Passion for Green Innovation
SEIBU GIKEN

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SEIBU GIKEN PRODUCTS

"SKY-SAVE" VOC CONCENTRATOR

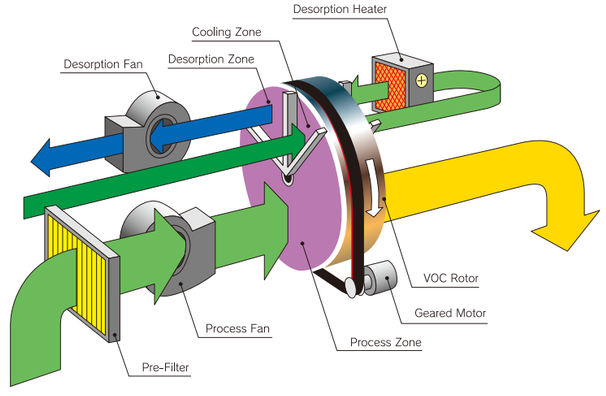
SKY-SAVE®

Passion for Green Innovation
SEIBU GIKEN

Seibu Giken VOC concentrator **"SKY-SAVE"**

Incombustible and high efficiency honeycomb element for adsorbing VOC and odor.

Seibu Giken "SKY-SAVE" is the VOC concentrator commercialized with 30 years of technical back ground, honeycomb processing, coating or impregnating various types of operative materials, behind us. SKY-SAVE is incorporated with the VOC adsorption rotor, which has several optional models and such adsorbents as a hydrophobic zeolite and others are used, either solitarily or in a mixture to be coated on or impregnated into a calcined honeycomb matrix.



Honeycomb rotor model for concentrator

V-MAX:
Hydrophobic zeolite is impregnated into inorganic honeycomb substrate with an inorganic binder and calcined under high temperature to tightly combine the zeolite with the substrate.
Various kinds of VOCs are efficiently purified and concentrated. The most suitable zeolite or mixture is selected in accordance with the system conditions.
(VMR-I, II, III, V)
Incombustibility: Heat resistance: 500℃
Desorption temperature: 150~220℃

Function of the VOC concentrator

1. Purification
The VOC laden in the exhaust air stream is purified by zeolite or other adsorbent while passing through the rotor and the purified air stream is vented into the atmosphere.

2. Concentration
The VOC laden in the exhaust air stream is adsorbed in the process zone and desorbed in the desorption zone by heated desorption air stream with much less air volume than that of process air stream. The concentration of VOC is concentrated nearly equal to the air volume ratio(5~30) of process and desorption.

VOC Concentrator rotor
4,250φ×500mm 200,000Nm³/h

Advantages

Seibu Giken VOC concentrator SKY-SAVE, outstanding in the purifying and concentrating efficiency, have been used world wide (Japan/USA/Europe/China/Korea/Taiwan/etc) as a high-quality and safety product owing to our material engineering expertise. By being combined with oxidizers, recovery equipments, the initial investment and running cost of the total system can be drastically diminished. Even for such VOCs as cyclohexanone/MEK/methylalcohol/ethylalcohol/styrene, which have been supposed not to be suitable for the existing technology, activated carbon, due to economic or safety concern,VOC concentrator SKY-SAVE is applicable insuring cost-effectiveness and safety.

■ Incombustibility
The development of our nonflammable rotors has been completed by engineering the appropriate materials for honeycombed substrate/adsorbent/binder being combined with our material processing technique.
Heat resistance:250 to 500℃.

■ Wide range of option
The performance of the concentrator is affected by many parameters, kinds of VOC, their combination,their concentrations, the temperature and moisture of the process air.
More than 10 kinds of options are prepared to select the concentrator which is the most suitable to such varying parameters each particular process air has.

■ High performance
High silica zeolites, which have enormous adsorption capacity, have been applied and have provided excellent ability for various kinds of VOC and different operational conditions.

■ Treatment of VOCs which have high boiling point
Taking the advantages of our zeolite rotors, incombustibility and high heat resistance, our concentrators can use the adsorption air with high temperature. Accordingly, such VOCs as could not be treated by carbon material due to its desorption temperature limit have turned to be easily treated.

■ Inertness
VOCs easily polymerized by heat energy, such as styrene, cyclohexanone, etc, can be effectively treated by our zeolite rotor.

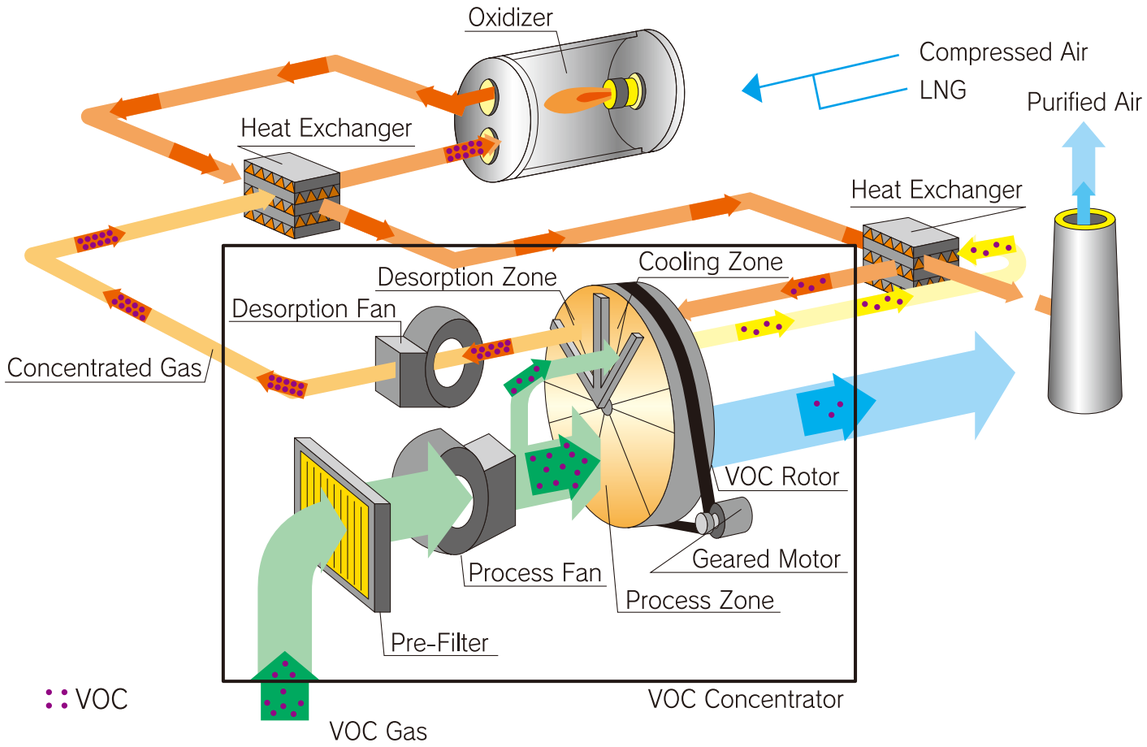
■ Cleaning and reactivation
Our zeolite rotors, which have been calcined under high temperature, have come to be the bodies which have combined with all inorganic materials including the adhesive. When the rotor is plugged, it can be washed and the dust can be removed. Our zeolite rotors can be reactivated by heat -treatment also depending on the state of things.

■ Non silicone request
In case that silicone materials are regulated due to the quality control measure of factories or their affection to the combustion catalyst downstream, we have prepared optional specifications.

■ Patents and technology protection
Each of our rotors has been protected its manufacturing method by a group of patents covering USA / Europe / Japan / others. Our patents for zeolite rotors with inorganic substrate do not allow any other similarities.

Basic design of VOC concentrator

VOC concentrator SKY-SAVE consists of a VOC rotor, a rotor driving device, a rotor casing with a set of seal, a pair of chamber(front/rear) with a zone partition wall.

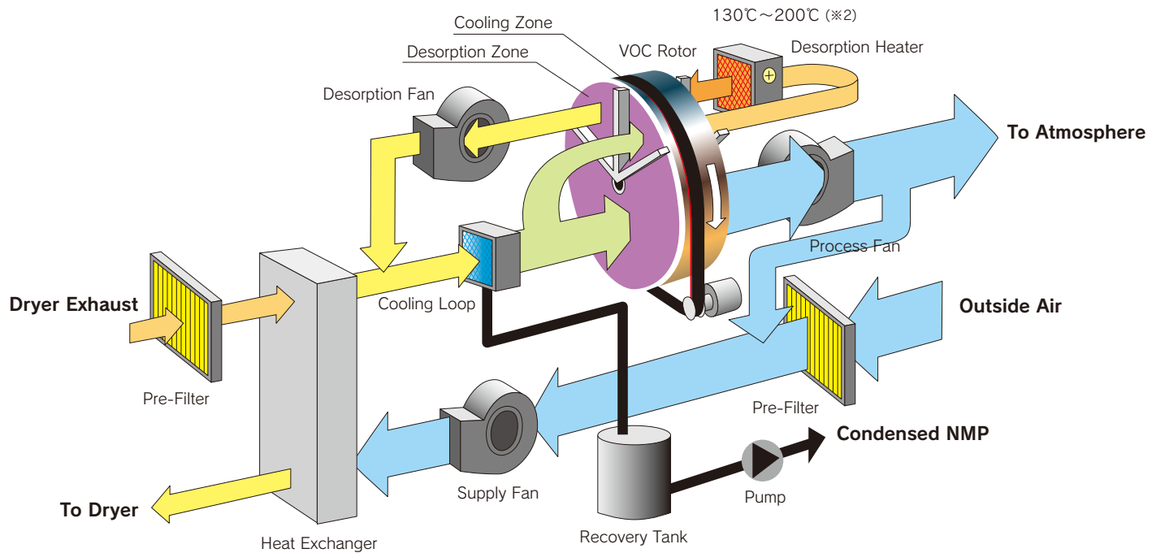


Typical applications of the concentrator

Industry	Facilities
Automotive Steel and structure manufacturing	Painting booth
Steel furniture	Painting booth, Oven
Printing	Dryer
Sticky tape Magnetic tape	Coating process Cleaning unit
Chemicals	Oil refinery, Reactors
Synthetic resin adhesive	Plastics, Plywood manufacturing process
Semi-conductor	Cleaning unit

VOC Concentrator for Recovery system

Lithium Ion Battery / Electrode forming process
NMP(*1) Recovery from dryer exhaust air
[General condition for Dryer exhaust]
Exhaust temperature: 80~130℃
NMP concentration: Approx. 2000ppm



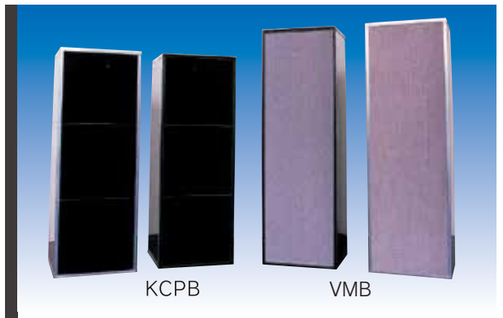
〈Basic NMP Recovery System diagram〉

*1 N-methyl-2-pyrrolidone
*2 Desorb temperature is designed due to the condition

NMP is high boiling point VOC and its vapor pressure at normal temperature is relatively low. So, high concentration NMP is easily condensed due to cooling down below normal temperature. By using of this unique characteristic, NMP laden dryer exhaust air and concentrator exhaust air are cooled down until designed temperature. Exceeded NMP at saturation temperature can be condensed and recovered due to this process.
After that, cooled dryer exhaust with still remaining NMP vapor is sent to the concentrator to adsorb NMP. The adsorbed NMP is concentrated and is recirculated to the cooling loop for condensation.

Our products

VOC concentrator rotor
(VMR-3550V40)
Remarks: Rotor to be supplied only for replacement.



VOC concentrator block.
KCPB: Laminated honeycomb block
Material:
Activated carbon fiber paper
700×234×254
Installation: Japan/USA/Germany

VMB:Laminated honeycomb block
Material:
Zeolite impregnated inorganic paper
800×234×254

VOC concentrator cassette
(VMC-3950V40,triplet)
Air volume: 160,000 m³/hr
VOC: IPA, Toluene, etc.
Installation: Gravure printing factory

VOC concentrator cassette
(VMC-3550V40)
Air volume: 58,000 m³/hr
VOC: IPA, Acetone, etc.
Installation: Semiconductor Factory

VOC concentrator unit
(VMU-2950V60)
Air volume: 85,000 m³/hr
VOC: Butanol, Butyl acetate, Xylene, Ethyl benzene, etc.
Installation: Automotive factory, Painting booth

VOC concentrator unit
(VMU-3550V40)
Air volume: 59,000 m³/hr
VOC:Toluene,Ethyl Acetate,MEK,IPA,ctc
Installation: Gravure printing factory

Efficiency of SKY-SAVE for typical VOCs

GROUP	NAME	VOC CONCENTRATION ROTOR V-MAX I	II	III	V
Alphatic hydrocarbons	n-Hexane	○	○	◎	◎
	Cyclohexane	△	△	△	△
Alcohols	Methanol	×	×	△	○
	Ethanol	△	○	△	◎
	n-Propanol	○	○	○	◎
	Isopropanol (IPA)	○	○	○	◎
	n-Butanol	◎	◎	◎	◎
	Diacetone alcohol	◎	◎	◎	◎
Ketones	Acetone	△	△	○	◎
	Methyl ethyl ketone (MEK)	○	◎	◎	◎
	Methyl isobutyl ketone (MIBK)	◎	◎	◎	◎
	Methyl amyl ketone (MAK)	◎	◎	◎	◎
	Methyl propyl ketone	◎	◎	◎	◎
	Cyclohexanone	◎	◎	△	△
Esters	Ethyl acetate	○	○	◎	◎
	n-Propyl acetate	○	◎	◎	◎
	n-Butyl acetate	◎	◎	◎	◎
	Methyl cellosolve acetate	◎	◎	○	○
	Ethyl cellosolve acetate	◎	◎	○	○
	Butyl cellosolve acetate	◎	◎	○	○
	Propylene glycol monomethyl ether acetate (PGMEA)	◎	◎	○	○
Ethers	Methyl cellosolve	◎	◎	◎	◎
	Cellosolve	◎	◎	○	○
	Butyl cellosolve	◎	◎	○	○
	Propylene glycol methyl ether (PGME)	◎	◎	◎	◎
Aromatic hydrocarbons	Benzene	△	△	○	○
	Toluene	○	○	○	○
	o-Xylene	◎	◎	×	×
	m-Xylene	◎	◎	×	×
	p-Xylene	◎	◎	○	○
	Styrene	×	×	◎	○
	Ethyl benzene	◎	◎	○	○
Chlorinatec hydrocarbons	Dichloro methane	×	△	○	○
	Trichloro ethane	△	△	○	○
Others	N-methyl-2-pyrrolidone (NMP)	◎	◎	○	◎
	N,N-dimethylformamide (DMF)	○	◎	◎	◎
	N,N-dimethylacetamide (DMAC)	◎	◎	○	○
	Dimethylcarbonate (DMC)	○	◎	◎	◎
	Tetrahydrofuran (THF)	○	○	◎	◎

Remarks
Peformance may be different from above grading subject to the actual condition.
◎…Very Good ○…Good △…Possible ×…Not Good

Model and dimension of SKY-SAVE

VM U Ⅲ-2450 V 40 -H
① ② ③ ④ ⑤ ⑥

① Kind of rotor
VM:High-silica zeolite rotor

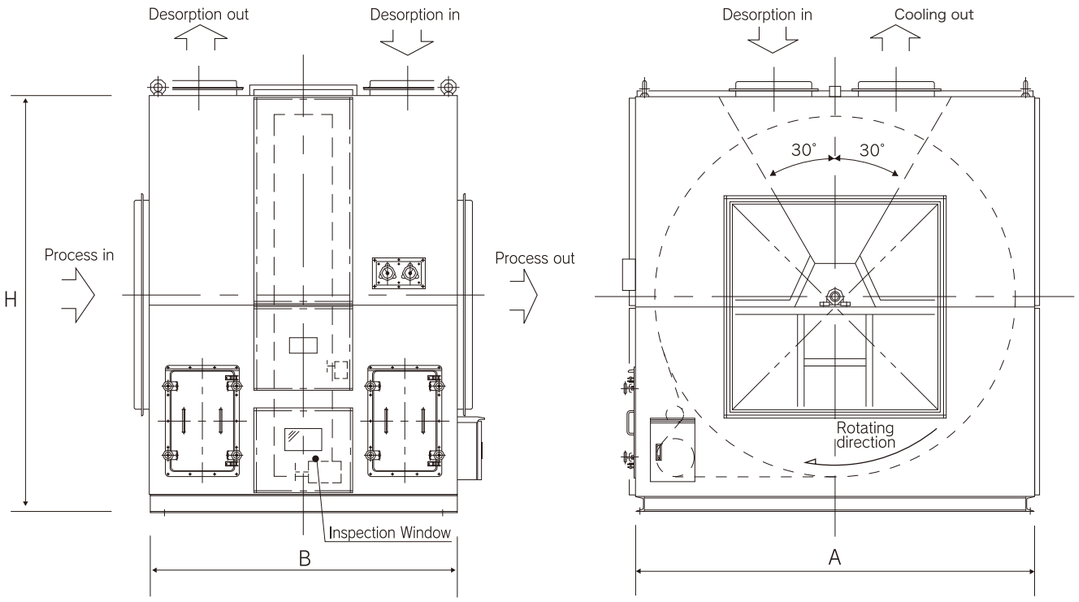
② Product sort
U: Unit
C: Cassette
R: Rotor
B: Block

③ Kind of zeolite
Ⅰ Ⅱ Ⅲ Ⅴ

④ Diameter of rotor (mm)

⑤ Depth of rotor
60: 600mm
50: 500mm
40: 400mm

⑥ Option
C: Low silicone type
H: High temp. desorb
R: Surface layer replaceable
S: Stainless steel type

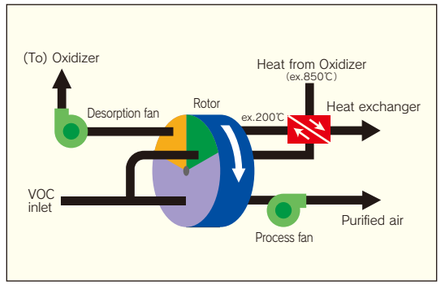


Model	Process flow rate ※1		Dimensions (mm)			Weight (kg)	Rotor driver output (kw) ※2
	(Nm³/h)	(Scfm)	Width A	Length B	Height H		
VMUⅢ-1220V40	10,800	6,830	1,500	1,940	1,600	900	0.1
VMUⅢ-1525V40	17,100	10,800	1,750	1,940	1,850	1,250	0.1
VMUⅢ-1730V40	21,600	13,650	1,950	1,940	2,050	1,350	0.1
VMUⅢ-1940V40	27,000	17,060	2,150	1,940	2,250	1,750	0.1
VMUⅢ-2190V40	35,100	22,170	2,400	2,000	2,500	2,150	0.1
VMUⅢ-2450V40	44,100	27,860	2,700	2,000	2,825	2,900	0.2
VMUⅢ-2650V40	52,200	32,970	2,900	2,000	3,025	3,200	0.2
VMUⅢ-2950V40	64,800	40,950	3,250	2,000	3,375	3,800	0.2
VMUⅢ-3250V40	78,300	49,350	3,600	2,000	3,750	4,850	0.4
VMUⅢ-3550V40	94,500	59,700	3,950	2,000	4,100	5,300	0.4
VMUⅢ-3750V40	103,500	65,250	4,200	2,000	4,350	6,000	0.4
VMUⅢ-3950V40	117,000	73,800	4,400	2,000	4,550	6,350	0.4
VMUⅢ-4250V40	135,000	85,200	4,700	2,000	4,850	6,950	0.4

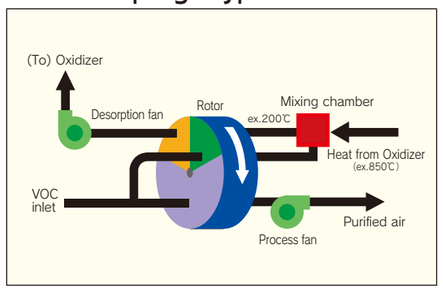
※1 : Process flow rate represents the value calculated with the face velocity of 3.0m/s and zone ratio of 10:1:1
It is an example. Please ask our representative for actual project.
※2 : Motor capacity will be different due to local specification at the site location. Please refer to the approval drawing.
Explosion proof for each local regulation is available.
※3 : Process fan, desorption fan, and heater are not our scope.
Note) The model size smaller than ϕ1220 can be manufactured.

Typical flow patterns

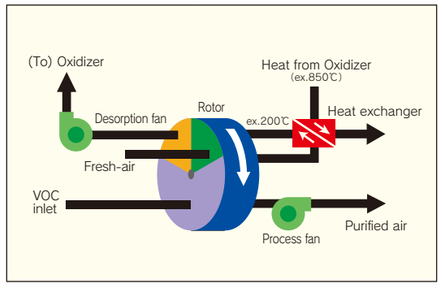
Standard purge type with H/X



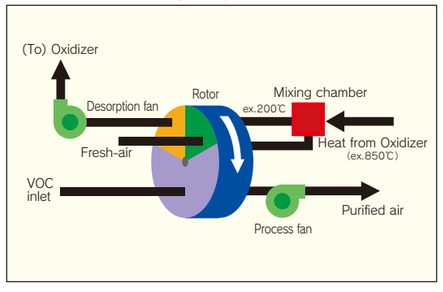
Standard purge type without H/X



Fresh-air purge type with H/X



Fresh-air purge type without H/X



Note: Please note that use of mixing air with combustion gas will cause deterioration depending on type of inlet VOCs.

Presentation/awarded/patent/trade mark

■ Presentation on our technical research to academic societies

1. Adsorption Society of Japan.Oct.1989,Kyoto.
"Odorous component removal and solvent recovery by silica honeycomb rotor"
2. The 2nd Korea and Japan Symposium on Separation Technology. May. 1990, Seoul,
"A honeycomb rotor continuous adsorber for solvent recovery and dehumidification"
3. The 56th Meeting of The Society of Chemical Engineers. Mar. 1991, Tokyo.
"Solvent recovery unit thermal swing honeycomb rotor of inorganic adsorber
4. The 4th International Conference on Fundamentals of Adsorption, May. 1992, Kyoto.
"A new solvent recovery unit thermal swing honeycomb rotor of inorganic adsorbent"
5. The 58th Meeting of The Society of Chemical Engineers. Mar. 1993, Kagoshima.
"Concentration/removal of ketones by a zeolite honeycomb adsorbing body"
6. The 59th Meeting of The Society of Chemical Engineers. Nov. 1994, Kumamoto.
"Example of solvent recovery with honeycomb rotor"
7. The 5th International Conference on Fundamentals of Adsorption, May. 1995, California.
"Parametric studies of a Silica Gel Honeycomb Rotor Adsorbent Operated with Thermal Swing"
8. The 4th Korea and Japan Symposium on Separation Technology Oct. 1996, Tokyo.
"Practice of the VOC abatement system by thermal swing ceramic monolith adsorbers"
9. Adsorption Society of Heat Japan Oct. 2000, Tokyo.
"How to get higher removal efficiency on honeycomb VOC concentrator rotor with thermal regeneration"

■ Awarded;

1. Best Ten New Industrial Products Award from The daily industrial News paper in 1987
2. The Technical award from Adsorption Society of Japan. 1992, for "Gas separation system with the inorganic honeycomb adsorber"
3. The Technical award from The Society of Chemical Engineers. 1995
4. The best paper award from American Society of Mechanical Engineers.
5. The Industrial technology center prize.
6. Commendation by the Minister of State for Science and Technology. 1997
7. The Director General of the Science and Technology Agency prize. The Director General of the Patent Agency prize.1997
8. The Testimonial for welfare works by association for support of employment, living and participation.1998
9. The Prize for invention by the Society of invention.1999
10. The Prize of The Medium & Small Business Research institute. 2001
11. The Technical award from the Society of Separation Process Engineers. 2002
12. The Technical award from the Society of Chemical Engineers. 2003
13. The Technical award from Adsorption Society of Japan. 2004

■ Patents;

Total 20 (Japan/overseas, granted or filed)

■ Trade marks;

SKY-SAVE, V-MAX, D-MAX, SEIBUGIKEN

Inquiry Sheet

To : Seibu Giken Co., Ltd. Overseas sales Section (+81-92-944-6811)

Company name		Department/Section	
Person in charge		Title	
Telephone		Fax	
E-mail			

Fill the data of inquiry

Project Name : _____

Installation area ☐ Outdoor ☐ Indoor

Motor and limit switch ☐ Explosion proof ☐ Not explosion proof

Application

(Very important) _____ (ex.From Printing process,From Painting booth)

VOC Details (ex. Xylnene, Toluene) Concentration (☐vol ppm ☐ ppmC ☐mg/Nm3, etc)

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Process air volume : _____ ☐ Nm³/min, ☐ Nm³/hr, ☐SCFM

Process air temp : _____ ☐ deg C, ☐ deg F

Process air humidity : _____ ☐ %RH, ☐ g/kg (DA)

Existence of Powder, Mist ☐ Yes, ☐ No

Target for clean air Outlet concentration_____ppm or lower, or Removal Efficiency _____%

Target concentration ratio times (against process air concentration)

Utility available Power _____Volt x _____Hz

Detailed queries, questions