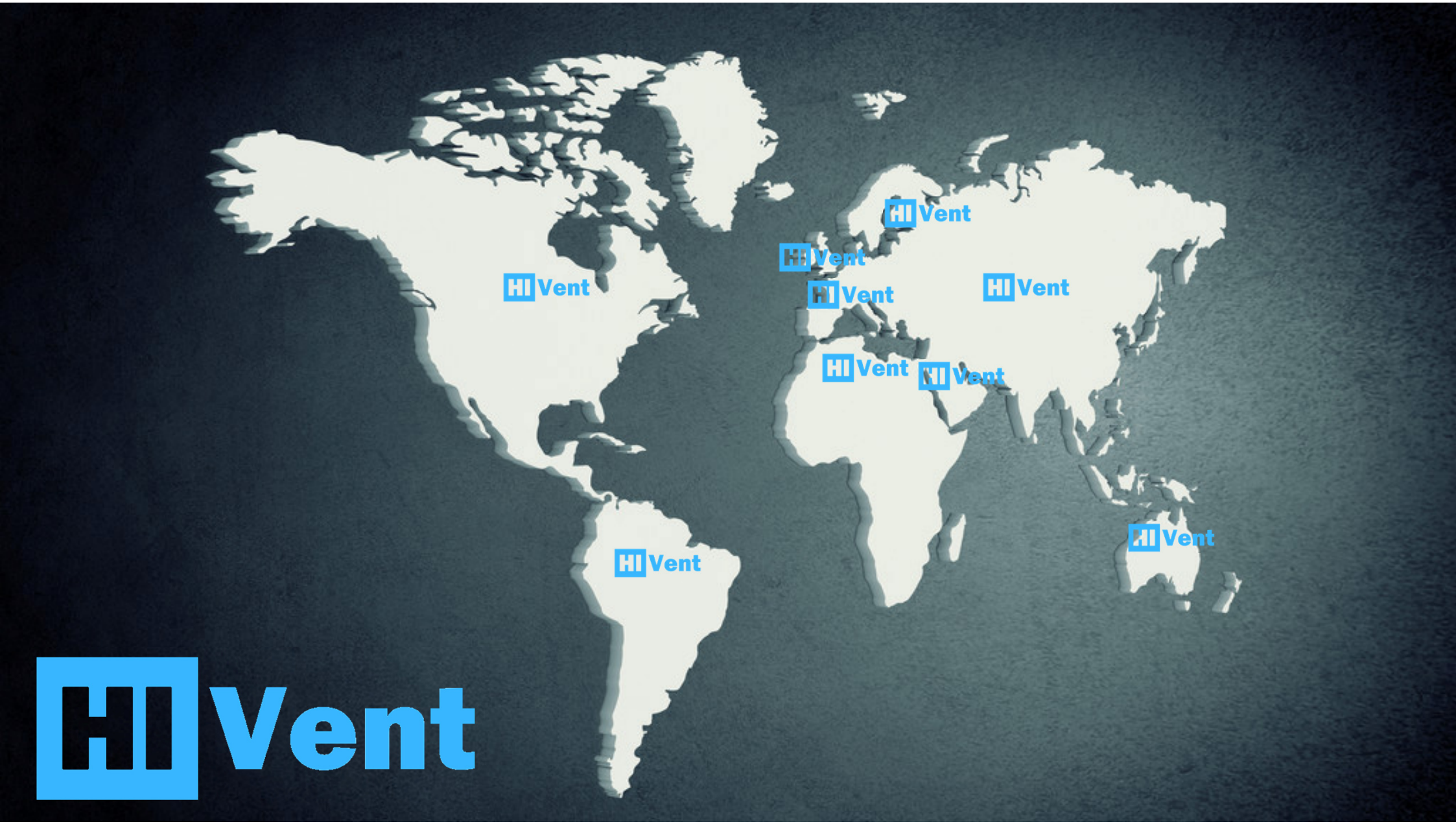
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HiVent
Our main goal is to provide safer working areas to our customers operating in different sectors.
25+ Years of sector experience
10+ Year Production Experience
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HiS

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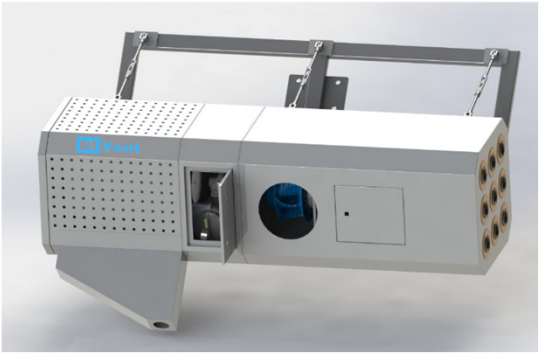

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All R&D studies of HiS swarm type ambient ventilation system were carried out within our company.
The system ensures that all volatile particles formed in the production areas are filtered in a way that prevents them from being sprinkled again and that the ambient air reaches a breathable value.
Each HiS unit has a 1.3 kW EC motor.
A composite fan with a maximum flow rate of 5000 m^3/h is available. Nanofibre coated cartridge filters are class F9 (EN779:2012). Filter cleaning system is fully automatic.

The HiS, which absorbs and filters the polluted air in the environment, adapts to the principle of displacement ventilation by releasing some of the cleaned air back into the environment at very low speeds at ground level.
Part of the cleaned air is blown through the jet nozzles towards the other HiS unit and the volatile particles are continuously mobilised. Thus, spattering is minimised.

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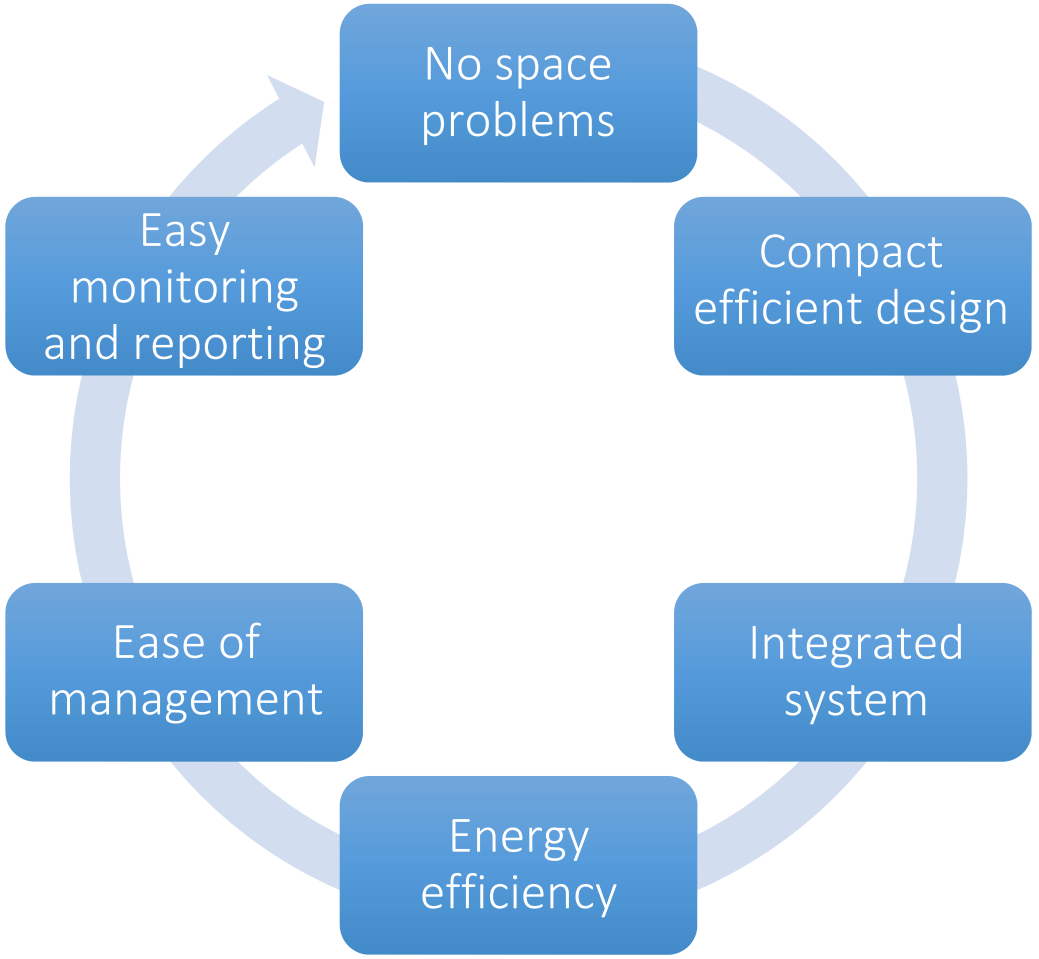
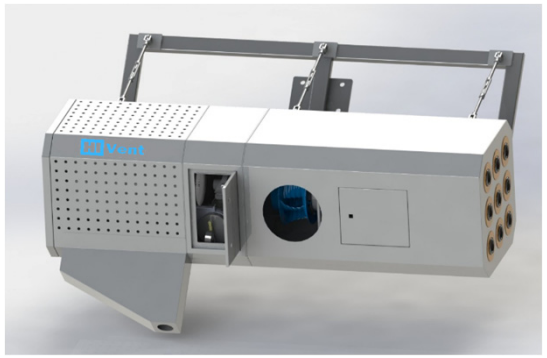
WHY HiS?



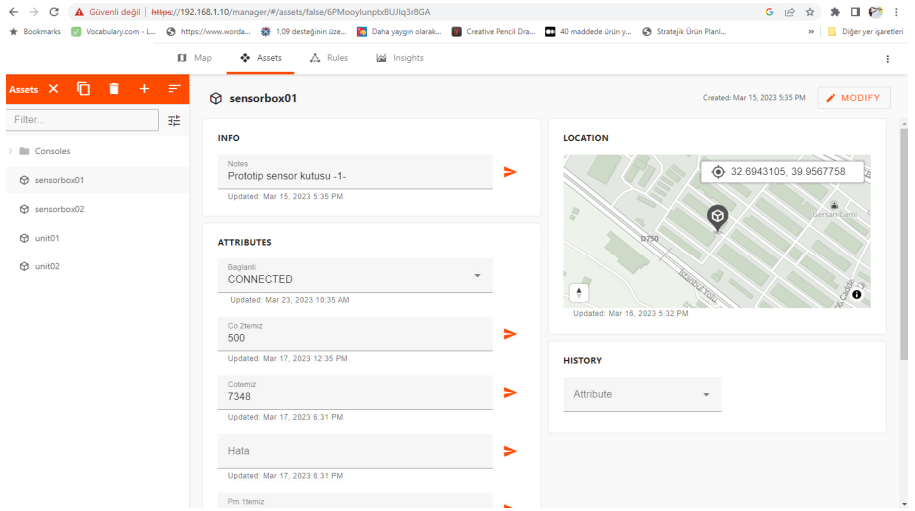
INTEGRATED SYSTEM - System Components

Filter Unit



Ambient Air Quality Monitoring

Central Monitoring and Management Software



INTEGRATED SYSTEM - Advantages

Energy efficiency

- With the environment monitoring system, only the units that need to operate are activated
- More efficient filtration technology with EC Motor technology

Autonomous operation

- With ambient monitoring and advanced sensor technology, units can perform joint missions.

Ease of management

- The entire system can be managed from a single point with centralised software
- The operation, maintenance and parameters of the units can be monitored centrally.

Monitoring and reporting

- The efficiency of the units can be monitored with sensors at the inlet and outlet of the units.
- Monitoring of ambient air quality in general thanks to ambient monitoring boxes.
- All data is recorded centrally and reports can be generated at the desired frequency and specifications.

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Filter Unit - Highlights

- EC Motor Technology
- Polluted Air Measurement Sensors (PM - CO - CO2 - F.dehyde - VOC)
- Clean Air Measurement Sensors
- Air Outlet Diverter Dampers
- Automatic Filter Cleaning System
- Space-saving
- Silent Operation

Central Software - Highlights

- Support for autonomous algorithms supported by artificial intelligence
- Scalable centralised web-based application
- Alternative communication support
- IoT Platform

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POLLUTANT LIMIT CONDITIONS USED IN OUR ANALYSES

WELDING PROCESS

- Determination of the amount of pollutants given to the environment by the particles coming out of the welding process is a separate subject of study. For this purpose, many academic papers have been examined and our knowledge accumulated over the years has been used.
- When the factory parameters in the sample application are analysed, it is seen that there are manual and autonomous welding units. Even if the arc-on times change, the pollutant flow (emission) of MIG welding will be entered into the calculations as at least 3.63 mg/s.

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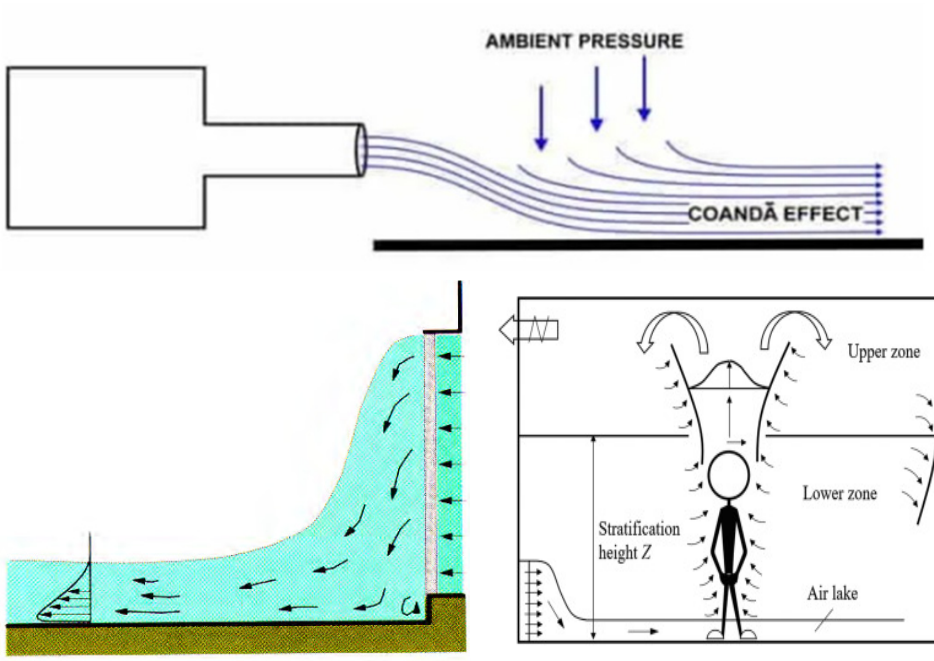
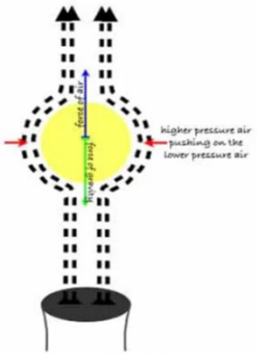
HALL VENTILATION SYSTEMS

Briefly defined, in displacement ventilation systems, conditioned air is supplied to the environment around the floor level and sucked from the ceiling level. The aim is to provide the required comfort conditions in the “occupied zone”, which is defined as the human head height, and in the meantime to optimise the air quality.

Compared to the alternative mixed air distribution systems, much better results are obtained, especially in places with high ceiling levels.





The Coanda Effect is the tendency of a fluid to stick and flow along flat and inclined surfaces. If we model it with an example; let's run a hair dryer and put the ping pong ball in the middle. We observe that the ball floats in the air.

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Thanks to this system, the breathing zone is optimally cleaned. Air containing hazardous substances remains much higher in the breathing zone. This results in almost completely clean air in the production hall at a height of at least 2 metres above the floor.

The risk of particle fallout is minimised as the polluted air remaining above is forced to move rather than remaining stationary.

This system, which is based on air circulation, saves up to 70% of heating costs in winter months. For example; expelling dirty air with acrobatic arms or large fans means expelling heated air, which leads to high heating costs.

Many different systems are produced based on the displacement ventilation system. What places the HiS system in a different position than all of them is that it can clean the ambient air in accordance with international standards without taking up space in the working area and with much lower energy consumption. The DBHVS feature that we use in our OHK-15 filter towers has also been our priority in our HiS system.

What is DBHVS?

Thanks to DBHVS, filtered return air can be returned to the environment from different parts of the tower or mixed, depending on the user's choice.

Our primary preference is to reintroduce a high percentage of clean air into the diffuser at the bottom of the system. However, in some special cases, users may want to completely switch off or restrict the bottom blowing. In such cases, only the upper blowing can be activated.

These special cases can be as follows:

- It may be necessary to weld in an area very close to the blowing distributor and the bottom blowing can be switched off to protect the shielding gas.
- It may be desirable to disperse the fog cloud seen near the ceiling. Increasing the upper blowing will solve this problem.

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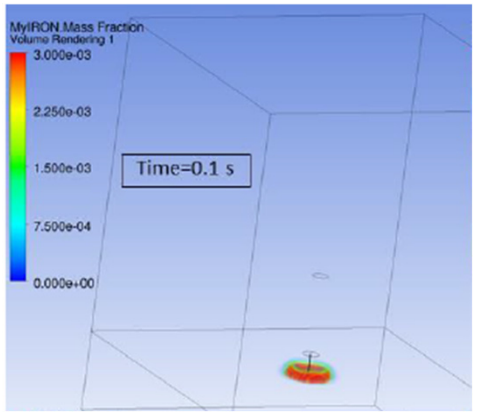
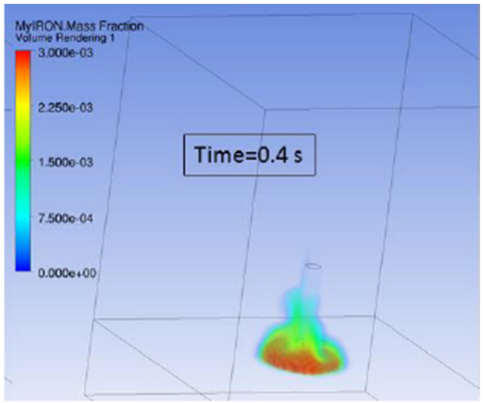
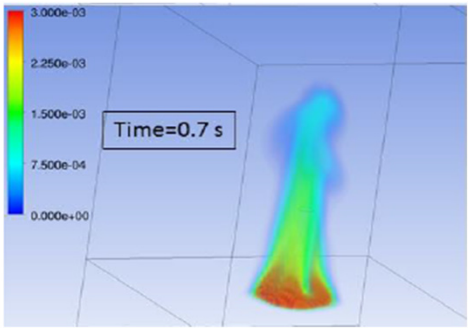
What is CFD Analysis?

The method known as Computational Fluid Dynamics is an important branch of fluid mechanics in which important problems of fluid behaviour are analysed in computer environment with numerical data and algorithms.

CFD is used in different industries for different calculations and analyses. It provides us with detailed information about phenomena and concepts such as velocity-temperature and pressure distributions, phased flows, particle-laden flows, constant and density flows, subsonic -supersonic flows, heat transfer.







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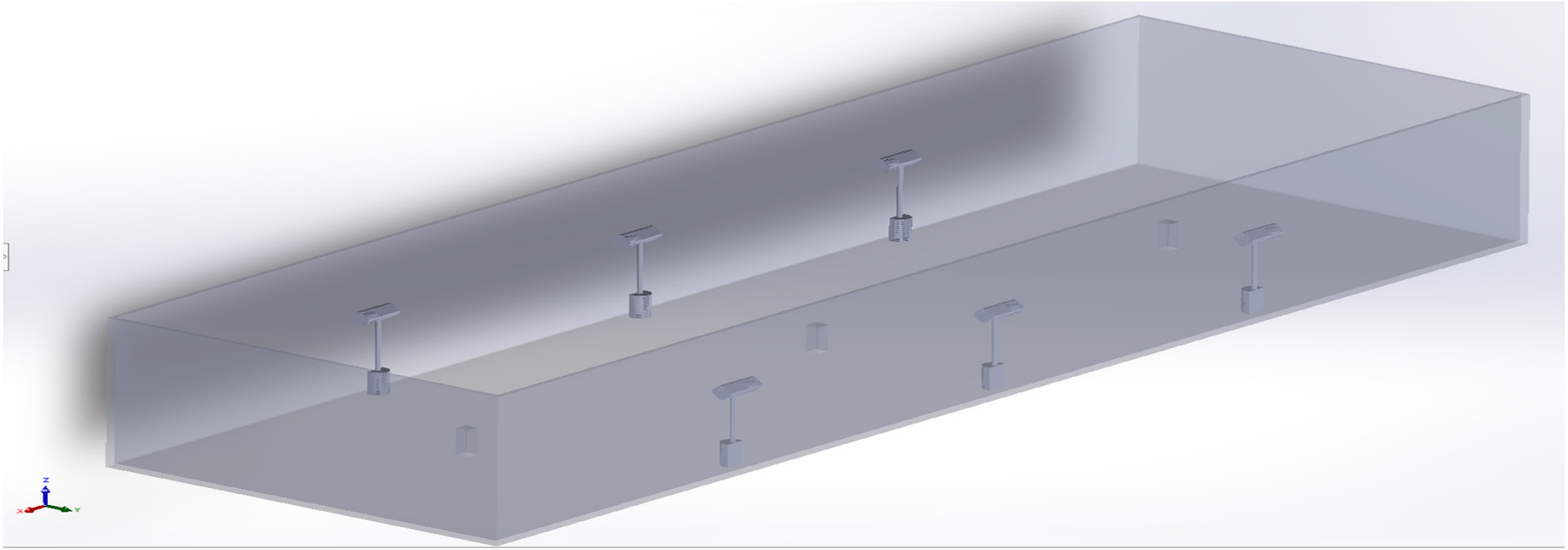
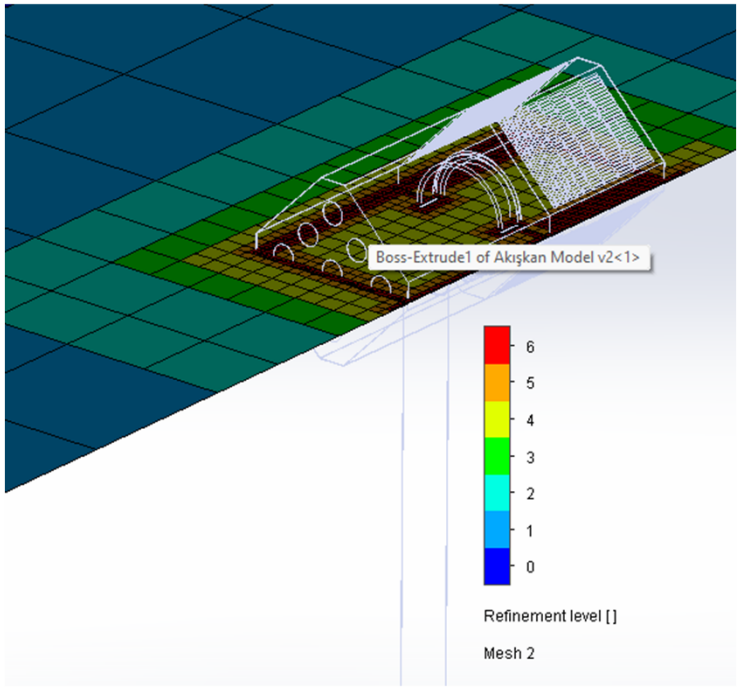
HiS CFD Results

The devices were placed in a flow volume with a ceiling height of 10 metres, a width of 16 metres and a length of 52.5 metres. In this volume, 6 devices were placed at a height of 4 metres from the ground with a spacing of 13 metres between them. In this study, the particles from the welding fume will be monitored with the particle monitoring module in the CFD software and the device positions will be adjusted parametrically according to the results.

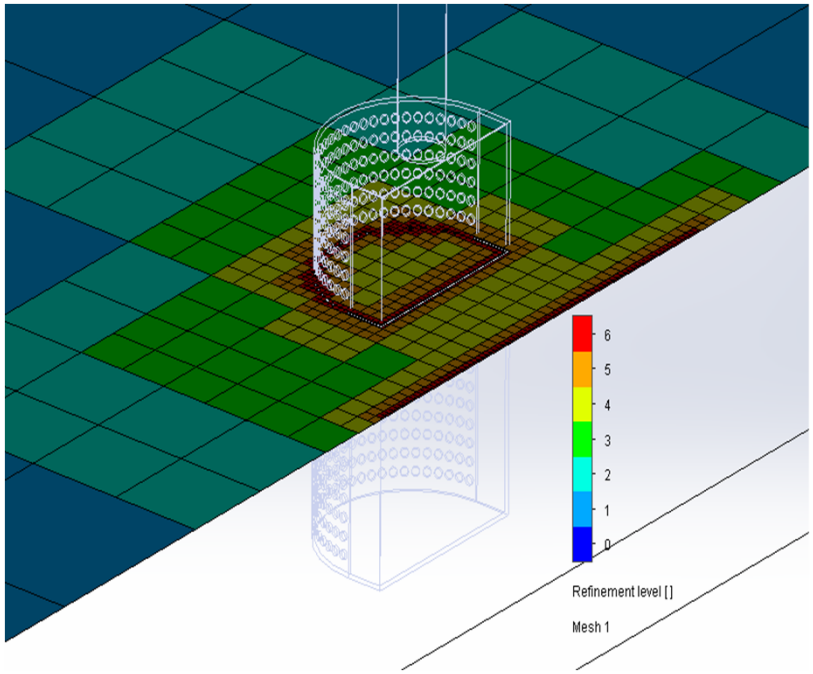


Boundary Conditions and Mesh Structure

- In the regions close to the boundary layer, the (y+) mesh structure was tightened by considering the boundary layer thickness.
- Direct pressure loss-flow approach was made and flow was provided to the system in the direction of the curve.



- The curve of our fan is defined as the driving force.
- 3 pollutant sources were placed in the environment.
- The welding fume is modelled as a uniform flow of approximately 0.5 m/s.



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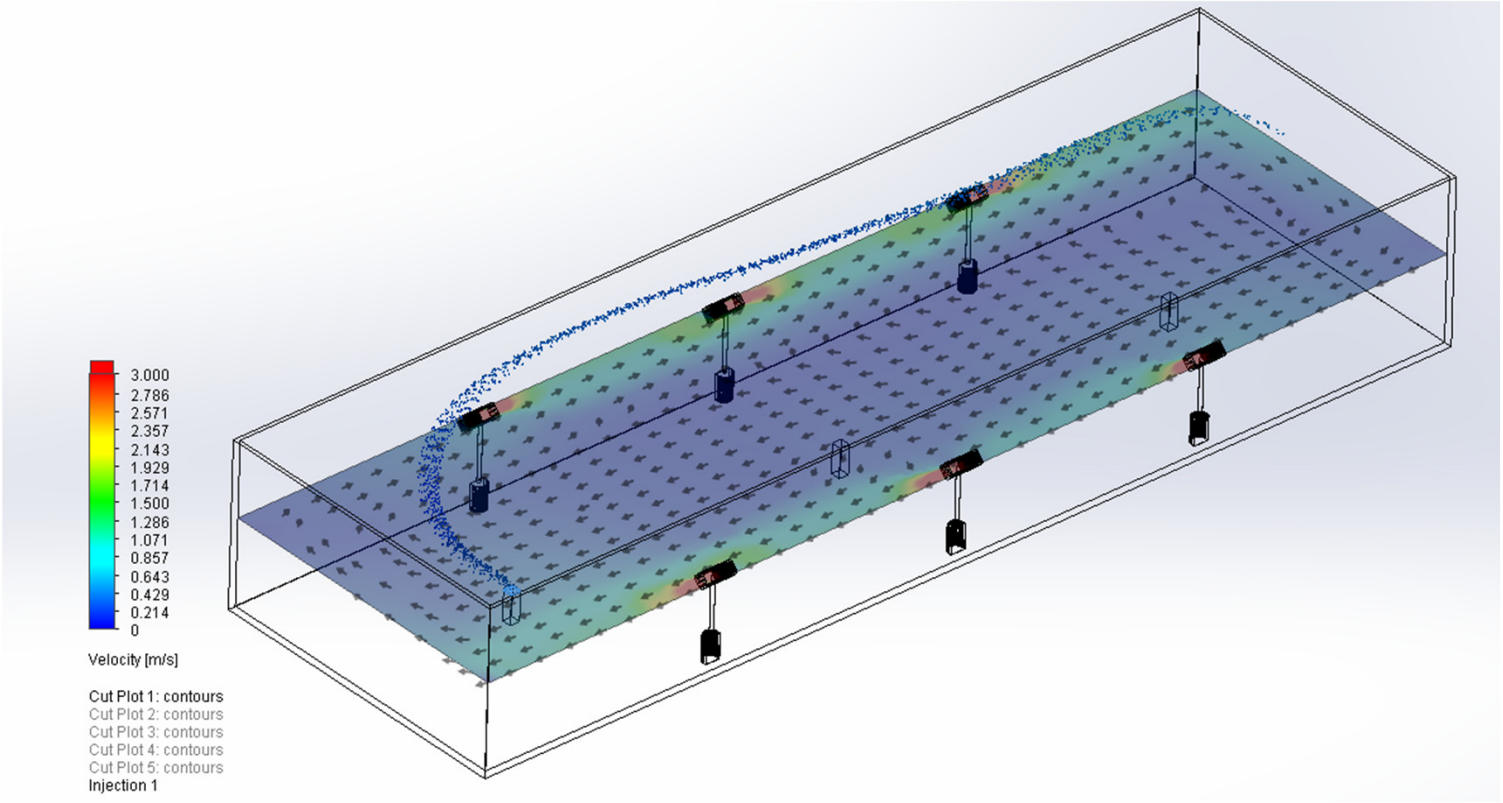
The air circulation of the devices placed 13 metres apart from the side view is as follows with streamline and colour contours. The levels where the particle is retained show laminar flow characteristics. This is an important factor for particles to be captured and not to descend into the working area.



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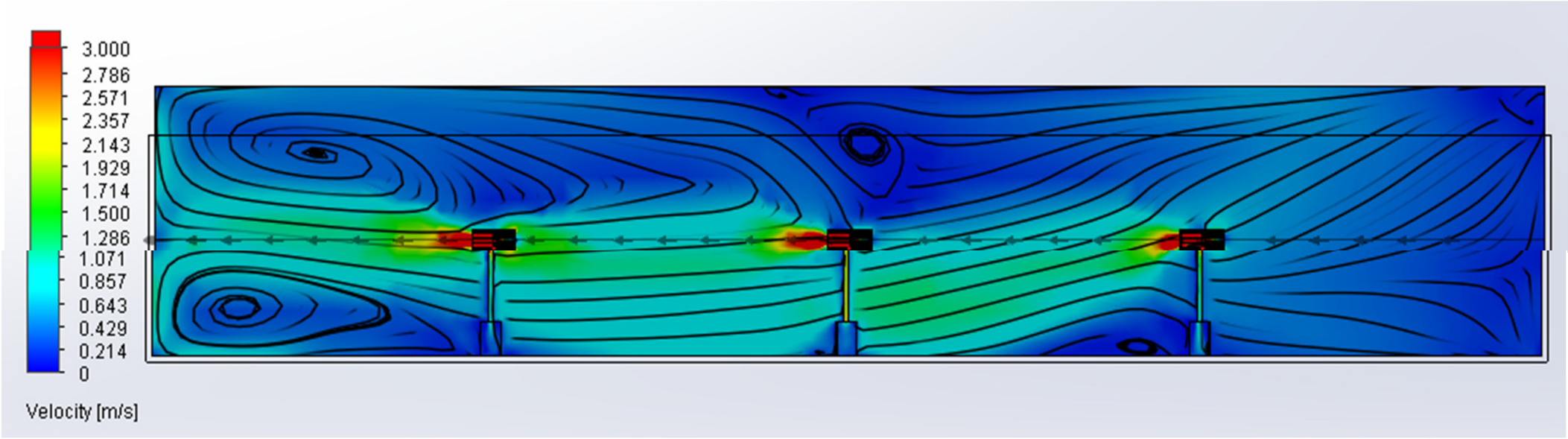
HiS

Instead of blowing alone, the distribution of fresh air to the environment was better observed in the devices that blow with support instead of blowing alone. In order for displacement ventilation to be more effective, the operation of the devices in air circulation has been determined in CFD analysis results. A distance of 13 metres is sufficient, the range can be up to 16-18 metres. The devices placed in appropriate scenarios will positively affect the air quality of the work area and reduce the ambient particle concentration.



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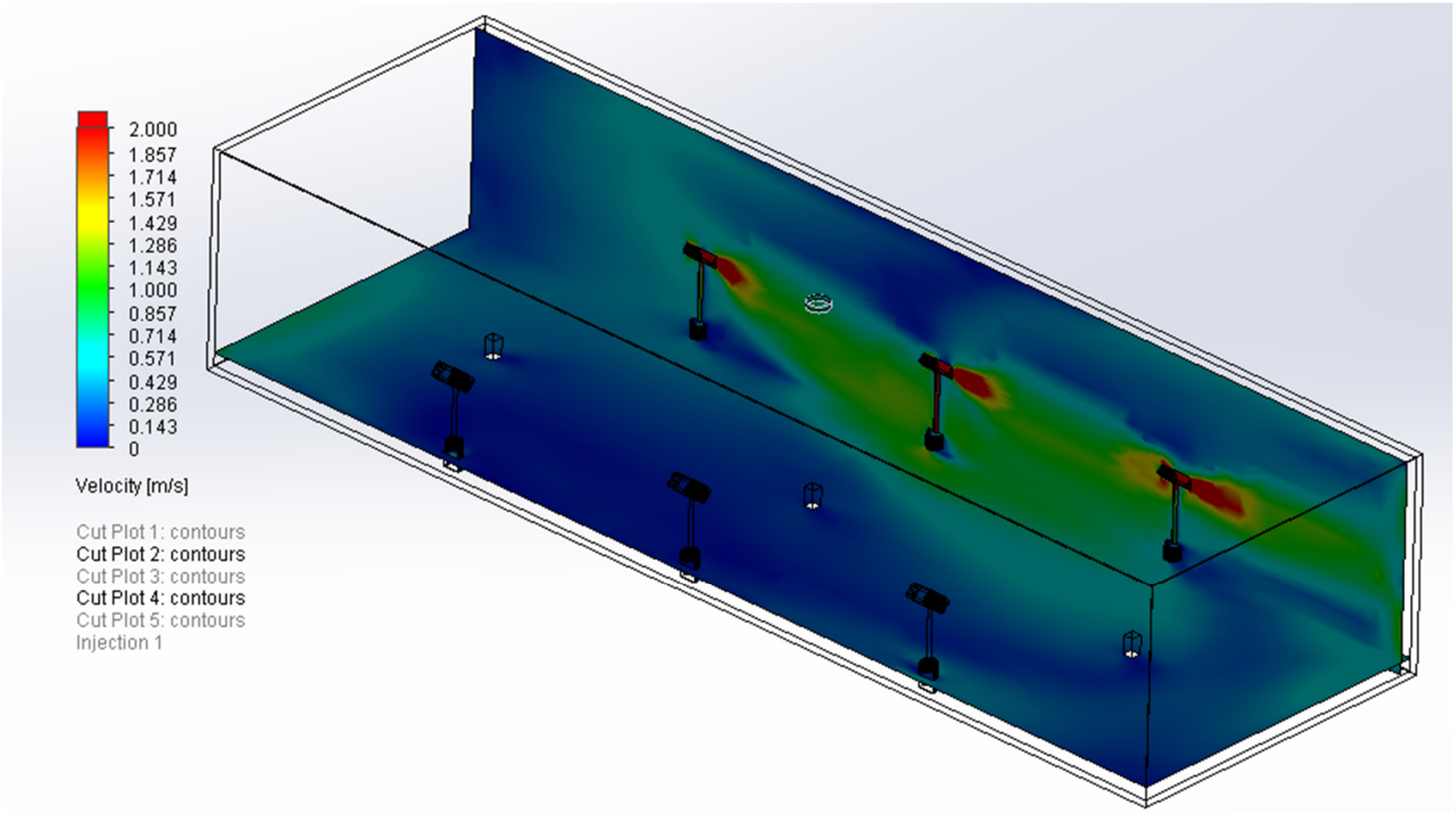
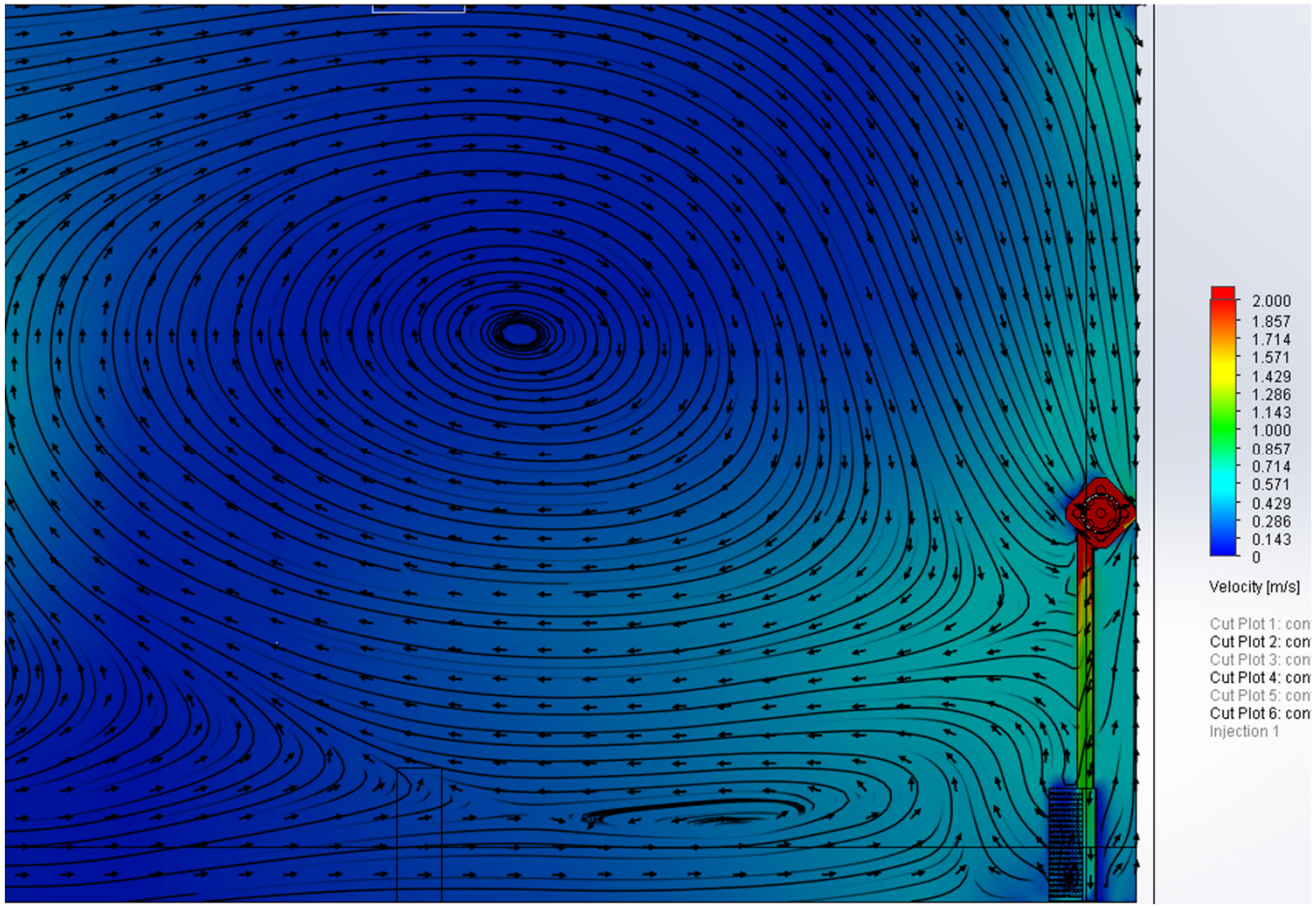
HiS


2.000
1.857
1.714
1.571
1.429
1.286
1.143
1.000
0.857
0.714
0.571
0.429
0.286
0.143
0
Velocity [m/s]
Cut Plot 1: contours
Cut Plot 2: contours
Cut Plot 3: contours
Cut Plot 4: contours
Cut Plot 5: contours
Injection 1

HiVent

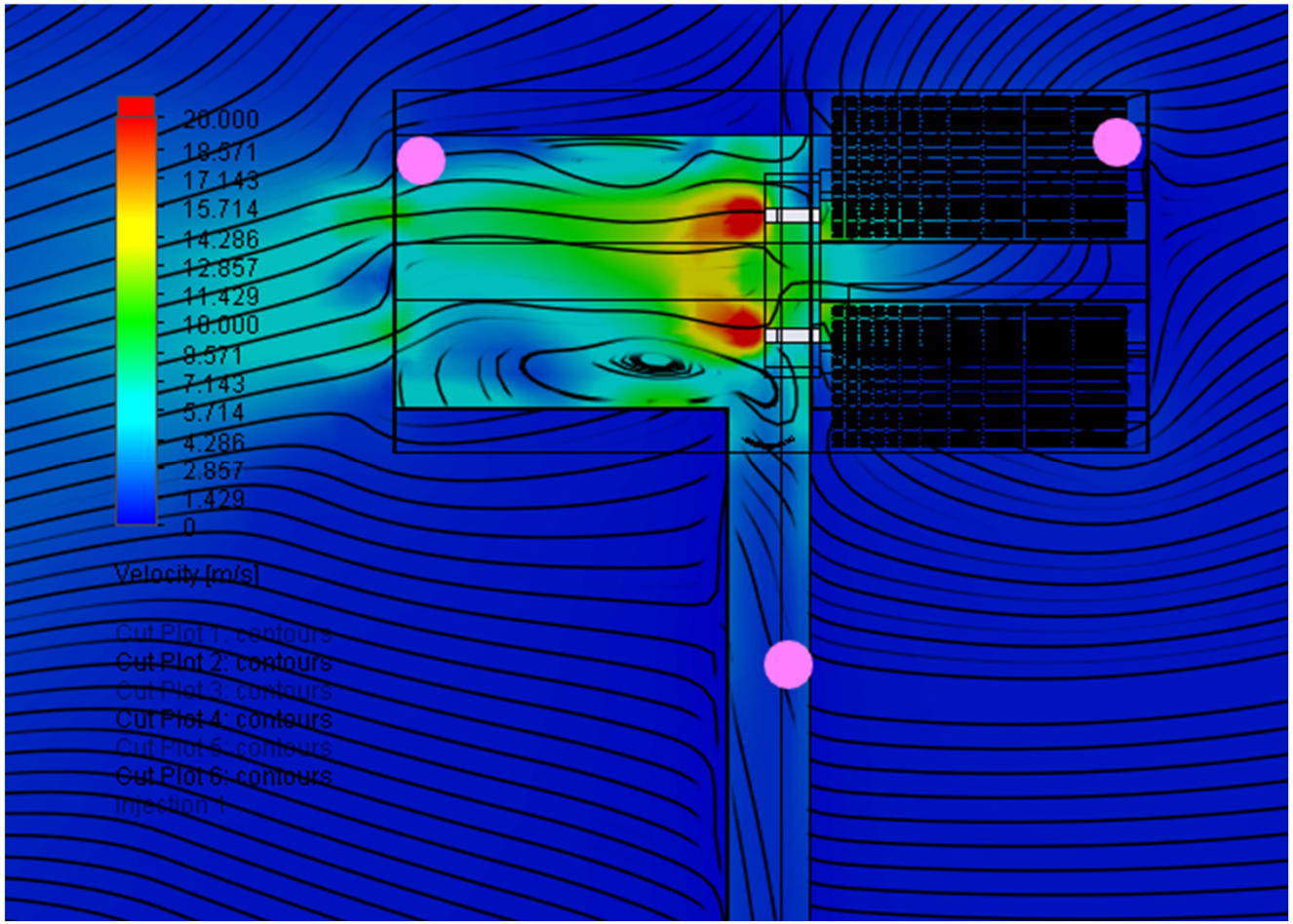
HiS



When the vector and mapping of the flow field created for bottom blowing and top suction are observed, it is observed that the pollutants are directed upwards and suctioned from above. CFD study as an application of the displacement ventilation system is shown on the left.

HI Vent

HiS



For the placement of the in-device sensor box, it was tried to determine the points that would least disturb the flow regime and where the air was not turbulent.
(Pink dots show the sensor placement areas.)

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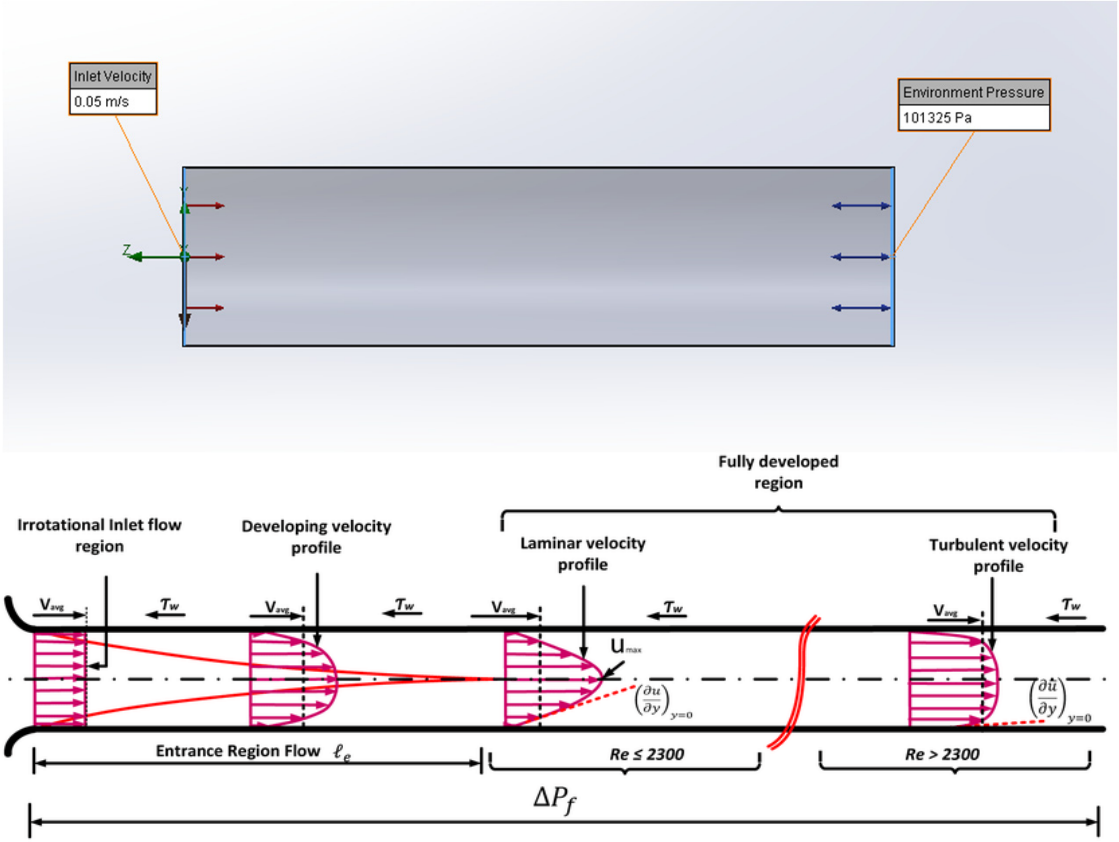
Particle Transport Experiment in Low Velocity Air Streams

- The diameter of the experimental set-up was chosen to be 1.5 m (in order to observe the Reynold's number above 4000 in the turbulent flow profile).
- The length of the assembly is 6 metres.
- The acceleration of gravity is 9.81 m/s in the -y direction.
- Starting from 0.05 m/s velocity, measurements will be taken up to 0.25 m/s velocity with a frequency of 0.05. (The flow is initially fully developed and turbulent.)
- The transport distances of stainless steel material in PM10 dimensions will be determined and statistical approach will be made.



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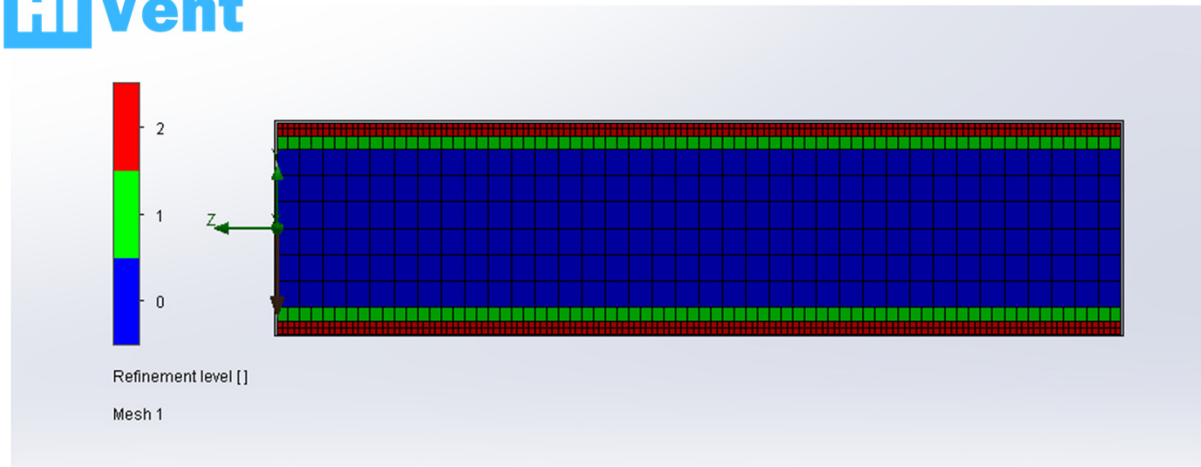
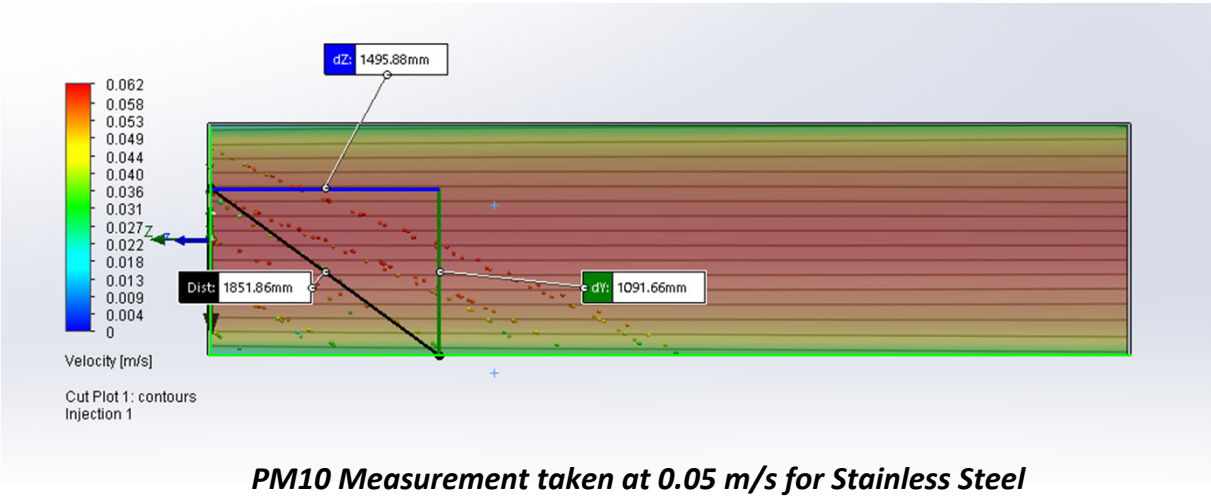
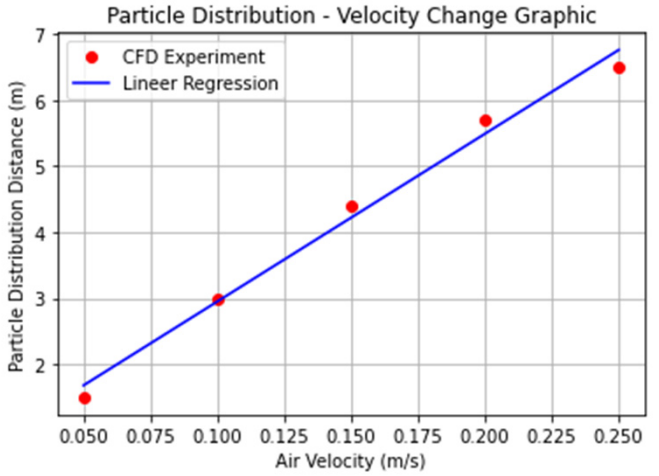


Mesh Structure for Solution



PM10 Measurement taken at 0.05 m/s for Stainless Steel

PM10 Stainless Steel	
Speed (m/s)	*Distance (metres)*
0,05	*1,5*
0,1	*3*
0,15	*4,4*
0,2	*5,7*
0,25	*6,5*



$$Distance\,(m) = 0.41 + 25.4 \times Velocity\,(m/s)$$

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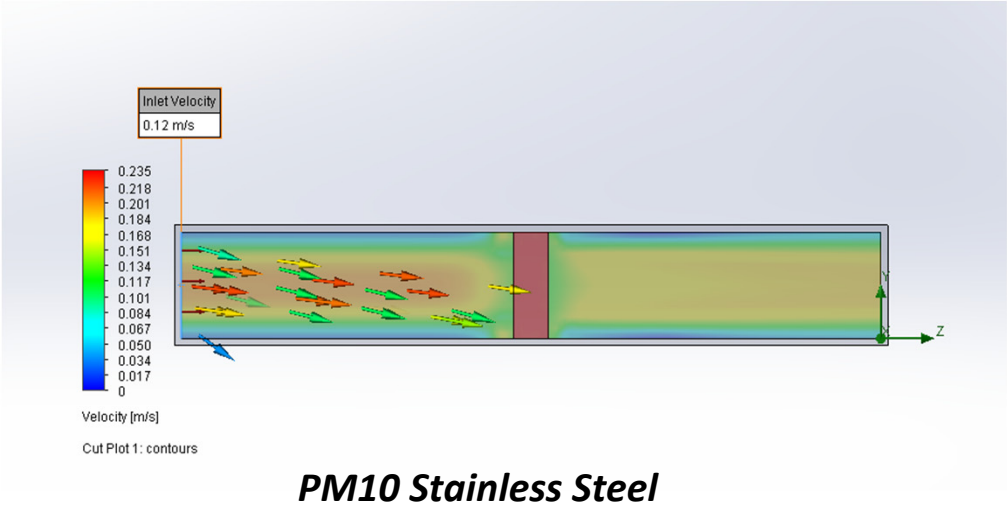
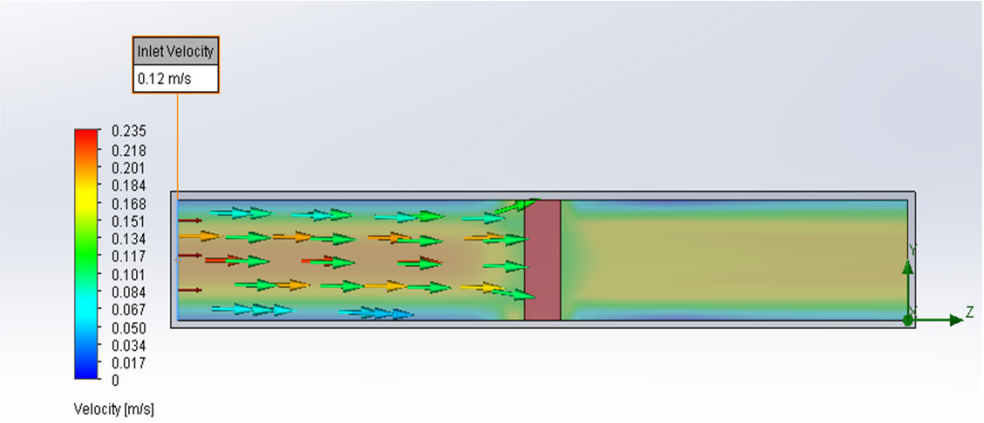
- In CFD results, a velocity of 0.12 m/s was observed even in stagnant regions (very large volumes). PM10 stainless steel particles can be transported 3 metres at these speeds. (Safe transport with circulation is accepted as 1 metre.) Stainless steel particles are very heavy. Particles produced other than stainless steel will be easily transported at minimum this speed. Acceleration will increase more as the capture speeds will increase as it approaches the HIS.



PM10 Stainless Steel



PM2.5 Stainless Steel

ADVANTAGES

1. Pipe and duct labour and costs are avoided.
2. It is very easy to change places.
3. When supplied in the right number and with the correct layout, it cleans the air in the production hall in accordance with international standards and regulations.
4. The projection is small, only the air blowing diffuser and dust collection bucket are available on the floor.
5. Thanks to EC motor technology; efficiency is high and energy consumption is low.
6. It saves up to 70% of heating costs.
7. Thanks to top quality filter media, it provides filtration in accordance with legal regulations.
8. It provides flexibility to users thanks to different fresh air blowing options.

CONCLUSION

The biggest problem in welded production halls is that local suction systems unfortunately do not provide any benefit, especially in cases requiring long welding seams. Local suction arms cannot capture welding fumes after a distance of approximately 30-40 cm. In this case, welding fumes will continue to spread into the hall. Even if welders protect themselves by using PPE, other workers cannot avoid being exposed to these particles.

For this reason, it becomes necessary to use ‘hall ventilation’ systems in production areas. In halls where many different systems can be applied, the most effective system is the ‘displacement ventilation’ system, but the installation and operating costs of tubular type displacement ventilation systems are very high and the future relocation or revision of the system poses great difficulties.

Despite all these disadvantages, ‘swarm type ambient air purification’ is an excellent solution. Compared to many filter towers, the HiVENT HiS system stands out with its advantages.

Thank you for choosing the HiVENT HiS system.

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