EXHAUST GAS MANAGEMENT
MAXIMISING POTENTIAL

Exhaust Management for Semiconductor Processes 502
Product Selection Guide 504

EXHAUST MANAGEMENT FOR SEMICONDUCTOR PROCESSES

Comprehensive Range

Edwards is unique in offering the broadest range of exhaust management technologies, demonstrated in a series of products and systems designed to meet all customer requirements – from low-cost facility management to full environmental protection. We are committed to supplying exhaust management systems that match customer specific application requirements. We strive to minimise cost of ownership while introducing innovative designs to achieve greater reliability, longer service intervals, reduced space and utilities requirements and lower waste emissions.

Leading-edge Manufacturing

primary manufacturing facility is located at Clevedon in the UK. The site comprises a factory with flexible production lines, assembly feed cells, just-in-time manufacturing techniques and one of the largest exhaust management research centres in the world. Additional manufacturing sites located at Chunan (Korea) and Ina (Japan) complement the global production capability. Underpinning our whole operation is a commitment to quality and world class manufacturing standards. An ISO 9001 and ISO 14001 management system, supported by TQM and Kaizen methodologies, is at the core of the operation. Product certification to the relevant international standard is conducted by ITS, the independent external test house.

Thermal Processing

The Atlas Range of inward gases combustion systems provides effective exhaust management of CVD processes must be able to handle the deposition gases and the associated powders. The fluoride wastes from cleaning gases also require suitable treatment along with the global warming gases. Abatement systems must be able to comply with these requirements in one complete unit.

The Atlas (Thermal Processing Unit) is the industry standard abatement system for CVD. One model is suitable for all CVD and etch applications. Each inlet can be configured for high level abatement of all Global Warming PFC gases, F2 or CIF3. All can accommodate total input flows up to 380 slpm. Where PFCs are not used, the Atlas (Thermal Conditioning System) provides a cost-effective means of handling both hazardous fluoride waste and deposition gases.

The Atlas Helios is an advanced solution for the abatement of high hydrogen flows designed to handle both toxic and carrier gases from Low Pressure Epitaxy and MOCVD processes.

The Atlas Kronis provides effective treatment for low k CVD process exhausts.

The HOx (Hot Oxidation System) offers an innovative electrical heated oxidation unit and the proven three-stage wet scrubber of the combustor product line, it combines superior performance for the abatement of CVD processes in facilities which do not have the ability to use fuel gas.

Gas Reactor Columns

Edwards offers a range of low-cost, point-of-use dry abatement systems for semiconductor processing. Each system uses the unique hot bed reactor technology developed for the GRC (Gas Reactor Column) range.

The GRC is the highest performance of any dry abatement technology for etch exhausts. It provides treatment by chemical reaction to stable inert salts and treats the widest range of gases from halogens and acids to CIF3, NF3, SF6 and other halide etch compounds.

The D150 Dual GRC provides dual-cartridge operation thus minimising the cost of ownership with 100% uptime. The M150 Single GRC is a compact dry gas treatment system for removing hazardous etch and CVD emissions at the source, converting them into harmless solids within an easily changed and disposable cartridge.

Pyrophoric Conditioning

For the removal of silane and pyrophoric gases to below lower explosion level (LEL) the PCS (Pyrophoric Conditioning System) offers an advanced solution. Specifically designed for the safe handling of silane, the PCS incorporates a unique particle handling system to keep ducts free from powders.

Integrated Systems & Sub-Fab Solutions

Our completely integrated and flexible vacuum and abatement solutions will ensure a safe operation in hazardous processes, and reduce overall your operating costs.

We are dedicated to providing the optimum solutions for semiconductor processes, and our expertise in sub-fab solutions is unrivaled. Our global applications expertise ensures each system provides the optimum hardware and software, best vacuum and exhaust management practices, suitable ancillary equipment, delivering the ideal installation with the most reliable operation.

All of our integrated systems have been designed based on global experience. We are leaders in vacuum and abatement, so we know what works. We constantly innovate and improve what we do because you demand excellence from Edwards.

EZENITH offers an advanced portfolio of systems providing fully integrated vacuum and exhaust management solutions for all of your semiconductor processes applications. EZENITH systems are unique in offering:

- Process-centric vacuum & exhaust management
- Complete Integration of Components
- Support of each function with a powerful, integrated control interface
- Designed for efficient use of space – for savings of up to 70%
- Full internal distribution, regulation and monitoring of services reducing utility hook-up by over 60% while ensuring smooth and reliable operation.

With just a pump and a gas abatement device, you still are not ready to run your process. You will need to connect the pump exhaust, connect up your line heaters where required, run your water, purge and electrical lines, and then get all of your control signals ready. You will also have to consider double-enclosure, gas leak detection, and how you want to conduct leak checks after your tool maintenance. All of these things will cost you design time and money. We understand the problem so we have developed integrated, process-specific solutions.

Our integrated systems are already pre-designed for most semiconductor processes. The exhaust heaters are set for the correct temperature to minimise cost and maximise up-time. We put leak check ports and gate valves where they are required. The whole system is enclosed and, most importantly, you only need to provide one of each of the required utilities. We distribute the gases, water, electricity, and control signals where they are needed and create a ready-to-go system.

TMS Temperature Management System

Edwards offers TMS (Temperature Management System) for processes involving condensable byproducts. TMS ensures that these compounds remain volatile until they enter the abatement device. The TMS is designed to heat both forelines and pump exhaust lines to the inlet of the abatement device. Moulded high surface area heaters maximise contact with pipes and are designed to maintain the temperature of the pipe between 90° and 180 ˚C. TMS monitoring is available as an option to provide both local and remote verification that the line is at a sufficient temperature. TMS has been successfully used in conjunction with the entire range of Edwards exhaust management equipment to alleviate the problems historically associated with solid deposition and corrosion.

Product Selection

Using our product selection guide customers have the opportunity to decide which Edwards point-of use abatement equipment is most suitable for their particular application on the basis of their exhaust gas management goals. Edwards will provide their experience and expertise to specify the exhaust management product for the chosen application.

PRODUCT SELECTION GUIDE

Market	Process type	Generic process	Generic gases	Application issues	Atlas TCS	Atlas TPU	Atlas Helios	Atlas Kronis	Atlas Etch	TMS	EZENITH	GRC M1500	PCS
					Environmental Health & Safety Management							HS + Capital asset protection	
					Exhaust Management						Integrated Vacuum & Exhaust Management		
DISPLAY, SOLAR & LIGHTING	ETCH	Dielectric	CHF3/NF3/CF4/ C2F6/C4F8/SF6/ C4F6/C5F8/CH3F	• Corrosive and toxic by-products • High use of global warming PFC gases					●		●	▲	
	ETCH	Conductive – poly silicon	Cl2/HBr/SF6/CF4/ CHF3	• Toxic and corrosive by-products					●	●	●	▲	
	ETCH	Conductive – metal	Cl2/BCl3/CF4/ CHF3	• Exhaust blockages from condensing vapours					●	●	●	▲	
	PECVD	Silane-based oxide/nitride/ HDP	SiH4/NH3/N2O/ PH3/SiF4	• Flammable/incompatible gas mixtures									
	PECVD		with PFC clean	• Very high use of global warming PFC gases		●				●	●	▲	▲
	PECVD		with NF3 clean	• Use of global warming PFCs, high quantities of fluorine produced	●					●	●		
	PECVD	TEOS based oxide/BPSG	TEOS/TEB/TEP	• Flammable/incompatible gas mixtures • Liquid sources can condense									
	PECVD		with PFC clean	• Very high use of global warming PFC gases		●				●	●	▲	▲
	PECVD		with NF3 clean	• Use of global warming PFCs, high quantities of fluorine produced	●					●	●		
	PECVD	Low k CVD	3MS/4MS/TMCTS	• Flammable/incompatible gas mixtures • Liquid sources can condense									
	PECVD		with NF3 clean	• Use of global warming PFCs, high quantities of fluorine produced			●			●	●		
	PECVD	Metalisation Tungsten	SiH4/WF6/H2	• Flammable/incompatible gas mixtures									
	PECVD	Clean Step	with PFC Clean	• Very high use of global warming PFC gases		●				●	●	▲	
	PECVD		with NF3 Clean	• Use of global warming PFCs high quantities of Fluorine produced				●			●		
	PECVD		with ClF3 Clean	• Highly toxic/corrosive gas used		●					●		
	PECVD	Metalisation Titanium	TiCl4/NH3	• Flammable/incompatible gas mixtures									
	PECVD		With ClF3/Cl2 clean	• Highly toxic/corrosive gas used		●				●	●		
	PECVD	High k CVD	High k Precursors				●			●	●	▲	
	EPITAXY	Low pressure EPI	H2/DCS/PH3/ SiH4/ AsH3/ B2H6/GeH4/HCl	• Very high flows of explosive gas used				●		●	●		
	IMPLANT	Implant	BF3/PH3/AsH3	• Highly toxic/flammable gases used	●							▲	
	LPCVD	Polysilicon	SiH4/PH3/AsH3	• Highly toxic/flammable gases used									
	LPCVD	Clean Step	None		●						●	▲	▲
	LPCVD		F2/HF	• Highly toxic/corrosive and incompatible gases used sequentially	●						●		
	LPCVD		ClF3			●					●		
	LPCVD	LPCVD Nitride	HCD/DCS/NH3	• Highly toxic/flammable gases used									
	LPCVD	Clean Step	None							●	●	▲	▲
	LPCVD		F2/HF	• Highly toxic/corrosive and incompatible gases used sequentially	●					●	●		

● = Full environment safety and health management
▲ = Health safety and capital asset protection

					Environmental Health & Safety Management							HS + Capital asset protection	
					Exhaust Management						Integrated Vacuum & Exhaust Management		
		Generic process	Generic gases	Application issues	Atlas TCS	Atlas TPU	Atlas Helios	Atlas Kronis	Atlas Etch	TMS	EZENITH	GRC M1500	PCS
DISPLAY, SOLAR & LIGHTING	MOCVD	Phosphide	H2/AsH3/PH3/ TMG/TMA/TMI	• Highly toxic gases used				●		●	●		
		Nitride	N2/H2/NH3/TMG/ TMA/TMI	• Highly toxic gases used			●	●			●	▲	
	Solar Cell	Amorphous Silicon	SiH4/NH3/NF3/ F2/SF6	• Pyrophoric and flammable gases used			●						
				• Exhaust blockages from solids formation		●					●		
		Crystaline Silicon	SiH4/NH3/NF3/ F2/SF6	• Pyrophoric and flammable gases used			●						
				• Exhaust blockages from solids formation		●					●		
		TCO	H2/DEZ/TMB	• Highly flammable/corrosive/ toxic gases used			●						
				• Exhaust blockages from solids formation									
	Flat Panel Display	Etch	**H2/O2/CF4/Cl2/ HCl/He/SF6**	• Highly flammable/corrosive gases used					●		●		
		CVD	**SiH4/NH3/NF3/ F2/SF6**	• Pyrophoric and flammable gases used			●			●			

● = Full environment safety and health management
▲ = Health safety and capital asset protection

This page has intentionally been left blank