CLEAN AIR

TAILOR MADE SOLUTIONS
FOR AIR TREATMENT
**AIR POLLUTION**

Industrial expansion, economic and population growth cause increasing emissions of hazardous pollutants into the atmosphere. Off gases and flue gases are often polluted by particulates, aerosols, acid gases and various other chemical substances that need to be removed before being discharged. Choosing the appropriate treatment and technology is project specific. Our tailor made solutions for any kind of air or gas treatment problems are based on research & development, pilot plants and on-site measurements. Our range of solutions is based on proprietary know-how and technology acquired from MECS-DuPont, BAYER, Reither, KIMRE Inc as well as Socrematic which has become our Waterleau France competence center for air treatment, located near Paris.

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**WATERLEAU’S MAIN AIR POLLUTION CONTROL SYSTEMS**

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OUR TRACK RECORD

Over 45 years of experience in all fields of air treatment
More than 500 references in all industries worldwide:

- Chemical, pharmaceutical
- Oil and gas
- Steel and construction
- Printing
- Food and beverage
- Fertilizer
- Pulp and paper
- Textiles
- Waste incineration
- Municipal & industrial wastewater treatment

OUR TECHNOLOGIES

Through the years, we have developed proprietary air treatment technology. The emphasis is on sustainable and reliable technologies that serve both our clients and the environment. We select from a comprehensive set of high-performance technologies, rather than to work with one and the same standard solution.

Collaboration with engineering companies:

OUR SERVICES

- Feasibility studies
- Pilot plants
- Design and engineering
- Procurement and construction
- Maintenance and after sales services

OUR TECHNOLOGY PARTNERS/LICENSES

- Selected distributor of KIMRE™ products for Europe
- Distributor of MECS-DuPont products: Brink®** and DynaWave®**
- Owner of REITHER®* and distributor of BAYER-REITHER® double venturi systems
- Preferred vendor for STAMICARBON and UHDE Fertilizer Technology (UFT)

* REITHER® is a trademark of Waterleau
** BRINK® and DynaWave® are registered trademarks of MECS-DuPont

WATERLEAU AIR COMPETENCE CENTER
Saint-Ouen-l'Aumône, France
Our range of packed bed scrubbers is capable of absorbing and separating chemical pollutants such as alkaline or acidic compounds, sulfurous or nitrogenous compounds, toxic gases, solid particles as well as aerosols.

**PROCESSES APPLIED**

- Absorption processes for chemical pollutants such as:
  - Alkaline: NaOH, KOH, ...
  - Acidic: HCl, HF, HCN, HBr, H₃PO₄, ...
  - Sulfurous compounds: H₂SO₄, SO₂, SO₃, H₂S, Mercaptans...
  - Nitrogenous compounds: NH₃, RNH₂, ...
  - Toxic gases: Cl₂, BF₃, SO₂, ...
- Separation processes for droplets and aerosols such as:
  - H₂CrO₄, H₂SO₄, HNO₃, (NH₄)₂SO₄, HCl, ...
- Separation processes for dust and solid particles such as:
  - ZnO, NH₄NO₃, Cr₂O₃, TiO₂, Zr₂O₅

**APPLICATIONS**

- Production, storage and packaging of basic chemical compounds
- Fluidized bed, prill tower, granulator, dryer, atomizers and coolers used in the production of fertilizers, sugar, alfalfa, urea and ammonia nitrate
- Degassing of reactors in fine chemistry and pharmacy
- Liquid/waste incineration in the chemical and pharmaceutical industry
- Metallurgy: iron and steel industries
- Treatment of SO₂/SO₃/HF/HBr/HCl gaseous emissions
- Lime kilns, paper waste
- Degreasing and chroming baths, preparation and metalizing surfaces

For all these applications, operating parameters are analyzed and proper processes recommended while fulfilling legal obligations based on following criteria: flow rate, nature of pollutant, temperature, concentration, pressure drop, emission limits, available space, references, MOC, budget...

Acid/Alkaline gases are absorbed by a vertical WATPACK® or horizontal cross flow SXF-WATPACK® scrubber using a corresponding reagent and using proprietary equipment, skid mounted if requested.

**TECHNOLOGIES**

**WATPACK® packed bed scrubber**: solution for gaseous pollutants absorption in a vertical counter-current flow packed bed scrubber using WATPACK® absorption packing and WATMESH® demister technologies.

**KIMRE™ SXF® horizontal cross flow scrubber**: gaseous pollutants absorption in a horizontal cross flow scrubber equipped with specific WATPACK® KON-TANE® KIMRE™ pads to maximize the gas/liquid contact, followed by a WATMESH® B-GON® mist eliminator.

**WATTRAY® tray scrubber**: Waterleau’s vertical tray scrubber technology for pollutants absorption and dust removal.

**WATSPRAY® spray scrubber**: Waterleau’s spray tower scrubber technology using multiple spray nozzles in different stages and WATMESH® technology.

**WATMESH® demister**: Waterleau’s high performance mist eliminator using proprietary composition of different bone crimp and mesh diameter, provided in different materials.

**WATMONIA® ammonia scrubber**: scrubber technology for ammonia removal in fertilizer production and chemical plants

* KIMRE™ is a trademark of Kimre, Inc.
INDUSTRIAL DUST REMOVAL

Particulate removal, conventionally called dust collection, involves the removal of coarse and fine particles from an air stream. The emission of particulate pollutants to the atmosphere from industrial and other sources can create serious health problems as well as economic consequences.

Particulates can have different chemical compositions depending on their origin. They are generally composed of:

- Salts (nitrates, sulfates, carbonates…)
- Organic carbon
- Trace elements such as heavy metals
- Black carbon (black carbon is linked to incomplete combustion of fossil fuels and biomass)

### APPLICATIONS

- Liquid and solid waste incineration
- Tire, rubber and plastic processing
- Chemical and fertilizer handling and processing
- Metal processing
- Food & beverage
- Petrochemical refining
- Paint and coatings
- Pharmaceutical plants
- Beetpulp drying
- Alfalfa drying

ELIMINATING THE FINEST DUST PARTICLES UP TO SUBMICRON LEVEL
France - Soil incineration
DYNAWAVE® flare gas desulphurisation, gypsum production
France - Sugar and starch industry
WATSPRAY® chimney dust removal

France - Fertilizer industry
TURBULAIRE® dust removal

Iran - Fertilizer industry
TURBULAIRE® urea dust removal
TECHNOLOGIES INDUSTRIAL DUST REMOVAL

Of all air pollution abatement technologies, wet scrubbing systems remain the most versatile and cost efficient. Depending on particle size distribution, dust composition and dust concentration, Waterleau has developed several processes to meet customer needs.

WATSPRAY®

The WATSPRAY® chimney system is composed of two different sections:
- The absorption and de-dusting section
- The mist eliminator section with swirl vane and WATMESH® demister

A typical application of the WATSPRAY® chimney is the dust removal of pulp dryers in the sugar industry as well as alfalfa dryers.

Capacity
- Gas flow: up to 500 000 m³/h
- Particle size distribution: > 10 µm

Advantages
- Extremely low pressure drop over gas side
- Low water consumption due to maximum water recycling in the process
- Low energy consumption due to low pressure to the sprayers
- Space saving
- Simultaneous absorption of gaseous pollutants possible

TURBULAIRE® DUST SCRUBBER

Using liquid to collect dust particles, the TURBULAIRE® dust scrubber combines a low energy variable venturi throat and high velocity gas impaction on the liquid surface. The combination results in high efficiency dust scrubbing with a minimal amount of energy.

The TURBULAIRE® scrubber consists of a vertical cylindrical shell with conical top and conical hopper at the lower end. It is divided into two chambers:
- The agglomerator chamber with humidifying section
- The eliminator chamber with swirl vane and WATMESH® demister

The TURBULAIRE® scrubber can be equipped if necessary with a final demister, a sub-cooling section or an absorption section.

Capacity
- Gas flow: up to 800 000 m³/h
- Particle size distribution: > 1 µm
- Outlet dust concentration: < 50 mg/m³

Applications
- Sugar industry (lime kiln, pulp dryer, sugar dryer/cooler)
- Fertilizer industry (fluidized bed dryer, cooler, granulator)
- Combustion and incineration (bagasse boiler, coal or fuel oil boiler)
- Paper pulp industry (paper dust)
- Atomizers in the food and beverage industry

Advantages
- Exemplary performances with low energy demand
- Easy operation and maintenance
- Large range of flow rates (up to 800 000 m³/h)
- System upgradable to new regulations
- Nearly maintenance free
- No moving parts
- Virtually no plugging risk
- Minimal liquid effluent blow-down rate
- Reliable and economical design proven by hundreds of installations operating worldwide
DynaWave® SCRUNBER*

The DynaWave® reverse jet scrubber is designed to solve air pollution control problems requiring reliable operation with dirty, hot gases. Reverse Jet scrubbers are particularly reliable in dirty environments with high collection efficiencies.

The DynaWave® Reverse jet scrubber design consists of an inlet barrel equipped with one or two reverse jet injectors which are very large bore, open throat nozzles, followed by a mist eliminator system. The feed gas stream enters the top of a vertical duct and collides with the scrubbing liquid that is injected upward through large bore injectors. The froth zone creates a very high rate of liquid surface renewal and efficiently quenches the gas to the adiabatic saturation temperature and absorbs dusts and acids. Even under upset conditions, the scrubber is capable of quenching hot gases above 400°C depending on the material.

Capacity
- Gas flow: up to 1,000,000 m³/h
- Particle size distribution: > 0.5 µm
- Inlet dust concentration: 100 g/m³

Advantages
- Handles huge dust loads
- No plugging: large open bore liquid injectors – non-restrictive open vessel
- Reduced bleed, by operating a high solid concentration in the recirculating liquid
- Multiple functions in one scrubber (gas cooling, dust abatement, gaseous pollutants absorption)
- Broad turndown ratio
- Low maintenance
- Possible use of a variety of reagents (NaOH, Ca(OH)₂, CaCO₃, Mg(OH)₂, H₂O₂) for absorption

* DynaWave® is a trademark of MECS-DuPont
REITHER® & BAYER-REITHER® SCRUBBERS

The REITHER® & BAYER-REITHER® scrubbers are double venturi scrubbers and particularly effective at removing dust and liquid particles from 0.3 to 50 µm at very high efficiencies. Venturi scrubbing of air particulates, aerosols and gases achieve removal efficiencies up to 99% on particles and aerosols. At the sub-micron zone, the principle of venturi scrubbing forces the contact of the particle with fine water droplets.

The REITHER® venturi scrubber is designed for efficient separation of the finest dust particles. It is equipped with an adjustable throat cross section which maintains a constant pressure drop across the throat, hence a constant separation efficiency, independent of any flow rate fluctuation.

Capacity REITHER®
- Gas flow: up to 200 000 m³/h
- Particle size distribution: > 0.5 µm
- Dust concentration: < 2 g/m³

Advantages REITHER® & BAYER-REITHER®
- Simple and compact design
- Cost effective
- High collection on superfine dusts and aerosols with low pressure drop
- Controllable on different flow patterns, dust loads, ...
- Simultaneous absorption of gaseous pollutants possible
- Non-clogging

Applications REITHER® & BAYER-REITHER®
- Chemical manufacturing (incineration/boiler)
- Metallurgic industry (iron & steel, metal smelting, metal finishing & plating)
- Pharmaceutical plant
- Pesticides plant
- Paint & coating industry
- Food & beverage industry (atomizer, dryer...)
- Electronics industry
- Nuclear industry

The BAYER-REITHER® venturi scrubber includes hybrid nozzles which atomize the scrubbing liquid, whereby a pulsation of ejection drops is produced by installed resonance chambers. The scrubber achieves very high efficiency separation of sub-micron dusts with a low pressure drop and can also be used as a gas absorber.

Capacity BAYER-REITHER®
- Gas flow: up to 30 000 m³/h
- Particle size distribution: > 0.3 µm
- Dust concentration: < 250 mg/m³

* Venturi Scrubber System BAYER-REITHER® is a registered trademark of Bayer, Germany
FERTILIZER DUST REMOVAL

Waterleau, previously Socrematic, has been present in the fertilizer antipollution since 1979. Today Waterleau designs and engineers antipollution systems treating the gas exhaust of the following fertilizer plants:

PRILL TOWERS
- Ammonium Nitrate (AN)
- Calcium Ammonium Nitrate (CAN)
- Urea

FLUIDIZED BED GRANULATION PLANTS
- Ammonium Nitrate (AN)
- Calcium Ammonium Nitrate (CAN)
- Urea

SANDVIK ROTOFORM PASTILLES
- Urea
- Urea + Ammonium Sulphate (UAS)

PHOSPHORIC ACID PLANTS
- Phosphoric Acid Digester Exhaust

NAUTRALIZERS AND AIR EVAPORATORS
- Phosphoric Acid Digester Exhaust

In urea CAN and ammonium fertilizer plants, the main pollution to the environment originates from the prilling tower or granulation plant. Exit air from urea prilling towers or granulators and cooler contains very fine urea dust in large quantities. Apart from dust, the off-gas from prilling towers or granulators also contains free ammonia liberated from melt/solid urea. The ammonia can be neutralised using WATMONIA® wet scrubbing technology by injecting sulfuric acid or nitric acid into the recirculation stream.

Waterleau counts over 40 plant references (more than 70 scrubbers) for air treatment in the fertilizer industry. Depending on the quantity of the gas to be treated, dust concentration, ammonia, as well as gas temperature, single, double or triple staged solutions can be designed, allowing to treat the urea abatement, the ammonia abatement as well as the cooling combined or separately.

The Waterleau TURBULAIRE®, WATTRAY®, WATMONIA® and KIMRE™ SXF® scrubber technology are state-of-the-art and high efficiency solutions for exhaust gas abatement in the fertilizer plant. Exhaust gas characteristics will define the technology to be applied: scrubber design, type of demisters and the gas moisturizing/spraying system.

* KIMRE™ is a trademark of Kimre, Inc.

WATERLEAU IS A PREFERRED VENDOR OF STAMICARBON AND UHDE FERTILIZER TECHNOLOGY (UFT) EXHAUST SCRUBBERS
TECHNOLOGIES FERTILIZER DUST REMOVAL

WATTRAY® TRAY SCRUBBER

The WATTRAY® tray scrubber is Waterleau’s tray scrubber technology using fixed valve trays in combination with multiple layer WATMESH® bone crimp demisters and is particularly adapted for:

- Urea dust removal in exhaust of fluidized bed urea granulation plants
- Calcium ammonium nitrate fluidized bed and prill tower exhaust
- Urea and ammonium nitrate prilling tower exhaust

KSA - Urea fluidized bed granulation plant
Double and single staged WATTRAY® Urea dust + WATMONIA® ammonia abatement

WATMONIA® SCRUBBER

The WATMONIA® scrubber is designed for the ammonia removal in fertilizer plant exhausts. In order to reduce footprint, the WATMONIA® scrubber can be integrated with the WATTRAY® tray scrubber into a single staged combination for urea dust and ammonia abatement.

KIMRE™ SXF® HORIZONTAL CROSS FLOW SCRUBBER

Gaseous pollutants absorption in a horizontal cross flow scrubber equipped with specific KIMRE™ B-GON® and KIMRE™ KON-TANE® demister pads to maximize the gas/liquid contact.

* KIMRE™ is a trademark of Kimre, Inc.
CASE: UGAA PROJECT FOR SAFCO

SAFCO (Saudi Arabian Fertilizer Company), the world’s single largest producer and exporter of Granular Urea, started the operation of its second ammonia and granular urea complex, located in al-Jubail Industry City in 1993. This was followed by a third plant which began production in January 2000 as well as a fourth plant in 2004 followed by a fifth new plant.

As a proactive approach for environment protection and sustainable development, SAFCO decided to implement the Urea Granulator Ammonia Abatement (UGAA) project for all Urea Granulators.

Waterleau designed and provided the WATMONIA® scrubbers, reducing the Ammonia Emissions with over 85%.

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<th>Plants</th>
<th>Significance</th>
<th>Ammonia Mg/Nm³</th>
<th>TPY</th>
<th>Result</th>
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<tr>
<td>SAFCO-2</td>
<td>Before UGAA</td>
<td>68.1</td>
<td>312.2</td>
<td>Ammonia emission from SAFCO-2 Urea Granulator Stack reduced by 92%</td>
</tr>
<tr>
<td></td>
<td>After UGAA</td>
<td>4.95</td>
<td>22.5</td>
<td></td>
</tr>
<tr>
<td>SAFCO-3</td>
<td>Before UGAA</td>
<td>100.9</td>
<td>410.2</td>
<td>Ammonia emission from SAFCO-3 Urea Granulator Stack reduced by 84%</td>
</tr>
<tr>
<td></td>
<td>After UGAA</td>
<td>16.5</td>
<td>66.2</td>
<td></td>
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BEST IN CLASS SOLUTIONS FOR UREA AND AMMONIA REMOVAL

Safo, Saudi Arabia - Fertilizer industry WATMONIA® urea fluidized bed granulator exhaust
FLUE GAS TREATMENT (FGT)
FLUE GAS DESULFURISATION (FGD)

Waste and sludge treatment, co-incineration and power plants generate hot gaseous effluents or flue gases containing acid, soluble salts and dusts mixed with heavy metals, dioxins and other pollutants. Waterleau proposes different processes to meet the regulation emissions, in stand-alone or in combination: electrostatic precipitator (ESP), wet and dry scrubbing, activated carbon filters for dioxins and furans absorption etc.

TECHNOLOGIES

WATPACK® PACKED BED SCRUBBER

Packed scrubbers are very efficient for atmospheric pollution control. These scrubbers allow to increase the liquid-gas contact and obtain a better component mass transfer. Acid/alkaline gases can be absorbed by our vertical counter flow WATPACK® packed scrubber using the corresponding reagent.

Advantages

- High pollutant mass transfer
- Low pressure drop
- High rangeability
- Possible use of a variety of reagents (NaOH, H₂O₂…)
- Reduction or absence of bleed depending on the reagent used in the system
- Low maintenance

During SO₂ abatement, air can be injected into the bottom of the recirculation tank as to oxidize sulfites into sulfates.

For all the applications, operating parameters are analysed and proper processes recommended while fulfilling legal obligations based on following criteria: flow rate, nature of pollutant, temperature, concentration, emission regulations, space available, references, pressure drop, MOC, budget…

**Particular application :** Regenerative flue gas desulfurization using hydrogen peroxide (H₂O₂) with sulfuric acid (H₂SO₄) production

The absorption of SO₂ using hydrogen peroxide is a simple method to remove SO₂ from effluent gases. The reaction between SO₂ and hydrogen peroxide (H₂O₂) can be simplified as follows:

\[ \text{SO}_2 + \text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{SO}_4 \]

The main advantage of this scrubber system is avoiding liquid waste because the H₂SO₄ produced in the scrubber system can be reused in the production process resulting into a zero waste treatment unit.
CASE: WATPACK® ADISSEO Burgos

ADISSEO, a subsidiary of the BLUESTAR International group, is a worldwide expert in animal nutrition, combining the excellence and quality of its know-how in a complete line of additives and services.

At the Burgos site, ADISSEO equipped 2 existing thermal oxidizers of sulfurous compounds with a new flue gas treatment. WATERLEAU supplied:
- One quench tower to cool down hot gases
- One WATPACK® vertical scrubber using hydrogen peroxide (H₂O₂) as to produce sulfuric acid (H₂SO₄) from SO₂ and reusable in the ADISSEO process, avoiding liquid waste.
Indaver offers high-quality and sustainable waste management solutions for industrial businesses and public authorities. Indaver recycles and treats both domestic and industrial waste and also provides advice on how to prevent waste as an integral part of their service.

At the site in Antwerp, Indaver built a new installation for the incineration of hospital and hazardous solid and liquid waste. The main part of the solid waste is medical waste.

Waterleau supplied a rotary kiln furnace with a continuous ash extraction system and a recovery heat steam boiler.

Waterleau also supplied the advanced flue gas treatment to meet emission regulations. This flue gas treatment is composed of:

- One electrostatic precipitator (ESP) as dust separation step
- Two DynaWave® scrubbers using CaCO₃ as reagent to cool down the gas and absorb acid gases and heavy metals
- Four activated carbon fixed beds to absorb dioxins/furans
DynaWave® REVERSE JET SCRUBBER

In the industrial dust removal section, the performance and reliability of the DynaWave® Reverse Jet Scrubber (cfr. p.10) as a solution for the dust abatement and cooling of large airflows were introduced. The DynaWave® technology also allows the use of variety of reagents to absorb gaseous pollutants as CaCO$_3$, Ca(OH)$_2$, Mg(OH)$_2$, ZnS, ...

Particular application: Flue gas desulfurization using limestone (CaCO$_3$) with gypsum production

The absorption of SO$_2$ with limestone slurry is a simple and economic method to remove SO$_2$ from effluent gases. The reaction between SO$_2$ and limestone slurry (CaCO$_3$) can be simplified as follows:

$$\text{SO}_2 + \text{CaCO}_3 + \frac{1}{2} \text{H}_2\text{O} \rightarrow \text{CaSO}_3 \cdot \frac{1}{2} \text{H}_2\text{O} + \text{CO}_2$$

To minimize the scaling and to enhance the filterability of the solution, the calcium sulphite must be further oxidized to calcium sulphate.

$$\text{CaSO}_3 \cdot \frac{1}{2} \text{H}_2\text{O} + \frac{1}{2} \text{O}_2 + \frac{3}{2} \text{H}_2\text{O} \rightarrow \text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$$

Air is injected into the sump of the DynaWave® scrubber to complete the oxidation of the sulphite to sulphate. After the sulphite oxidation, a blowdown stream is withdrawn from the vessel and sent to filtration as to recuperate gypsum.

REITHER® & BAYER-REITHER®** VENTURI SCRUBBER

Venturi scrubbers (cfr. p.11) are particularly effective at removing particles from 0.3 to 50 µm with very high efficiencies. New technology in venturi scrubbing of air particulates, aerosols and gases achieves removal efficiencies up to 99% on particles and aerosols down to 0.3 µm. At the sub-micron zone, the principle of venturi scrubbing forces the contact of the particle with fine water droplets.

The REITHER® venturi scrubber is designed for efficient separation of the finest dust aerosols. It is equipped with an adjustable throat cross section which maintains a constant pressure drop across the throat and allowing a constant separation efficiency, independent of any flow rate fluctuation.

Developed in association with Bayer, the BAYER-REITHER®** venturi scrubber includes Hybrid nozzles which lead to dust pre-agglomeration. In the Hybrid nozzle the scrubbing liquid is atomized by compressed air, whereby a pulsation of ejection of drops is produced by installed resonance chambers. This scrubber achieves very high efficiency separation of sub-micron dusts with a low pressure drop. The design allows it also to be used as a gas absorber.

Applications

- Chemical manufacturing (incineration/boiler...)
- Pharmaceutical plant (incineration)
- Pesticides plant
- Electronics industry
- Nuclear industry

Advantages

- Simple and compact design
- Extremely high turndown
- Cost effective
- High collection efficiency on superfine dusts and aerosols with low pressure drop
- Controllable on different flow patterns, dust loads, etc...
- Simultaneous absorption of gaseous pollutants possible
- Adjustable venturi throat – manual or automatic
- Handles high inlet gas temperatures
- Non-clogging
- High rangeability

* DynaWave® is a trademark of MECS-DuPont
** Venturi Scrubber System BAYER-REITHER® is a registered trademark of Bayer, Germany

France - Nuclear industry
REITHER® venturi scrubber
MIST PARTICLE AND AEROSOL REMOVAL

In processes involving contact between liquid and flowing gas, tiny mist droplets as well as ultra fine liquid particles called aerosols are carried away with the gas. Mist elimination or demisting can be defined as the mechanical separation of liquids from gases. Demisters or mist eliminators are specially designed to provide a large surface area in a small volume to collect these liquid droplets without substantially impeding gas flow.

Small mist particles are an inevitable product of many manufacturing processes. Within a process, these particles can cause problems such as corrosion of equipment, contamination of product, fouling of heat exchangers, and damage to instruments. When released to the atmosphere, these mist particles can cause violations of air pollution emission standards or opacity regulations.

Mist can be formed in manufacturing processes in three different ways:

- Mechanical forces may break up or “atomize” a liquid to form a mist
- Cooling of a gas stream may result in the condensation of vapor to form a mist
- Chemical reaction of two or more gases may take place at temperatures and pressures where the reaction products are mists

Mechanical forces typically create mists with large particles while particles formed by condensation and chemical reactions are usually small (submicron).

Waterleau is the European distributor for KIMRE™ mist eliminators with brand names KIMRE™ B-GON® or KIMRE™ KON-TANE® as well as the French distributor for BRINK® Fiber bed Mist Eliminators. For fertilizer application, Waterleau has developed WATMESH® demisters composed of metal wire mesh with different bone crimp layers, especially manufactured for Waterleau.

BRINK® FIBER BED MIST ELIMINATORS

BRINK® incorporates a special wound fiber, computer controlled quality, and a patented bi-component design. They provide a high efficiency removal of aerosols from gas streams where they coalesce the liquid particles collected on the individual micro fibers to form liquid films which are moved through the bed by the gas flow, then drained off the downstream face of the bed by gravity. They excel at collecting the very-difficult-to-remove, submicron-size mist particles that cause visible emissions.

Collection efficiencies on sub-micron particles can be designed to exceed 99.5%.

Advantages

- Modular systems
- Demister
- Pollutant removal
- Dedusting
- Low Pressure drop
- High-fouling applications
- Avoid maintenance problems
- High liquid loading
- Excellent operational references

TECHNOLOGIES

* BRINK® is a registered trademark of MECS-DuPont
KIMRE™ MIST ELIMINATORS

KIMRE™ mist eliminators consisting of a uniquely interlaced structure of a monofilament material, are produced in a variety of thermoplastic filament material which allows continuous service from -15°C to 204°C and process corrosion resistance. Various style and layers can be combined into single pad as to meet requested efficiency.

For more than 40 years Kimre Inc. has developed different types of B-GON® and KON-TANE® pads with their own geometrical texture and efficiency depending on particles and droplet sizes. The requested efficiency depends on the combination of different pad sizes as well as fiber diameter.

KIMRE™ composite pad mist eliminators: A modular system with layer specific performances.

WATMESH® MIST ELIMINATORS

Our proprietary WATMESH® mist eliminators consist of co-knitted multiple layers with metal wire mesh having different bone-crimp. They come in multiple zones each with a specific surface and density and are especially designed for fertilizer application using an elaborated spray system.

- The WATMESH® type 1996 consists of multiple zones each with a specific surface area and density. This unique mesh build-up ensures an improved drainage and is especially designed for use in Urea applications.
- The WATMESH® pad type 2007 consists of multiple zones each with a specific surface area and density. This unique mesh build-up ensures an improved drainage resulting in an increased capacity compared to a traditional single-zone mesh pad and is therefore often applied in case of space constraints, e.g. retrofits. It is the high capacity equivalent of type 351U and has a slightly elevated pressure drop and high removal efficiency.
- The WATMESH® pad type 2014 consists of a bottom metal mesh drainage zone and a co-knit high-efficient top zone consisting of metal wires and PTFE fibers. The PTFE fibers are added to increase the surface area which boosts the removal efficiency.

WATMESH® type 1996, 2007 and 2014 mist eliminator and type efficiencies
VOC TREATMENT

VOC’s and, in particular, solvents, constitute one of the primary elements of air pollution in the industry. These compounds are used for their capacity to evaporate after utilizing them, amongst others, for cleaning purposes, mixing purposes and pigment applications.

Depending on the VOC concentration and recovery cost, VOC can be recuperated when the VOC has a significant reclaim value. When, for economic reasons, VOC concentration does not justify recovery, VOC can be destroyed using biological, thermal or chemical destruction systems.

Waterleau’s BIOWAVE®, BIOTON® and BELAIR® VOC destruction technology makes uses of biological oxidation processes where VOC’s are degraded by micro-organisms using the VOC as carbon and energy source.

ODOUR CONTROL

Biological oxidation processes are also used to treat unpleasant odours coming from wastewater treatment plants, composting, platforms, meat rendering or fish meal plants. These odours may disturb the surroundings of a site, even if the concentrations in the ambient are minimal. This is the case with polluted air containing nitrogen or sulphur-based compounds as mercaptans, amines, hydrogen sulphur, ammonia, aldehydes, ketones, acrylates and organic acids.

Because of relatively low operating costs compared to other abatement technologies, biofiltration often offers the most economical solution.
TECHNOLOGIES VOC TREATMENT + ODOUR CONTROL

BIOTON® BIOFILTER

BIOTON® biofilter is Waterleau’s proprietary biofilter, acquired from MECS-DuPont. Before entering the biofilter compartment, the off gas is led to a humidifier in order to cool off the gas and in order to remove dust particulates and contaminants. Due to intensive contact between the air and the BIOTON® filtration media in the biofilter compartment, the VOC and inorganic compounds will be absorbed in the biofilm where the biological oxidation into harmless end products will proceed (H₂O, CO₂, and new bacteria).

BELAIR® BIOFILTER WITH BIOWACK® BIOFILTER MATERIAL

The contaminated gases are passed through a BIOWACK® material that has a water phase in which the micro-organisms are immobilized. Typically, the BIOWACK® material consists of organic material, containing difficult to degrade components such as cellulose and lignin, accompanied by a large amount of cell matter, dead and alive. This provides a source of nutrients for the micro-organisms, as well as serving as a matrix to support the water phase. Ideally, to minimize power consumption, the filter material should have a low resistance to gas flow. The BIOWACK® has a high capacity to retain water without becoming saturated, a low bulk density, structural integrity, a capacity to buffer acidification of the filter material and the ability to buffer peak concentrations of contaminants. The water phase, which is stationary, is formed by water absorbed in the BIOWACK® material. Equally importantly, the material should not be expensive as it often has to be used in large quantities.

\[
\text{Pollutants (carbon & energy source)} + \text{O}_2 \rightarrow \text{Heat} \quad \text{Extra products} \quad \text{Cellular development} + \text{CO}_2
\]

Advantages

- Relatively low capital cost
- Very low operating cost
- High VOC and odour destruction
- Environment friendly technology – no chemicals or supplemental fuels required
- Proven technology (>120 references)
- High availability
4 TYPES OF BIOFILTER CONSTRUCTIONS:
CONCRETE - CONTAINER - SEMI-BURIED - WOOD
**WATPACK®**

The WATPACK® packed bed scrubber is used for the absorption of nitrogen- and sulphur-based compounds in a vertical counter-current flow packed bed using combined WATPACK® absorption packing and WATMESH® demister technology.

**Advantages Biofilter**
- Relatively low capital cost
- Low operating cost
- Proven technology (>120 references)
- High availability

**Applications**
- Municipal wastewater treatment
- Waste handling
- Composting
- Tobacco
- Solvent users
- Pet food processing
- Oilseed processing
- Cannery plants
- Rendering
BIOGAS TREATMENT

BELGAS®

Desulphurization of biogas will increase life duration of combustion engines. Waterleau has developed a simple, flexible, reliable and high-capacity technology for the desulphurization of extraction and biogas. The BELGAS® scrubber technology uses activated sludge as a washing liquid available from the aerobic wastewater treatment. The BELGAS® scrubber design reduces the amount of H₂S in gasses to levels below 500ppm. The robust BELGAS® scrubber technology is safe, smart and efficient, while low in operation and maintenance costs.

Compared to low pH fixed bed reactors and high pH caustic scrubbers, the BELGAS® scrubber has multiple advantages:

Advantages
- pH neutral values
- No H₂SO₄ accumulation
- No scaling
- No slurry production
- Compact footprint
- No chemicals required
- Low maintenance
- Low CAPEX and OPEX

CASE STUDY- CARGILL MAINZ: EXTRACTION GAS

In an agro industry plant located in Mainz Germany, a rape seed crushing and extraction facility of an oil pressing plant makes use of Waterleau’s stand-alone BELGAS® technology for S and odour removal from extraction gases. Washing liquid from the dedicated Bio-Flash Aeration Tank is therefore available 24/7. The BELGAS® scrubber has proven to be an excellent solution for desulphurisation. A 4-stage BELGAS® scrubber with a capacity of 150 m³/h removes up to 2,5 kg S/h from the extraction gases. The BELGAS® scrubber has high removal efficiencies for hydrogen sulfide and organic sulphur compounds.

Inlet (bio)gas with high H₂S
Outlet (bio)gas with low H₂S

**KEY DATA CARGILL MAINZ**

<table>
<thead>
<tr>
<th>Capacity</th>
<th>150 m³/h</th>
</tr>
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<tbody>
<tr>
<td>H₂S removal</td>
<td>&gt; 99.5 %</td>
</tr>
<tr>
<td>Organic sulphur compounds removal</td>
<td>73%</td>
</tr>
<tr>
<td>Di-methyl sulfide removal</td>
<td>58%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>INLET</th>
<th>OUTLET</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,000 - 30,000 ppm H₂S</td>
<td>&lt; 50 ppm H₂S</td>
</tr>
<tr>
<td>2,500 g H₂S/h</td>
<td>&lt; 20 g H₂S/h</td>
</tr>
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SOME OF OUR REFERENCES
WATERLEAU FRANCE HAS OVER 45 YEARS OF EXPERIENCE IN ALL FIELDS OF AIR TREATMENT AND MORE THAN 500 REFERENCES IN ALL INDUSTRIES

DESIGN
ENGINEERING
CONSTRUCTION
OPERATION
MAINTENANCE

PROTECTING THE 4 ELEMENTS

We all have the responsibility to handle our natural resources in a careful and sustainable way. Waterleau develops environmental technologies and offers sustainable solutions for water, air and waste treatment, as well as for energy recovery. As an EPC contractor and operator, Waterleau counts more than 1000 references for municipal and industrial clients around the world.