

# ADVANCED OXIDATION PILOT PLANTS FOR WASTEWATER & GAS TREATMENT

## “CATADOX” Process

### The First Step in Effluent Treatment

ESCO International has developed and tested a new advanced oxidation pilot plant, **CATADOX**. The process combines treatment by ozone, UV, hydrogen peroxide and proprietary catalyst to enable the industry to meet the ever-tightening environmental standards for wastewaters & gases.

The **CATADOX**, performs excellently in challenging applications such as micro-pollutant oxidation, non-biodegradable COD removal, TOC reduction, VOCs abatement, toxicity reduction, colour & odour removal.

Advanced oxidation processes are the most reliable means of meeting the new standards.

They offer substantial capital and operating cost savings compared with other conventional treatment processes.



# “CATADOX” Process

## CONCEPT & BENEFITS

The **CATADOX** system is specifically designed to efficiently treat a wide range of refractory organic pollutants, COD and TOC in water & gas effluents.

The process combines ozone, UV, H<sub>2</sub>O<sub>2</sub> and proprietary catalyst.

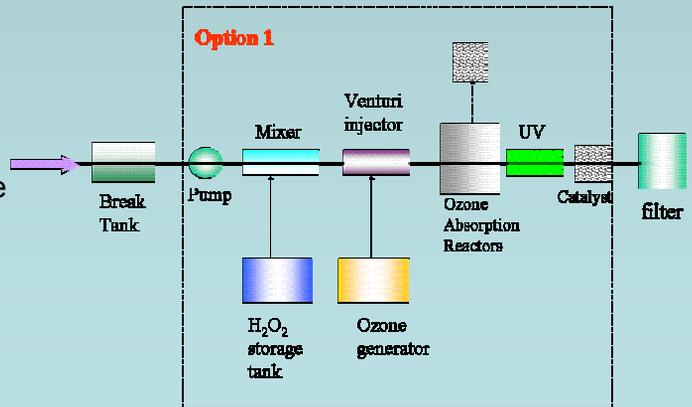
By combining two oxidants, the oxidation potential will increase and the treatment can be more successful than a single oxidant.

The **CATADOX** system involves three main components for the effective generation & optimum use of hydroxyl free radicals for the enhanced oxidation of pollutants, COD and TOC:

- 1- UV-radiation,
- 2- ozone & hydrogen peroxide,
- 3- a proprietary catalyst.

### The **CATADOX** process provides unique benefits:

- Significant cut down in ozone demand, hence smaller ozone generator
- Important reduction in oxygen and dry air requirements, hence lower power consumption
- Major reduction in cooling water capacity
- Reduction in plant size
- Higher flexibility in oxidants dosing vs incoming TOC or COD
- Better process performance and reliability
- Much lower overall power consumption
- no oxidant residual problems
- optimal combination of ozone , H<sub>2</sub>O<sub>2</sub>, UV available depending on water quality and requirements before discharge or reuse
- lower ozone, H<sub>2</sub>O<sub>2</sub> and UV power requirements when compared to conventional H<sub>2</sub>O<sub>2</sub>/UV, O<sub>3</sub>/UV and O<sub>3</sub>/H<sub>2</sub>O<sub>2</sub> AOP processes.



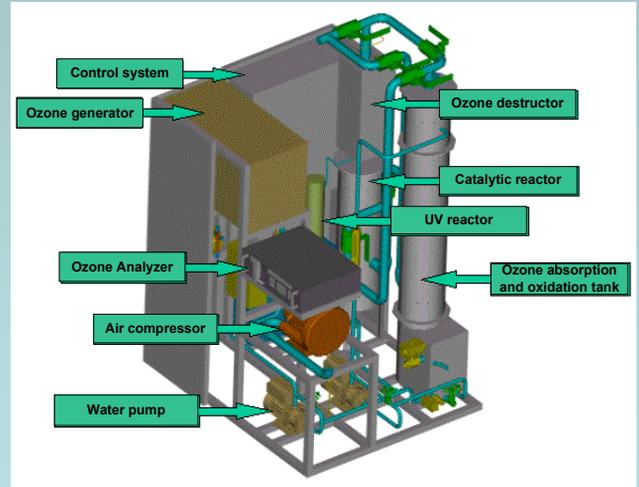
# “CATADOX” PILOT

## TECHNICAL SPECIFICATIONS

Wastewater feed flow rate range: 1-7 m<sup>3</sup>/h  
 Waste gas flow rate range: 0-50 m<sup>3</sup>/min  
 Ozone generation capacity: 0-240 g/h  
 Ozone concentration range: 0 -150 ppm  
 Hydrogen peroxide concentration range: 0-70 ppm  
 UV oxidation power range: 0-1500 W  
 Oxidation contact chamber: 5 – 20 min

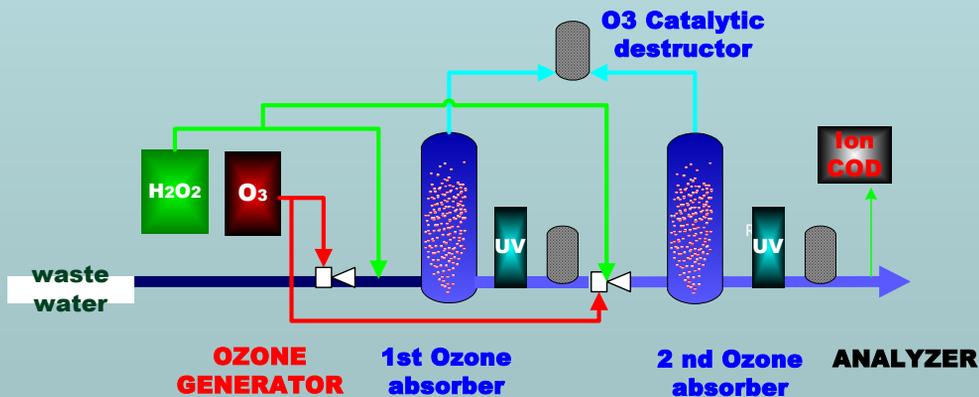
### Services requirements:

Mains power 400V, 50-60HZ, 3Phase  
 Cooling water : by customer  
 Oxygen (integrated)  
 Hydrogen peroxide (integrated)  
 pH adjustment (integrated)



## KEY BENEFITS:

- On-site destruction treatment technology
- No phase transfer required, thereby eliminating secondary handling
- Efficient for a wide range of contaminants types and concentrations including IPA, TMAH, NMP, DMSO, Glycols, VOCs, PAHs, PCBs, Alcohols, Ethers, Urea, TOC & COD and others..
- Low maintenance and operating requirements
- Quiet and unobtrusive equipment
- Safe and environmentally friendly



# “CATADOX” PILOT

## FEATURES:

- combination of advanced oxidation process (AOP) including ozone / UV / H<sub>2</sub>O<sub>2</sub>/Catalyst
- designed to mimic full scale plant operation
- mobile & self-contained plant
- high ozone dissolution and mass transfer performance
- pH correction of influent
- ozone generator
- integrated oxygen generating system
- vent ozone destruction
- dissolved ozone monitoring device



## ADVANTAGES:

- allows experimentation with different loadings
- demonstrates effluent treatability
- enable you to conduct trials on your own site with the actual effluent to be treated
- establishes precise design parameters
- accurately predicts capital & operating costs

## Recommendations:

If you are thinking of installing an on-site advanced oxidation plant for wastewater reclaim, it is sometimes necessary to carry out pilot studies to ensure that the correct design criteria are used for the full scale plant. ESCO recommends that the pilot plant evaluation work is carried out for at least a week.



# ADVANCED OXIDATION TECHNOLOGIES FOR WASTEWATER & GAS TREATMENT

## What is Advanced Oxidation Process ?

Advanced oxidation processes (AOPs), uniting together ozone and properly designed ultraviolet systems, in conjunction with hydrogen peroxide, may offer a powerful water treatment solution for the reduction of undesirable organic compounds, COD and TOC.

The AOP process is successfully used to decompose many hazardous chemical compounds to acceptable levels, without producing additional hazardous by-products or sludge which require further handling.



The development of AOPs is an attempt to produce the non-selective and rapid hydroxyl radical  $\text{OH}^\bullet$  to oxidize pollutants. The most widely applied conventional AOP systems has been the  $\text{H}_2\text{O}_2/\text{UV}$ ,  $\text{O}_3/\text{UV}$ ,  $\text{H}_2\text{O}_2/\text{O}_3$  and  $\text{H}_2\text{O}_2/\text{O}_3/\text{UV}$  processes. Oxidizing agents, Hydrogen peroxide and Ozone are added to the contaminated water and is activated by the UV light to form oxidizing species called hydroxyl radicals, via:



The hydroxyl radical reacts with the dissolved contaminants, initiating a rapid cascade of oxidation reactions that ultimately fully oxidize (mineralizes) the contaminants.

The most recent generation in advanced oxidation technologies is the CATADOX process, developed, designed and tested by ESCO International.

