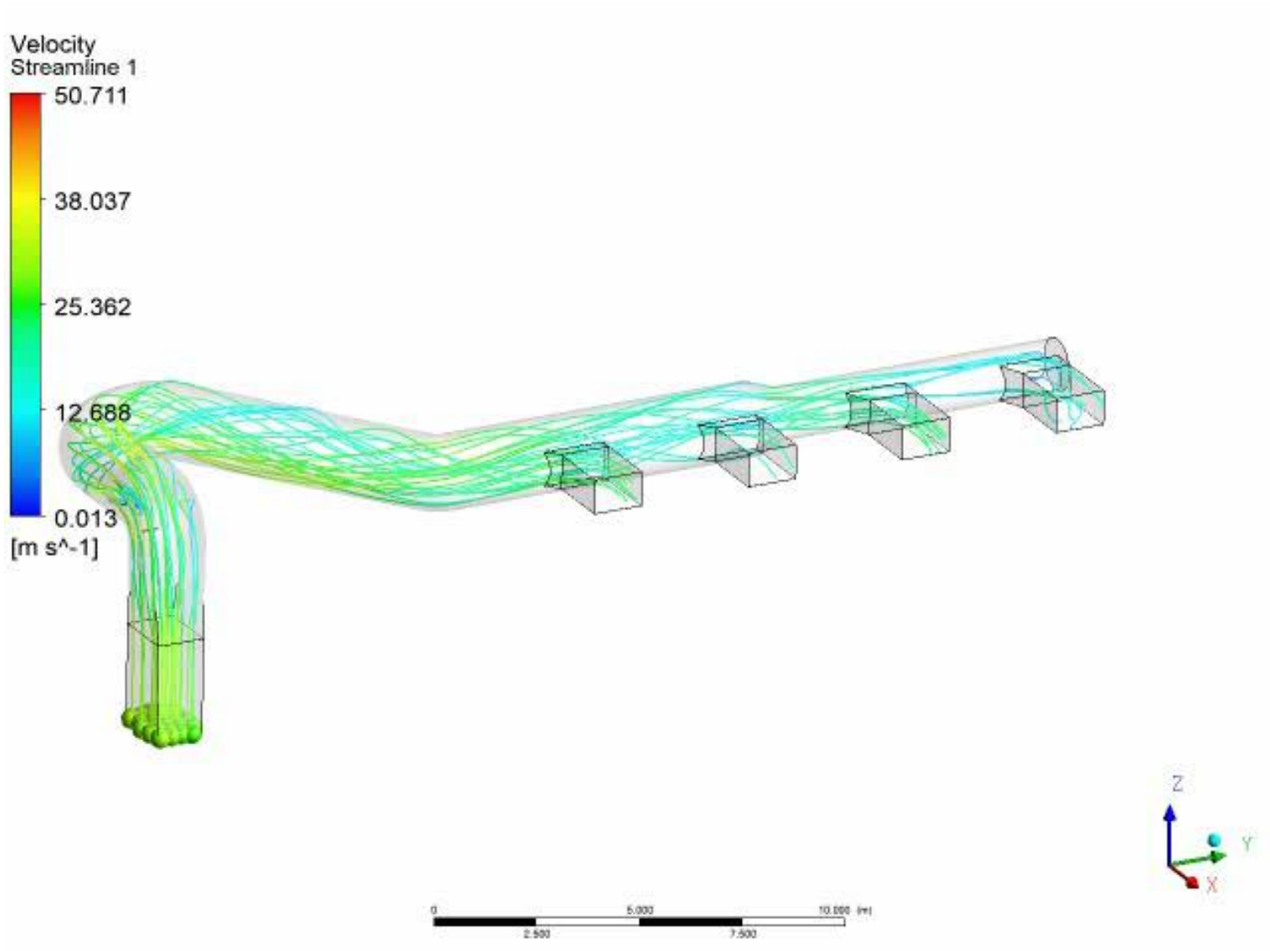




40205_Nikko_CFD report



40205_Nikko_CFD report



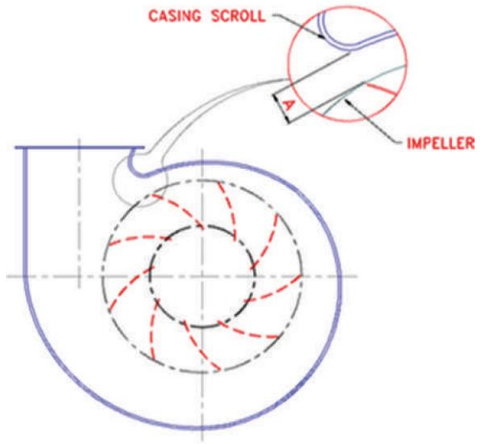
REITZ RETROFIT

Power Saving & Improved Productivity

REITZ SELECTION CRITERIA FOR CEMENT PLANT FANS

- Selecting material for impeller.
- Sizing the shaft.
- Selecting bearings and coupling
- Considering wear protection, depending on application and dust concentration.
- Deriving at motor rating, based on starting conditions.
- Manufacturing static and dynamic components in case of gas-tight constructions.
- Improving efficiency is the main criteria of up-gradation of existing fans at minimal shut down period.
- This is always a cost- effective win-win solution while ensuring longevity.

REPLACEMENT OF OLD IMPELLER WITH A NEW ONE



- Based on the given parameters, we are designing the impeller from the proven design, keeping the impeller diameter near to the existing fan impeller size, so that impeller can be inserted in the existing fan casing without any modification.

- With our past experience, we have found that cut off clearance (cut off clearance means, minimum clearance between fan impeller and casing – please refer the enclosed sketch) may vary between 6% and 13% depending on flow and pressure combination.

- Again, while retrofitting, we look for use of existing coupling and motor also, provided the required parameters permit to use them.

ADVANTAGES OF RETROFITTING

Increase Reliability

Save Cost $

Better Performance

Improve Energy Efficiency

Quick ROI

Replace obsolete internals

Increase productivity of the plant

Help the Environment

RETROFIT PROJECTS – FEW EXAMPLES

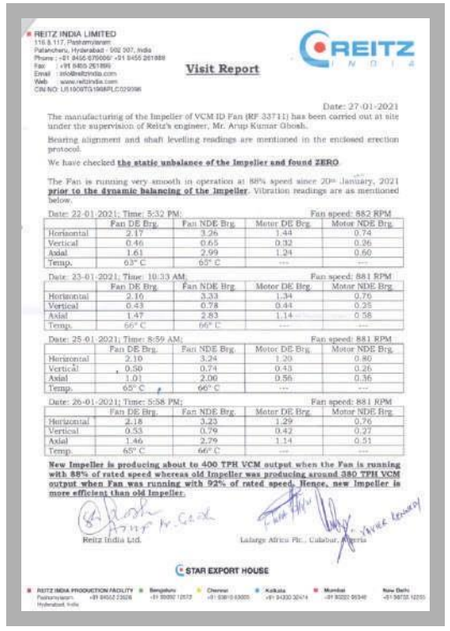
Client: LAFARGE

Africa, Nigeria

Application:
Cement Mill Fan (VCM IDFan: RF 33711)

Components replaced:
Pre-fabricated shrouds and blades

Reason for retrofitting/Refurbishing:
Improving Efficiency, Increasing Capacity & Low Power Consumption



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CIN NO: L51909TG1988PLC029096

REITZ INDIA

Visit Report

Date: 27-01-2021

The manufacturing of the Impeller of VCM ID Fan (RF-33711) has been carried out at site under the supervision of Reitz's engineer, Mr. Arup Kumar Ghosh.

Bearing alignment and shaft levelling readings are mentioned in the enclosed erection protocol.

We have checked **the static unbalance of the Impeller and found ZERO**

The Fan is running very smooth in operation at 88% speed since 20th January, 2021 **prior to the dynamic balancing of the impeller**. Vibration readings are as mentioned below.

Date: 22-01-2021; Time: 5:32 PM; Fan speed: 882 RPM

	Fan DE Brg.	Fan NDE Brg.	Motor DE Brg.	Motor NDE Brg.
Horizontal	2.17	3.26	1.44	0.74
Vertical	0.46	0.65	0.32	0.36
Axial	1.61	2.99	1.24	0.60
Temp.	63° C	65° C	---	---

Date: 23-01-2021; Time: 10:33 AM; Fan speed: 881 RPM

	Fan DE Brg.	Fan NDE Brg.	Motor DE Brg.	Motor NDE Brg.
Horizontal	2.16	3.33	1.34	0.76
Vertical	0.43	0.78	0.44	0.25
Axial	1.47	2.83	1.14	0.58
Temp.	66° C	66° C	---	---

Date: 25-01-2021; Time: 8:59 AM; Fan speed: 881 RPM

	Fan DE Brg.	Fan NDE Brg.	Motor DE Brg.	Motor NDE Brg.
Horizontal	2.10	3.24	1.20	0.80
Vertical	0.50	0.74	0.43	0.26
Axial	1.01	2.00	0.56	0.36
Temp.	65° C	66° C	---	---

Date: 26-01-2021; Time: 5:58 PM; Fan speed: 881 RPM

	Fan DE Brg.	Fan NDE Brg.	Motor DE Brg.	Motor NDE Brg.
Horizontal	2.18	3.23	1.29	0.76
Vertical	0.53	0.79	0.42	0.27
Axial	1.46	2.79	1.14	0.51
Temp.	65° C	66° C	---	---

New Impeller is producing about to 400 TPH VCM output when the Fan is running with 88% of rated speed whereas old Impeller was producing around 380 TPH VCM output when Fan was running with 92% of rated speed. Hence, new Impeller is more efficient than old Impeller.

Reitz India Ltd. Lafarge Africa Plc., Calabar, Nigeria

STAR EXPORT HOUSE

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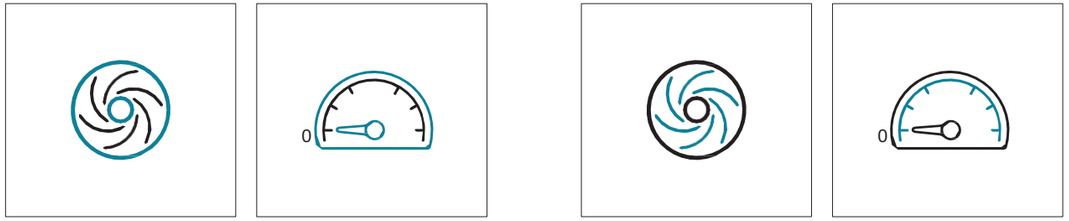
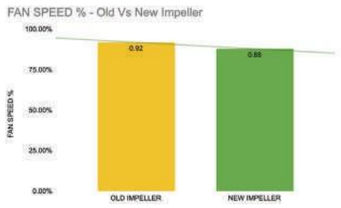
Visit Report

Insights



Static balancing weight of the Impeller is **ZERO.**

Dynamic balancing weight of the Impeller is **ZERO.**



By reconditioning the new impeller the production capacity has increased to 400 TPH VCM output at 88% fan speed whereas old Impeller was producing 380 TPH VCM output at 92% fan speed.

There is a power saving of
175 KW ~ 200 KW from the new Impeller.

RETROFIT PROJECTS – FEW EXAMPLES

Client:

DANGOTE CEMENT

Senegal SA - Senegal

Application:

Preheater ID Fan

Components replaced:

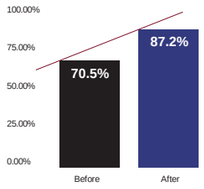
Impeller, Shaft & Inlet Cone

Reason for retrofitting:

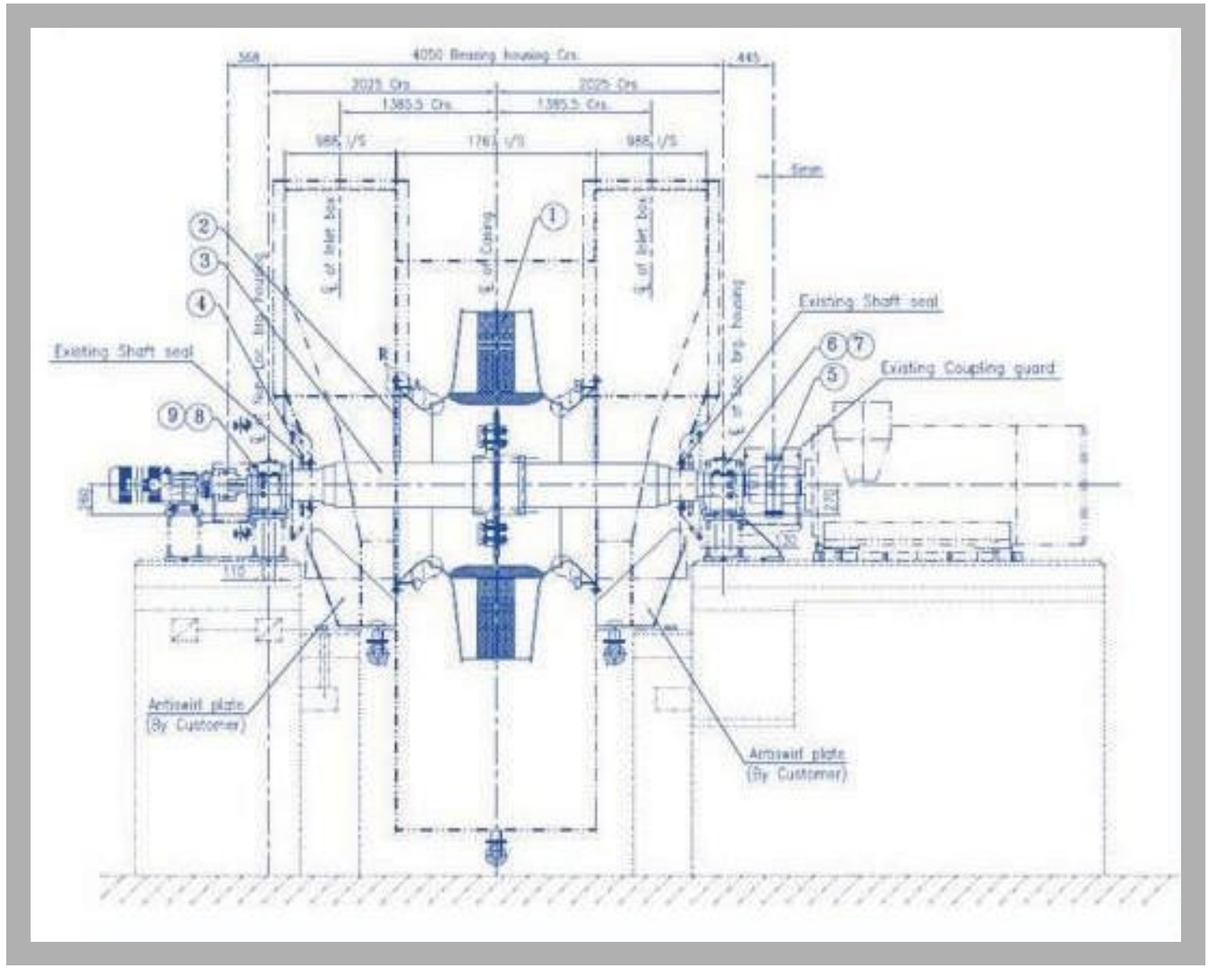
Improving Efficiency,
power saving
and increasing capacity

	BEFORE	AFTER
Flow	552,000 m3/Hr	552,000 m3/Hr
Static Pressure	748 mm WG	734 mm WG
Power	1594 kW	1316 kW
Fan Speed	990 rpm	980 rpm

Efficiency



There is a power saving of 278 KW after retrofitting.



RETROFIT PROJECTS – FEW EXAMPLES

Client: FLSmidth

Denmark

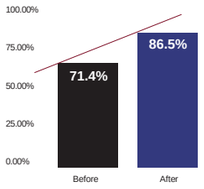
Application:
Raw Mill Bag House Fan

Components replaced:
Impeller, Shaft & Inlet Cone

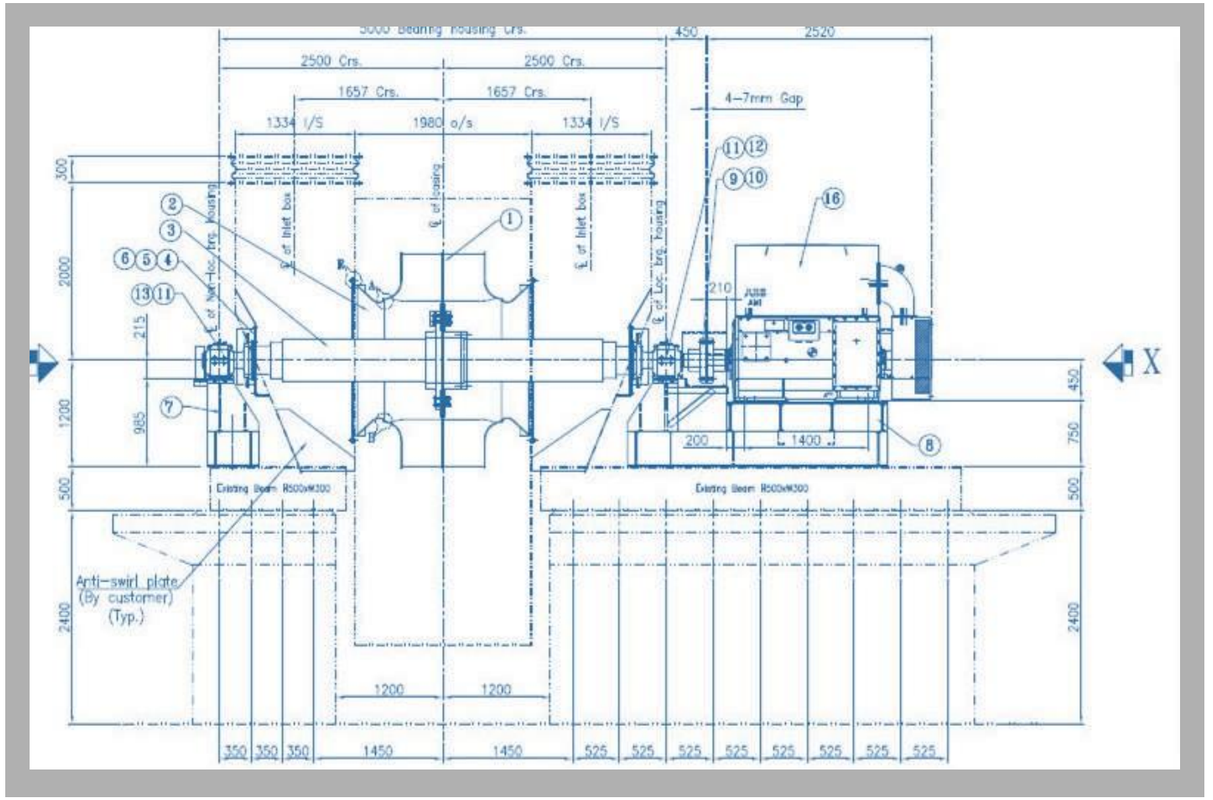
Reason for retrofitting:
Improving Efficiency
& Increasing Capacity

	BEFORE	AFTER
Flow	683,995 m3/Hr	683,995 m3/Hr
Static Pressure	403 mm WG	400 mm WG
Power	1050 kW	861 kW
Fan Speed	990 rpm	980 rpm

Efficiency



There is a power saving of 189 KW after retrofitting.



RETROFIT PROJECTS – FEW EXAMPLES

Client:

DANGOTE CEMENT

Senegal

Application:

Cement Mill Fan

Components replaced:

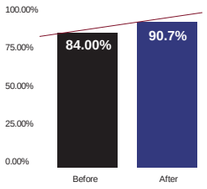
Impeller, Shaft & Inlet Cone

Reason for retrofitting:

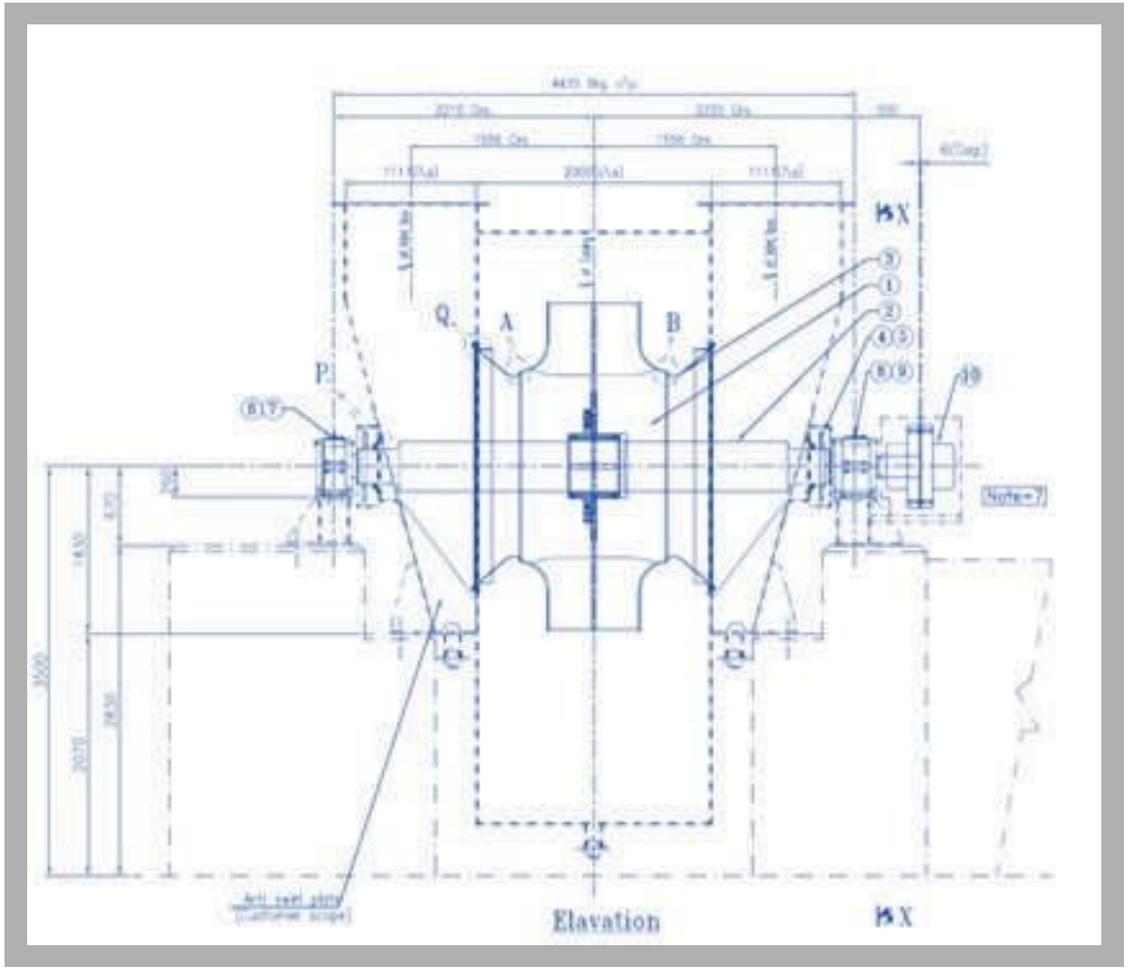
Improving Efficiency & Increasing Capacity

	BEFORE	AFTER
Flow	690,000m3/Hr	690,000m3/Hr
Static Pressure	938 mm WG	917 mm WG
Power	2096 kW	1954 kW
Fan Speed	993 rpm	980 rpm

Efficiency



There is a power saving of 142 KW after retrofitting.



RETROFIT PROJECTS – FEW EXAMPLES

Client:

DANGOTE CEMENT

Senegal SA - Senegal

Application:

Raw Mill Fan

Components replaced:

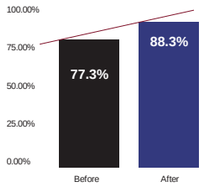
Impeller, Shaft & Inlet Cone

Reason for retrofitting:

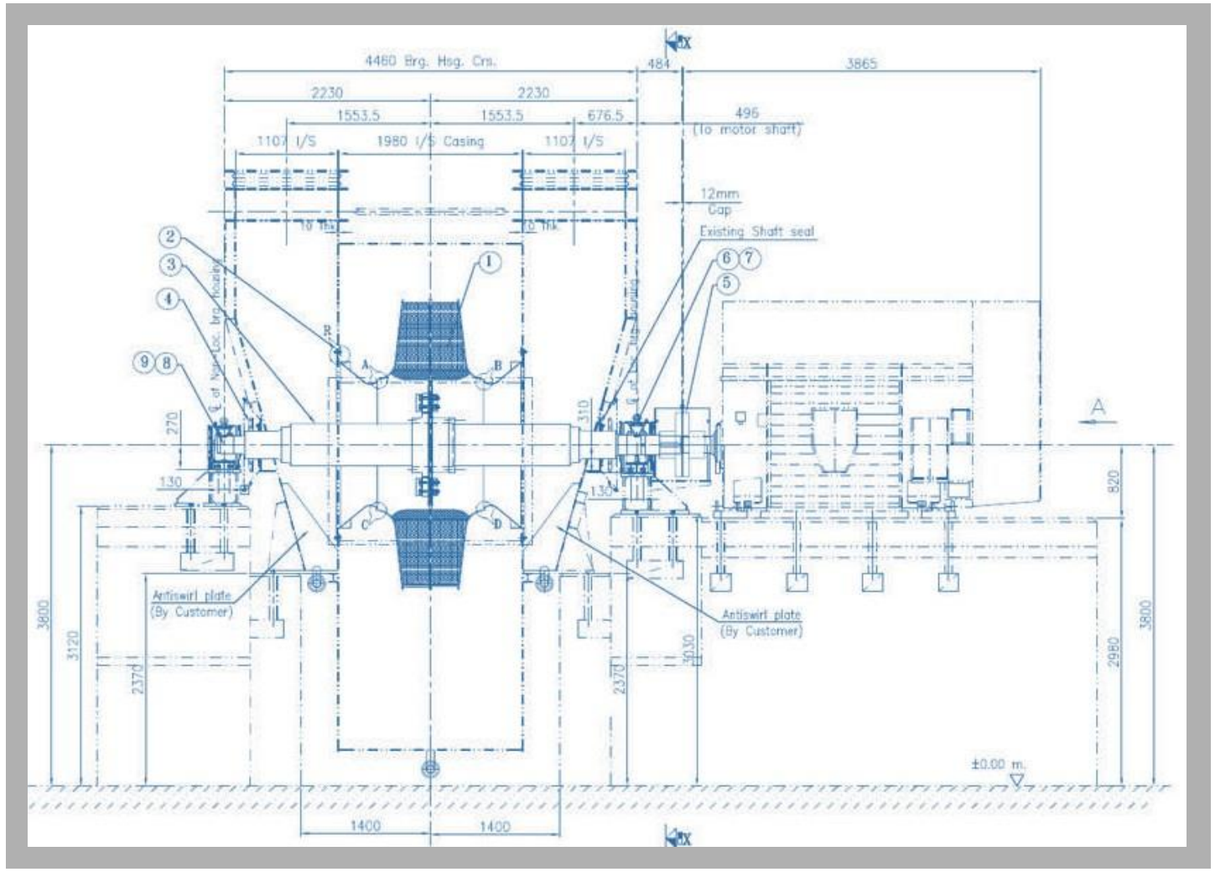
Improving Efficiency & Increasing Capacity

	BEFORE	AFTER
Flow	625,750 m3/Hr	627,750 m3/Hr
Static Pressure	1178mm WG	1197 mm WG
Power	2595 kW	2320 kW
Fan Speed	990 rpm	982 rpm

Efficiency



There is a power saving of 275 KW after retrofitting.



RETROFIT PROJECTS – FEW EXAMPLES

Client:

Pahang, Malaysia

Application:

Retrofitted Pre heater fan

Components replaced:

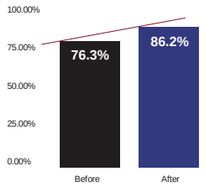
Impeller, Shaft, Inlet Cone and casing

Reason for retrofitting:

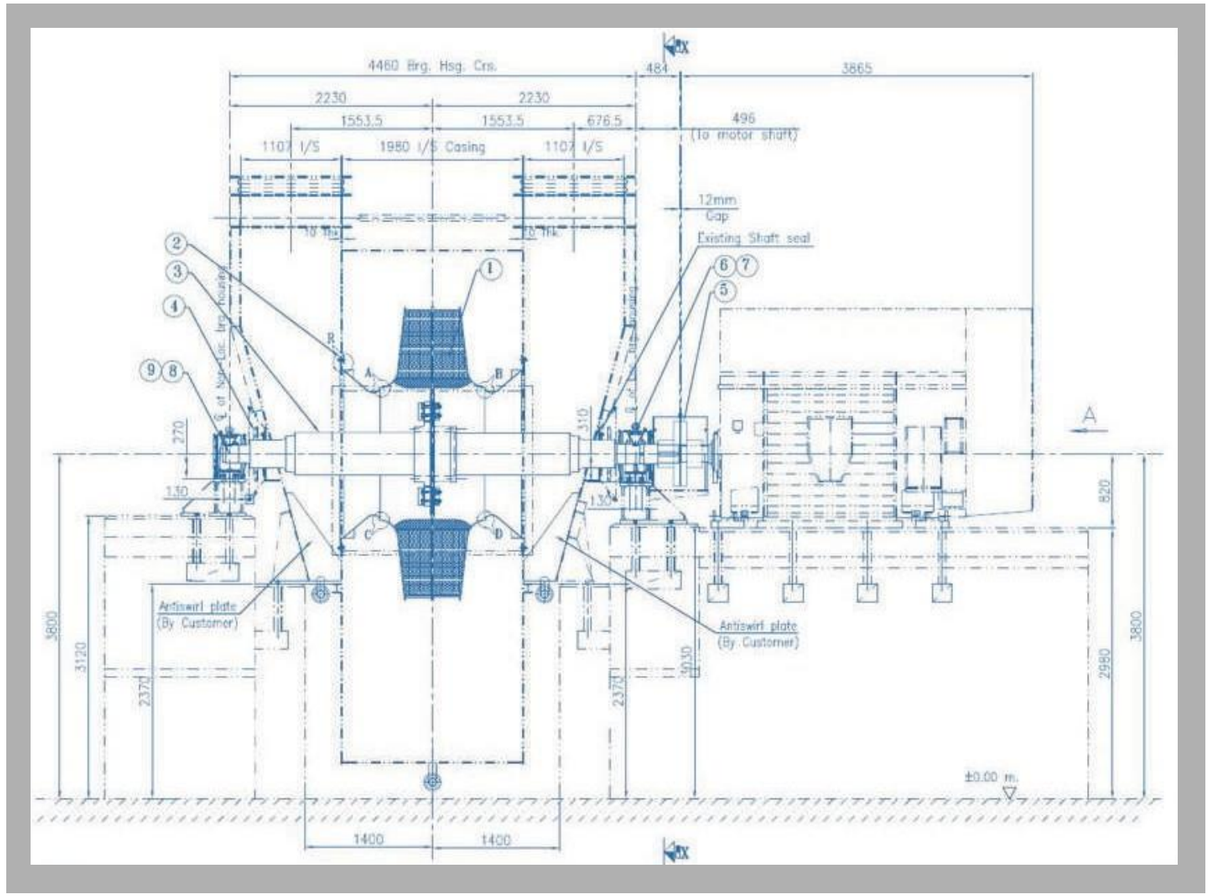
Improving Efficiency & Increasing Capacity

	BEFORE	AFTER
Flow	330,000 m3/Hr	330,000 m3/Hr
Static Pressure	431 mm WG	450 mm WG
Power	510 kW	470 kW
Fan Speed	980 rpm	985 rpm

Efficiency



There is a power saving of 40 KW after retrofitting.



RETROFIT PROJECTS – FEW EXAMPLES

Client: LAFARGE

Bangladesh

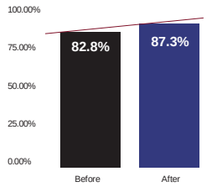
Application:
Retrofitted Raw Mill fan

Components replaced:
Impeller, Shaft, casing and Inlet Cone

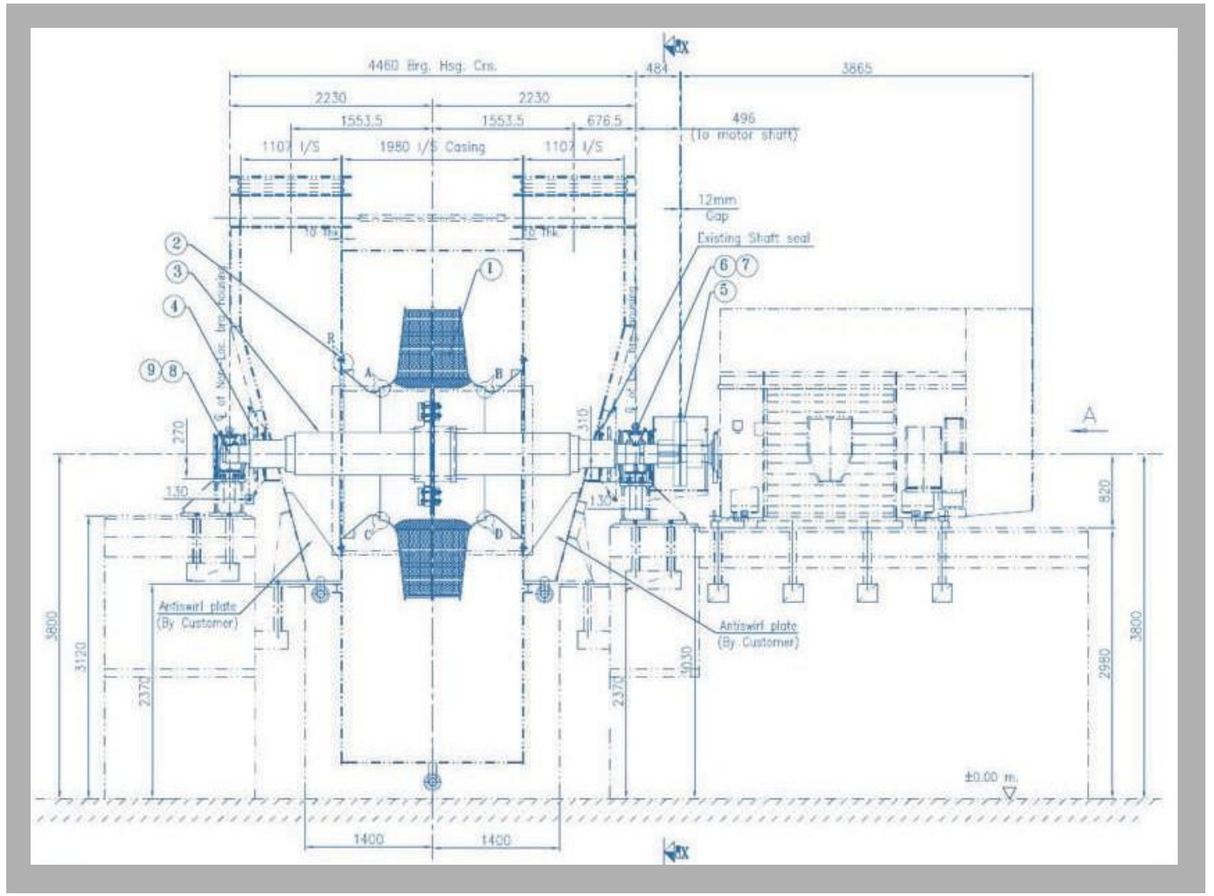
Reason for retrofitting:
Improving Efficiency & Increasing Capacity

	BEFORE	AFTER
Flow	786,600 m3/Hr	786,600 m3/Hr
Static Pressure	984 mm WG	1004 mm WG
Power	2545 kW	2414 kW
Fan Speed	990 rpm	985 rpm

Efficiency

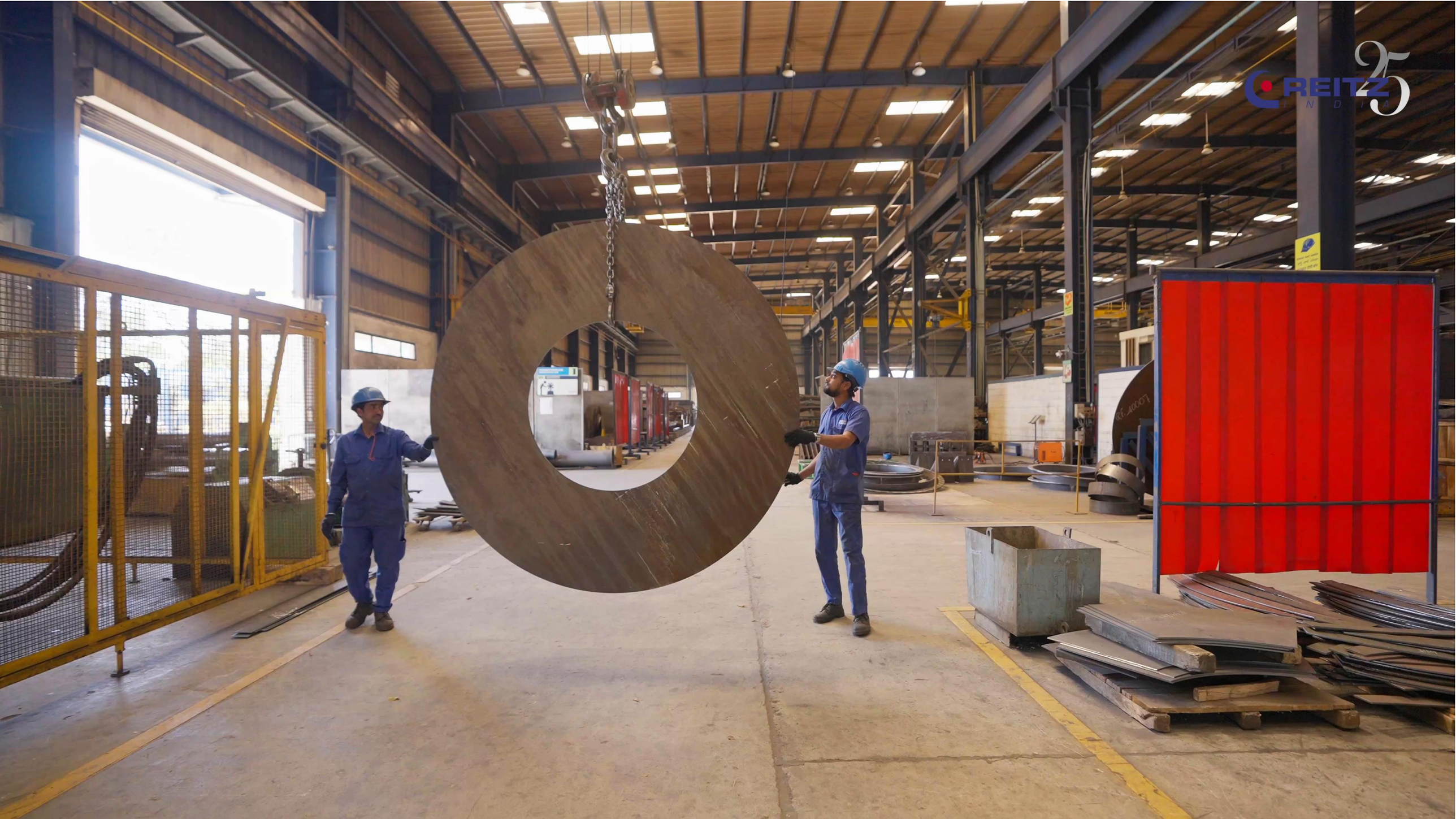


There is a power saving of 131 KW after retrofitting.



Spinning Machine

Machine: CNC Spinning Machine
Make: Nodi
Country of Origin: Denmark.
Application: Shrouds, Inlet Cone, etc.
Pro’s: High precision quality & low production time.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…and write your own Script…

Thank you…

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