AllsWell

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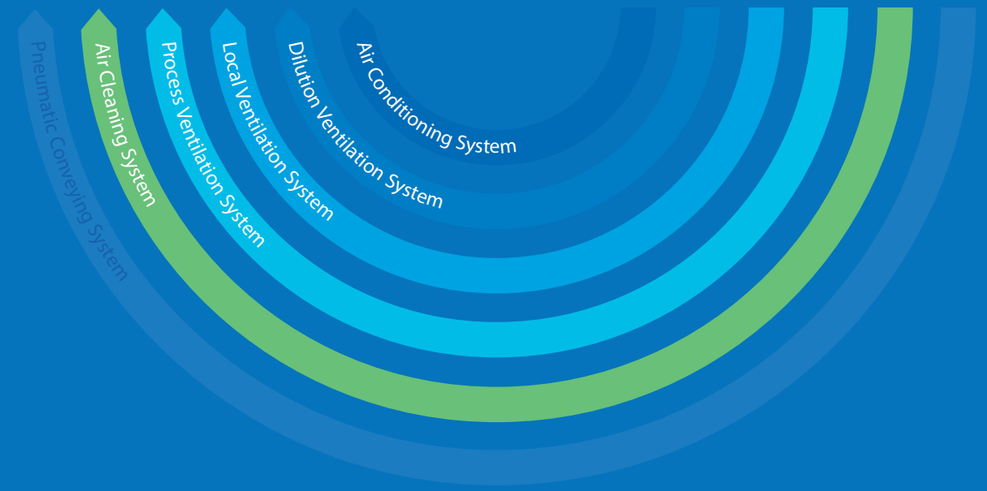
www.alls-well.co.kr

Auto-Mobile

Customized Optimization Solution

Auto-Mobile Industry



Leaping

Leaping from South Korea's first professional air technology company to become a world-renowned air technology specialist company.

AllsWell **Air Tech.**

ALLSWELL Website: http://www.alls-well.co.kr
(Scan the QR code to get connected to the website.)

Established in 2015, ALLSWELL is Korea's first company specializing in air technology and provides customized solutions based on an optimized design given space characteristics and air flow.

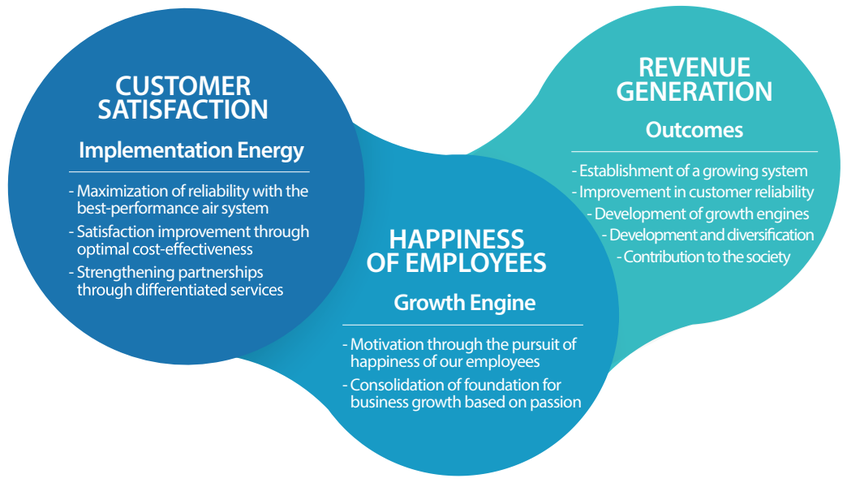
Value and Mission

ALLSWELL protects human life and health by creating space for people to breathe freely.

We put the greatest value on "people." We create a healthy and safe future for humanity with technology for people, and furthermore air technology for the world.

Management Philosophy

A company that contributes to society based on the happiness of its members!
ALLSWELL pursues the "value" of "togetherness."



Thinking

Critical emissions affecting productivity and working environment!
Seriously thinking about innovation of manufacturing process.

Need to eliminate emissions by applying airflow control technology

Various emissions such as welding fume, painting odor, dust and heat in assembly line, exhaust gas and fine dust in inspection line should be taken into account specialized technology because these emissions can cause many and serious issues in productivity, quality, operating and maintenance cost, workers safety, environmental regulations.

Control

The optimized air solution based on air flow control technology completely controls the air quality of the manufacturing sites.

Necessity of Air Flow Control in Industrial Sites

- Material emitted during the manufacturing process causes a variety of issues.
- Material emitted during the manufacturing process needs to be managed and controlled in comprehensive consideration of its physical and chemical characteristics.

If facility emission substances are not removed smoothly from the equipment

- It causes product defects.
- It reduces the operation time due to frequent inspection.

If emission substances are accumulated in the equipment

- It increases the failure occurrence rate due to contamination of the equipment.
- It makes the work conditions unstable due to inconsistent equipment performance.

If emission substances are not properly dealt with

- It causes the reduced operating efficiency due to worsening working environment.
- It generates potential economic costs due to environmental regulations.

- Lower productivity
- Quality issue
- Shortened equipment life-time
- Decreased energy efficiency
- Increased operating cost
- Worker's safety and health issue
- Environmental laws & regulations
- Economic losses

'Air Technology' that manages the cause of emissions to the quality of air emitted

With precise diagnosis and design of airflow control engineering considering the characteristics of the automotive manufacturing process, the air quality at the manufacturing site can be completely controlled.

excellence

Korea's Only Airflow Control Technology, Manages the Entire Space

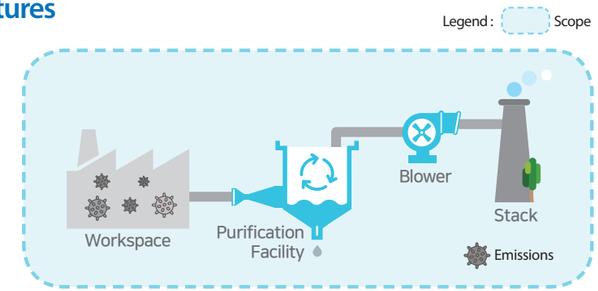
Air flow control engineering must be conducted for the entire space to manage emissions comprehensively and systematically. ALLSWELL is the only company in Korea to have this technology.

Air Flow Control Technology Features

ALLSWELL

Comprehensive response considering the entire space

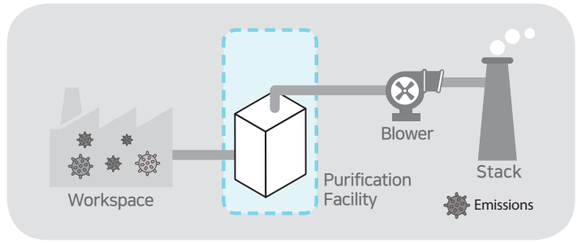
- System design considering emission characteristics and amount
- Control of air quality and emission concentrations throughout the workspace



General

Partial response focused on purification facilities

- Manufacture and installation of purification facilities based on the specified design criteria
- Lack of reflecting internal emission characteristics



Category	ALLSWELL	Existing Companies	Points of Difference
Collaboration Phase	Review Phase	Execution Phase	Planning - Review - Decision - Execution
Design Scope	Process - Facility - Chimney	Facility Consider	Total Space
Process Condition Data	Direct Calculation	Customer Presentation	Utilizing Our Data Base
Facility Specification Data	Direct Calculation	Customer Presentation	Calculated to Meet Customer Needs
Process Warranty	Full Warranty	Partial Warranty	Existing Companies Guarantee Facility Function

Korea's only "preliminary design technology" (performance guarantee design) considering the entire space

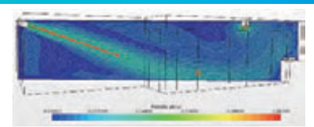
system

Considering Needs and the Entire Space Increase Trust with a Customized System

Using a variety of engineering design techniques for airflow control considering the entire space, it provides accurate and reliable results to meet customer needs.

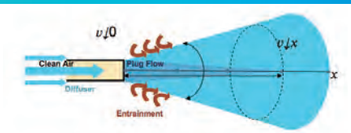
Main Engineering Tools

Airflow Control



- Ventilation: Discharges particulate matters from the target space.
- Dilution: Reduces the concentration of internal particulate matters by introducing clean air into the target space.

Diffuser Design

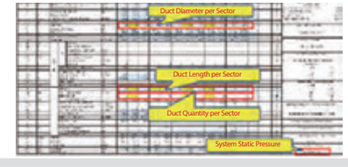


- Optimally feed the air to increase pressure in the target space.
- Design flow rate distribution by distance (movement of emissions along airflow).

Parallel Jet Model

- Considering the airflow and flow velocity in the target space.
- Designing the shape, size, spacing, and air volume of the diffuser.

DSBM

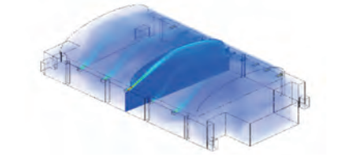


- Calculate optimum system power from the source to the outlet.
- Clearly identify the energy recovery/loss relationship by section.

Hood Design

- Set a mathematical model of airflow movement to capture and remove emission substances.
- Accurately predict changes in target space based on hood shape.

CFD Simulation



- Verification of design feasibility through CFD analysis before construction
- Set analysis conditions reflecting building structure, emission characteristics and surrounding environment

process

Industrial Airflow Control Optimization Process,
Implement Optimization in 4 Stages and 6 Processes

From on-site diagnostics, preliminary design, EPC implementation and performance evaluation to maintenance we operate 4 Phases and 6 processes to optimize air flow control in industrial sites.

ALLSWELL's Industrial Airflow Control Optimization Process

Stage	PHASE 1	PHASE 2	PHASE 3			PHASE 4
	On-Site Diagnosis	Preliminary Design	EPC Implementation & Performance Evaluation			Maintenance
	On-Site Diagnosis & Analysis	System Design	Manufacturing Design	Installation/ Construction/ Inspection	Performance Evaluation/ Verification	Maintenance Stabilization
Purpose	On-site data analysis of customer requirements	Basic design for satisfying requirements (Determines 90% of performance)	Detailed design for construction	System installation and operation inspection	Verification and confirmation of the implementation of required performance	Maintaining optimum performance
Main Tasks	- Identifying process/ facility features - Defining customer requirements - External environment analysis - On-site survey and analysis - Data measurement - Identifying problems and drawing solutions	- Building a project team - Cleaning up design elements - Selecting applied technology - Designing overall system - Determining system efficiency - Determining facility specifications - Calculating the estimated amount	- Reflecting detailed data - Production/ Construction drawings - Calculating construction costs	- Selecting contractors - Equipment production - Installation/ Construction management - Conducting a trial run	- Performance evaluation - Effect analysis	- Continuous monitoring - Periodic inspection and test - User training

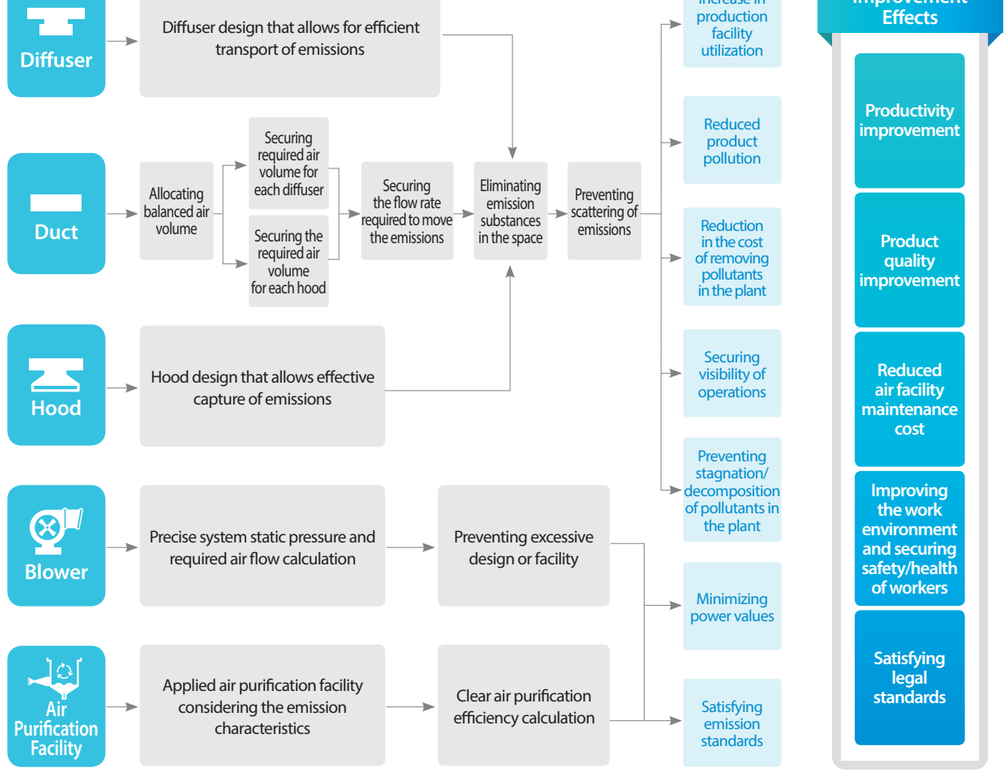
effect

With Airflow Control Technology,
Obtain Economic and Environmental Effects

Applying airflow control technology to industrial sites can improve productivity, improve quality, reduce maintenance costs, ensure worker safety and health, and meet legal standards.

Expected Benefits

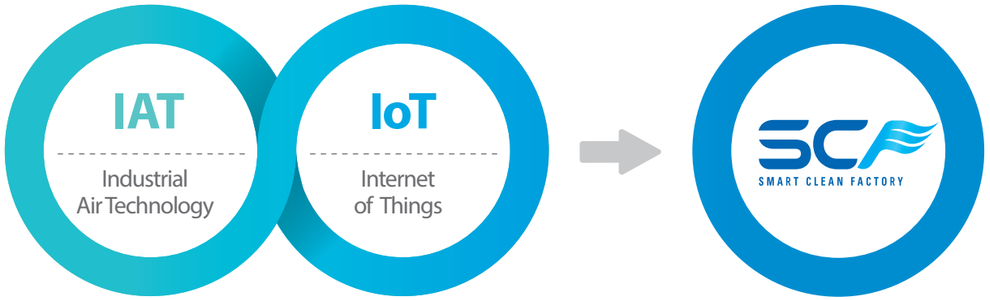
Various improvement effects such as increased productivity, quality improvement, and maintenance cost reduction are continuously maintained.



SCF, a state-of-the-art integrated management system,
Identify and integrate abnormalities in systems and target spaces in advance

'Smart Clean Factory', which combines Industrial Air Technology (IAT) and IoT technology, is a state-of-the-art integrated management system that prevents process problems by recognizing abnormalities in the system and target space in advance.

Smart System combining Industrial Air Technology (IAT) and Internet of Things (IoT) Technology



Technical features

Minimizing the issues of poor performance by the sensor or system itself

Category		Variables	No. of Sensor	Feature
General Company	Case #1.	Real-time value	Single Location Single Sensor	•Simple monitoring on field status •In case of sensors malfunctioned, it is impossible to judge field status.
	Case #2.	Real-time value	Single Location Multi Sensors	•Airflow control system single location, multiple sensors →High installation cost •Most general solution that "S" company and "A" company provides
AllsWell	Real-time value	Change Prediction Value	Multi Locations Single Sensor	• Designed to reflect characteristics of airflow system → Predict physical variable range for multiple locations. → Identify and track system errors or sensor problems. •Add productivity and quality enhancements using big data accumulated through the system

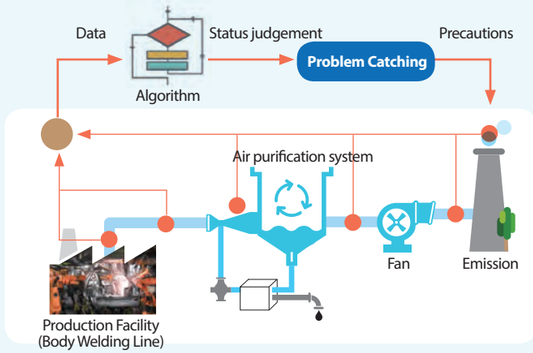
Accurately predict and fully distinguish,
Improve quality and maximize stability of production process

'Smart Clean Factory' installs single sensors at multiple-locations to accurately predict and completely distinguish between facility failures and sensor errors. It contributes to quality improvement and maximum stability of production process by fully utilizing Big Data.

Judgment algorithm based on accurate physical data that are generated by ALLSWELL's technology

- Deriving correlation between system
- Calculate the range of the physical variable values
- Based on the derived model formula that is reflected in the algorithm

Based on ALLSWELL's unique algorithm, airflow system's accuracy is guaranteed that is 95 ~ 98%

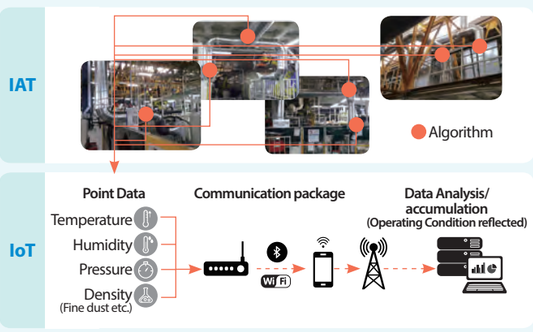


Big Data Collection and Processing (Guided Learning)

- Continuously data received from the production line that is connected to ALLSWELL systems
- Data correlation analysis of the production line or product quality with ALLSWELL system
- The relation of production status and ALLSWELL systems are applied to Smart Clean Factory for autonomous operation

Improving of productivity and quality of products

Deriving optimal operating conditions of airflow control systems



Guarantee
Differentiation

We contribute to productivity improvement and workers' working environment improvement with world-recognized

Industrial Air Technology (IAT)

which is based on airflow control technology

ALLSWELL is being recognized for its brand power in the global market with its unique airflow control technology and specialized air purification system!
With industrial air technology that takes into account productivity, quality, working environment, and environmental safety, we will become a technology partner that effectively controls and completely removes various emissions from the automotive manufacturing process.

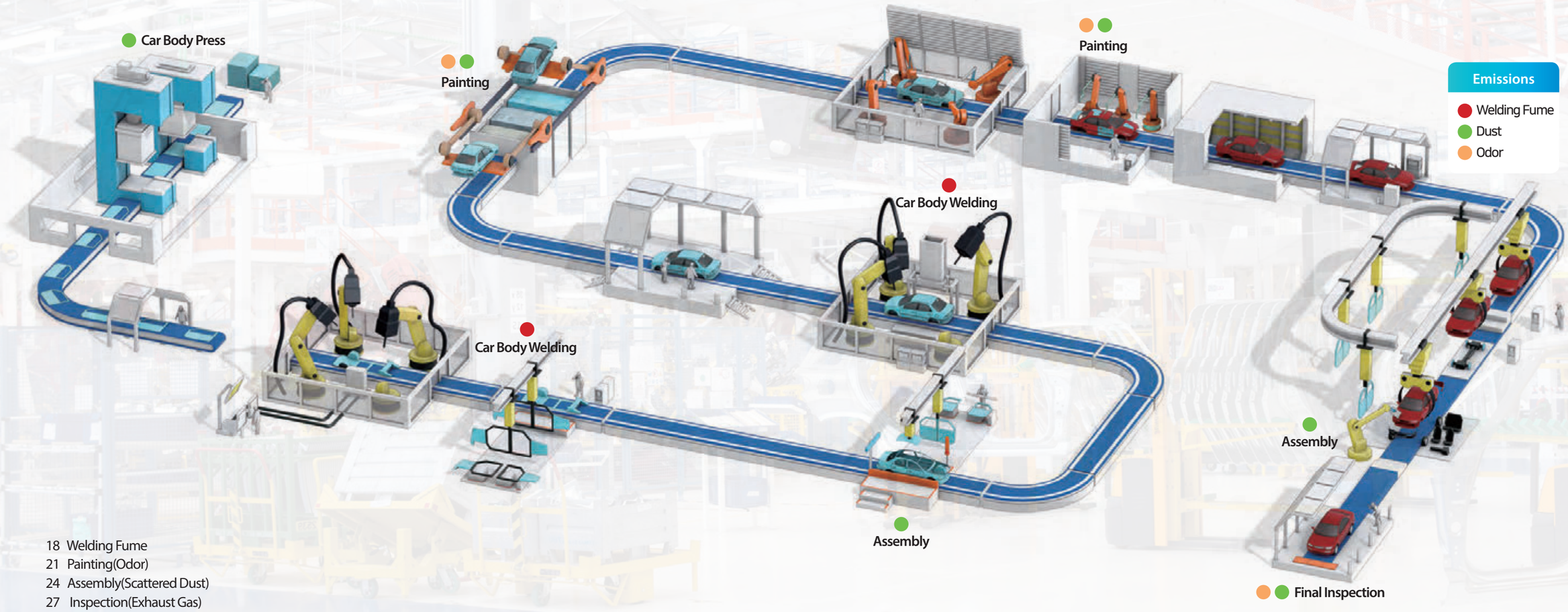
Engineering Differentiation

Division	General	AllsWell Engineering
Result Value	•Basic ACGIH method using quadratic function Q=60sec/min * Vc * (10X2+A) * K (Vc: Airflow velocity, X: Capture distance, K: Safety factor) •15 ~ 20 % Margin rate(K) → wide variation compared to actual value	•Predict air volume based on vector and air molecule movement velocity in the space - Application of the general solution model of the partial differential equation of the x, y, and z axes •Realization of the final result within 5% tolerance of predicted values
Design Feature	•Hard to satisfying the operating feature and requirements - The more target points are, the harder to substantiate - Manufacturing and installation cost improve in parallel •Mainly applied to meet law standards → Often used for small-sized business	•Specification decision considering process, quality, property of emissions - ROI(Return of Investment) of productivity and quality improvement are calculable •The further and more target points are, the lower installation cost are generated - Possible to realize with minimum equipment specification
Result Analysis ("R" Company case)	•Air volume: 300m3/min •Static Pressure: 350mmH2O •Power: 30kW	•Air volume: 202m3/min → 30% equipment and material cost reduction •Static Pressure: 237mmH2O → 30% reduction of installation location and period •Power: 15kW (50% Reduction) → 50% reduction of Operating Cost

With ALLSWELL's unique "airflow control technology"

Re-engineer manufacturing process for Future Mobility

ALLSWELL diagnoses the production characteristics and emissions of each process from the first process to the last, and presents customized air solutions based on airflow control technology.



① Welding Fume
② Painting(Odor)
③ Assembly(Scattered Dust)
④ Inspection(Exhaust Gas)
⑤ Opened Workspace (Fume, Scattered Dust)
⑥ Underground Space (Heat, Vapor, Odor)

With Ventilation System and Engineering, Welding Fume will be eliminated most effectively

ALLSWELL effectively eliminates generated welding fume by controlling capture velocity, face velocity and air volume with local ventilation and precise engineering.

Overview

Adverse effect generation on working environment due to fume emission generated main body MIG welding process

- Because welding is an important part of automotive quality, it is required to remove the welding fume to meet legal regulations and quality at the same time

Configure a separate local exhaust ventilation system for proper removal of the generated fume → Removing the Fume and ensuring operating stability

- Control of capture velocity, surface velocity and wind flow through engineering to effectively eliminate emissions to meet legal regulations and quality at the same time

Major Issues

•Cause surrounding air pollution, worker safety threats
•MIG welding feature : Defect arises if near wind velocity is above 1.2m/s

Improvement Directions

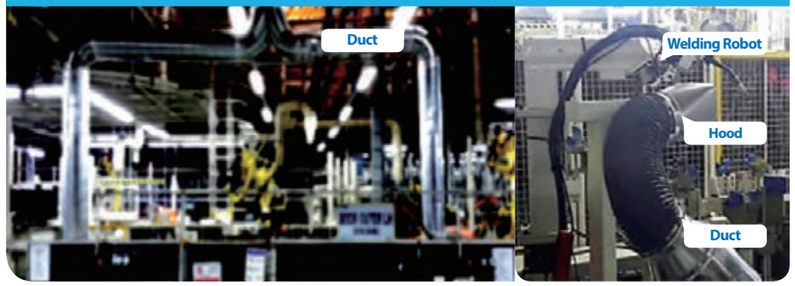
•Above 95% of Fume elimination + capture velocity 0.5~1.0m/s
•Exact air volume distribution by detailed duct segment balancing

Engineering

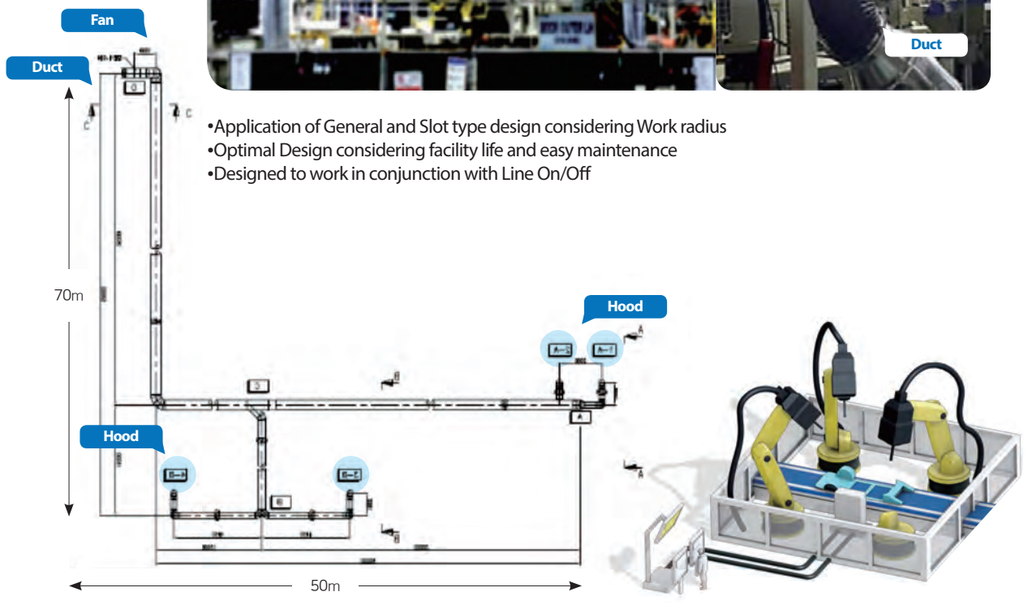
Solution

Welding Robot interference check

Local exhaust installation



•Application of General and Slot type design considering Work radius
•Optimal Design considering facility life and easy maintenance
•Designed to work in conjunction with Line On/Off



Installation case ("A" Company)

Local exhaust fume capturing

[m/s]

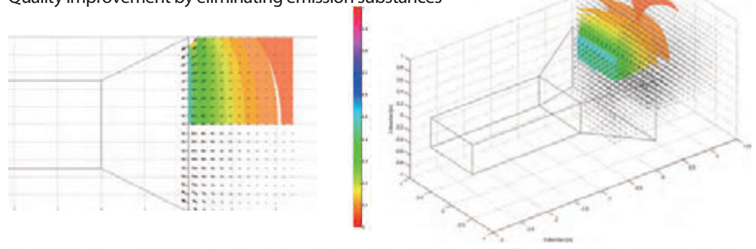
No. of Hood	Customer's Needs	Test result
#1	0.5~1.2 (Target: 1.0)	0.98
#2		0.94
#3		0.93
#4		1.01
#5		0.96
#6		1.04
#7		0.99
#8		1.03
Average	1	0.98

Capture Velocity(30cm distance basis)

Above 95% of fume elimination satisfying capturing velocity(1m/s) which is not affecting welding quality

→ Improvement of working condition

→ Quality improvement by eliminating emission substances



$$v_z = -\frac{1}{2\pi} \cdot \left| arctan\frac{x_+ \cdot y_+}{z \cdot \sqrt{z^2 + x_+^2 + y_+^2}} - arctan\frac{x_- \cdot y_+}{z \cdot \sqrt{z^2 + x_-^2 + y_+^2}} - arctan\frac{x_+ \cdot y_-}{z \cdot \sqrt{z^2 + x_+^2 + y_-^2}} + arctan\frac{x_- \cdot y_-}{z \cdot \sqrt{z^2 + x_-^2 + y_-^2}} \right|$$

$$v = \sqrt{v_x^2 + v_y^2 + v_z^2}$$

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Through spatial analysis and prediction of odor generation, Design the optimum exhaust system applying Control Volume

By accurately predicting the amount of odor generated and analyzing the space of the paintwork process, design the optimal exhaust system with Control Volume so that completely control diffusion of odor.

Overview

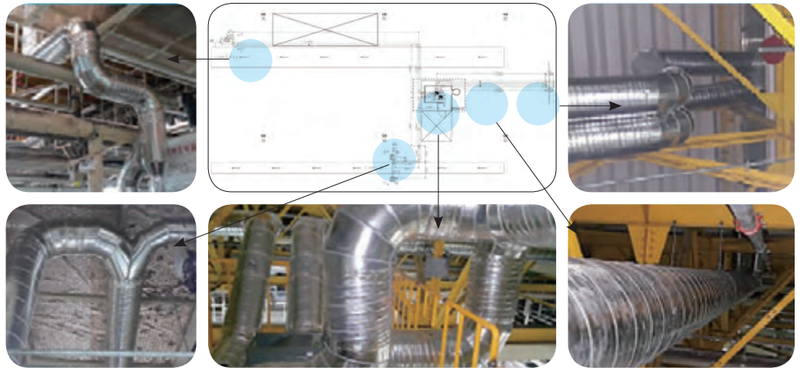
Work efficiency reduction due to generated odor during car body painting/drying process
- Control the spread of odors through local exhaust in the workplace

Most suitable emission system design by predicting exact odor volume and analysis for space
- Precise Control Volume application precise control volume application so as not to make non-captured space

Major Issues

•Lack of local exhaust volume on painting process
•Need solution considering worker's working space and position

Improvement Directions

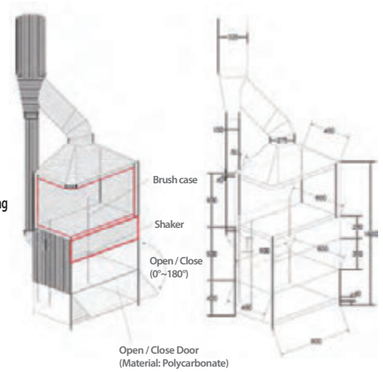
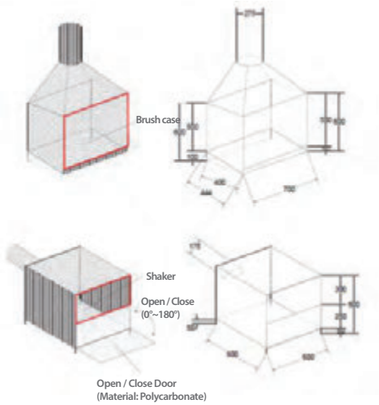


•Optimal duct configuration for calculating energy loss for each section
•Optimal hood design considering contaminants and restricted space

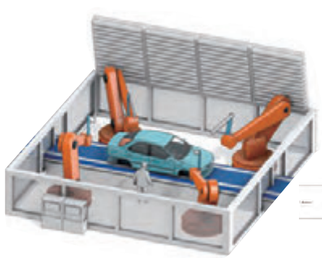
Engineering ("A" Company)

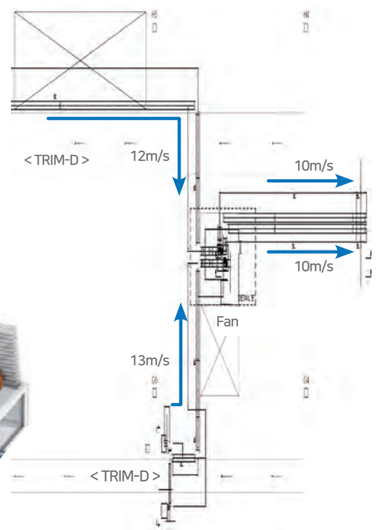
Primer Facility

Hood shape and airflow velocity calculation considering worker's activity scope, Primer brush case and size of shaker

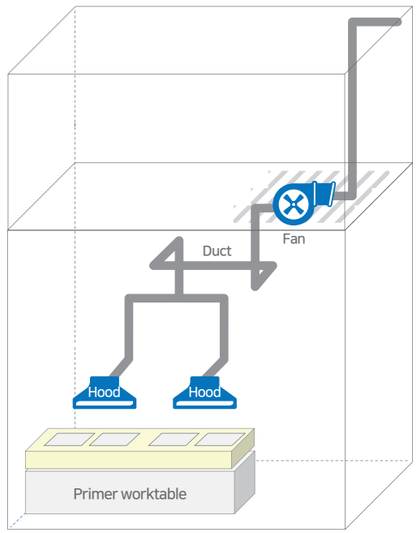
Division	TRD	TRE
Measuring point		
Airflow velocity	Brush case : 1.0m/s Shaker : 1.2m/s	Brush case : 1.7m/s Shaker : 1.4m/s

Duct floor plan and airflow velocity design





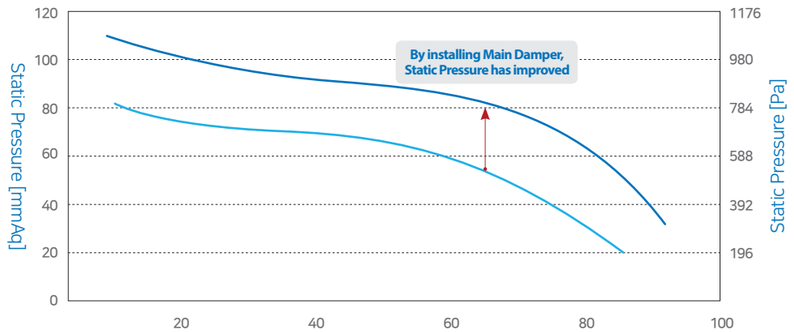
Schematic Diagram

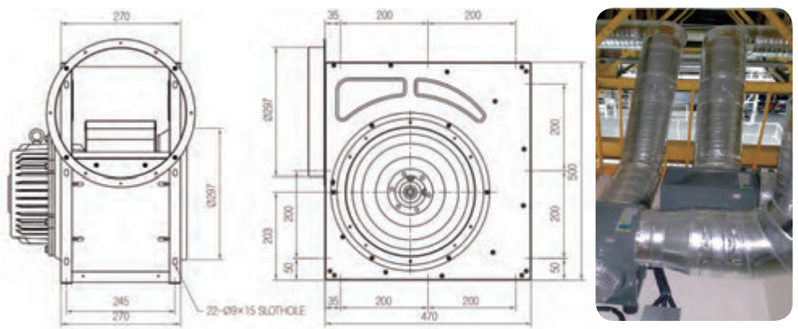


System Efficiency

- To maximize local exhaust capture efficiency, ALLSWELL analyzed lack of static pressure by checking existing fan specification
- To minimize the cost of replacing the blower, ALLSWELL utilized dampers to increase the positive pressure of the system to ensure optimal capture performance

Model No.	Volt/ Phase	Motor Power	Power Input	Ampere	Revolution	Air Volume	Static Pressure	Noise	Weight
ASF-704 (S-BLADE)	220V/1φ /60Hz	2HP	3.1KW	15.8A	1,670 RPM	Max. 95㎥/min	Max. 98mmAq	87dB	23Kg





- Fans with performance curves that exactly match TRIM-D(57㎥/min, 56mmAq), TRIM-E(56㎥/min, 59mmAq) Duct System needed to be custom-made, but still applied existing fan to reduce build period and cost
- Main Damper is installed in the Duct System to increase the static pressure so that the air flow can be maintained below 60㎥/min

With duct design and hood type change, Maximize dust capture by improving the performance of the exhaust system

In the case of dust-prone floor carpet assembly process, the exhaust performance is improved by duct design considering the work flow and interference and by changing the hood type to maximize dust collection.

Overview

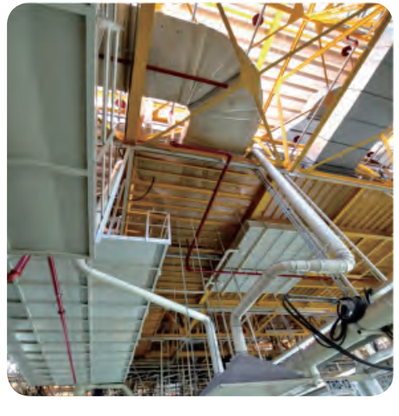
Work efficiency reduction due to generated odor during car body painting/drying process
- Dust elimination using local exhaust system Floor carpet

Duct design and most suitable hood type needed considering working scope and interference

Major Issues

•Dust scattering issue due to inappropriate hood position and size
•Large pressure loss due to inappropriate duct size

Improvement Directions

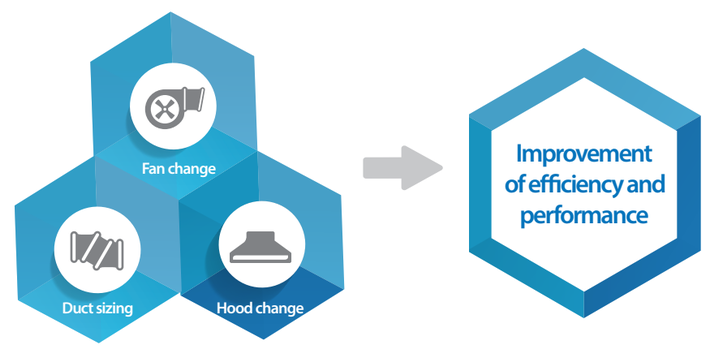


•Scattered dust collection by improving exhaust efficiency
•Scattered dust is not visually detectable

Engineering

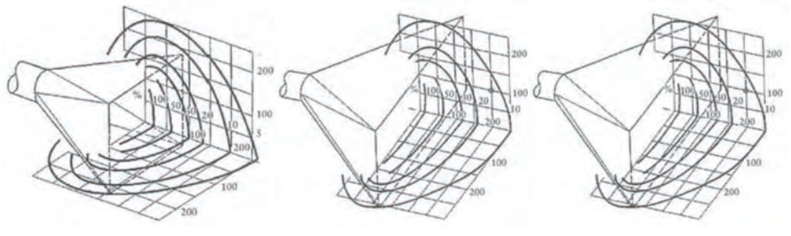
System Efficiency

Floor Carpet assembly process
- Air volume increase with new system design → Air volume increase by fan change and enlarging duct size
- Hood type and size optimization



•Required airflow velocity is implementable per hood type at emission generation area
※ Air volume design basis : American Conference of Governmental Industrial Hygienists (ACGIH®)
•Dust elimination by exhaust efficiency improvement
•No visible scattered dust

Hood type capture velocity analysis



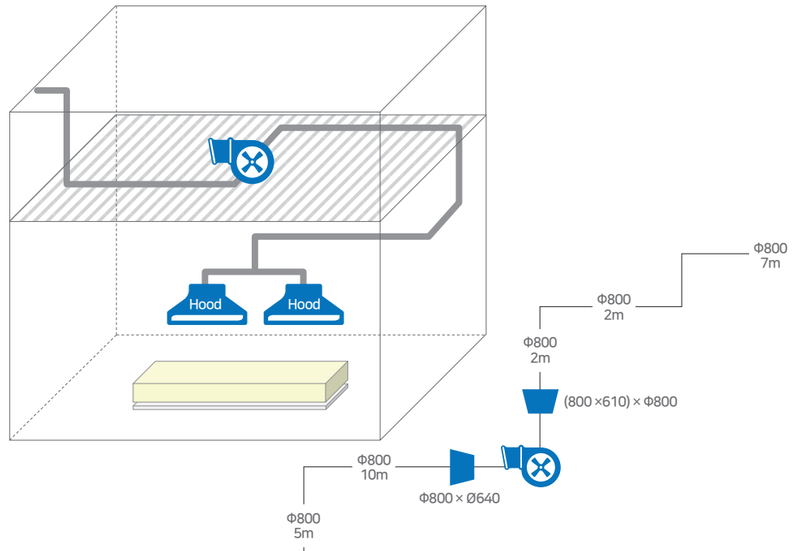
Local exhaust controlled wind velocity basis(Ministry of Employment and Labor)

Controlled wind velocity for organic solvent	Controlled wind velocity for dust generating sources
- 0.4m/s(Booth hood)	- 0.7m/s(Booth hood)
- 0.5m/s(Canopy hood, side/below section)	- 1.0m/s(Canopy hood, side/below section)
- 1.0m/s(Canopy hood, upper section)	- 1.2m/s(Canopy hood, upper section)

Engineering
("A" Company)

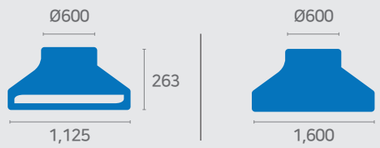
Primer Facility

Schematic Diagram



Duct Segment Balance

Hood Spec



Velocity Pressure Method Calculation Sheet — AllsWell

Project : RSM LFD Fume Collector Installation

Order	Symbol	Description	Unit											Input Data	
1		Duct Segment Identification		1-B	2-A	3-B	4-A	B-C	A-C	C-D	D-E	E-F		1	
2	T	Dry-Bulb Temperature	℃	25	25	25	25	25	25	25		25		2	
41	ΔP_{SP}	Segment Pressure Loss	Pa	179.457	179.457	208.148	208.148	84.5897	84.5897	75.9136		148.929		41	11
46	VP_{corr}	Corrected Velocity Pressure	Pa											46	

Velocity Pressure Method Calculation Sheet — AllsWell

Project : RSM HZG Closure Line LVS Installation

Order	Symbol	Description	Unit											Input Data	
1		Duct Segment Identification		1-A	2-A	A-C	3-B	A-B	B-C	C-D	G-H	H-I	I-J	1	
2	T	Dry-Bulb Temperature	℃	25	25	25	25	25	25	25	25		25	2	
41	ΔP_{SP}	Segment Pressure Loss	Pa	121.512	119.83	214.49	107.44	89.1944	215.738	3.92353	80.7106	0	126.695	41	11
46	VP_{corr}	Corrected Velocity Pressure	Pa		0	0				0	0		0	46	

Design and system static pressure calculation considering energy balance and loss relation at duct branch point

① Welding Fume
② Painting(Odor)
③ Assembly(Scattered Dust)
④ Inspection (Exhaust Gas)
⑤ Opened Workspace (Fume, Scattered Dust)
⑥ Underground Space (Heat, Vapor, Odor)

With the establishment of an air push ventilation system, Push smoke that is stagnant inside the factory out of the target space applying Control Volume

The air push ventilation system, which forms a smooth air flow at the finished-vehicle inspection site, resolves the problem of smoke congestion in the plant during the inspection process.

Overview

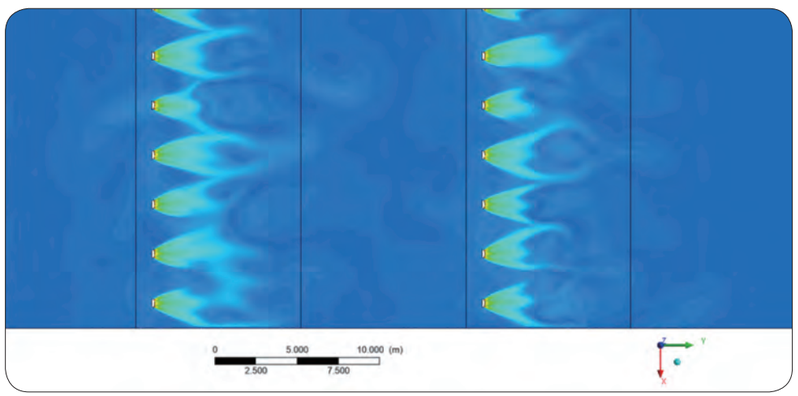
Smoke stay inside of the factory caused by starting engine during inspection of the finished vehicle
- Contaminated work space, worker's health problem occurs

Need to solve the problem by establishing a ventilation system that does not interfere with the movement of the vehicle and wrapping in the examination room

Major Issues

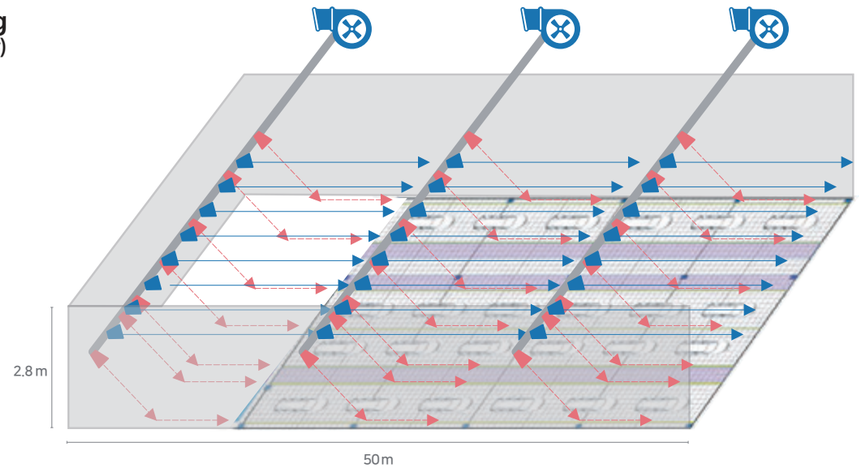
- Problems due to stagnant smoke inside the factory
- Ventilation considering wrapping process condition /auto-mobile moving line

Improvement Directions

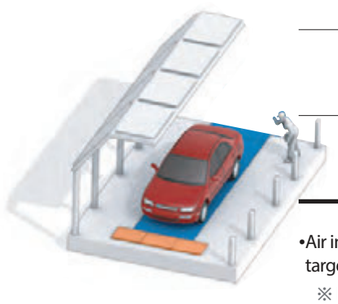


- Airflow formation by Air Push method
- Up/down airflow formation → Maximum efficiency with minimized airflow velocity

Engineering
("A" Company)

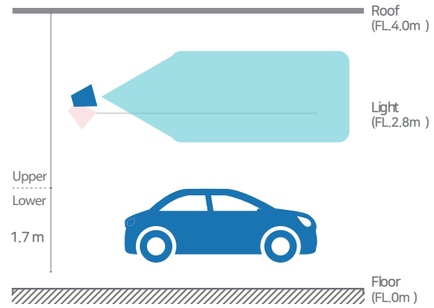


Division	Facility	Quantity	Spec
	Fan	2~3	400~600CMM
	Duct	-	Φ200~Φ800
	Upper air inlet	16~20	0.5 x 0.2m
	lower air inlet	14~18	0.3 x 0.2m



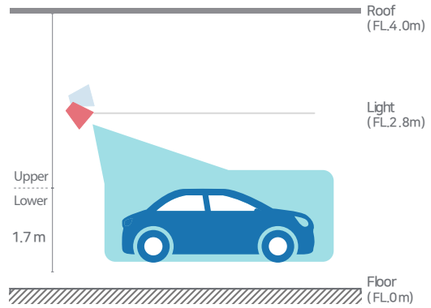
- Air inlet line: 2 to 3 configurations → Set up the exhaust so that emission will be pushed out of the target space
  - ※ If a single duct line is configured, fast flow rate (10m/s or higher) interfere with the wrapping process at locations close to the air outlet
- Direction of air inlet: 20° upper and 45° lower →Without interference with the wrapping, the exhaust is pushed out of the target space.
  - Top : setting for the enough emissions should be pushed out of the target space
  - Lower : setting for preventing interference of the wrapping operation while pushing out the exhaust
- Location of supply/duct installation: 2.8m above ground → No interference with internal structures and equipment

Upper 20° Air inlet



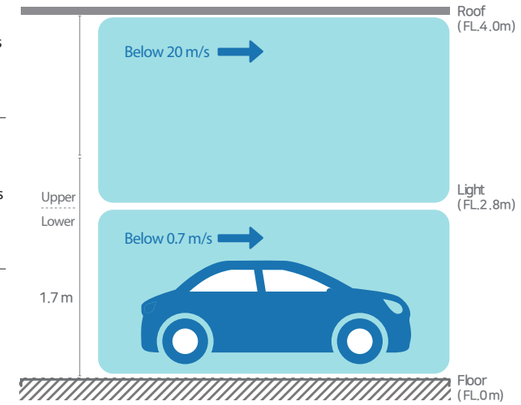
Height(m)	Velocity(m/s)	Considering Point
FL.0~1.7	Below 0.1	Wrapping process height
FL.1.7~4.0	Below 20	Push & eliminate emissions

Lower 45° Air inlet



Height(m)	Velocity(m/s)	Considering Point
FL.0~1.7	Below 0.7	Wrapping process height Push & eliminate emissions

Division	Position	Values	Remark
Flow velocity	FL.1.7 ~ 4.0m	Below 20 m/s	
	FL. 0 ~ 1.7m	Below 0.7 m/s	
Flow direction	FL. 0 ~ 4.0m	Open direction	



- By applying an air push method towards an open surface, create a smooth airflow
- By installing air inlet at upper part, eliminate emission substances without interference
- By forming upper/lower airflow, get rid of emission substances without interference with Wrapping process

① Welding Fume
② Painting(Odor)
③ Assembly(Scattered Dust)
④ Inspection(Exhaust Gas)
⑤ Opened Workspace (Fume, Scattered Dust)
⑥ Underground Space (Heat, Vapor, Odor)

With airflow and duct balancing applied large space ventilation system, The emissions are discharged to the outside of the workspace

The air push ventilation system, which forms a smooth air flow at the finished-vehicle inspection site, resolves the problem of smoke congestion in the plant during the inspection process.

Overview

The inside of the plant is not isolated from process to process, resulting in the scattering of fume and dusts in the plant. However, due to lack of internal airflow, emissions are happened to be stagnant Emissions should be released to the outside through the large-space ventilation system

The location of the process in the factory has changed from time to time. Therefore, local exhaust ventilation cannot be applied

Major Issues

- Emissions are stagnant per process inside the factory
- Large-space ventilation system is required without interference with work

Improvement Directions

- Inside emissions are eliminated using airflow of atmosphere
- Optimized air volume is allocated using Duct Balancing method

Engineering ("J" Company)

- **Fine dust concentration level has reduced 65% with IAT engineering inside of the targeted factory**
  - Effectively eliminated welding fume by controlling airflow
  - Welding velocity & productivity have increased by improving visibility

Application Case

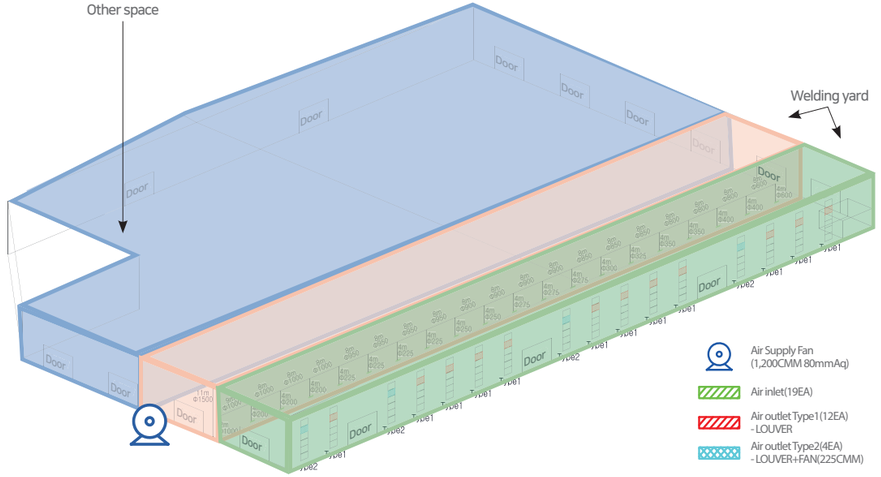
Provided Spec	Guarantee Value		Finished Date
	Industrial Regulation	Actual Result	
•Air volume : 1,200CMM •Target Space : 2,992㎡	- Fine dust level reduction in welding yard	- Before : 1,059μg/㎥ - After : 370μg/㎥	February 2017

Improvement result

- **Fine dust concentration reduced 65% at workplace → Productivity increased by improving welding yard work condition**

Target place

160m(W) x 19m(D) x 12m(H)



Division	Division																	Aver.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Before	1,337	1,144	1,209	862	750	756	618	798	1,196	1,483	1,267	987	932	811	1,175	1,414	1,272	1,059
After	408	341	366	285	230	384	239	210	376	273	280	250	443	434	501	644	634	**370**

① Welding Fume
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⑤ Opened Workspace (Fume, Scattered Dust)
⑥ Underground Space (Heat, Vapor, Odor)

Through re-designing Duct Line and newly installing air inlet system, Work efficiency is increased by diluting emissions and controlling heat

By re-designing the Duct Line in consideration of the characteristics of underground spaces where natural ventilation is difficult, and establishing an outdoor air supply line, it dilutes the emissions and lowers the temperature to increase the efficiency of summer work.

Overview

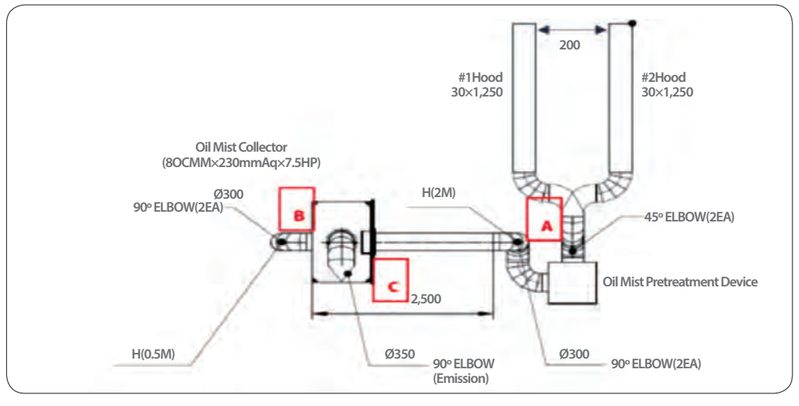
Degraded workability due to increased concentration of emissions in underground space and increased temperature in summer season
- Required air volume calculation per space size, improving workability by supplying outer air to dilute concentration and lower temperature

Air volume distribution and reconfiguration is required with airflow re-design

Major Issues

•Inappropriate air volume and ventilation system
→ Increased emission concentration
•Temperature increase during summer season
→ Emission quantity increase and workability reduction

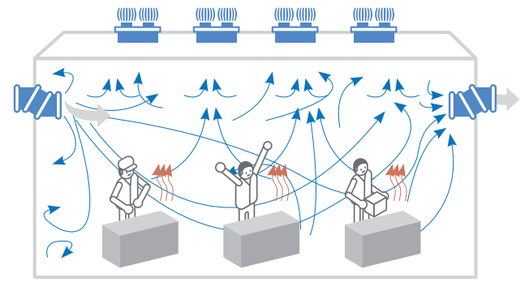
Improvement Directions



•Duct Line Re-design → Suitable air volume distribution
•Newly install outer air inlet → Maximize cost-effectiveness

Engineering ("J" Company)

•Supplying outer air inlet to underground space → Optimized air volume and structure design
•Concentration reduction by diluting inner emission
•By supplying outer air, lower underground space temperature at least 5℃



Dilution Ventilation Technology
- By supplying enough fresh air, dilute contaminated air and lower the emission concentration to the wanted level
- Suitable inner/outer hole position selection based on emission's properties
- Inner/outer air volume calculation with Material balance → Realization of optimized ventilation efficiency

Improvement Result ("A" Company)

•**Fan power optimization with duct segment balancing**
- More than 95% of fan Performance → Operating cost minimization

•**Optimized result despite limited budget**
- Maximize cost-effectiveness compared to high cost ventilation design