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Introduction

The Company

Air Water Soil are set up to serve “you” best. “YOU” are our valued customer. AWS number one target is to satisfy our customer’s needs.

We want to provide engineered solutions to our customer’s problems in several fields of industrial applications and pollution control.

We can provide:
- Consulting and analysis
- Basic engineering
- Detailed engineering
- Planning and project management
- Execution of turn key contracts
- Commissioning
- After sales service

Products and services

Our solutions and services include the following main fields of activity:

- Air pollution control systems
- Waste and primary water treatment
- Soil treatment
- Industrial fluids purification

We can serve the following industries:
- Chemical
- Petrochemical
- Fertilizers
- Fibers
- Pharmaceutical
- Food processing
- Pulp and paper
- Textile
- Rubber and plastics

We can provide:
- Consulting and analysis
- Basic engineering
- Detailed engineering
- Planning and project management
- Execution of turn key contracts
- Commissioning
- After sales service
Services

**Industrial engineering**

Project management, design and site supervision services cover all aspects of asset and site condition surveys, site selection with planning and environmental requirements, procurement and cost control, detailed design and commissioning works.

We provide our technical advisory services in a variety of ways – by seconding key staff into a customer’s organisation, working as part of a co-located integrated project team involving all parties or as traditional consultancy services.

Across all sectors of industry
- from power plants to biotechnology
- from pharmaceuticals to mining and metals
- oil and gas
- food and drink
- chemicals and textiles

We provide a comprehensive suite of fully integrated,
- multi-disciplinary services including feasibility and front end design facilities engineering
- process design
- project management
- containment engineering and validation

**Environmental engineering**

Across the AWS we provide the full spectrum of environmental services for the needs of all the sectors we serve.

Our comprehensive skills include:
- water master planning and demand growth prediction
- feasibility studies and conceptual design
- specification, tender adjudication and contractor selection
- design review and construction supervision
- troubleshooting
- operation and maintenance advice
- refurbishment and rehabilitation
Product range – Air Pollution Control System

Wet Electrostatic Precipitator

Wet Electrostatic Precipitators (WESP) offer efficient emissions control for sub-micron particulate, heavy metals, acid mist, oil mist.

The WESP is recommended because of its proven performance, compactness, robust design, automatic operation, and low operating costs and allows the removal of following pollutants:

- HCl, HBr, HF, H₂S, NH₃
- SO₂, SO₃, SiO₂
- Oil mist, sub-micron particulate, VOCs
- Aldehyds, phenol

Venturi scrubbers

Venturi scrubber offers efficient emission control for particulate and water soluble compounds.

The system is designed to effectively use the energy from the inlet gas stream to atomize the liquid being used to scrub the gas stream.

Venturi scrubbers can have the highest particle collection efficiencies (especially for very small particles) of any wet scrubbing system.

This system have been applied to control PM emission from utility, industrial, commercial and institutional boiler fired with coal, oil, wood and liquid waste.

The ability of venturis to handle large inlet volumes at high temperatures makes them very attractive to many industries; consequently, they are used to reduce particulate emissions in a number of industrial applications such as:

- Cement kiln emission reduction
- Control of emission from basic oxygen furnace
- Control of fly ash and sulfur dioxide emission

Depending on the application, AWS can choose the most efficient and cost-effective WESP model.

We can choose from different technology:

A) Condensing tubular WESP
B) Tubular WESP
C) Honeycomb WESP
D) Horizontal plate WESP

Waste incinerator – Conductive GRP WESP (Tessenderlo Group)
Product range – Air Pollution Control System

Catalytic DeNOx systems

Selective Catalyst Reduction (SCR) system for flue gas denitrification consists of a NOx reduction process on a catalytic bed using ammonia or urea as reagent.

The right operating temperature is secured through a gas-gas heat exchanger and an external heat source. Flue gas is fed through the catalytic bed, where NOx is reduced to form nitrogen and water. The SCR reactor may be charged with an additional layer for toxic organic compound oxidation.

The DeNOx SCR of AWS are normally assembled of the following main components:

- DeNOx SCR catalyst
- Reagent storage and dosing system
- Ammonia injection grid
- Heat exchanger
- Local control system (PLC)
- NOx analyzer

Regenerative Thermal Oxider

Regenerative Thermal Oxidizer (RTO) offers efficient emissions control for Volatile Organic Carbons (VOC) and odor emissions.

The RTO is recommended because of its proven performance, compactness, robust design, automatic operation, and low operating costs.

Autotherm regenerative oxidizer is the optimal solution in case of large waste gas quantity with low VOC concentration. The high heat efficiency (>96%) allows autothermicity of the process.

The two bed RTO systems are used when the required average VOC removal efficiency is more than 96%.

The three bed RTO systems are used when the required average VOC removal efficiency is more than 99%.

RTO are used in different fields:

- Printing and packaging industry
- Production and molding of plastics
- Production of polymer-bitumen membranes
- Chemical and pharmaceutical industry
- Tile and brick industry
- Odours emissions
- Varnishing and coating industry
Product range – Air Pollution Control System

Bag House Filters

Bag filters are used to separate dust particulates from dusty gases.

They are one of the most efficient and cost effective types of dust collectors available and can achieve a collection efficiency of more than 99% for very fine particulates.

Dust-laden gases enter the baghouse and pass through fabric bags that act as filters. The bags can be of woven or felted cotton, synthetic, or glass-fiber material in either a tube or envelope shape.

The high efficiency of these collectors is due to the dust cake formed on the surfaces of the bags.

FIBRE Wind Plants

FIBREWIND plants of AWS are specifically made to remove mainly submicron liquid or soluble solid particles from an air or gas stream.

The system are normally assembled of the following main components:

- Pre-filtration
- Heat recovery system
- Filtration system

FIBERWIND plants are constructed in a cylindrical form (candle filters) between two concentric open mesh bed formers into which special fibres of various materials are either densely packed or wound or wrapped.

Typical application are:

- Sulphuric acid
- Phosphoric acid
- Fertilizer
- Chlorine
- Ammonium nitrate
- Detergents (sulfonation)
- Plastic manufacturing
- Pulp and paper ammonia based sulfite recovery
- Ammonia scrubbers
### Physical-Chemical treatment

Flocculants, or flocculating agents, are chemicals that promote flocculation by causing colloids and other suspended particles in liquids to aggregate, forming a floc.

Flocculants are used in water treatment processes to improve the sedimentation or filterability of small particles.

After this treatment any of the small particles that were originally present in the raw water absorb onto the surface of these small precipitate particles and so get incorporated into the larger particles that coagulation produces.

In this way the coagulated precipitate takes most of the suspended matter out of the water and is then filtered off or separated by settling unit.

### Traditional aerobic system

Most biological oxidation processes for treating industrial wastewaters have in common the use of oxygen (or air) and microbial action.

Surface-aerated basins achieve 80 to 90% removal of Biochemical Oxygen Demand (BOD) and consequently Chemical Oxygen Demand (COD).

In an aerated basin system, the aerators provide two functions: they transfer air into the basins required by the biological oxidation reactions, and they provide the mixing required for dispersing the air and for contacting the reactants (that is, oxygen, pollutants and microbes).

In some case an anoxic section is sized before oxidation basin to remove nitrogen.

The final settling unit separates biological sludge from treated water.
Ultrafiltration treatment

Ultrafiltration (UF) is a variety of membrane filtration in which hydrostatic pressure forces a liquid against a membrane. Suspended solids and solutes of high molecular weight are retained, while water and low molecular weight solutes pass through the membrane.

This separation process is used in:

- industry and research for purifying and concentrating macromolecular (10^3 - 10^6 Da) solutions, especially protein solutions.
- municipal for drinking water production from surface water through UF turbidity removal and disinfection. Ultrafiltration is not fundamentally different from microfiltration or nanofiltration, except in terms of the size of the molecules it retains.

The available membrane geometries are the following:

- Spiral wound module
- Tubular membrane
- Hollow fiber membrane
- Flat membranes

MBR Membrane Reactor

MBR process is a technology that consists of a suspended growth biological reactor integrated with an ultrafiltration membrane system, using hollow fiber or flat membranes.

Essentially, the ultrafiltration system replaces the solids separation function of secondary clarifiers and sand filters in a conventional activated sludge system.

MBR process combines the unit operations of aeration, secondary clarification and filtration into a single process, producing a high quality effluent, simplifying operation and greatly reducing space requirements.

MBR Advantages versus conventional technologies:

- Effluent Quality and Reuse Potential
- Simple Operation – full automatic system
- Compact Plant – saving space and small footprint
- Expandability - modular filtration surface
Product range – Waste and primary water treatment

Sand filtration and activated carbon adsorption

Sand filtration is used in water purification and is commonly used in municipal water treatment facilities or as tertiary treatment after conventional wastewater treatment plant. Sand filters use sand and other granular media to remove particles and impurities (Dual media filter).

Reverse Osmosis

Reverse osmosis is the process of forcing a solvent from a region of high solute concentration through a membrane to a region of low solute concentration by applying a pressure in excess of the osmotic pressure.

The membranes used for reverse osmosis have a dense barrier layer in the polymer matrix where most separation occurs. This barrier is a semipermeable membrane that does not allow the solutes to move from one compartment to the other, but allows just the solvent to move.

The process requires that a high pressure be exerted on the high concentration side of the membrane, usually 2-17 bar (30-250 psi) for fresh and brackish water, and 40-70 bar (600-1000 psi) for seawater, which has around 24 bar (350 psi) natural osmotic pressure which must be overcome.

Typical applications for RO are:

- Landfill treatment
- Sea water desalination
- Boiler water production

Sometimes suspended solids are trapped in a floc through the use of flocculation chemicals - typically salts of aluminium or iron. Water and flocs flows through the filter medium under gravity or under pumped pressure and the flocculated material is trapped in the sand matrix.

Sand filtration can be driven by gravity or by pressure. Operating parameters, as filtration specific rate, operating pressure, backwash reqency, overall dimension and materials can so change case by case.

Sea water desalination with RO - (Courtesy of ONDEO IS)
Product range – Industrial fluid purification

**FIBRE WIND Mist eliminators**

**FIBREWIND type BM (Brownian Movement)**

This type of mist eliminator works at fiber bed velocities of about 0.10-0.15 m/sec depending on specific processes. The collection efficiency will be essentially 100% for all particles 3 micron and larger and 99.5% or more, for all particles smaller than 3 micron.

**FIBREWIND type IM (Impaction Movement)**

This type of mist eliminator works at fiber bed velocities of about 1.0-1.5 m/sec depending on specific processes. The collection efficiency will be essentially 100% for all particles 3 micron and larger and 99.5% or more, for all particles smaller than 3 micron.

They are similar to mesh pad mist eliminators except that the filaments are extremely fine fibres, randomly but very closely spaced.

**FIBREWIND mist eliminators of AWS are constructed in a cylindrical form (candle filters) between two concentric open mesh bed formers into which special fibres of various materials are either densely packed or wound or wrapped.**

**IMPACTION MOVEMENT FILTERS for water mist removal from CO2 stream (Tecnoproject)**
Product range – Industrial fluid purification

TYDE VANES mist eliminator

TYDE VANE type mist eliminators of AWS are specifically made to remove mainly liquid droplets together with solid particles from an air or gas stream. Unlike filters, which hold particles indefinitely, TYDE VANES mist eliminators of AWS separate fine droplets and drain the liquid away from the gas stream.

Our TIDE VANE panels have been studied to accomplish several applications, namely:
• evaporators / vacuum evaporators
• concentrators
• cooling towers
• scrubbers / FGD scrubbers
• packed towers
• cooler-condensers
• high pressure separators
• knock out drums

Mesh pad mist eliminator

These mist eliminator types are widely used in industry to separate liquid droplets from gas streams.

The most widely applicable type of mist eliminator is made of metal or plastic wire with typical diameter of 0.15 to 0.3 mm, loosely knitted, flattened to form different layers and crimped in a diagonal pattern with ridges. When these strips are laid together, the ridges slant in alternate directions, forming an open structure through which gas flows freely. Such mesh can efficiently capture mist droplets as small as 5 microns (micrometers). For eliminating droplets down to 1 micron in diameter, multi-filament yarns of various plastics or glass are knitted into the mesh. The result is called a composite or co-knit mesh.

Typical MESH PAD application are:
• evaporators
• vacuum evaporators
• concentrators
• cooling towers
• scrubbers
• packed towers
• cooler-condensers
• high pressure separators
• knock out drums
Product range – Industrial fluid purification

LUBE OIL mist eliminators

The LOV of AWS was designed to remove oil mist originated in the lubricating systems of compressors and turbines.

The principle of performance is based on brownian diffusion, as for the fibre wind system.

The lubricated rotating parts of all gas and steam turbines, turbo compressors and vacuum pumps generate a visible oil plume which is to be removed from the air vented to atmosphere.

AWS can supply the simple mist eliminator or, according to customer’s requirements, a skid mounted unit which includes by-pass pipe, control valves, instrumentation, blower and motor.

The LOV from AWS is well tested and reliable and guarantees the following:

• No visible plume
• Constant and very low pressure drop
• Recover expensive oil
• Easy operation and change over

Coalescers

AWS liquid-liquid separation technology can solve a wide range of separation problems involving immiscible liquids. Whether it is capacity constraints, loss of valuable solvents or more stringent environmental compliance, AWS can help you meet these requirements.

AWS offers different types of coalescer media and has solutions for even the most difficult to separate applications. For new applications or for retrofits, AWS can provide cost-effective solutions for your liquid-liquid separation requirements.

Typical COALESCER applications:

• Oil-water separations
• Removal of aqueous solutions from hydrocarbon streams
• Removal of haze from fuels
• Enhanced separation of reflux streams
• Three phase separations
• Wastewater treatment
• Offshore wastewater cleanup
• Groundwater runoff
• Oil spill recovery
Product range – SKIDS and PED Vessels Construction

AWS provides the full spectrum of engineering disciplines from Design and Mechanical through to Fabrication.

AWS has extensive experience in the fabrication and assembly of process piping modules and equipment skids.

Shop pre-fabrication and the assembly of modules allows for disciplines typically done in the field to be preformed in a controlled shop environment, which in turn provides the greatest opportunity to control quality, systems operation, and schedule while reducing overall project construction cost.

Phases of construction are the following:

- Detail design according to client’s conceptual drawings
- Setting of executive P&ID and construction drawings
- Material procurement
- Shop pre-fabrication and assembling
- Test / start-up
Pilot Plants

Pilot plants

A pilot plant is a small processing system which is operated to generate information about the behavior of the system for use in design of larger facilities.

The concept of modeling full-scale water and air treatment processes by using pilot-scale equipment manufactured provides consulting engineers and end-users with a powerful method for analyzing water and air treatment processes.

Pilot studies that use pilot plant equipment can accomplish the following objectives.

- Comparison of different conventional treatment technologies for new plant construction or existing plant expansion.
- Comparison of alternative treatment technologies.
- Optimization of existing treatment processes.
- Flexible and safe experimentation without the worry of potentially hazardous effluent quality going to the public.
- Plant operator training and public education.
- Establishment of design criteria with confidence, thus ensuring the best technical and economic choice.

AWS has various pilot testing plants available for rent on request:

- WESP
- FIBER WIND Plant
- MBR
- Ultrafiltration
- Aerobic plant
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