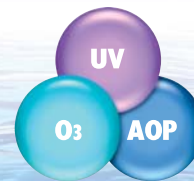




**ESCO**  
International



Advanced Treatment  
Technologies

# Advanced Oxidation Processes

Reclaim, recycle, reuse

Expert solution provider  
and equipment supplier  
for water & gas treatment

Specialists in Ozone, UV and  
Advanced Oxidation Technologies



[www.escouk.com](http://www.escouk.com)

Never has industry been under such pressure to reduce waste. But capturing, treating and reusing waste can be complex and expensive.

ESCO International is an expert solution provider and equipment supplier for the treatment of water, waste water and gas effluent.

### We all have a responsibility for the environment

We are all seeking efficient yet straightforward and cost effective means of reducing waste.

That's why ESCO International has developed cutting edge advanced oxidation processes (AOP).

A process that will efficiently and effectively reduce waste & enhance water and gas purification.

The AOP process meets and exceeds the increasingly high standards demanded by today's environmental regulators where "traditional" physical and biological methods often fail.



ESCO International offers complete process solutions to meet these essential needs, from initial research and process design, through to commissioning of best-fit engineered systems and quality support services.

Our experience in the development and application of AOP for water, waste water and gas effluent treatment has developed over many years, thanks to the expertise of technical staff and application know-how.

Through Research and Development, we remain at the forefront of the latest technical advancement and technology development throughout the world.

Such commitment to R&D ensures our customers are one step ahead of ever tightening and heavily regulated waste management procedures. ESCO International has successfully designed AOP technologies and quality ISO9001/2000 products suitable for use in:

- Microelectronics and Semiconductors
- Petrochemicals
- Pharmaceutical and Life Sciences
- Power Generation
- Food and Beverage
- Municipal Drinking and Wastewater Treatment Plants
- **Ballast water**, Mining and Metal Processing
- Textile & Palm Oil Industries
- Chemicals, Disinfectants and Cosmetics
- Pulp and Paper
- Biologically Treated Waste Waters

AOP is a proven treatment suitable for a wide range of contaminants types and concentrations including:



## How Advanced Oxidation Process Technology Works

AOP uses a powerful and effective combination of ozone, UV and hydrogen peroxide to decompose unwanted chemical and organic compounds, TOC, COD and BOD.

Unlike physical and biological treatment methods, AOP doesn't produce additional by-products and sludge, eliminating the need for further handling.

Furthermore, physical and biological treatment methods fall short of meeting the new environmental standards. AOP is a proven, more efficient and effective means of treating waste streams that meets and exceeds industry requirements.

AOP systems can be adapted to suit specific applications and are fully automated, reducing capital and operating costs.

These processes are ideal for:

- Reclaim, recycle and reuse of process and waste water
- Waste water treatment
- Gas effluent treatment
- Treatment for ultra-pure water

## CATADOX – the next generation of AOP for water and gas treatment

ESCO is proud to announce CATADOX, the most efficient and reliable treatment of waste water and gas effluent available today.

Thanks to continuous research and development, CATADOX uses a refined AOP technique that combines ozone, UV, hydrogen peroxide and an additional proprietary catalyst.

Because there are two oxidants rather than one, CATADOX is more effective in waste treatment. In addition, CATADOX:

- cuts down on ozone, oxygen and dry air requirements
- reduces power consumption, capital and running costs
- minimises the space needed for equipment



## The right solution first time

ESCO International's self-contained CATADOX pilot plant enables engineers to experiment with and test the technology before committing to full implementation.

Trialling CATADOX will ensure the most efficient and engineered process is installed in an effective and sound design.

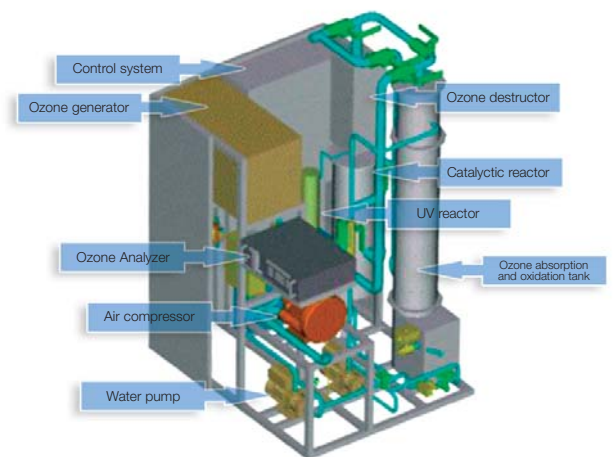
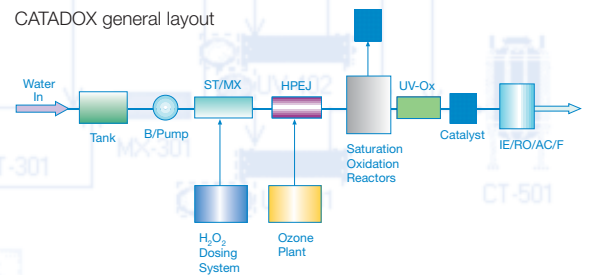
This means the right solution is designed and installed every time.

CATADOX Pilot is fully automated and mimics full scale plant operation

It is safe and simple to use, takes up minimal space and features low maintenance and operating requirements

Using CATADOX Pilot you can:

- Experiment with different loadings
- Use the actual effluent to be treated to demonstrate effectiveness to the end user
- Hold on-site trials for more accurate performance evaluation
- Establish precise design parameters for site-specific equipment
- Evaluate capital and operating costs of full implementation



Advanced oxidation technologies available from ESCO International:

- O<sub>3</sub> / H<sub>2</sub>O<sub>2</sub> / UV / Catalyst
- O<sub>3</sub> / H<sub>2</sub>O<sub>2</sub>
- O<sub>3</sub> / UV (with or without catalyst)
- UV / H<sub>2</sub>O<sub>2</sub> (with or without catalyst)

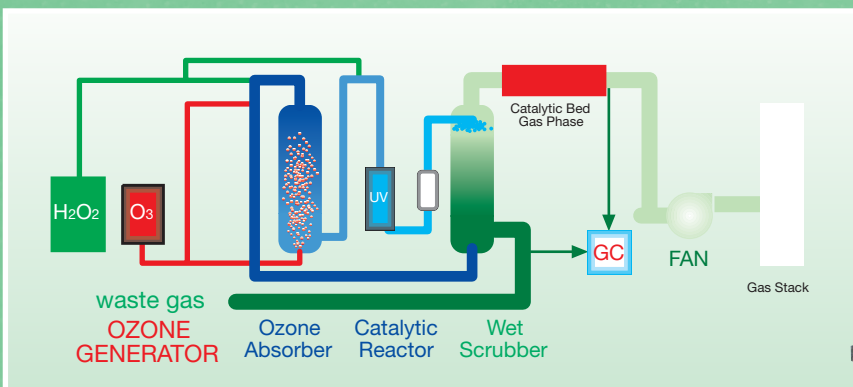
# Measurable benefits of using CATADOX Actual Case Studies...

## Petrochemical/Petroleum Refinery Industries

### Odorous gas effluent treatment

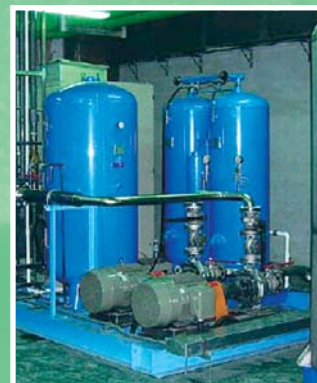
- Issue:** Heavy, bad smell from wastewater holding tanks
- ESCO solution:** Design and supply catalytic AOP system to eliminate hazardous air pollution
- Project detail:** Waste gas flow: 200 m<sup>3</sup>/hr
- Target organic compounds:** Mercaptan, hydroxybenzene, H<sub>2</sub>S
- Inlet:** 2000ppm of THC as methane, 1000 ppm Mercaptans
- Result:** 90 to 99% of Mercaptans removed, 90% VOC removal

- Issue:** Odorous gas effluent
- ESCO solution:** Design and supply of full scale AOP treatment system
- Project detail:** Waste gas flow: 100 m<sup>3</sup>/min  
C<sub>2</sub>H<sub>5</sub>S (ppm), inlet: 12,181  
C<sub>2</sub>H<sub>5</sub>S (ppm), outlet: 6.5
- Result:** Reduction efficiency >99.9 per cent (target 95%)



### Organic waste gas effluent treatment

- Issue:** Odorous gas effluent requiring removal
- ESCO Solution:** Design and supply of full scale AOP system
- Project detail:** Waste gas flow: 1,200 m<sup>3</sup>/min  
Inlet THC: 200ppm  
Outlet THC: 15ppm
- Result:** Reduction of THC by 92.5% (target 90%)



## Measurable benefits of using CATADOX Actual Case Studies...

### Biological wastewater treatment plants

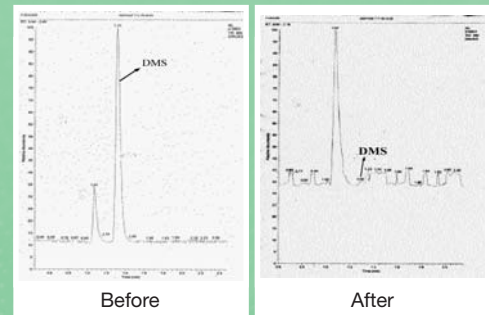
#### Odorous gas effluent treatment

**Issue:** Bio-plant reactor treating industrial wastewater in a residential area, giving off a bad smell

**ESCO Solution:** Installation and operation of skid mounted CATADOX pilot for demonstration purposes

**Project detail:** Waste gas flow: 100 l/min  
DMS (ppm), inlet: 61.9  
DMS (ppm), outlet: N.D.

**Result:** Reduction of emission >99.99%. Gas samples were tested by the company and an independent laboratory, showing that odour-causing organic compound had been completely destroyed.

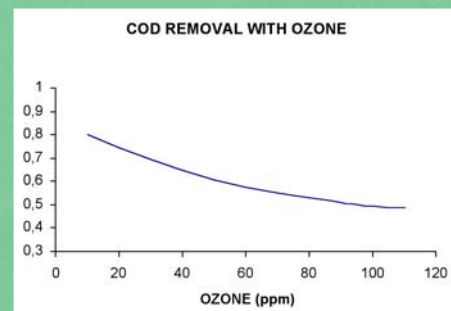
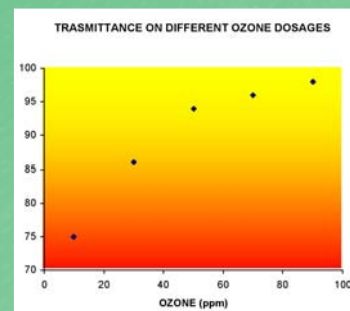
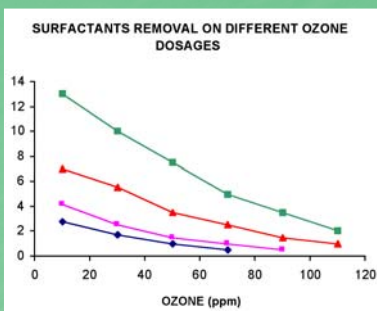


### Industrial wastewater treatment plant

**Issue:** COD, Surfactant & Colour removal.

**Solution:** Full scale Ozone treatment system

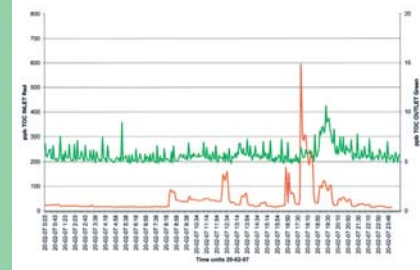
**Results:** see results below.



## Microelectronic Industries/TFT-LCD Industry

### Water reclaim using AOP system

- Issue:** Treat process water to reduce TOC from 150ppb to below 10ppb
- ESCO Solution:** Design and supply full scale AOP system using ozone, H2O2 and UV oxidation, followed by an RO system
- Project detail:** Water flow: 40 m3/hr

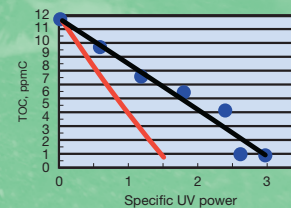
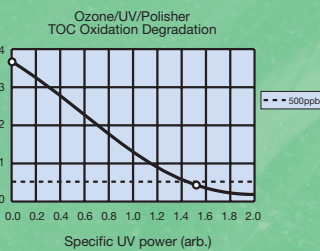
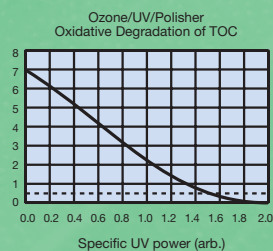


- Result:** During commissioning, results under certain conditions showed TOC reductions from as high as 800ppb incoming to below 10ppb. A second full scale AOP system was ordered to treat 65m3/hr of process water for the same company, with a local company carrying out construction and engineering works.

### Water reclaim in TFT-LCD plant using CATADOX system

- Issue:** Treat process water to reduce TOC to below 2ppm
- ESCO Solution:** Supply and design of CATADOX plant
- Project detail:** Water flow: 300 m3/hr
- Result:** Process water contained up to 20ppm TOC. The reduction target was met thanks to the CATADOX system and as a result the company saves up to 2.6 million m3 of water per year. ESCO signed a new contract to supply a 600 m3/h AOP system.

### Industrial AOP pilot results for TOC (IPA, acetone) reduction



## Semiconductor Industries

### Water reclaim using CATADOX system

- Issue:** Reduce TOC from 5ppm to below 200ppb
- ESCO Solution:** Deployment of compact skid mounted CATADOX pilot
- Project detail:** Water flow: 25m3/hr (phase 1) and 40m3/hr (phase 2)
- Result:** TOC results of less than 50ppb under specific conditions when CATADOX was used in ozone/H2O2/UV/Catalyst mode. Full scale equipment ordered, and installed by local engineering company



# **ESCO** International



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## About ESCO International

ESCO International provides cutting edge water, waste water and gas effluent treatment solutions to industries around the world.

We have successfully developed the most environmentally friendly technologies available, helping organisations meet and exceed high purification standards and local and national regulations by providing simple, safe, clean and cost effective solutions.

In addition to waste water, soil and gas effluent treatments, ESCO International is a specialist supplier for:

**Ozone and oxygen generators,  
and UV systems**

**Skid packaged ozone and AOP solutions**

**Accessories and ancillary equipment for  
waste water and gas effluent treatment**

Working with renowned engineering and water treatment organisations and suppliers, we strive to provide the most effective solution that meets your needs.

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