



R&D Consulting / Engineering Simulation Services



Innovative Solutions



Client-Centric Approach



Technical Proficiency



Proven Track Record

Table of Contents

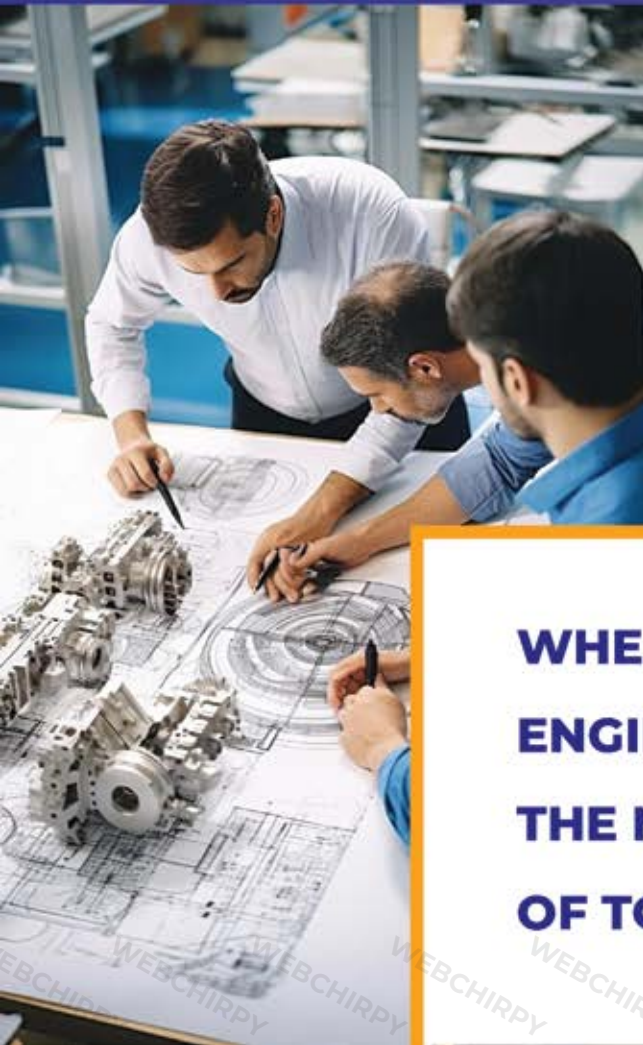
Introduction	3
About Company	4
Key Leadership	7
Primary Services	9
Our works/ Case Studies	10
Certifications	20
Contact info	30

Who are we?

HTFE Solutions is the Design Service provider company established in 2014.

We are continuously providing Design Services in Mechanical, Electrical and Architectural Design.

We have the team of Expertise Designers in their respective CAD Software.



WELCOME TO HTFE

**WHERE INNOVATION MEETS
ENGINEERING EXCELLENCE TO SOLVE
THE MOST INTRICATE CHALLENGES
OF TODAY AND TOMORROW**

WEBCHIRPY WEBCHIRPY WEBCHIRPY WEBCHIRPY WEBCHIRPY WEBCHIRPY WEBCHIRPY WEBCHIRPY

Expertise

- ⚙️ Multiphysics analysis
- ⚙️ Modal analysis
- ⚙️ Multiphase analysis
- ⚙️ Aero/hydroacoustic
- ⚙️ Non-linear analysis
- ⚙️ Acoustic analysis
- ⚙️ Transient dynamic analysis
- ⚙️ Solid Modelling
- ⚙️ Multibody simulation
- ⚙️ Revit BIM
- ⚙️ Vibration a.
- ⚙️ HVAC Design & Development
- ⚙️ Seismic a
- ⚙️ Product Design & Development
- ⚙️ System Modelling & Analysis
- ⚙️ Process Engineering
- ⚙️ Conjugate Heat Transfer
- ⚙️ Piping Analysis
- ⚙️ Non-Newtonian Flows
- ⚙️ Compressible flows
- ⚙️ FSI
- ⚙️ Structural analysis
- ⚙️ Fire & smoke simulation
- ⚙️ Fluid mixture, separation, particulate
- ⚙️ Particle flow
- ⚙️ Crash Worthiness
- ⚙️ Fatigue, buckling analysis

Primary Services

1.1 Automobile Industry	7
1.2 Turbo - Machinery	8
2.1 HVAC - R	9
2.2 Horizontal Ventilation	10
2.3 Car-Park Ventilation	10
2.4 Data Center	11
3.1 Thermal Analysis	11
3.2 Thermal Performance Enlargement of Fin-and-Tube Heat Exchanger Using Vortex Generators Including Distinct Circular Punched Holes	12
General Problems	
4.1 Finite Element Analysis on Roll Glider	13
4.2 Designing / Optimizing the loth dryer equipment	14
4.3 Thermal-Structural analysis on Satellite	14
5. Product Engineering	15





Title

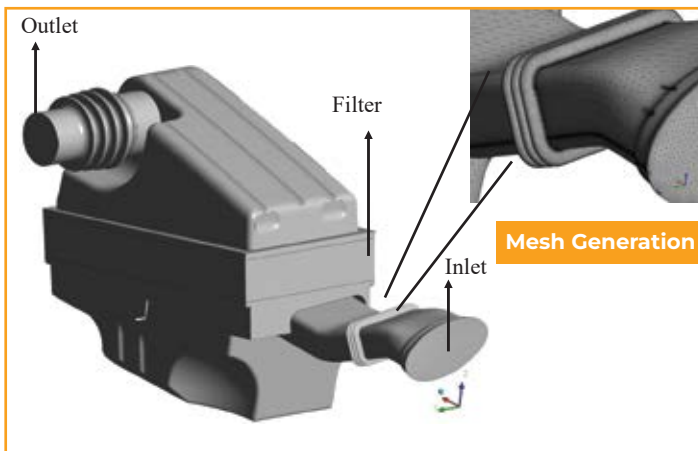
CFD - Pressure Drop Analysis of Automobile Engine Air Intake System.

Objective

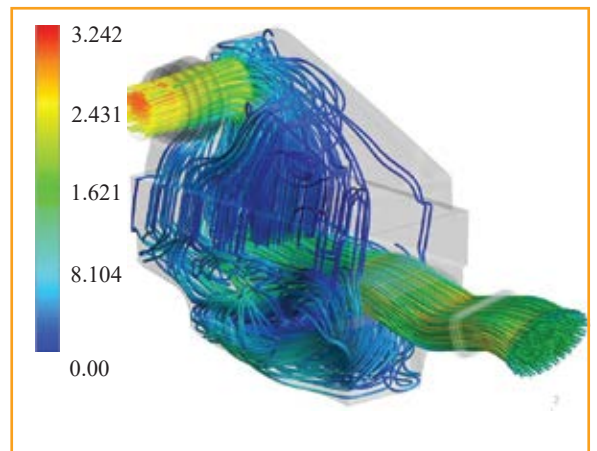
Perform CFD analysis on components of air intake assembly to predict the pressure drop for given mass flow rate and temperature conditions.

Pressure - Drop summary

OUTPUT		
Model	Component	Status as per CFD
31	Air DuctInlet + Air Filter Box	PASS

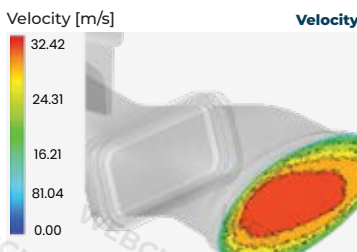
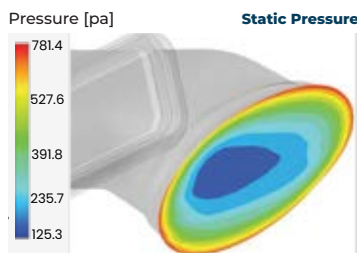


3D Model and mesh of Automobile Engine Air Intake System

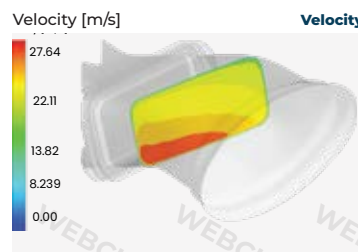
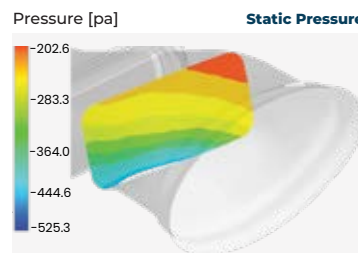


Automobile Engine - Air Intake System Streamlines

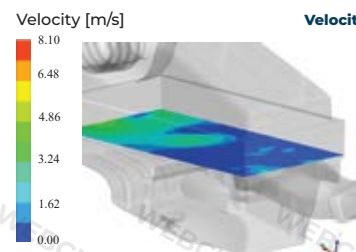
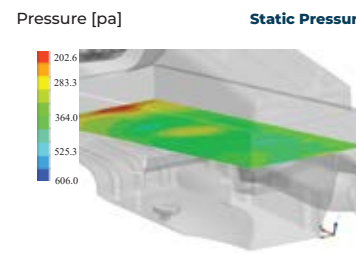
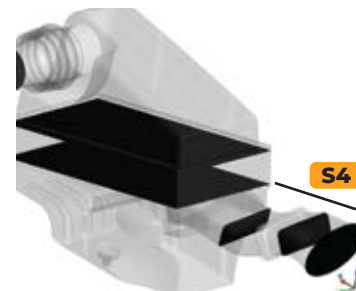
Static Pressure & Velocity Contour Plot at S1



Static Pressure & Velocity Contour Plot at S2



Static Pressure & Velocity Contour Plot at S4





Title

Automobile Centrifugal Blower **Design & Optimizations** are suggested and implemented throughout this study.

Objective

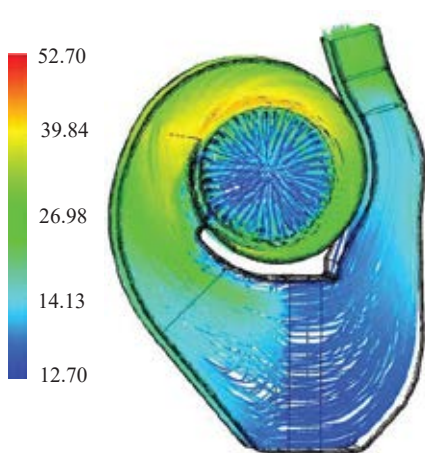
3D Simulation of Automobile air conditioning system centrifugal blower to:

- Predict **flow rate** & distribution through HVAC passages.
- Suggest **design optimizations**.

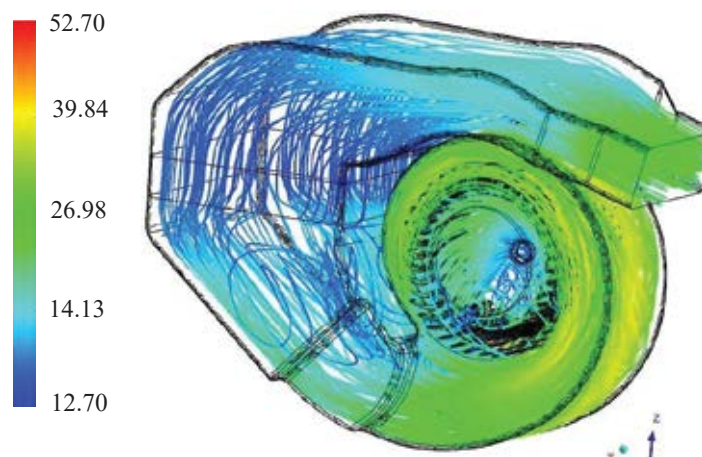
Output

- **Tapering** can be provided in this portion to avoid sudden change in flow path to avoid recirculation observed in the diverging duct just before heater.
- **Baffles** can be provided along the whole cross section to guide the flow to reduce swirl and recirculation in this portion.
- **Radius of curvature** can be increased at this portion of duct. This will better assist the flow and reduce the cross sectional area to slightly improve flow rate.

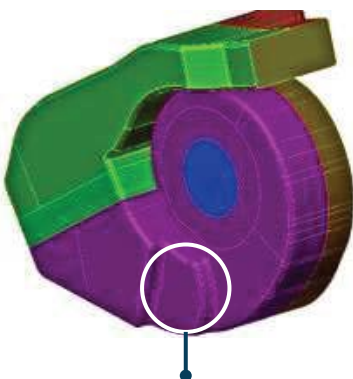
Velocity [m/s]
(Streamline inlet)



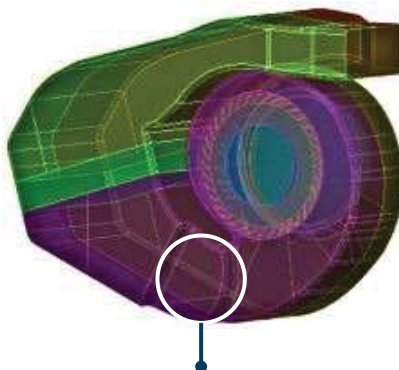
Velocity [m/s]
(Streamline inlet)



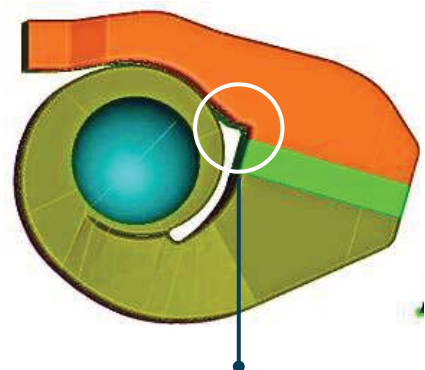
Design Changes Suggestions



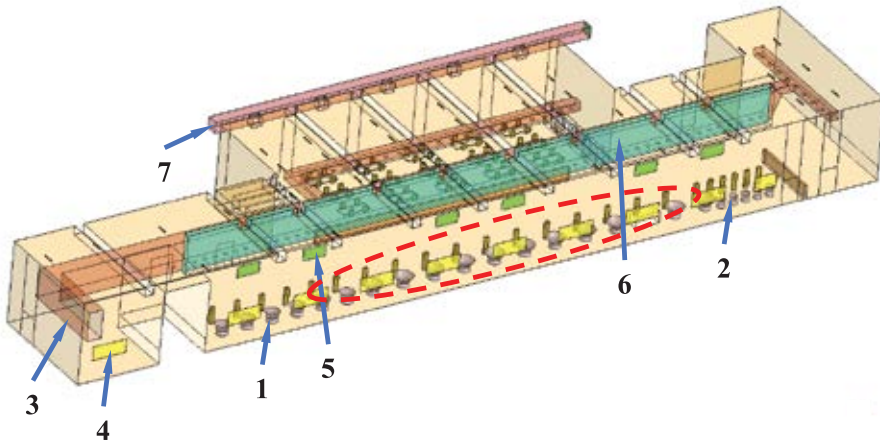
Tapering can be provided in this portion to avoid sudden change in flow path to **avoid recirculation observed in the diverging duct** just before heater.



Baffles can be provided along the whole cross section to guide the flow to **reduce swirl and recirculation** in this portion



Radius of curvature can be increased at this portion of duct. This will better **assist the flow and reduce the cross sectional area** to slightly improve flow rate



- | |
|-----------------------|
| 1. Steam Kettles |
| 2. LPG Bhatti |
| 3. Supply Air Duct |
| 4. Window |
| 5. Exhaust Air Grille |
| 6. Pardi Wall |
| 7. Exhaust Air Duct |

Client

- No disclosure Agreement with the Client

Project Highlight

- India's biggest FMCG Plant with 400000 Sq.ft. floor area.

Contribution of HTFE Solutions

- ▶ Validated the consultant design for 20 ACPH
- ▶ Optimized the design further to achieve the client requirement at 12 ACPH to save the cost as follows -
 - Up to INR 1.5 CR operational cost of two stage air washer system can be saved per year.
 - Up to INR 1 CR can be saved on ducting supply and installation and other project CAPEX.

Work done by HTFE Solutions

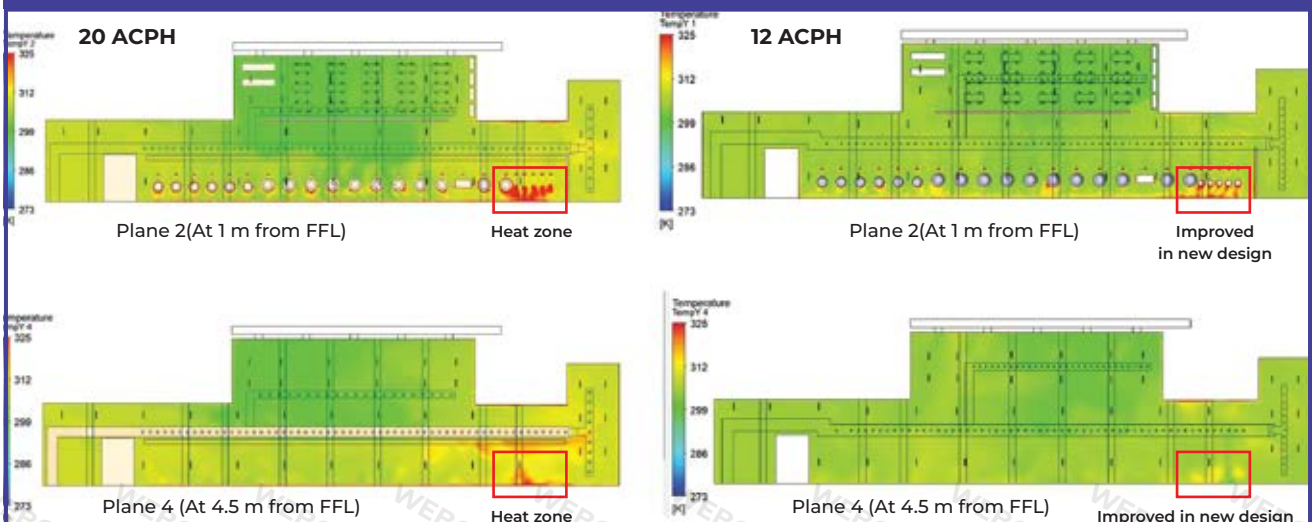
Initially, they have modeled the air-washer system as per consultant's design is at 20 ACPH.

We performed simulation and optimization in their designs.

Design is modified to reduce the ACPH value from 20 to 12.

It can be seen from temperature distribution (find in next slide) is improved remarkably in new design even when shifting from 20 ACPH to 12 ACPH value.

Temperature Contour Horizontal Plane Comparison





CASE STUDIES

Horticulture ventilation



Project - CFD Analysis of the Canopy arrangement

Client - Canopy manufacturer in USA

Horticulture ventilation

Project & Scope

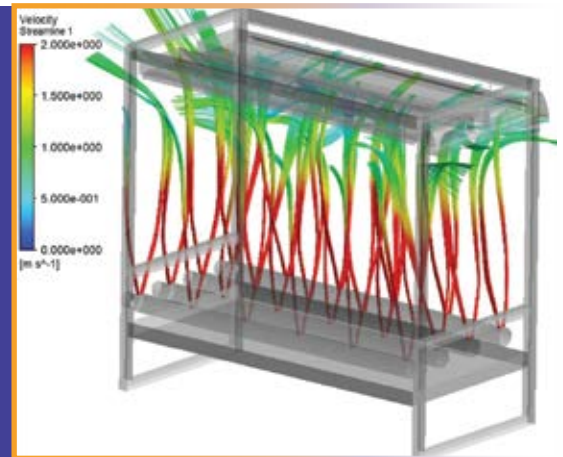
Analyse the existing design.
Optimize the design through CFD analysis.

Challenges

Analysis for **unpredictable conditions**.
Maintaining the **uniform flow** in a system.
Optimizing the flow around supply and exhaust duct.

Key Points

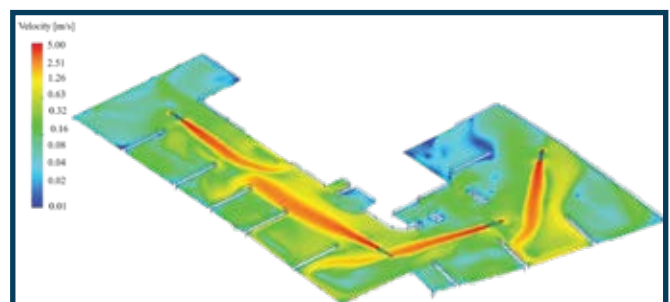
- ▶ Analysis was assisted with several rounds of **iterative testing** to qualify the overall progress of the project
- ▶ Recommend **optimizing the size and positioning of supply duct inlets, imposing restrictions around exhaust ducts, and adjusting supply CFM**



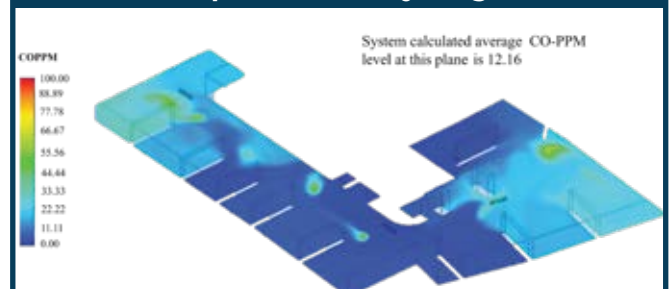
HVAC - Car-park Ventilation

Objective Of the project

- To check the effectiveness of the ventilations system Forfire, so that the fire and smoke can be put out And there should be **clear visibility** for the people To **escape** at stipulated time.
- The event of a **co high level (>100 ppm)** is avoided At short term exposure of 30 min.
- To investigate the **performance of the system**, so that there is adequate air movement throughout The car park under normal operating conditions.
- The cfd study aims to analyze and simulate all The above mentioned conditions and **validate** The design of the system, in the achievement Of its objectives.



Contourplot of velocity magnitude



Contourplot of co ppm

The mathematical modeling for the analysis involves a few simplifying assumptions and care has been taken to meet the safety requirements. The analysis is done with Jet Fans operating at Normal Mode speed, placed and optimized so as to remove the stagnant areas and to reduce the concentrations of CO in the car park.



CASE STUDIES

Data Center



Data Center Cooling

Scope

The objective of the project was to check the temperature distribution in & around the racks, short circuiting of cold/hot air and sufficient supply of air to cool the racks. Also the air recirculation zones were checked to achieve more efficient flow.

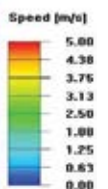
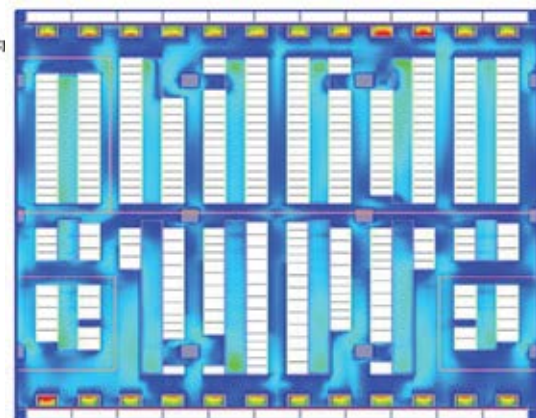
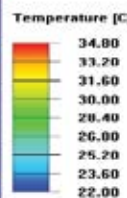
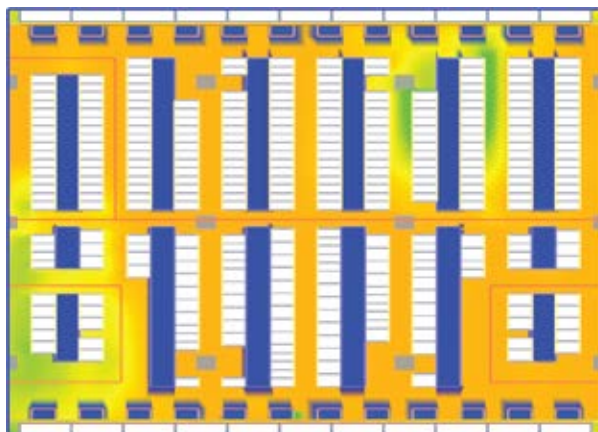
Parameters Studied

- ▶ Velocity distribution
- ▶ Air recirculation area
- ▶ Temperature profile
- ▶ Pressure contour plot in
- ▶ Fresh air supply air rate
- ▶ Cold and hot aisle

■ 166 RACKS 990 KW	■ 42 RACKS 10 KW EACH	■ PAHU IN OPERATION
■ 32 RACKS 256 KW	■ 53 RACKS 6 KW EACH	■ FLOOR GRILLE
■ PDU IN OPERATION	■ WALL	■ WIRE MESH
■ CAFE WALL	■ COLUMNS	
■ WIRE MESH	■ RAISED FLOOR	
■ COLD AISLE CONTAINMENT	■ 20 RACKS 10 KW EACH	

Report/ Deliverables

- ▶ Detail report will be provided.
- ▶ Velocity and Temperature distribution at different sections, animations for visual inspections.



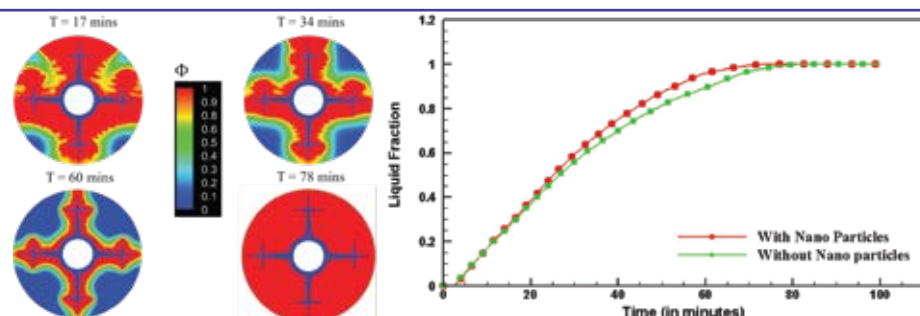
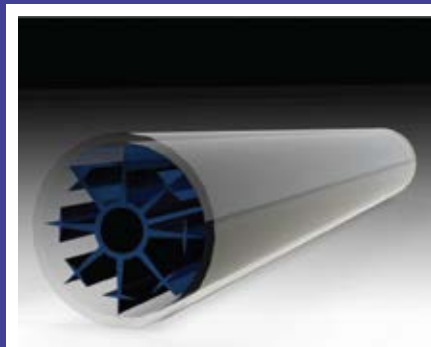
CASE STUDIES • Thermal Analysis

Two Phase modelling of a Latent Heat Storage Unit using Cesaro Fins

Work Done

- Created additional fin types to enhance the system's performance. To investigate the system's performance, transient simulations were also run. As a result, the performance of the system has been studied using a number of combinations, including the type of fins, metal foams, and nanoparticles.
- Conducted a detailed investigation & offered thorough customer support to improve the product. Consequently, a thorough report of the survey has been provided. Different fin combinations, such as Cesaro, cross-type and cross with side hand, were taken into consideration in the study. After picking the best fins, the system was improved by adding different amounts of metal foam and nanoparticles.

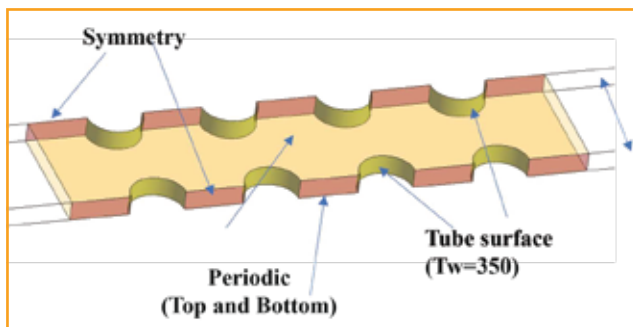
- ▶ The present problem simulates the process of melting of phase change materials inside a finned tube.
- ▶ The simulation is performed in two dimensions and hence only a hollow circular section of the pipe is modelled.
- ▶ The phase change material used is RT-82.
- ▶ When the temperature around a liquid substance drops, the PCM hardens, and value of Liquid fraction is '0'.
- ▶ Whereas value of liquid fraction equal to '1' indicates that PCM is in liquid phase.



1. The liquid fraction changes faster with time in Nano particle infused PCM material.
2. Copper is used as nano particles with 4% volume fraction



3.2 Thermal Performance Enlargement of Fin-and-Tube Heat Exchanger Using Vortex Generators Including Distinct Circular Punched Holes

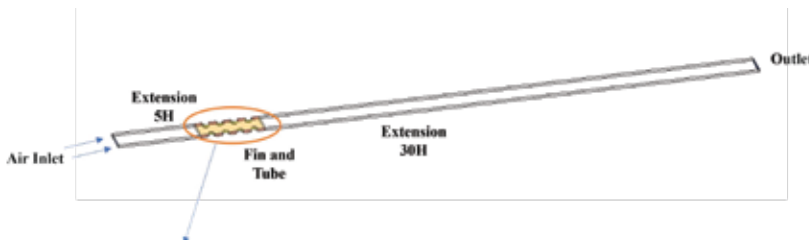


A vortex generator with punched holes

Summary

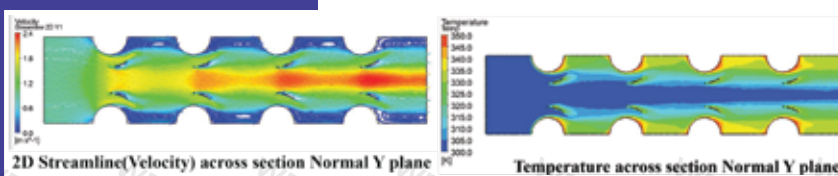
- It has been widely explored to enhance the air-side convective heat transfer coefficient, particularly in plate-fin and tube-fin compact heat exchangers.
- Our customer is a Manufacturer, Exporter and Supplier of various types of heat exchangers.
- A vortex generator with punched holes was studied to explore the performance of the compact heat exchangers.

- HTFE Solutions modelled the vortex generators based on given dimensions and configurations.
- Modelled VGs have been attached to a fin tube heat exchanger so that it increases the heat transfer rate, and the computational domain has been restricted to the region of concern.
- The thermal contact resistance between the tube and fin collar is ignored, and the tube surface is set at a constant temperature.



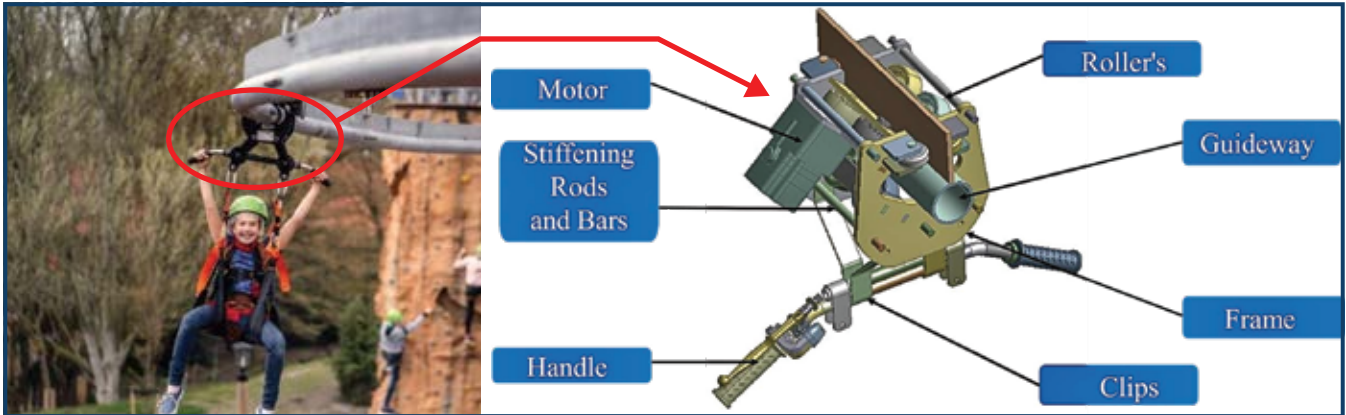
- HTFE Solutions team optimised the design by doing trial & error on VGs locations, orientations and configurations.
- More than 40 simulation data have been compiled and the report has been submitted to the customer for future reference.

Thermal analysis



CASE STUDIES - General Problems

Finite Element Analysis on Roll Glider



Title

- ▶ Strength Analysis of Roll Glider

Applicant Requirements

- ▶ For the **Roll Glider** unit, it is required to validate the strength of the **Roll Glider assembly** under operational loads.


Scope

- ▶ Perform FEA on Frame for following Operational load case.
- ▶ LCI - **Strength Analysis at 500 Kg Load** (linear static)

Output

- ▶ The max stress is 242 MPa which is well within the yield limit.
- ▶ In order to review the detailed results of roller's while application the dynamic analysis is suggested which will give comprehensive idea about the possible deformations in wheels during motion.
- ▶ Considering all above observations for given distributed loading of 500 Kg over anchor and holding locations the design is safe.

- Over Constrained
- Far
- Near
- Sliding
- Sticking

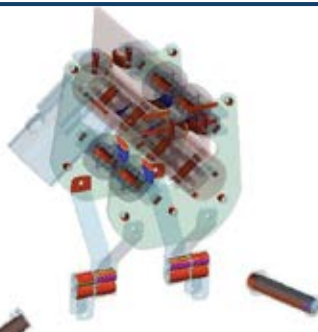


Average element size range is 3 mm

Details of "Mesh"	
Display	Use Geometry Setting
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Mechanical
Element Order	Program Controlled
Element Size	Default
Sizing	
Use Adaptive Sizing	Yes
Resolution	Default (2)
Mesh Defeaturing	Yes
Defeaturing Size	Default
Transition	Fast
Span Angle Center	Coarse
Initial Size Seed	Assembly
Bounding Box Di...	965.02 mm
Average Surface ...	508.64 mm ²
Minimum Edge L...	0.2 mm
Quality	
Inflation	
Advanced	
Statistics	
Nodes	590651
Elements	279743

Mesh Setting applied

- Over Constrained
- Far
- Near
- Sliding
- Sticking



Bonded contact (highlighted in & color) is been modelled at the location where there is a possibility of fastening of two components

Details of "Bonded - 800441_Standard To 800442_1_..."	
Scope	
Scoping Method	Geometry Selection
Contact	4 Faces
Target	4 Faces
Contact Bodies	800441_Standard
Target Bodies	800442_1_Standard
Protected	No
Definition	
Type	Bonded
Scope Mode	Automatic
Behavior	Program Controlled
Trim Contact	Program Controlled
Trim Tolerance	2.3327 mm
Suppressed	No
Advanced	
Formulation	MPC
Detection Method	Program Controlled
Constraint Type	Program Controlled
Reball Region	Radius
Reball Radius	5. mm
Geometric Modification	
Contact Geometry Correction	None
Target Geometry Correction	None

Contact Setting applied



Machine Design



Gold Wash Plant



Industrial Blender



Garbage Cleaner



Mixing Auger



Crumbler (Crusher)



Garlic Cleaning Line



Helium Heat Testing



Belt Conveyer



Automated Feed Plant



Scissor Lift



Breather Cutting Machine



Flat Belt Conveyer



Machine Design



Granite Multiwire Saw



Automotive Conveyor Tech



Lifting Station



Cleaning Station



Saw Crusher



Packing Machine



Buffer Conveyor

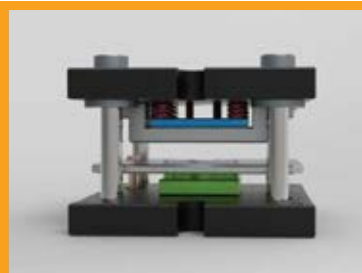


Garlic Cleaning Line

Jig & Fixture, Inspection Gauge, Press Tool Design



DPF Vetri Gauge



Compound Die



End Gauge



Jig & Fixture, Inspection Gauge, Press Tool Design



Euro Leak Tester



DPF Gauge



Progressive Tool



Strap Mould



Progressive Tool

Product Design



Muffler Design



**Smart Wifi
Switch Board**



Camera Enclosure



Screw Feeder



Rope Courece



**Sliding Robot
for Pipe Weld**



Miscellaneous



Screw Feeder



Rope Course



Sliding Robot for Pipe Weld



Industrial Shed



Pellet Cooler



Structure Design



Oil Gas Pressure Sensor



Solar Controller



Turbine



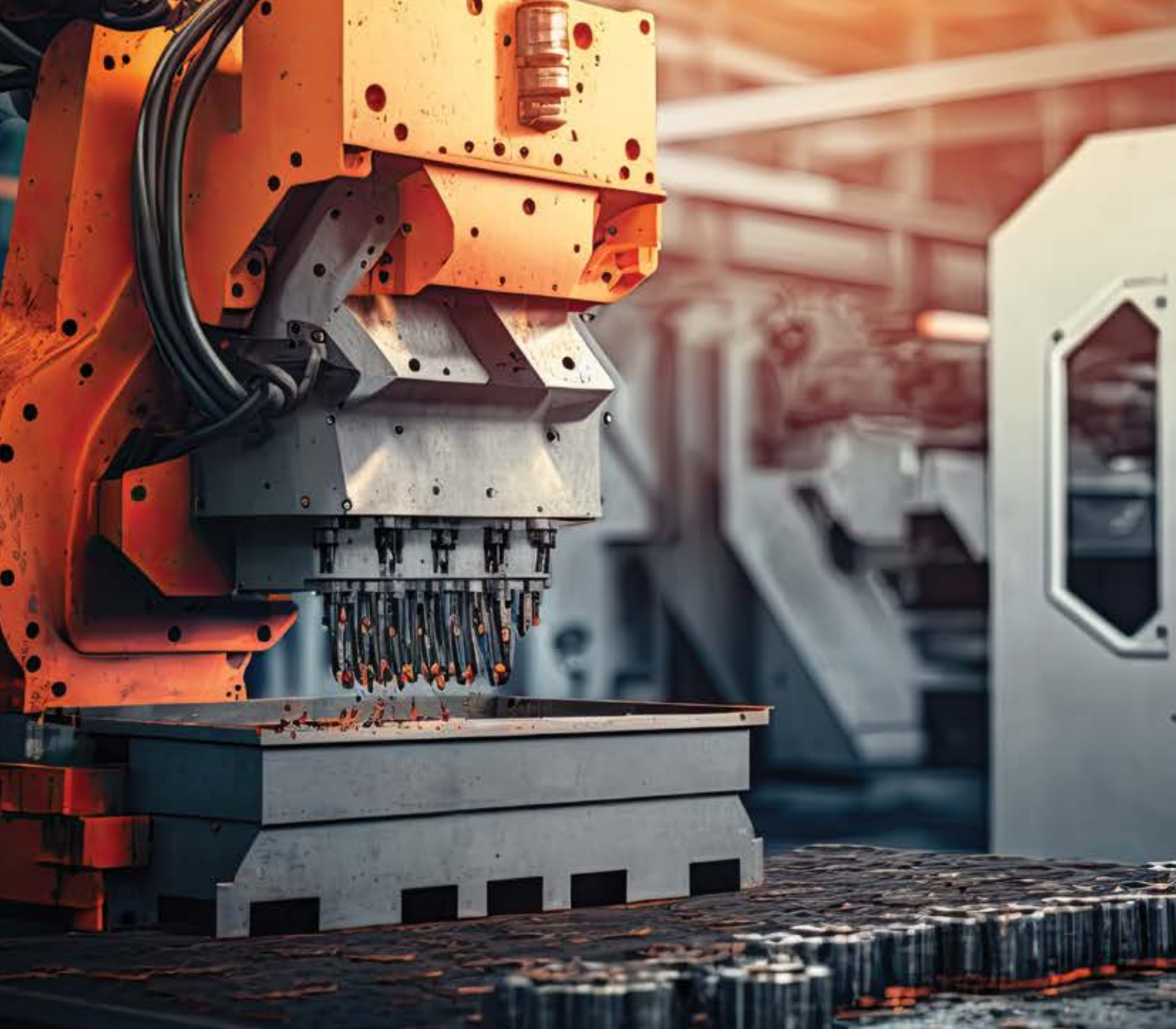
Tool Stand



Pressure Vessel



Chemical Plant



R&D Consulting / Engineering Simulation Services

Heat Transfer & Fluid Mechanics, Pressure Drop, Ansys FLUENT, CFD, 3D Modelling, Product Design & Development, FEA Analysis.



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