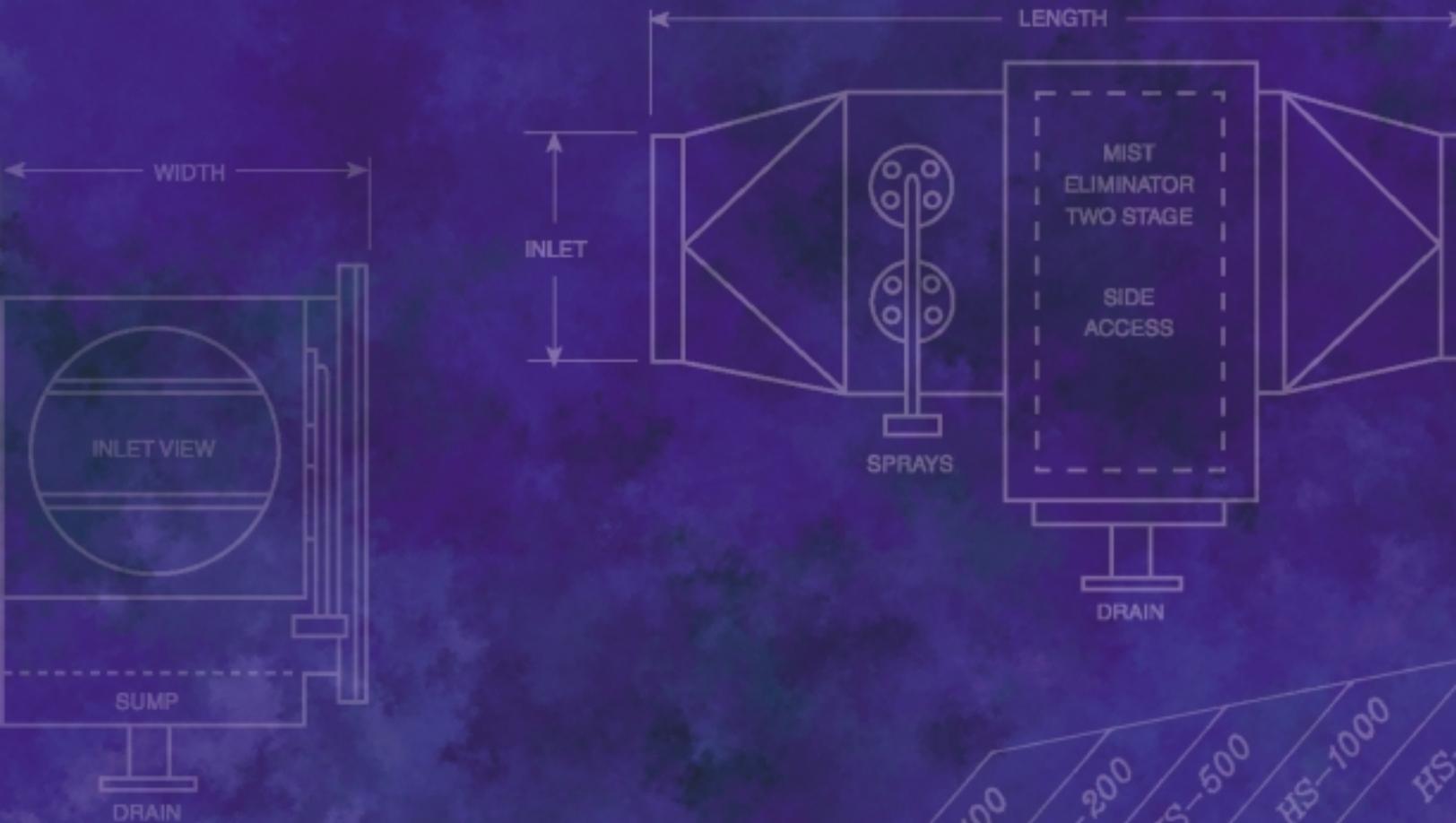


Solutions

To Air Pollution Control



Corrosion Resistant Air Emissions Equipment



Plasticair

	PA-100	PA-200	PA-500	PA-1000	PA-2000
OPERATING WEIGHT	910	1140	1590	2090	2590
HEIGHT	2000	2500	3500	4600	5700
WEIGHT	1600	1700	2000	2200	2600
HEIGHT	67"	67"	79"	87"	102"
WIDTH	32"	51"	1600	2200	1400
LENGTH	3100	3100	3100	3500	3500
HEIGHT	122"	122"	122"	137"	137"
LENGTH	1.7	1.7	1.7	3.5	5.2
WEIGHT	2500	2500	2500	7500	11100

Scrubbers



From the Engineers and Craftsmen at Plasticair...

Plasticair is a tightly integrated developer and manufacturer of specialized emission control solutions. Since we were established in 1980, we've committed ourselves to offering a unique combination of engineering excellence and manufacturing craftsmanship to help our clients solve the most demanding environmental challenges.

Technical Excellence...

The key to our success is the quality of our products. It begins with the expertise of our mechanical and chemical engineering staff whose patented designs give us the edge in the marketplace. It continues with our selection of state-of-the-art materials and our strategic relationships with the research chemists. But there is more to environmental engineering than state-of-the-art chemistry and precision mechanics; keeping up with regulatory changes can be a full-time job. Our engineers and managers are routinely exposed to local, national and global regulations - we keep current. We are always ready to help you engineer an optimal, future-proof, cost-effective solution. That is why a partnership with Plasticair is unbeatable.

Minds and hands...

Within our manufacturing facility our commitment to quality is evident in everything we build, from the skilled hands of our staff, their fabrication experience, methodical assembly skills and dedication to excellence, to our tight, comprehensive process controls and quality audits. This quality is evident in the reliability and economy of thousands of units we have deployed all over the world. At Plasticair our unique combination of engineering vision, modern manufacturing techniques and old-fashioned craftsmanship is at your service.

Working Together...

We believe in hands on engineering. Our design and manufacturing teams work closely not just to deliver the best in quality design, but also to do it fast. We can offer custom design services, short lead-time and rush deliveries, consulting and support services to address all your environmental management solutions from concept to implementation.

TABLE OF CONTENTS

Introduction to Scrubber Technology	3
Scrubber Selection Guide	3
Scrubber Fundamentals	4
Mass Transfer	
Impingement	
Coalescing	
Mist Eliminators	5
P - Series Mist Eliminators	6
Scrubber Bed Packing	6
Crossflow Packed Bed Scrubber	7
Counter Current Packed Bed Scrubber	8
Odour Scrubbers	9-10
Acid Scrubbers	11-14
Venturi Scrubbers	15-16
Laboratory Fumehood Scrubbers	17-18
Automated Systems	19-20
PLC Control	
Chemical Dosing System	
FRP Industrial Fans	21-22



INTRODUCTION TO SCRUBBER TECHNOLOGY

In recent years, greater environmental awareness has meant increasing regulatory requirements on industry for environmental control and pollution abatement to meet occupational health standards within the plant as well as meeting community and national air quality standards in the plant vicinity.

But there's more to environmental control than regulatory compliance - the right engineering decisions today can mean increased flexibility in choosing a greenfield site, a future-proof process that anticipates tomorrow's environmental regulations as well as optimized process costs and maximized profits. That's why we at Plasticair advocate a total solution approach, partnering with our customers throughout the design and implementation cycle. We can deliver a range of pollution control solutions that offer:

- *the capacity* to meet the most challenging regulatory requirement
- *the performance* to meet the toughest operating environments
- *efficiency and reliability* to minimize your operating overheads
- *the flexibility* to handle future growth in plant capacity
- *innovative design and construction* to provide corrosion resistance and longevity
- *at a price point* designed to minimize your total acquisition costs

Additionally, as part of our total solution approach, Plasticair's engineers can provide consultancy services for situation analyses, system customization, commissioning and start-up support.

Wet scrubber technology offers the most powerful, cost-effective range of solutions to industrial airborne pollution challenges. At Plasticair we're uniquely qualified to help you design and implement emission control solutions. We've been designing, manufacturing and deploying this technology worldwide since 1980. Our experienced staff is ready to supply fully automated scrubber systems complete with fans, fully programmed PLC control panels and chemical dosing systems offering contaminant removal efficiencies of up to 99.9% on particles as small as one micron.

This bulletin explains how scrubber technology works and introduces Plasticair's complete line of scrubber technology solutions.



The Plasticair Scrubber Selection Guide

	Foul Odour	Acidic Gas	Fine Acid or Alkaline Mist	Fine Oil and Dust Particles (Up to 1 Micron)	Medium Acid or Alkaline Mist (From 1.2 - 30 Micron)	Heavy Acid or Alkaline Mist (Up to 30 Micron)	Medium to Heavy Oil, Mist and Dust Particles	SUMMARY
HCS Series Horizontal Packed Bed	R	R	R	NR	R	R	NR	BEST SUITED FOR HIGH EFFICIENCY REMOVAL OF HYDROGEN SULPHIDE, MERCAPTANS, ALDEHYDES WHEN A HORIZONTAL APPLICATION IS REQUIRED.
VCS Series Vertical Packed Tower	R	R	R	NR	R	R	NR	BEST SUITED FOR HIGH EFFICIENCY REMOVAL OF HYDROGEN SULPHIDE, MERCAPTANS, ALDEHYDES WHEN A VERTICAL APPLICATION IS REQUIRED.
HS Series Horizontal Packed Bed	NR	R	R	NR	R	R	NR	BEST SUITED FOR HIGH EFFICIENCY REMOVAL OF INORGANIC/ORGANIC ACID MIST AND OR ACID GAS WHEN A HORIZONTAL APPLICATION IS REQUIRED.
VS Series Vertical Packed Tower	NR	R	R	NR	R	R	NR	BEST SUITED FOR HIGH EFFICIENCY REMOVAL OF INORGANIC/ORGANIC ACID MIST AND OR ACID GAS WHEN A VERTICAL APPLICATION IS REQUIRED.
ECE Series Horizontal Venturi	NR	NR	R	R	R	R	R	BEST SUITED FOR HIGH EFFICIENCY PARTICULATE REMOVAL MOST COMMONLY USED FOR GAS STREAMS CONTAINING OIL OR DUST.
FHS Series Counter Current Fumehood	NR	R	R	NR	R	R	NR	DESIGNED SPECIFICALLY FOR LABORATORY INORGANIC ACID AND PEOHLORIC ACID EXHAUST.
E Series Multi Stage Mist Eliminator	NR	R	R	R	R	R	R	ECONOMICAL MULTI PURPOSE SCRUBBERS. CAN BE UTILIZED FOR ACID MIST, ACID GAS AND CHROME.
P Series Mist Eliminator	NR	NR	NR	NR	R	R	R	MIST ELIMINATOR SUITABLE FOR ANY REMOVAL OF 12 MICRON PARTICLES OR LARGER.

FUNDAMENTALS

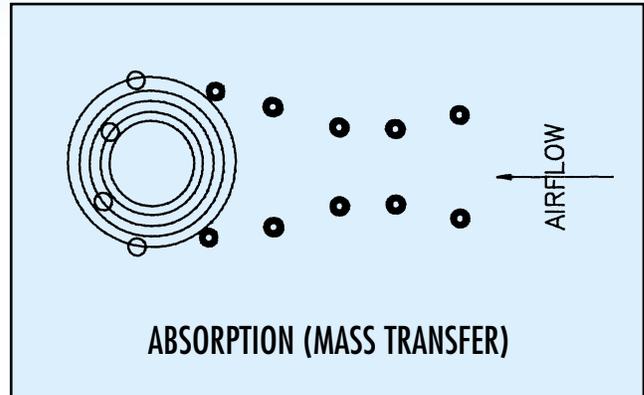
Mass Transfer

Mass transfer is the chemical process by which scrubber units absorb contaminated gas molecules, sub-micron mists and particulates into a scrubbing liquid. This fundamental process is independent of the scrubber unit's configuration or orientation.

At its simplest, mass transfer involves a contaminated air stream moving through a mixing chamber. A liquid sprayed into this chamber mixes with the air stream. Contaminated gas molecules are dissolved by contacting with the sprayed liquid and are removed from the air stream. The process relies on the natural affinity, or attraction, of the contaminant molecules to the scrubbing solvent which may be plant water or involve the addition of chemical solvents to improve the absorption of certain chemical contaminants.

The efficiency of the mass transfer process is enhanced by introducing packing media into the mixing chamber to create turbulence within the air stream, forcing the molecules of the scrubbing liquid and the contaminants into intimate contact. Efficiency may be further enhanced by ionizing the air stream.

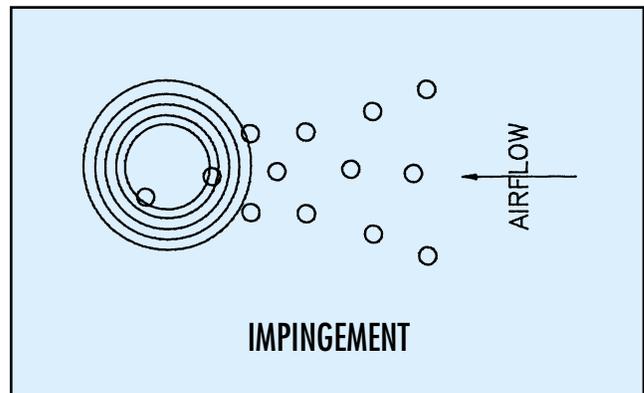
Scrubbing technology, using the mass transfer process, is the most cost effective pollution control solution for sub-micron gaseous contaminants at velocities below 2.5 m/sec (500 fpm) particularly where the contaminant concentration is low.



Impingement

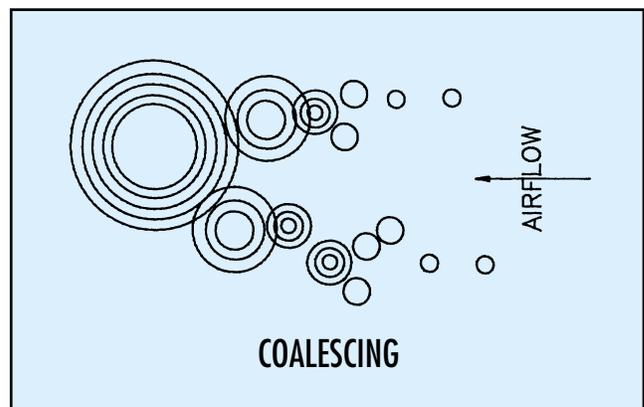
Impingement refers to the simple mechanical process of forcing molecular collisions between scrubbing liquids, particulates or mists. These collisions may be either between molecules and fixed media or among the molecules themselves. Typically the fixed media are packing, mesh, profile blades or rods.

Impingement is most effective when used with air stream velocities greater than 7.5 m/sec (1500 fpm).



Coalescing

This is a cost effective mechanical process for removing mists or entrained liquid by forcing small liquid drops to coalesce or combine to become larger drops. This is accomplished by introducing a coalescing pad into the air stream as part of a vertical or horizontal system implementation. Upon exiting the coalescer unit, the coalesced liquid is removed from the contaminated air stream by means of a mist eliminator. This process is effective at high gas velocities, typically of 5.08 m/sec (1000 fpm) or higher.



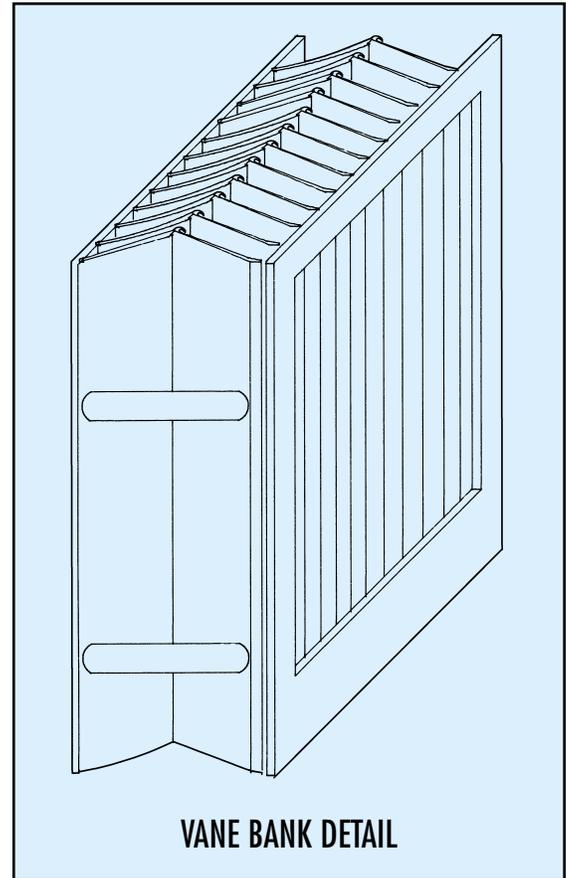
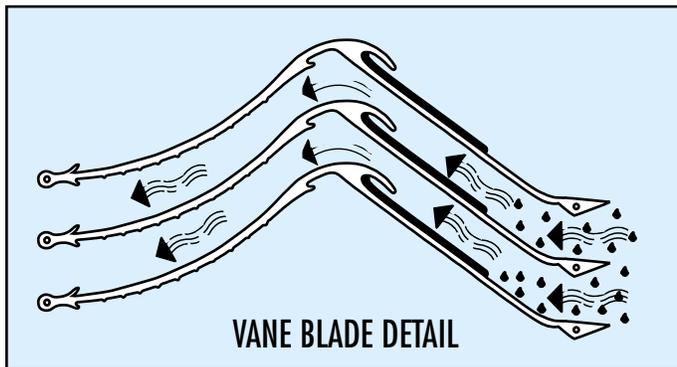
MIST ELIMINATORS

Plasticair's **P series** vane module mist eliminator is an impingement separator unit consisting of an FRP shell, FRP transitions, CPVC sprays for periodical wash-down, a drain and two removable PVC Vane Bank modules. [Detail on Next Page](#) ▶▶▶▶

Vane Banks

Plasticair's proprietary Vane Bank Module is fabricated by us using our patented PVC extruded vane blade design. The vane blades are assembled into a removable frame unit for easy inspection and maintenance. Vane bank units incorporate a standard spacing of 16 mm (0.625") between blades and can be operated vertically or horizontally. These vane banks may be incorporated with various Plasticair scrubber units as part of a comprehensive elimination solution or may be used in a stand-alone mode as an effective particle and mist removal unit.

Plasticair high efficiency vane bank units are capable of achieving removal rates of up to 99% of particulate contaminants of 12 microns or larger. They operate at an effective velocity range of 1.5 M/sec (300 fpm) to 10.16 M/sec (2000 fpm).



Mesh-Type Mist Eliminators

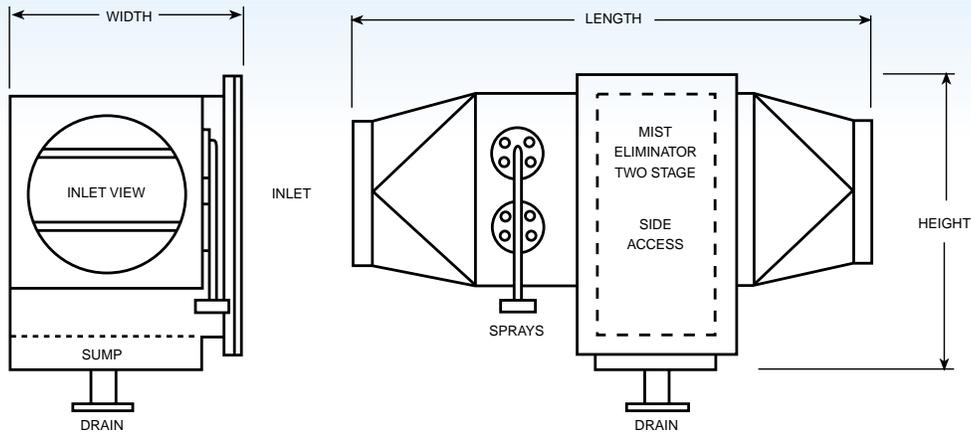
Plasticair's mesh mist eliminators are high efficiency collection units ideally suited for small liquid particle collection. Mesh mist eliminators are suitable for air stream velocities of less than 3.048 M/sec (600 fpm). Mesh-type units should be used for mist elimination solutions with low exposure to particulates to avoid clogging.

High Density Packing

High density packing has between 2 and 3 times more surface area per volumetric unit than standard packing media and may be used as a mist eliminator for air stream velocities of approximately 2.4 M/sec (480 fpm). High density packing results in a much higher pressure drop per unit of packed bed length because of the increased surface area.

Plasticair's standard mist eliminator using high density packing incorporates a 305-914 mm (12-36") bed length. This type of mist eliminator achieves a standard efficiency of 99% removal for particles of 10 microns or larger.

P-SERIES

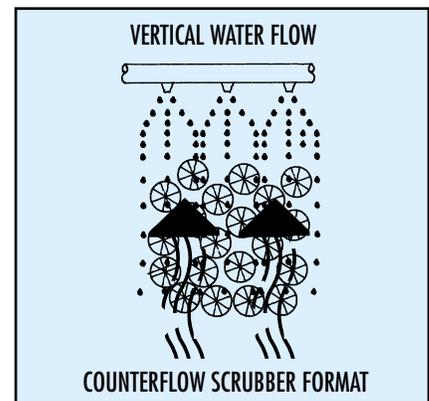
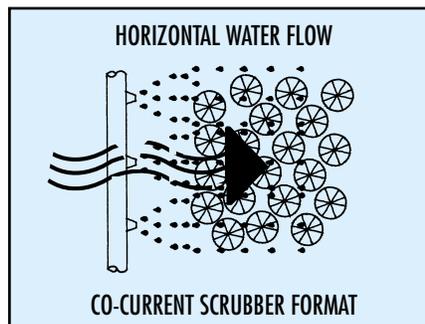
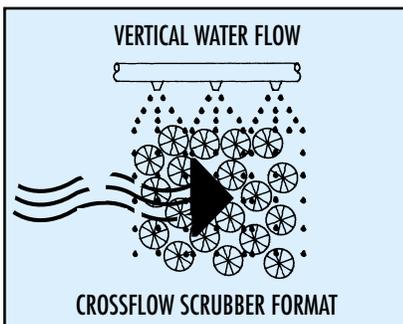


	P-100	P-200	P-500	P-700	P-1000	P-2000	P-3000	P-4000	P-5000	P-6000	UNIT OF MEASUREMENT
VOLUME	0.354	0.708	1.75	2.5	3.56	7.08	10.62	14.06	17.7	20.4	CMS
	750	1500	3700	5250	7550	15000	22500	29800	37500	43200	CFM
VELOCITY	7.62	7.62	7.62	7.62	7.62	7.62	7.62	7.62	7.62	7.62	M/sec.
	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	feet/min.
LENGTH	1727	1727	1727	1727	1727	1727	1727	1727	2032	2032	mm
	68	68	68	68	68	68	68	68	80	80	inches
WIDTH	305	381	559	635	762	1041	1270	1448	1600	1676	mm
	12	15	22	25	30	41	50	57	63	66	inches
HEIGHT	457	533	711	787	914	1194	1422	1600	1753	2159	mm
	18	21	28	31	36	47	56	63	69	85	inches

GENERAL DIMENSIONS ONLY. INTERMEDIATE SIZES ARE NOT LISTED IN THIS BULLETIN.

SCRUBBER BED PACKING

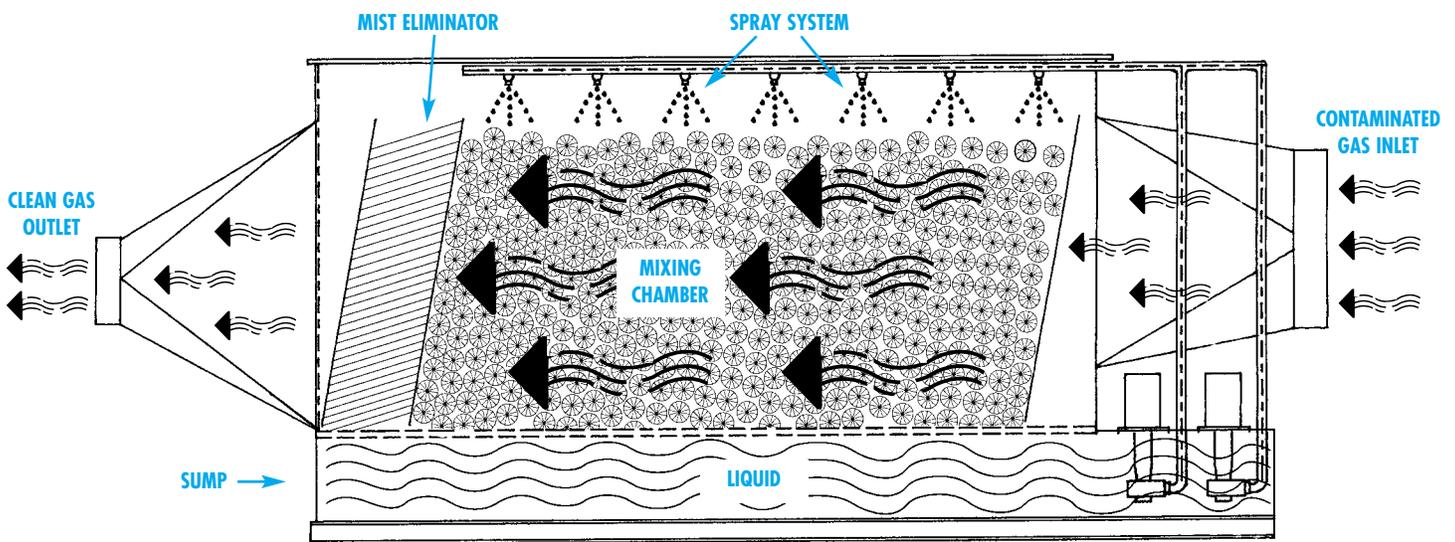
A packing medium is usually introduced into the mixing chamber to increase both impingement and mass transfer processes within a scrubber unit. Referred to as scrubber bed packing, this material is designed for maximum surface area, with minimal air stream impedance and, consequently, the least possible pressure drop within the mixing chamber. This packing material maximizes the wetted-surface contact between the contaminated air stream and the applied scrubber liquid. By minimizing the pressure drop within the chamber, the packing material minimizes power requirements, energy consumption and operating costs. Polypropylene is typically used as a packing medium although certain applications may require PVC, PVDF, ceramic or polyethylene based scrubber beds.



OPERATING FUNDAMENTALS - CROSSFLOW PACKED BED SCRUBBER

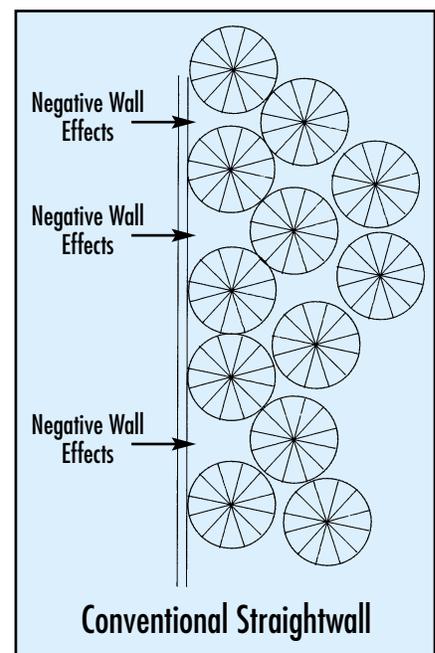
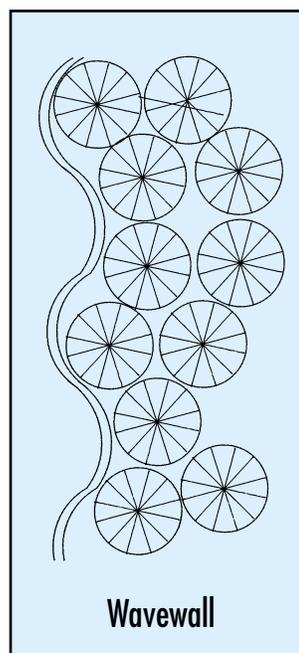
Crossflow Packed Bed Scrubbers are used in environmental control applications which require contaminant gas absorption with or without particle removal. The process involves a scrubbing liquid flowing vertically through the scrubber mixing chamber perpendicular to the contaminated air stream. The mixing chamber contains packing material which maximizes contact between the two streams, facilitating contaminant absorption of the scrubbing liquid before falling into the sump below.

Plasticair's HCS/HS Series Crossflow Scrubbers are used for gaseous and particulate contaminant removal as well as for odour control applications. Plasticair scrubbers incorporate a unique WAVEWALL™ construction which offers greater structural integrity of the scrubber unit than traditional straight wall construction. More importantly, this construction enhances operating efficiency by forcing packing material into the patented wall crevices, maximizing contact and reducing negative wall effects. This increased efficiency is particularly evident when dealing with low volume airflows.



For applications involving complex contaminants in a noxious gas stream, Plasticair offers crossflow scrubber configurations with multiple packing bed sections, each designed to capture a particular contaminant. The chemical dosing process of each bed is isolated by incorporating a separate mist eliminator and sump within each section.

Plasticair also offers crossflow scrubber configurations incorporating an ionizing section, manufactured from 316 stainless steel, to more effectively eliminate sub-micron and non-polar particulates by charging arriving contaminant molecules before they enter the packed bed sections. The charged particles are attracted to the wetted packing media, greatly increasing absorption and removal.



OPERATING FUNDAMENTALS - COUNTER CURRENT PACKED BED SCRUBBER

Counter current packed bed scrubbers involve a downward flowing liquid, either plant water or chemical solvent, impinging upon an upward flowing contaminated air stream. Contaminants are absorbed by the scrubbing liquid which collects in the sump. This type of scrubber is used to achieve gas absorption, with or without particle removal, using the principle of mass transfer. Once again, packing material is used to maximize the wetted surface contact between the opposing streams.

As with crossflow scrubbers, Plasticair can customize the number of beds or modify the bed length to meet the contaminant or efficiency objectives of any application. Note that unlike crossflow scrubber implementations, a multiple bed counter current scrubber requires a separate vessel for each bed section to avoid any carry over between sections. High density random packing, often in conjunction with mesh pads may be configured to further prevent mist carry over. PVC vane-type mist eliminators are most commonly used in Plasticair counter current applications.

Comparing Cross Flow and Counter Current Scrubber Applications

Maintenance:

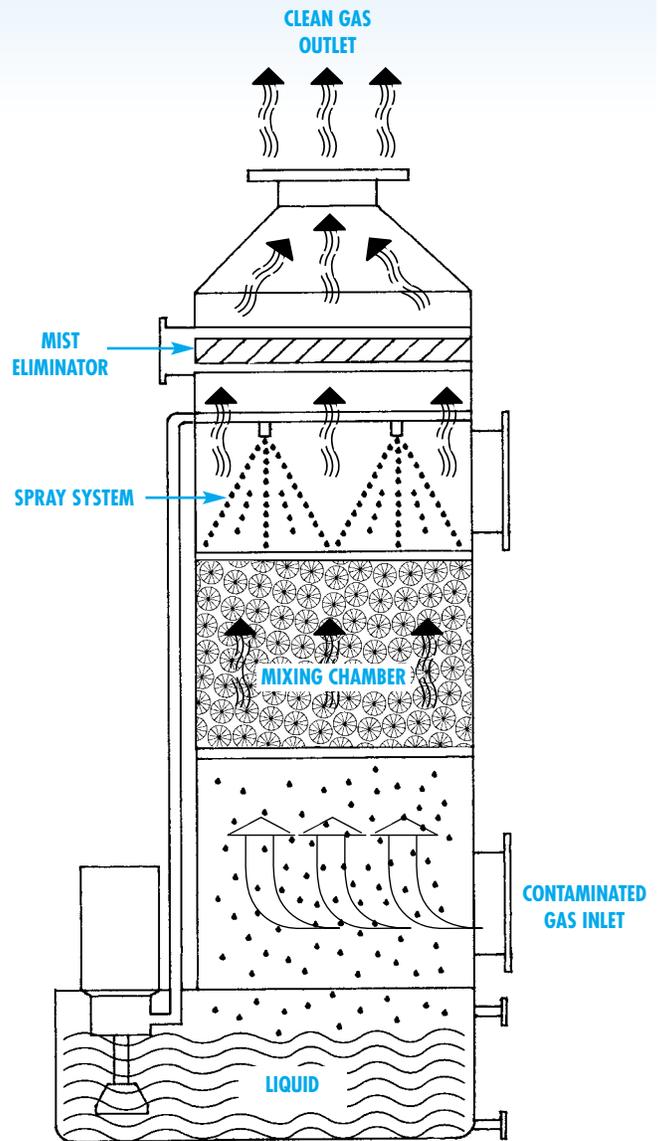
Because the liquid and gas streams in crossflow scrubber applications do not directly impinge upon each other, this design is less susceptible to clogging.

Cost:

Crossflow scrubbers use less liquid than comparable counter current scrubbers thus requiring less pump capacity. The pressure drop in vertical counter current scrubbers is slightly higher than in cross flow scrubbers because of the opposing gas and liquid streams. Consequently, cross flow scrubber energy consumption costs are lower than for comparable counter current models.

Space Constraints:

Horizontal scrubbers are ideal for height-restricted installations where height is limited. The height and width of Plasticair's HCS/HS series scrubbers can be customized to accommodate most scrubber service rooms. Counter current scrubbers are ideal for applications where floor space is limited and height is unrestricted.



A TOTAL SOLUTION APPROACH TO ODOUR CONTROL

We continue to see increasingly stringent regulations to abate industrial odours in many sectors from agricultural facilities to industrial users of chemical processes to municipal waste treatment facilities.

Plasticair offers a wide range of vertical and horizontal odour scrubbers designed to meet a wide range of performance objectives, process chemistries, operating budgets and physical constraints.

In addition, Plasticair's engineers can provide consultancy services for situation analyses and evaluations, customized system design, commissioning and start-up support.

Horizontal Odour Scrubbers - The Plasticair HCS Series

The Plasticair HCS series of crossflow scrubbers are designed to provide high efficiency odour control in environments where height is a major constraint. The HCS design allows both the height and the width of the unit to be customized to accommodate restrictive scrubber mechanical rooms. The HCS series can support air volumes from 236 l/sec (500 cfm) up to 47,200 l/sec (100,000 cfm) and can achieve gas absorption efficiencies of up to 99.9%.

Plasticair's HCS series exemplifies the Company's commitment to leading-edge design and state-of-the-art materials selection. Each unit is built with a solid Fibre Reinforced Plastic (FRP) scrubber shell for maximum corrosion resistance, structural integrity and longevity which is further enhanced by Plasticair's unique WAVEWALL™ design for improved efficiency and structural integrity. Internal components utilize a combination of Polypropylene, PVC, CPVC and Fiberglass. Multiple units may be configured in series to further improve efficiency and to support several scrubbing liquids for complex odour control situations.

Vertical Odour Scrubbers - The Plasticair VCS Series

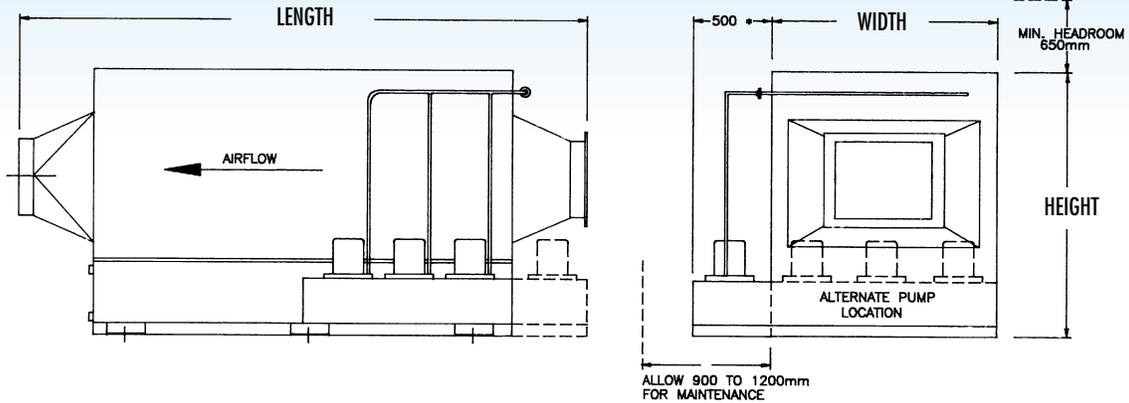
The Plasticair VCS series of counter current scrubbers provide ideal odour control in locations with limited floor space but without height restrictions. The VCS series can support air volumes ranging from 236 l/sec (500 cfm) up to 35,400 l/sec (75,000 cfm) while achieving gas absorption efficiencies of up to 99.9%.

Like their HCS series counterparts, Plasticair's VCS series units are built with a solid Fibre Reinforced Plastic (FRP) scrubber shell and internal components of Polypropylene, PVC, CPVC and Fiberglass Reinforced Plastic (FRP).

In standard configuration, HCS/VCS series units are supplied with a 2438 mm (8' 0") packed bed for maximum absorption efficiency. These units can be configured with optional integral pumps, PLC Control Panels and secondary containment systems. In addition, Plasticair can provide custom HCS/VCS series configurations based on the individual process application or gas absorption efficiency objectives. Custom configurations may involve changes to any of the following HCS/VCS series design parameters:

- packed bed length
- water volume
- chemical dosing volume
- dosing system chemicals selection
- air velocity
- use of ionization section(s)
- use of flushing section(s)
- choice of premium quality vinyl ester or polyester resins for scrubber shell
- choice of alternative thermoplastics and resins for internal components

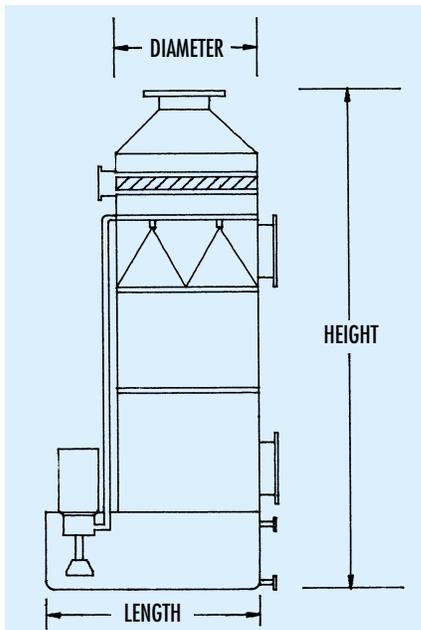
HCS-SERIES



	HCS-100	HCS-200	HCS-500	HCS-1000	HCS-1500	HCS-2000	HCS-3000	HCS-4000	HCS-7000	HCS-10000	UNIT OF MEASUREMENT
OPERATING WEIGHT	1200	1500	2000	3000	4000	4900	5600	7200	11360	15000	KG
	2640	3300	4400	6600	8800	10780	12320	15840	25000	33000	lbs
HEIGHT	1600	1700	2000	2200	2600	2600	2600	3600	5400	6300	mm
	63"	67"	79"	87"	102"	102"	142"	142"	211"	246"	inches
WIDTH	820	1300	1600	2200	1400	2300	2400	3200	3050	3650	mm
	32"	51"	63"	87"	53"	91"	95"	126"	120"	144"	inches
LENGTH	4000	4000	4000	4400	4400	5000	5000	5000	6000	7000	mm
	158"	158"	158"	173"	173"	197"	197"	197"	236"	275"	inches
MIN. GAS VOLUME	0.236	0.71	1.7	3.5	5.2	6.9	11.0	14.58	22.5	31.2	CMS
	500	1500	3500	7500	11100	14700	23280	30900	47700	66000	CFM
MAX. GAS VOLUME	0.71	1.2	2.4	4.7	7.1	9.4	14.2	18.9	33.1	47.2	CMS
	1500	2500	5000	10000	15000	20000	30000	40000	70000	100000	CFM

GENERAL DIMENSIONS ONLY. INTERMEDIATE SIZES ARE NOT LISTED IN THIS BULLETIN.

VCS-SERIES



	OPERATING WEIGHT in kg pounds in brackets				GAS VOLUME	
	1120 (2480)	1270 (2800)	1610 (3550)	1780 (3930)	MIN.	MAX.
	LENGTH in mm inches in brackets				DIA. in mm inches in brackets	
	HEIGHT in mm inches in brackets					
VCS-100	550 (1200)	1120 (2480)	610 (1350)	4780 (10580)	0.378 CMS 800 CFM	0.708 CMS 1500 CFM
VCS-200	730 (1600)	1270 (2800)	760 (1680)	4880 (10800)	0.661 CMS 1400 CFM	1.18 CMS 2500 CFM
VCS-400	1140 (2500)	1580 (3480)	1070 (2360)	5080 (11250)	1.27 CMS 2700 CFM	2.27 CMS 4800 CFM
VCS-600	1410 (3100)	1730 (3800)	1220 (2690)	5160 (11450)	1.79 CMS 3800 CFM	2.97 CMS 6300 CFM
VCS-800	1960 (4300)	2030 (4480)	1520 (3350)	5330 (11750)	2.74 CMS 5800 CFM	4.63 CMS 9800 CFM
VCS-1000	2275 (5000)	2180 (4800)	1680 (3700)	5440 (12000)	3.35 CMS 7100 CFM	5.62 CMS 11900 CFM
VCS-1200	2775 (6100)	2340 (5150)	1830 (4030)	5540 (12250)	3.96 CMS 8400 CFM	6.61 CMS 14000 CFM
VCS-1500	3180 (7000)	2490 (5480)	1980 (4360)	5610 (12350)	4.72 CMS 10000 CFM	7.84 CMS 16600 CFM
VCS-1800	3910 (8600)	2640 (5810)	2130 (4690)	5720 (12600)	5.43 CMS 11500 CFM	8.97 CMS 19000 CFM
VCS-2000	4550 (10000)	2790 (6110)	2290 (5050)	5820 (12850)	6.13 CMS 13000 CFM	10.38 CMS 22000 CFM
VCS-2300	5100 (11200)	2950 (6500)	2440 (5370)	5920 (13050)	7.08 CMS 15000 CFM	11.8 CMS 25000 CFM
VCS-2500	6800 (15000)	3250 (7160)	2740 (6030)	6100 (13550)	8.97 CMS 19000 CFM	15.104 CMS 32000 CFM
VCS-3500	8600 (19000)	3560 (7840)	3050 (6720)	6270 (13850)	10.86 CMS 23000 CFM	18.41 CMS 39000 CFM
VCS-4000	9000 (20000)	3350 (7380)	3250 (7160)	6480 (14300)	13.22 CMS 28000 CFM	22.18 CMS 47000 CFM
VCS-5000	12000 (27000)	3660 (8060)	3660 (8060)	7110 (15650)	16.05 CMS 34000 CFM	26.43 CMS 56000 CFM
VCS-6000	14000 (31000)	3960 (8730)	3960 (8730)	7370 (16300)	18.89 CMS 40000 CFM	31.15 CMS 66000 CFM
VCS-7500	17000 (38000)	4270 (9410)	4270 (9410)	7870 (17300)	21.71 CMS 46000 CFM	36.34 CMS 77000 CFM

GENERAL DIMENSIONS ONLY. INTERMEDIATE SIZES ARE NOT LISTED IN THIS BULLETIN.

SOLUTIONS FOR ACIDIC EMISSION MANAGEMENT

In addition to traditional applications such as plating, metal processing and battery manufacturing, the industrial use of acid-based etching processes have increased significantly in recent years particularly in the electronics sector. Etching and plating process design requires stringent management of acidic emissions for clean air and workplace safety regulatory compliance. In addition, tight control of airborne acidic contaminants can prevent plant and process equipment from premature deterioration through corrosion.

For over fifteen years, a broad spectrum of industrial sectors have relied upon Plasticair to meet their acidic emission control needs. To address wide ranging process applications as well as a diversity of global emission control standards, Plasticair has developed a series of four highly efficient acid scrubber models which can flexibly and economically meet the toughest emission management challenges. These scrubber units may be custom configured to offer a range of elimination efficiencies from 60% using spray chambers and mist eliminators to 99.9% using packed beds.

Horizontal Acid Scrubbers

Plasticair's HS series of horizontal acid scrubbers incorporates a high efficiency crossflow design ideally suited for elimination of both acidic and alkaline mists. These designs can be configured to eliminate corrosive particulates generally by incorporating a spray unit at the front face of the packed bed. This provides a flushing action which reduces clogging and maintenance overhead. Please refer to the introduction to scrubbing technology at the beginning of the document for a more detailed explanation of crossflow scrubber operating principles.

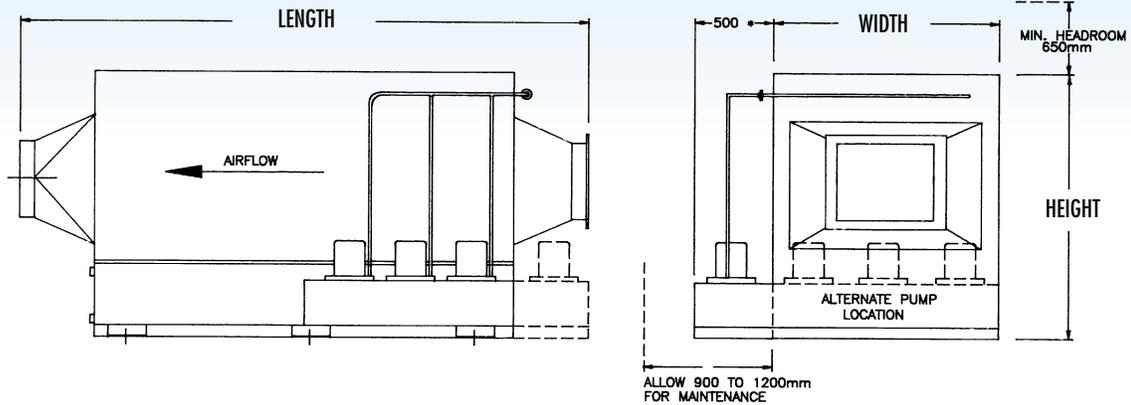
The HS series may be configured to support gas volumes ranging from 236 l/sec (500 CFM) up to 47,200 l/sec (100,000 CFM) with efficiencies of up to 99.9%.

Vertical Acid Scrubbers

The Plasticair VS series of vertical acid scrubbers use the counter current process, as described in the introduction to scrubbing technology at the beginning of this document, to provide high efficiency elimination of corrosive mists and particulates, both acidic and alkaline. This range of scrubber units can be configured to handle a range of gas volumes from 236 l/sec (500 CFM) up to 35400 l/sec (75,000 CFM) at up to 99.9% contaminant elimination efficiency.

In standard configuration, the HS and VS series of acid scrubbers incorporate a 1524 mm (60") packed bed. The optimum bed length is application specific and Plasticair's designers can extend or reduce the standard dimensions to accommodate specific contaminants or removal efficiency objectives.

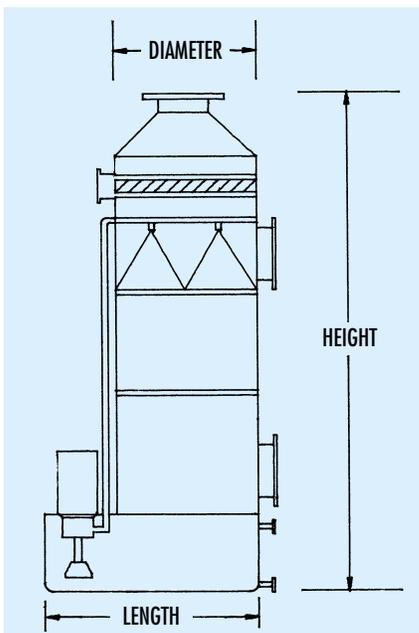
HS-SERIES



	HS-100	HS-200	HS-500	HS-1000	HS-1500	HS-2000	HS-3000	HS-4000	HS-7000	HS-10000	UNIT OF MEASUREMENT
OPERATING WEIGHT	910	1140	1590	2090	2590	3640	4550	5450	9090	11820	KG
	2000	2500	3500	4600	5700	8000	10000	12000	26000	26000	lbs
HEIGHT	1600	1700	2000	2200	2600	2600	3600	3600	5400	6300	mm
	63"	67"	79"	87"	102"	102"	142"	142"	211"	246"	Inches
WIDTH	820	1300	1600	2200	1400	2300	2400	3200	3050	3650	mm
	32"	51"	63"	87"	53"	91"	95"	126"	120"	144"	Inches
LENGTH	3100	3100	3100	3500	3500	4100	4100	4100	5100	6100	mm
	122"	122"	122"	137"	137"	161"	161"	161"	200"	239"	Inches
MIN. GAS VOLUME	0.236	0.71	1.7	3.5	5.2	6.9	11.0	14.58	22.5	31.2	CMS
	500	1500	3500	7500	11100	14700	23280	30900	47700	66000	CFM
MAX. GAS VOLUME	0.71	1.2	2.4	4.7	7.1	9.4	14.2	18.9	33.1	47.2	CMS
	1500	2500	5000	10000	15000	20000	30000	40000	70000	100000	CFM

GENERAL DIMENSIONS ONLY. INTERMEDIATE SIZES ARE NOT LISTED IN THIS BULLETIN.

VS-SERIES



	OPERATING WEIGHT in kg pounds in brackets				LENGTH in mm Inches in brackets		DIAMETER in mm Inches in brackets		HEIGHT in mm Inches in brackets		GAS VOLUME	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
VS-100	500 (1100)	1120 (44*)	610 (24*)	3860 (152*)	0.378 CMS	0.708 CMS	800 CFM	1500 CFM				
VS-200	680 (1500)	1270 (50*)	760 (30*)	3960 (156*)	0.661 CMS	1.18 CMS	1400 CFM	2500 CFM				
VS-400	1100 (2400)	1580 (62*)	1070 (42*)	4170 (164*)	1.27 CMS	2.27 CMS	2700 CFM	4800 CFM				
VS-600	1360 (3000)	1730 (68*)	1220 (48*)	4240 (167*)	1.79 CMS	2.97 CMS	3800 CFM	6300 CFM				
VS-800	1865 (4100)	2030 (80*)	1520 (60*)	4420 (174*)	2.74 CMS	4.63 CMS	5800 CFM	9800 CFM				
VS-1000	2180 (4800)	2180 (86*)	1680 (66*)	4520 (178*)	3.35 CMS	5.62 CMS	7100 CFM	11900 CFM				
VS-1200	2680 (5900)	2340 (92*)	1830 (72*)	4620 (182*)	3.96 CMS	6.61 CMS	8400 CFM	14000 CFM				
VS-1500	3100 (6800)	2490 (98*)	1980 (78*)	4700 (185*)	4.72 CMS	7.84 CMS	10000 CFM	16600 CFM				
VS-1800	3550 (7800)	2640 (104*)	2130 (84*)	4850 (191*)	5.43 CMS	8.97 CMS	11500 CFM	19000 CFM				
VS-2000	4140 (9100)	2790 (110*)	2290 (90*)	4950 (195*)	6.13 CMS	10.38 CMS	13000 CFM	22000 CFM				
VS-2300	4700 (10300)	2950 (116*)	2440 (96*)	5060 (199*)	7.08 CMS	11.8 CMS	15000 CFM	25000 CFM				
VS-2500	6400 (14000)	3250 (128*)	2740 (108*)	5310 (209*)	8.97 CMS	15.104 CMS	19000 CFM	32000 CFM				
VS-3500	7700 (17000)	3560 (140*)	3050 (120*)	5460 (215*)	10.86 CMS	18.41 CMS	23000 CFM	39000 CFM				
VS-4000	8200 (18000)	3350 (132*)	3250 (132*)	5610 (221*)	13.22 CMS	22.18 CMS	28000 CFM	47000 CFM				
VS-5000	11000 (24000)	3660 (144*)	3660 (144*)	6450 (254*)	16.05 CMS	26.43 CMS	34000 CFM	56000 CFM				
VS-6000	13000 (28000)	3960 (156*)	3960 (156*)	6710 (264*)	18.89 CMS	31.15 CMS	40000 CFM	66000 CFM				
VS-7500	15500 (34000)	4270 (168*)	4270 (168*)	7210 (284*)	21.71 CMS	36.34 CMS	46000 CFM	77000 CFM				

GENERAL DIMENSIONS ONLY. INTERMEDIATE SIZES ARE NOT LISTED IN THIS BULLETIN.

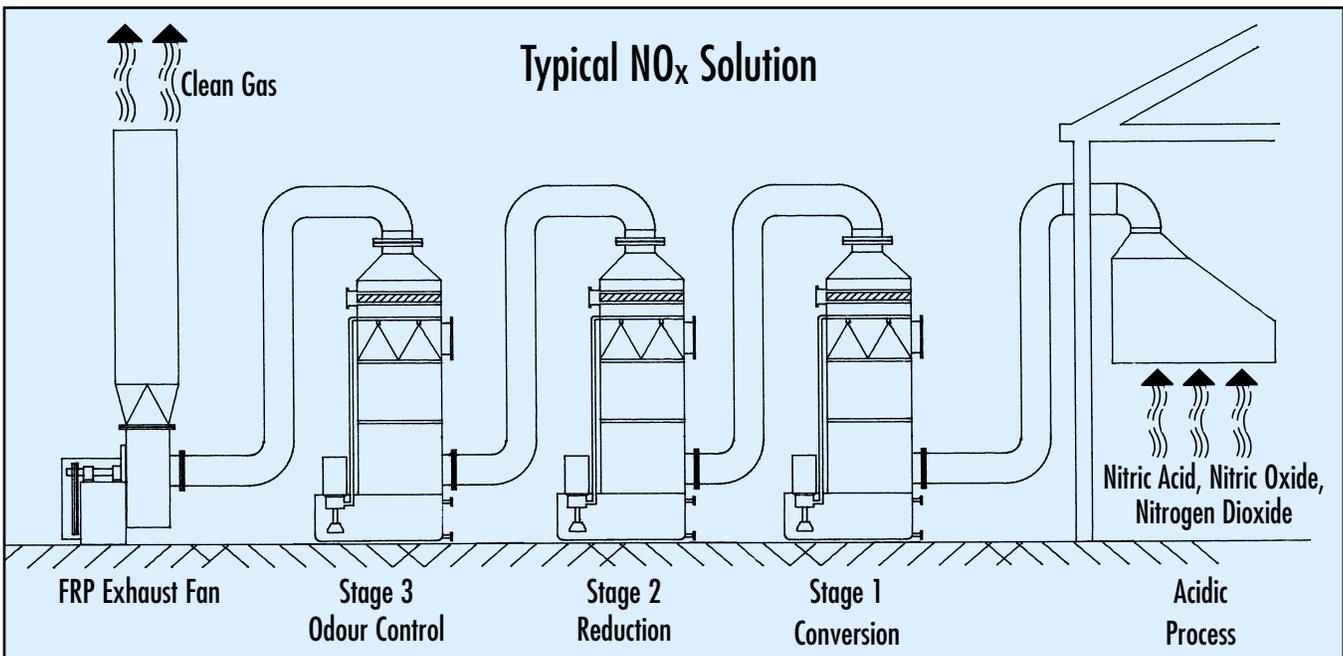
OPTIMIZING ACID SCRUBBER EFFICIENCY

The following examples illustrate the versatility of standard designs in addressing a wide range of process challenges. The first case study involves a Nitric Acid elimination scenario.

Removal Efficiency Objective	99.9%
Contaminant	HNO₃
<u>Solution</u>	
Length of packed bed	3048 mm (120")
Bed material	Polypropylene
Chemical dosing	NaOH
pH Level	9
Air velocity (through packing)	2.2 m/sec (450 fpm)

The scrubbing liquid is dosed with the neutralizing agent (NaOH, Sodium Hydroxide) in the scrubber unit's recirculation system. The recirculated liquid is sprayed into the packed bed, absorbing the oncoming nitric acid mist and neutralizing the corrosive emission. Because of the unusually high efficiency objective in this case, Plasticair's engineers solved the problem by extending the bed length to provide a sufficient neutralization interval.

In a more complex case study, an acid scrubber is used for removal of an NO_x contaminant stream containing HNO₃ (Nitric Acid), NO (Nitric Oxide) and NO₂ (Nitrogen Dioxide). For cost effectiveness, a counter current scrubber is ideally suited to this application and Plasticair's approach to NO_x removal normally involves a three stage counter current packed bed implementation. The first stage converts NO to NO₂ through oxidation. The second stage reduces the concentration of HNO₃ and NO₂. Finally, the third stage is used for odour removal. This system typically will have an air stream velocity of 1.5 m/sec (300 fpm) and achieve a 99% removal efficiency.



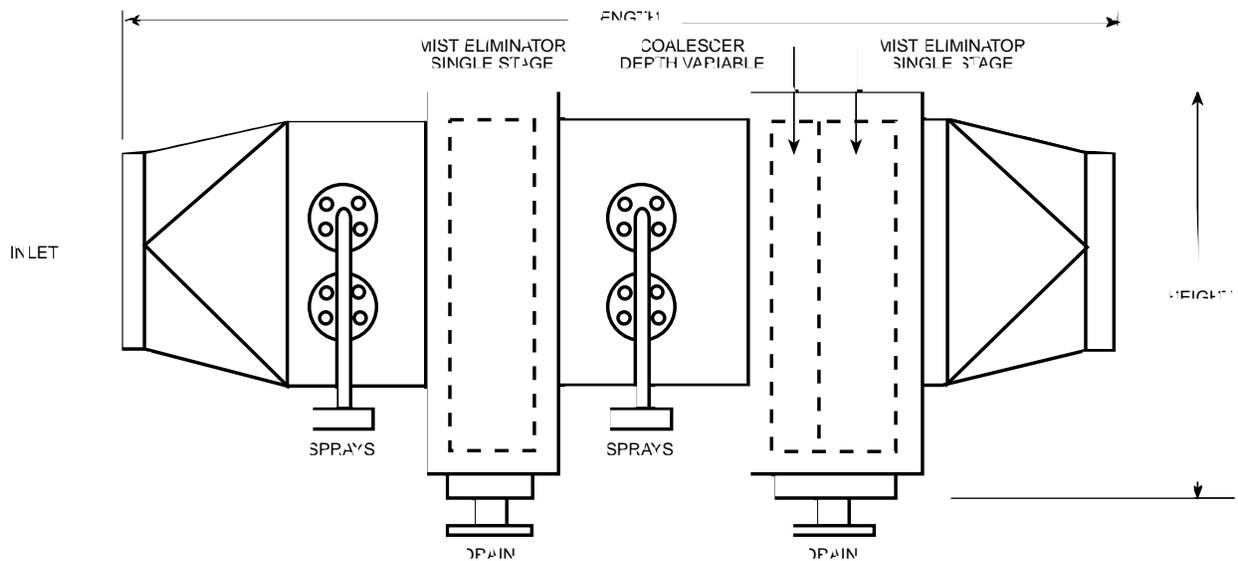
ACIDIC EMISSION MANAGEMENT WITH MULTI STAGE MIST ELIMINATORS

E-Series

The E series of scrubber units from Plasticair offers an extremely cost effective, low maintenance set of mist elimination solutions. These units are used in a variety of corrosive control applications, most commonly in the metal finishing industry. In plating applications, E series scrubbers may be used for chrome particulates down to 1 micron in size. The most common configurations incorporate a combination of internal sprays and mist eliminators in conjunction with a coalescer unit. Packed beds are not normally included in these designs.

Stringent design and materials selection contribute to the efficiency and cost effectiveness of Plasticair's multi-stage mist eliminators. E series units are built upon a solid FRP scrubber shell and employ CPVC sprays and piping. Mist elimination sections, operating on the principle of mechanical impingement, use a PVC vane stage incorporating Plasticair's patented, high-efficiency vane design. The coalescer stage utilizes a polypropylene coalescer pad. The E series offers significant configuration flexibility and Plasticair can offer custom designs and material selections for a wide range of applications.

E Series configurations support gas volumes of between 94.4 l/sec (200 cfm) and 28320 l/sec (60000 cfm). In gaseous contaminant applications, 80% removal efficiency may be achieved with velocities of 2.286 m/sec (450 ft/min). For solid contaminants, 99% removal efficiency of 3 micron, or larger, particulates is achievable using air stream velocities up to 10.16 m/sec (2000 ft/min.).



	E-100	E-200	E-500	E-700	E-1000	E-2000	E-3000	E-4000	E-5000	E-6000	UNIT OF MEASUREMENT
VOLUME	0.472	0.94	2.36	3.3	4.7	9.4	14.2	18.9	23.6	28.3	CMS
	1000	2000	5000	7000	10000	20000	30000	40000	50000	60000	CFM
VELOCITY	7.62	7.62	7.62	7.62	7.62	7.62	7.62	7.62	7.62	7.62	M/sec
	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	feet/min.
LENGTH	2590	2590	2590	2590	2590	2590	2590	2590	3050	3050	mm
	102	102	102	102	102	102	102	102	120	120	inches
WIDTH	330	432	635	737	864	1194	1448	1651	1829	2007	mm
	13	17	25	29	34	47	57	65	72	79	inches
HEIGHT	483	584	787	889	1016	1346	1600	1803	1981	2159	mm
	19	23	31	35	40	53	63	71	78	85	inches

GENERAL DIMENSIONS ONLY. INTERMEDIATE SIZES ARE NOT LISTED IN THIS BULLETIN.

VENTURI SCRUBBERS

The Plasticair ECE series of venturi scrubbers are ideal for fine particle collection. These horizontal non-clogging units operate on the impingement principle and are capable of collecting 99% of particles 1 micron or larger. ECE Series units operate at air flow velocities ranging from as low as 94.4 l/sec (200 cfm) to 33040 l/sec (70,000 cfm) at up to 2484 Pa (10.0" W.G.) pressure drop. Custom designed vertical units are also available.

In addition to the ECE series, Plasticair also offers an economical series of mini-venturi scrubbers suitable for very low volume applications.

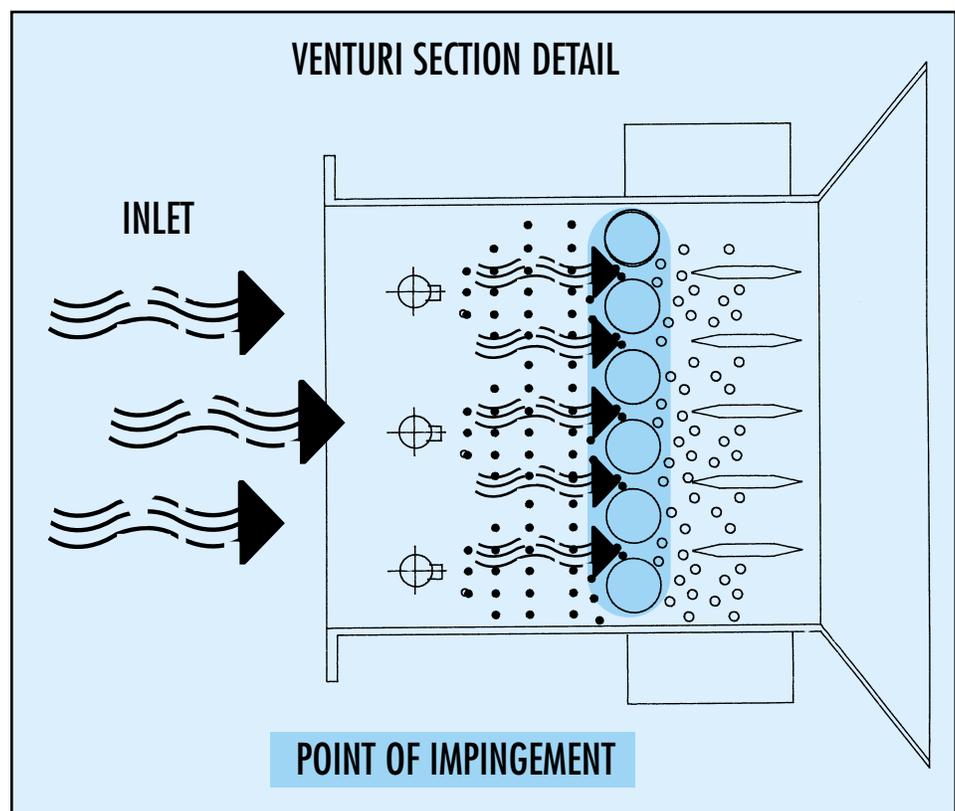
Venturi Scrubber Operation

A contaminated air stream entering the scrubber inlet is immediately drawn into the venturi section, where molecular impingement occurs. A scrubbing liquid sprayed directly into the venturi section impinges upon the gaseous contaminant. This scrubbing liquid usually contains a chemical dosing agent to neutralize and dissolve contaminant particles. The air stream is accelerated significantly within the venturi section with velocities ranging from between 20.3' m/sec (4000 ft/min) to as much as 45.72 m/sec (9000 ft/min) depending on the removal efficiency objectives.

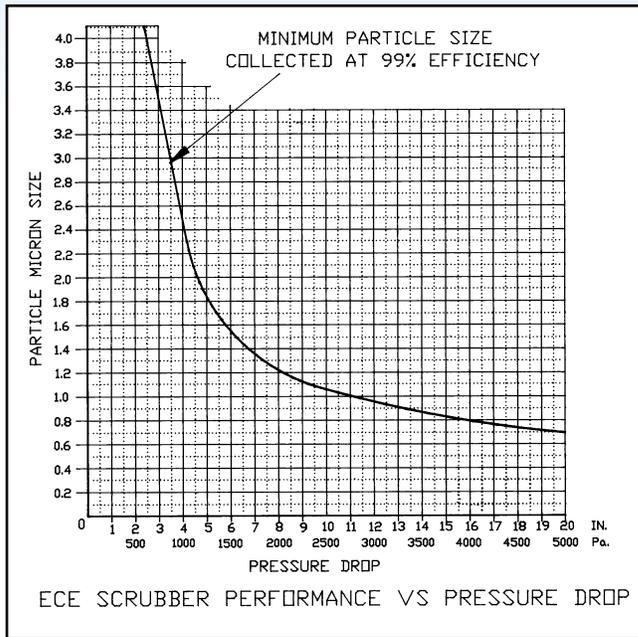
ECE series units can provide low maintenance particulate elimination solutions to meet the toughest challenges. Plasticair's venturi scrubber design incorporates knock-down baffles, located directly behind the venturi section, which significantly eliminates liquid entrainment from the air stream. This prevents over-loading in the unit's mist elimination section by reducing vane bank clogging.

Stringent materials selection is critical to the quality and robustness of ECE series venturi scrubbers. All units incorporate, as standard, a solid FRP scrubber and venturi shell, internal components constructed from FRP, PVC or CPVC and standard recirculation pumps constructed from CPVC.

Plasticair can supply customized ECE series-based solutions including fully programmed PLC control panels ready for standalone automation or ready for integration with existing process designs. Customized designs for piping and chemical dosing systems, integral sumps and pumps, vane bank wash-down units and optional solid fiberglass industrial exhaust fans are a Plasticair specialty. In addition to custom solution engineering and fabrication, we also offer system start-up support and commissioning services as part of our commitment to offering total environment control solutions.

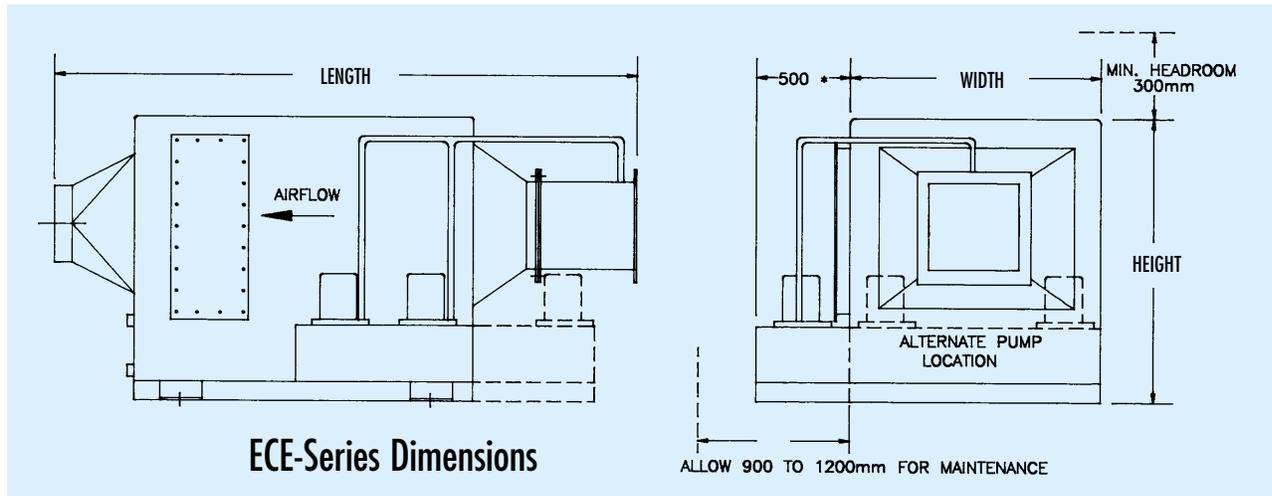


ECE-SERIES



STANDARD FEATURES AND OPTIONS

1. Adjustable Venturi Section
2. Chemical Sampling Housing
3. PH/ORP Control Panel
4. Liquid Recirculation System
5. Mist Elimination Section
6. Clean Air Outlet (Round or Rectangular)
7. Dirty Air Inlet (Round or Rectangular)
8. Mixing Chamber
9. Chemical Injection Piping



	ECE-500	ECE-700	ECE-1000	ECE-1500	ECE-2000	ECE-3000	ECE-4000	ECE-5000	ECE-6000	ECE-7000	UNIT OF MEASUREMENT
VOLUME	2.4	3.5	4.7	7.1	9.4	14.2	18.9	23.6	28.3	33.0	CMS
	5100	7400	10000	15000	20000	30000	40000	50000	60000	70000	CFM
OPERATING WEIGHT	1200	1400	1600	1900	2200	3200	4000	4400	4900	5400	Kg
	2640	3080	3520	4180	4840	7040	8800	9680	10780	11880	lbs
LENGTH	2500	2600	2800	3000	3000	3300	3500	3500	3800	4000	mm
	98	102	110	118	118	130	138	138	150	157	inches
WIDTH	900	1100	1200	1500	1700	2100	2400	2600	2900	3100	mm
	36	43	47	59	67	83	94	102	114	122	inches
HEIGHT	1400	1500	1700	2000	2200	2500	2800	3000	3300	3500	mm
	55	59	67	79	87	98	110	118	130	138	inches

GENERAL DIMENSIONS ONLY. INTERMEDIATE SIZES ARE NOT LISTED IN THIS BULLETIN.

LABORATORY FUMEHOOD SCRUBBERS

Plasticair's FHS series of fumehood scrubbers, ideal for elimination of acidic emissions, offers a unique solution to laboratory emission management. The patented design of the FHS series offers major advantages over traditional solutions including

- reduced installation cost
- reduced maintenance cost
- longer operating life
- high quality industrial design in a compact integrated unit

while meeting the most stringent air emission standards.

The FHS series integrates a counter current scrubber with a traditional fumehood design to reduce space requirements, eliminate the need for a remote scrubber and significantly reduce installation and maintenance costs. The standard FHS series unit is capable of removing 96% of acidic contaminants up to 500 PPM. These units, originally designed for [perchloric acid elimination](#), are effective in controlling the complete spectrum of industrial inorganic acids including Hydrochloric, Hydrofluoric, Sulphuric and Nitric acids and Aqua Regia.

This compact unit incorporates a scrubber unit located at the back of the fiberglass hood while the scrubber recirculation pump and tank are located in the cabinet area directly below the fumehood workspace. As a result, an integrated fumehood scrubber can be accommodated in the same space as a traditional fumehood.

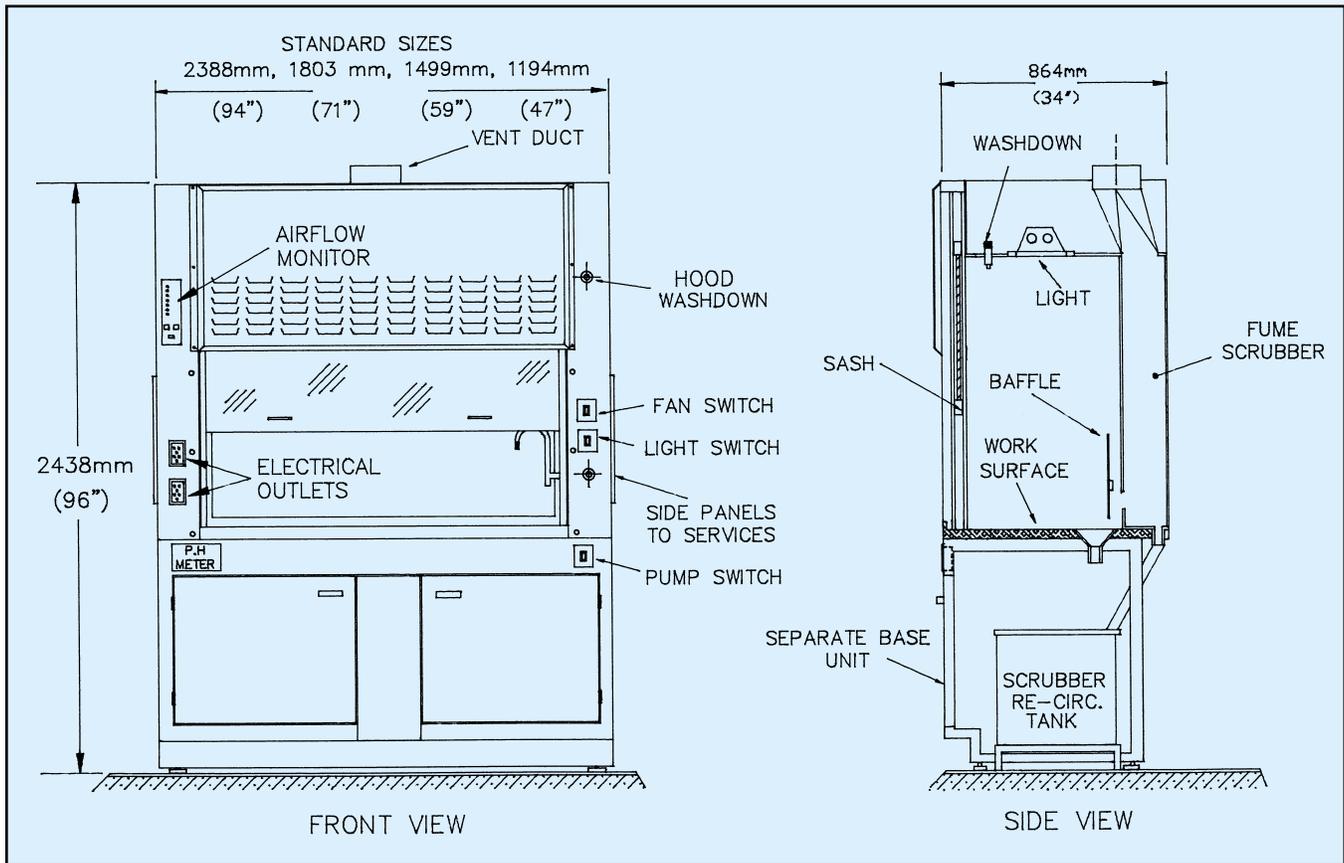
By providing an integrated fumehood and scrubber design, Plasticair's FHS series unit offers a far simpler and less expensive installation than traditional fumehood and remote scrubber combinations. Maintenance costs are reduced by the improved accessibility of the scrubber components.

The FHS series has been designed for performance, robustness and longevity. It uses premium quality polyester in the FRP inner casing and bypass louvers to provide the greatest resistance to acidic corrosion while offering greater structural integrity and a wider operating temperature range than traditional thermoplastics.



The FHS series offers more than a powerful emission control solution. It's crisp exterior design and choice of custom colour options, the attention to detail and careful fabrication by Plasticair craftsmen as well as the rigorous visual and functional quality audit each unit undergoes before leaving our facility means easy integration with existing laboratory fixtures and furnishings.

FHS-SERIES



Fumehood Scrubber Optional Equipment

- **pH Control:** Plasticair can supply a complete chemical dosing system for FHS series units to allow automatic pH control.
- **Hood Wash-down Unit:** This unit allows the work chamber to be washed-down from outside the fumehood.
- **Fan Control:** The FHS series can incorporate a remote variable frequency control unit to allow easy air flow adjustment at the hood.
- **Work surfaces:** A variety of work surface materials are available from Plasticair.
- **Custom Electrical Outlets:** We can provide customized receptacle location to satisfy any client requirements.
- **Airflow Monitor:** This option provides air flow indication and may be set to trigger an alarm should the air flow drop below safe levels.

	FHS-2400	FHS-1800	FHS-1500	FHS-1200	UNIT OF MEASUREMENT
VOLUME	661	472	378	283	l/sec
	1400	1000	800	600	CFM
PRESSURE DROP	373	373	373	373	Pa
	1.5	1.5	1.5	1.5	inches W.C.
LENGTH	2388	1803	1499	1194	mm
	94	71	59	47	inches

AUTOMATED SYSTEMS

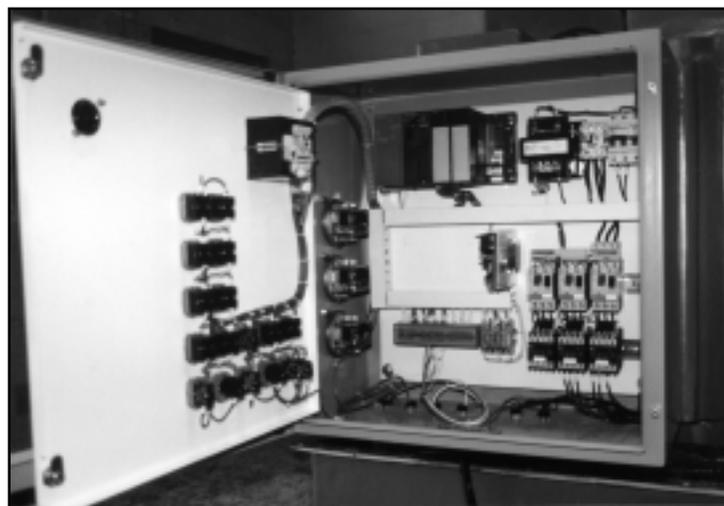
Programmable Logic Control

PLC Control Panels are critical to the successful implementation and integration of any automated emission control system. Plasticair offers standard and customized control panel configurations as well as custom programming for each system we deliver. We stock a wide range of branded PLC hardware to accommodate specific functional requirements, price objectives or vendor-preference constraints. In addition, we can provide commissioning and start-up electrical services.

Plasticair can design PLC solutions which incorporate control and monitoring of pumps, fans and chemical dosing systems. Our designs can accommodate either scrubber-mounted control instrumentation or via remote mounted panels. We only use UL/CSA approved control panel components.

Options

- Choice of Enclosure Rating
- Fiber Glass Enclosures
- Motor starters
- Selector Switches
- Pilot Lights
- Beacon Lights
- Alarms
- Annunciators
- Sump Heaters
- Variable Frequency Drives
- LCD Display Monitors
- Remote Terminal Panels
- Thermostats
- Flow Sensors
- Level Sensors
- Pressure Sensors
- Auto Pump Sequencing
- Auto Fan Sequencing
- Interface Contacts

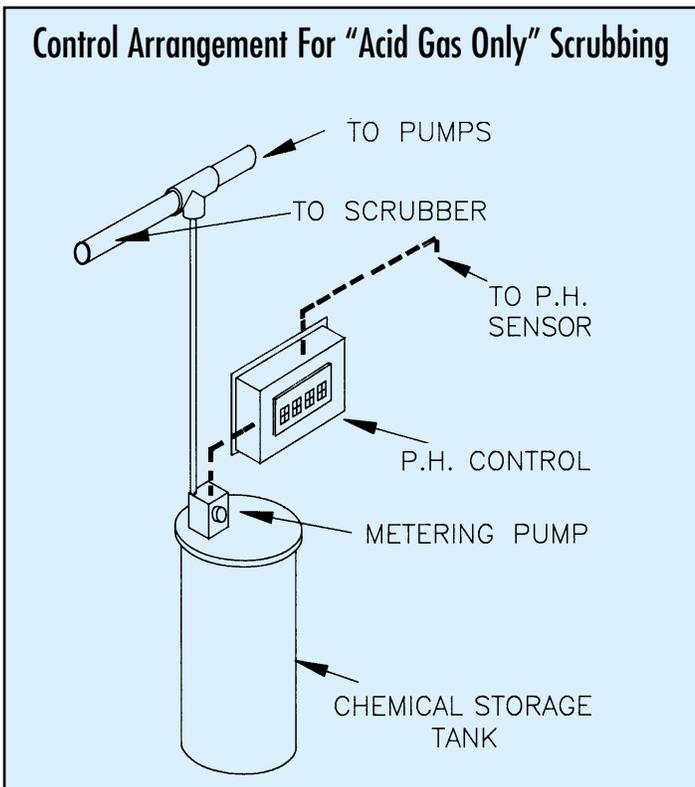


AUTOMATED SYSTEMS

Chemical Dosing Systems

Scrubbing solutions routinely incorporate a chemical dosing system. Plasticair's chemical engineering staff have the expertise and experience to design and supply appropriate chemical dosing systems for the most complex elimination scenarios.

Again stringent raw materials and OEM component selection ensures quality, robustness and longevity. Our dosing systems use FRP, PVC or polyethylene chemical holding tanks, top quality metering pumps, and precision pH and ORP analyzers.



Options

- Custom Backlit LCD Display
- High and Low Set points
- Limit Timers for Each Output
- 4-20 mA recorder Output (option)
- Proportional Pulse or Relay Output

- pH Programmable Response Delay pH
- Single and Dual Point Calibration pH
- 0-14 pH Scale pH

- +2000 mV Scale ORP
- ORP Programmable Response Delay ORP

Display Options

- Current mA Output
- Current Pump Speed
- Timer Settings and Readings
- Alarm Conditions

- Current pH Value pH
- Temperature pH

- Current mV Value ORP



FRP INDUSTRIAL EXHAUST FAN

Plasticair manufactures a wide range of centrifugal and axial exhaust fans in FRP and polypropylene. Note that scrubber applications typically use a centrifugal fan

Plasticair BCMPA Series Centrifugal Exhaust Fans

Plasticair's BCMPA series of centrifugal exhaust fans are typically used for low and medium pressure applications. These units support air stream volume ranges from 94.4 l/sec (200 cfm) to 47,200 l/sec (100,000 cfm) at pressures of up to 3477 Pa (14" W.G.). BCMPA series units use a Class 1 or Class 2 impeller incorporating a heavy duty, industrial-rated airfoil design of FRP construction. BCMPA series units are built with a heavy duty FRP housing and use 316 stainless steel fasteners throughout.

Plasticair HP Series Centrifugal Exhaust Fans

Plasticair's HP series of centrifugal exhaust fans are typically used for medium and high pressure applications. These units support air stream volume ranges from 47.2 l/sec (100 cfm) to 18,880 l/sec (40,000 cfm) at pressures ranging from 2,484 Pa (10" W.G.) up to 14,902 Pa (60" W.G.). HP series units use a Class 3 or Class 4 impeller incorporating an extra heavy duty, industrial-rated radial FRP construction. HP series units incorporate an extra-heavy duty FRP housing and use 316 stainless steel fasteners throughout.

Plasticair 800 Series Inline Centrifugal Exhaust Fans

Plasticair's 800 series of inline centrifugal exhaust fans are typically for low to medium pressure applications. These units support air stream volume ranges from 236 l/sec (500 cfm) to 18,880 l/sec (40,000 cfm) at pressures up to 2,484 Pa (10" W.G.). 800 series units use a Class 1 or Class 2 impeller incorporating a heavy duty, industrial-rated airfoil design of FRP construction. 800 series units are built upon a heavy duty FRP housing and use 316 stainless steel fasteners throughout.

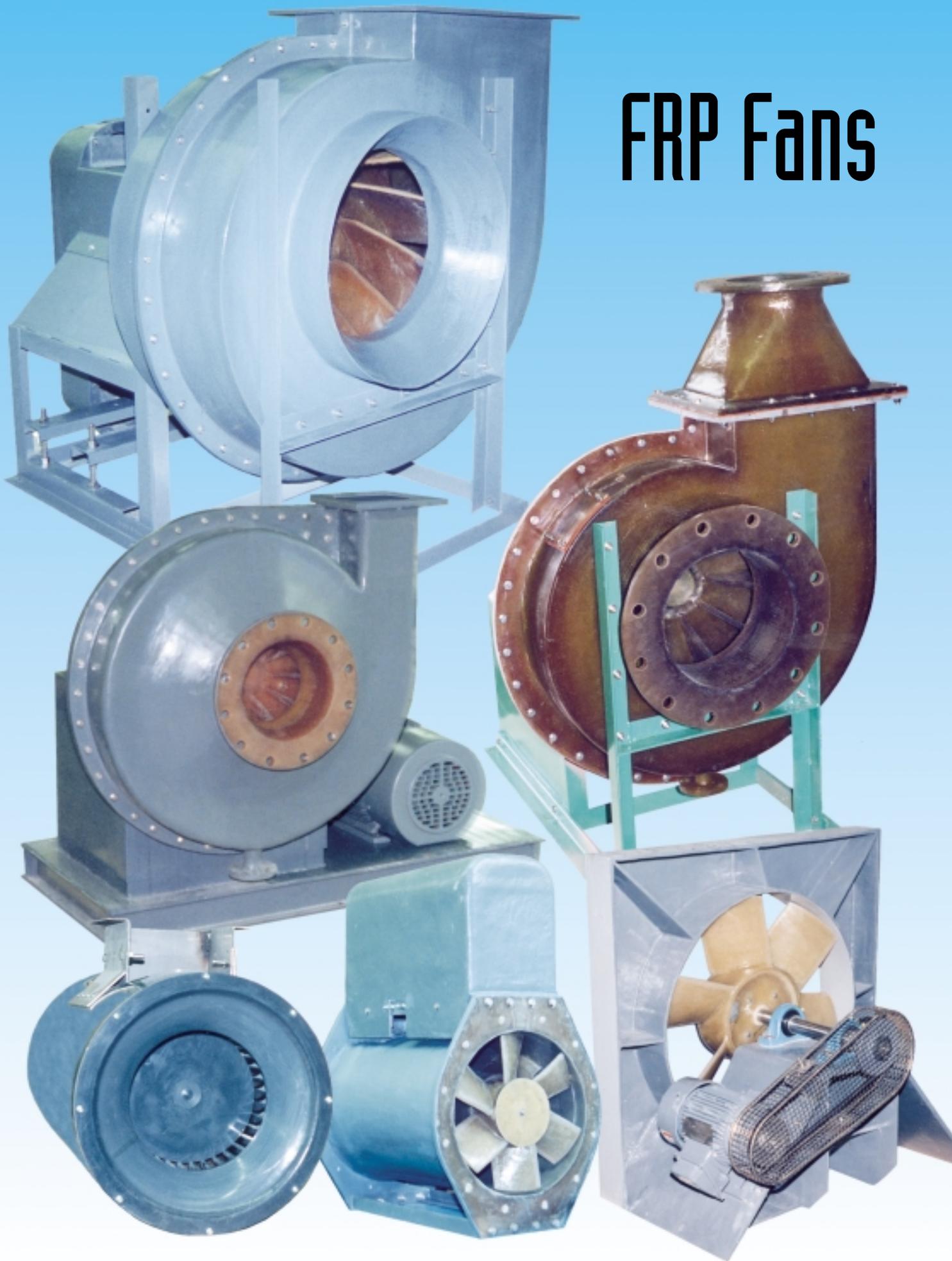
Plasticair Clamshell Series Centrifugal Exhaust Fans

Plasticair's Clamshell centrifugal exhaust fans offer a unique center-line discharge configuration and are ideal for low volume, low pressure applications such as laboratory exhausts. These units support air stream volume ranges from 47.2 l/sec (100 cfm) up to 944 l/sec (2000 cfm) at pressures of up to 993 Pa (4.0" W.G.). Clamshell series units use a polypropylene or FRP Class 1 backward inclined impeller. The fan housing is of polypropylene or FRP and uses a combination of 304 and 316 stainless steel fasteners



Laboratory Fumehood Exhaust Fan
Clamshell Series

FRP Fans



Plasticair Inc., Servicing Industry



FRP Fans



Scrubbing Equipment



Laboratory Fumehoods

Plasticair Product List

Scrubbers:

- Horizontal Packed Bed - Single/Double (HS-Series)
- Vertical Packed Bed Towers (VS-Series)
- Odour Control Scrubbers (HCS, VCS-Series)
- Demisters - Vane Type (P-Series)
- Demisters - Mesh Type (M-Series)
- Demisters - Multiple Stage Type (E-Series)
- Venturi Scrubbers (ECE-Series)
- Laboratory Fume Hood Scrubbers (FHS-Series)

Scrubber Applications:

- Oil/Air Separators
- Chlorine Scrubbers
- Micro Chip Manufacturing Scrubbers
- Plating Plant Scrubbers
- Pickling Line Scrubbers
- Chromic Acid Scrubbers And Demisters

FRP Fans:

- Axial Fans - Vane/Tube/Roof/Panel (900/700-Series)
- Inline Centrifugal Fans (800-Series)
- Bifurcated Fans - Centrifugal/Axial (BIF-Series)
- Clamshell - Light Duty Centrifugal Fans (C-Series)
- Centrifugal - Low Pressure Fans (LP-Series)
- Centrifugal - Medium Pressure Fans (MP-Series)
- Centrifugal - High Pressure Fans (HP-Series)

Plasticair's Sales Forces are located in major cities around the world.



Contact the factory for the agent closest to you.

Your Local Plasticair Representative is:

Bulletin #055
March, 1999



Plasticair Inc.

1275 CRESTLAWN DRIVE,
MISSISSAUGA, ONTARIO, CANADA L4W 1A9
TEL: (905) 625-9164 FAX: (905) 625-0147

Plasticair Inc.

12555 SW FIRST STREET,
BEAVERTON, OREGON, USA 97005
TEL: (503) 672-7086 FAX: (503) 672-9852

email: sales@plasticair.com • Web Page: www.plasticair.com