

ENVIRONMENTAL SOLUTIONS FOR INDUSTRIES

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3V TECH **3V GREEN EAGLE**

TOGETHER, WE MAKE PROGRESS
BY PROCESS.

We provide process solutions, plants, equipment and services for wastewater and sludge treatment and for waste recovery to process industries and multiutilities, working in partnership with our customers.

We support them from the design to the building phase and help them in the management of their plants, according to the “DBO” model (Design, Build, Operate). Multidisciplinary approach, balance between technological expertise and consulting attitude, engineering & manufacturing know-how are today our distinctive elements: the result of a long history of progress.

3V Tech and 3V Green Eagle are the technological and sustainable soul of the 3V Group, in a merger of experience and know-how that has its origins in the chemical branch of the group, 3V Sigma, and has lived through more than 60 years of process developments and technological improvements.

Together we represent a unique asset for our customers, as every customer will receive a comprehensive support embracing design, manufacturing and operational experience, leading to progress-oriented solutions.



3V ENTERPRISE

 3V TECH
PROGRESS BY PROCESS

 3V GREEN EAGLE
FROM CHEMISTRY TO ENVIRONMENT

WE MAKE **PROGRESS** BY PROCESS.

Progress is both our driving force as well as the goal we are striving for, whether it is in continuous improvement actions or complex development projects.

Our process competence, consolidated over years, is the tool to achieve this goal.



DESIGN

We take care of all design stages, from the feasibility study to detailed engineering, to best satisfy the multiple needs of our customers and make them confident from the earliest stages.



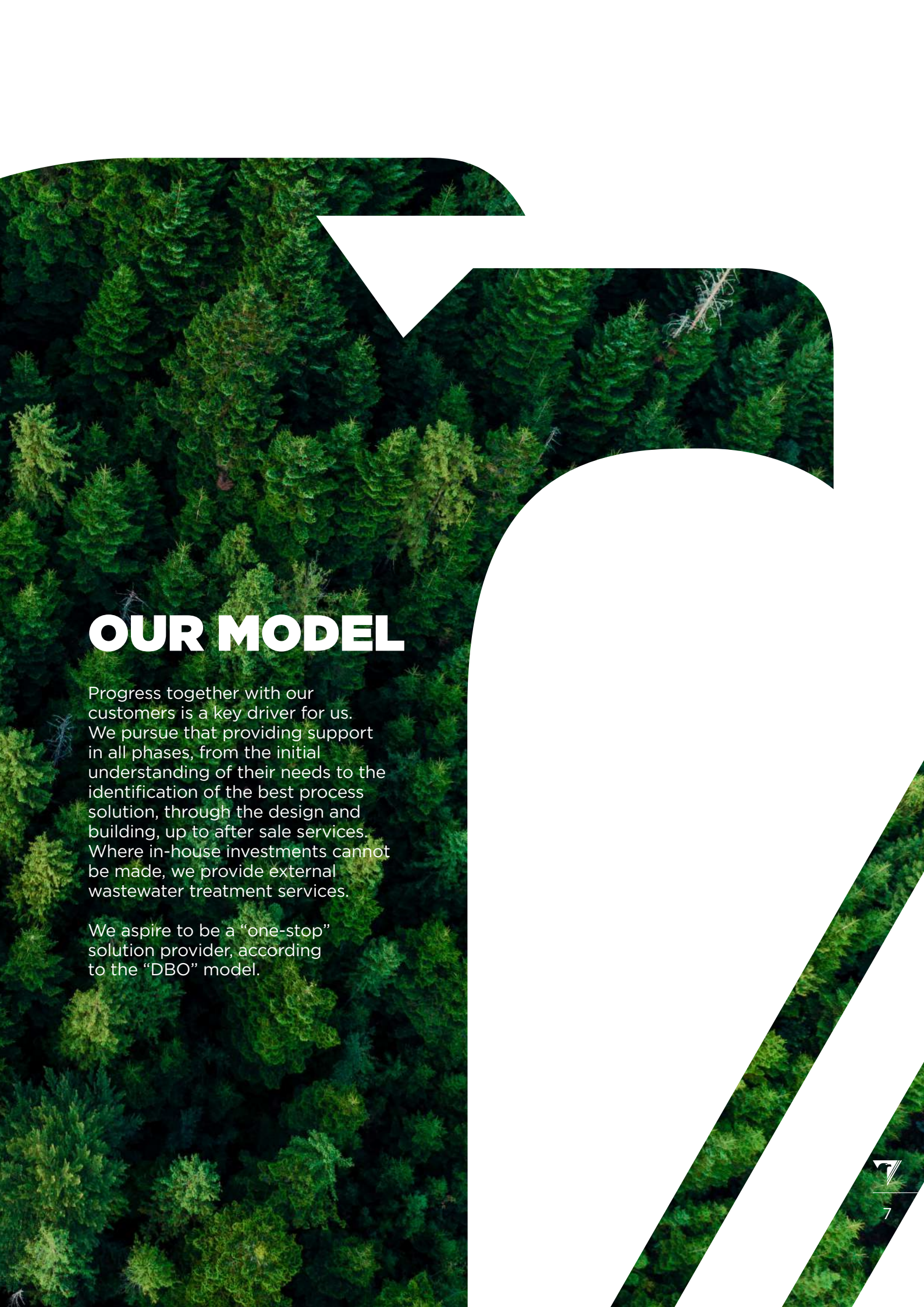
BUILD

We ensure to our customer the best quality undertaking the full manufacturing process, from raw material machining up to installation.



OPERATE

We provide a wide range of services, from on field assistance during installation and startup, up to aftersale and environmental services.

An aerial photograph of a dense, lush green forest of coniferous trees. The image is partially obscured by large, white, abstract geometric shapes: a large 'M' shape in the upper left and a large '7' shape on the right side. The text is placed within the white space of the 'M' shape.

OUR MODEL

Progress together with our customers is a key driver for us. We pursue that providing support in all phases, from the initial understanding of their needs to the identification of the best process solution, through the design and building, up to after sale services. Where in-house investments cannot be made, we provide external wastewater treatment services.

We aspire to be a “one-stop” solution provider, according to the “DBO” model.

ENVIRONMENTAL SOLUTIONS FOR INDUSTRIES

We provide process solutions to industries and multiutilities to treat wastewater, sludge or for liquid waste recovery.

Customers				
Processes		Industries: Oil & Gas, Pharma, Chemicals...	Multiutilities	Waste Treatment & Recycling
Environmental	Wastewater Treatment			
	Sludge Treatment			
	Waste Recovery			

We integrate in the process solutions portfolio proprietary and third-party technologies.

Processes/Customers				
Environmental Wastewater & Sludge Treatment, Waste Recovery				
3V: Solutions/ Proprietary Technologies	Industries: Oil & Gas, Pharma, Chemicals...	Multiutilities	Waste Treatment & Recycling	
Wet Oxidation				
Thermal Separation				



OUR SOLUTIONS PORTFOLIO

Wastewater Treatment

- Wet Oxidation
- Evaporation and Crystallization
- Distillation
- Stripping
- Neutralisation
- Chemical-physical Treatment
- Filtration
- Biological Treatment
- Chemical Oxidation

Sludge Treatment

- Wet Oxidation
- Thickening
- Dewatering
- Drying

Waste Recovery (Solvents and Oils)

- Dehydration
- Evaporation & Distillation



WASTEWATER TREATMENT

Since more than 20 years we are committed to help communities and industry to treat effluents in order to **reduce their contamination, to comply with regulation** and to potentially **increase water reuse or recovery of other valuable substances**.

We **integrate multiple process treatments and technologies** to achieve the desired quality of treated water depending on its end use:

- **Discharge**
- **Reuse/Recycling**
- **Concentration**
- **Nutrients Recovery**
- **Solvents Recovery**

Discharge

Depending if water is discharged to surface water, sewer or to other treatment plants we identify the best treatments for the different kind of contaminants, organic and inorganic, suspended or dissolved, in accordance with local regulations.

Standard considered parameters:

- Color
- COD
- BOD
- Metals
- Total Nitrogen
- Ammonia
- Total Phosphorus
- pH

For wastewater having a high COD content and/or **refractory organic contaminants, hard to degrade, Wet Oxidation is the key solution we provide.**

Wet Oxidation (TOP® Technology)



A cutting-edge technology to get:

- reduction up to 99% of dissolved or suspended volatile solids;
- transformation of non-biodegradable compounds into easily biodegradable compounds;
- COD reduction up to 80%;
- odor and color removal.

Performed at high temperature and elevated pressure to maintain water in liquid phase. Air or pure oxygen are used.

Efficacy checked on hundreds of **different contaminants**, present **in spent caustic water or other industrial wastewater, from pesticide to pharmaceutical and chemical wastewater.**

Reuse/Recycling Concentration Nutrients Recovery Solvents Recovery

Reuse of treated water (MLD or ZLD)

Produce clean water for reuse, minimizing water discharge (MLD) up to eliminating it completely (ZLD), requires to **make treated water in line with reuse or recycling applications.**

Evaporators or crystallizers are the ideal solution to **remove dissolved solids**, the most common pollutants: a condensate, free of salts, metals, high boiling point organics, is generated and in most cases it can be reused.

If necessary, we combine the evaporator or crystallizer with other technologies for a final refinement of the condensate.

Concentration

Concentration of wastewater, prior to off-site disposal, is a valuable solution to **reduce its volume** and related disposal costs.

Evaporators are the technological solution par excellence:

- a concentrate is generated for off site disposal;
- the separated condensate contains mainly water that can be discharged, reused or additionally treated.

Valuable substances can be recovered by the concentrate or distillate.

Nutrients Recovery (and ammonia removal)

Nitrogen is, on one hand, a harmful pollutant when present in wastewater, on the other hand a valuable nutrient, used in numerous fertilizers. Its **removal and recovery** from wastewater is therefore the winning path to pursue **through stripping and scrubbing technologies.**

We provide:

- stripper columns or, in case of fouling streams, thin film evaporators;
- scrubber units using sulfuric acid to recover ammonia as ammonia sulphate.

Removal of ammonia can also **improve the operation** performances of **aerobic biological plants** or, still more, those of **anaerobic digesters.**

Solvents Recovery

Solvents, often present in industrial wastewater, may be recovered in-house from the waste stream and reused, generating a relevant economic value for the industrial user.

Different solvents (methanol, ethanol, chloroform, DMSO etc.) can be recovered and purified.

Evaporation, distillation or stripping technologies can be used depending on the purity to be achieved.

Thermal separation technologies

Evaporators and Crystallizers



We design and build **different types of equipment:**

- Distillation columns
- Forced circulation evaporators
- Natural circulation evaporators
- Falling film evaporators
- Thin film evaporators
- Forced circulation crystallizers

To satisfy specific water treatment needs and process parameters:

solid content, scaling tendency, viscosity, substance to be recovered, operating hours, volumes.

Provided in different configurations to optimize energy consumption:

- Multiple effect
- Thermal vapor recompression
- Mechanical vapor recompression

in addition to usage of waste energy.



SLUDGE TREATMENT

Conscious from a long time that sludge management is a huge concern globally, we dedicated efforts in developing and designing an hydrothermal process, based on **wet oxidation**, to **reduce** its **mass**, **volume** and **remove harmful substances and microorganisms**.

The Wet Oxidation - TOP® Technology **treats the sludge achieving in one step multiple goals**:

- sludge **mass reduction up to 80-90%**;
- oxidation of **suspended organic (volatile) solid up to 96-98%**;
- **COD removal up to 70%**;
- **increase** of sludge **settleability and dewaterability**;
- removal of harmful and biorefractory organic pollutants;
- microbes removal.

It can be used to treat:

- **municipal sludge** produced by large biological plants;
- **industrial sludge** with different compositions, from pharmaceutical to mining industries.

Wet Oxidation - DUAL TOP® Technology - for simultaneous treatment of wastewater and sludge.

Wet Oxidation (TOP® and DUAL TOP® Technology)



Patented technology to treat thickened sludge (6% - 8% DS) that is converted in:

- a liquid stream with a lower content of dissolved organics and rich of biodegradable compounds;
- a solid mainly inorganic waste having high settleability and dewaterability.

Performed at high temperature and pressure to maintain water in liquid phase.
Air or pure oxygen are used.

WASTE RECOVERY

Aware that waste generation is increasing day and becoming more and more an environmental issue we operate to **value waste as a resource itself**. We develop and design process solutions for **waste oil and spent solvents recovery**.

Waste oil recovery

Re-refining to base oil of **waste oils** is considered to be **the best practice**, in particular with regard to the **circular economy** and waste hierarchy.

Different processes may be developed depending on the oil origin, application, aging and contamination.

The overall treatment mainly consists of dehydration, diesel oil separation and final refining.

We design the core steps of the process (distillation and evaporation) and we provide the related equipment and plants.

Spent solvents recovery

Spent solvents constitute a significant share of hazardous waste and therefore is of **critical relevance to recycle** them, by an **environmental and economic perspective for the industrial user**.

We develop the process case by case: we use **evaporation, distillation or stripping** by air, vapor or inert gas depending on the **nature of the solvent/s, the presence or not of water and other impurities**.

Thermal separation technologies

Evaporators



We design and build **different types of evaporators**:

- Flash evaporators
- Thin film evaporators
- Short path evaporators

To satisfy specific needs and process parameters:

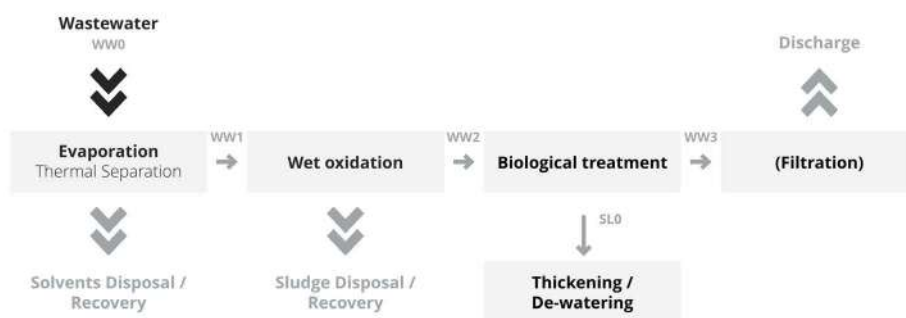
- solid content, scaling tendency, viscosity, operating hours, volumes.

We design the best heat exchange network to minimize energy consumption.

EXAMPLES OF TREATMENT PLANT LINES

Case 1 - Wastewater stream - Multiple industries

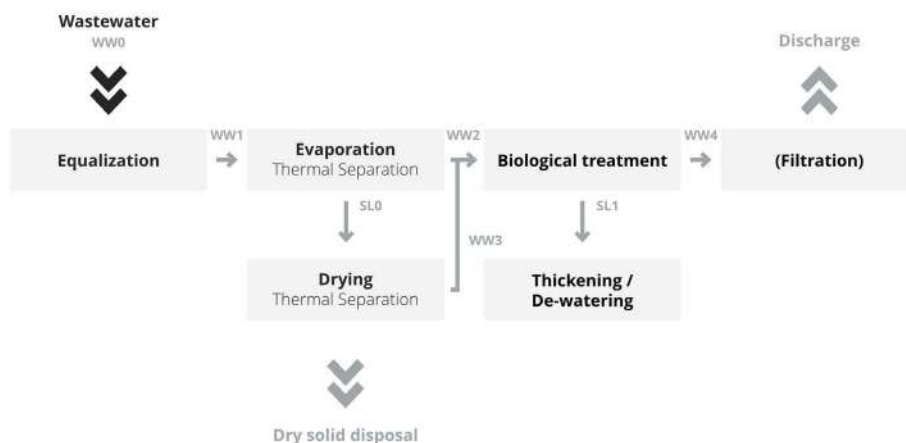
Containing multiple kinds of contaminants (mainly refractory organics, solvents, nitrogen, metals, sulfur compounds).



WW: Wastewater.
Its composition change after each treatment stage.
SL0: Biological / Digested Sludge.

Case 2 - Wastewater stream - Food additives industry

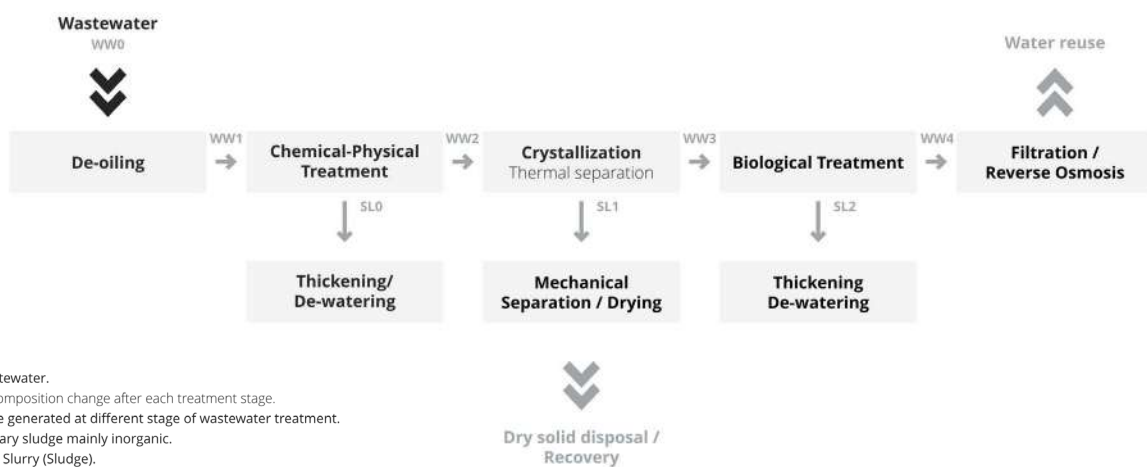
Containing different kinds of dissolved solids (chlorides, sulphates, organics, nitrogen).



WW: Wastewater.
Its composition change after each treatment stage.
SL: Sludge generated at different stage of wastewater treatment.
SL0: Salty Slurry (Sludge).
SL1: Biological / Digested Sludge.

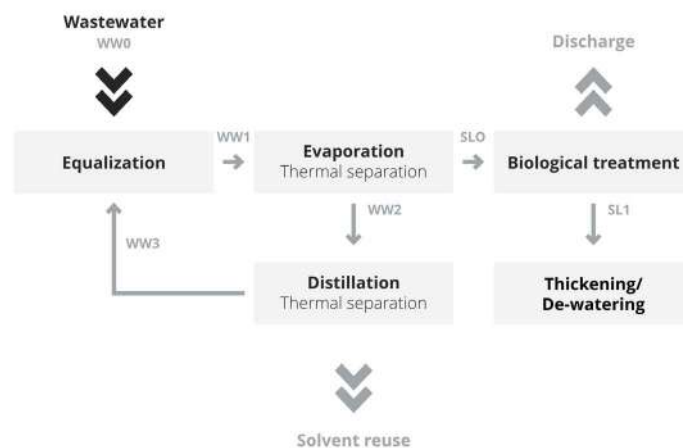
Case 3 - Produced water - O&G industry

Containing oil, different kinds of suspended solids and dissolved solids (chlorides, sulphates, metals, organics).



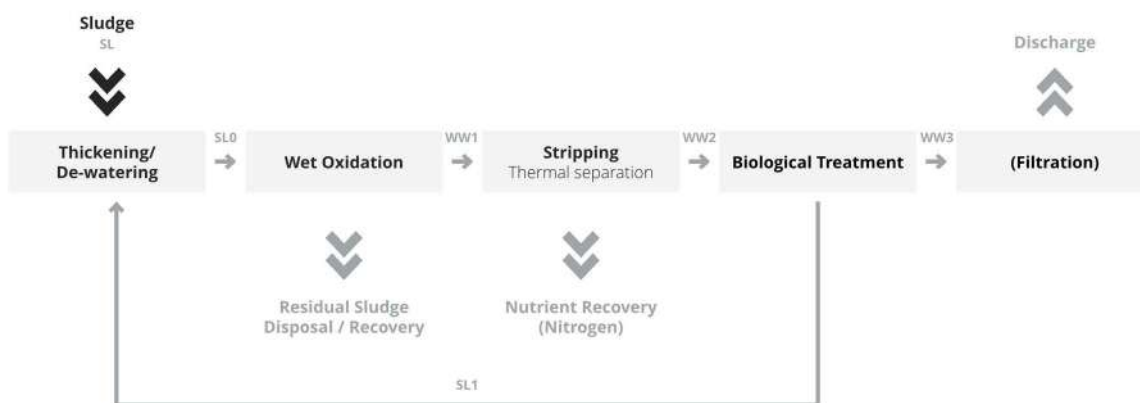
Case 4 - Wastewater stream - Pharmaceutical industry

Containing suspended solids and dissolved solids (mainly different kinds of organics, including a valuable solvent).



Case 5 - Municipal or industrial sludge

Containing suspended solids and dissolved solids (mainly organics, including refractory pollutants).



WW: Wastewater.

Its composition change after each treatment stage.

SL: Sludge.

Its composition change after each treatment stage.

Case 6 - Refining to base oil of waste lubricants oils



WO: Waste oil.

Its composition change after each treatment stage.

WO1: Dried waste oil.

WO2: Oil + Low volatile additives + solids.

WO3: Purified oil from volatile additives and solids.

WO4: Color, Odor Improvement...

STORIES OF PROGRESS

SOME OF OUR REFERENCES

» WASTEWATER
(MULTIPLE INDUSTRIES:
PHARMA, CHEMICAL,
COSMETIC, OIL & GAS, ETC.)

Industry: Liquid Waste Treatment
Location: Italy

3V Solutions Plants: **Thermal Separation
and Wet Oxidation**



STORIES OF PROGRESS



SULPHIDIC SPENT CAUSTIC WATER

Industry: Oil & Gas
Location: Saudi Arabia

3V Solutions Plants: **Wet Oxidation**



NAPHTENIC SPENT CAUSTIC WATER

Industry: Oil & Gas
Location: Oman

3V Solutions Plants: **Wet Oxidation**





WASTEWATER REUSE (ZERO LIQUID DISCHARGE)

Industry: Landfill
Location: Italy

3V Solutions Plants: **Thermal Separation**



WASTEWATER CONCENTRATION

Industry: Liquid Waste Treatment
Location: Italy

3V Solutions Plants: **Thermal Separation**





NUTRIENTS RECOVERY/AMMONIA REMOVAL

Industry: Biofuel Production
Location: Italy

3V Solutions Plants: **Thermal Separation**



LUBE OILS RECOVERY

Industry: Oil Recovery
Location: Italy

3V Solutions Plants: **Thermal Separation**





SPENT SOLVENTS RECOVERY

Industry: Solvents Recovery
Location: Italy

3V Solutions Plants: **Thermal Separation**



NITRIC ACID RECOVERY AND DRYING OF RESIDUAL METAL OXIDES

Industry: Metal Wiring
Location: Belgium

3V Solutions Plants: **Thermal Separation**



SERVICES

To best serve our customers we offer technical consulting services from the earliest stages of conceptual design.



CUSTOMER NEEDS UNDERSTANDING

A dedicated and multidisciplinary team assists our clients for a full understanding of their needs and to identify the proper solution:

- Engineers
- Technicians
- Scientists
- Sales people



TECHNICAL FEASIBILITY STUDY

We run the feasibility study in order to get missing data, investigate process criticalities and reliability, as well establish design criteria. We perform:

- Process simulations
- Laboratory tests
- Pilot plant tests
- Physical-chemical analysis



ECONOMICAL FEASIBILITY STUDY

Economical feasibility studies are prepared including:

- Capex
- Operating costs
- Costs recovery

The core of technical consultancy services relies on the possibility to **run tests** and **physical-chemical analysis**.

LABORATORY TESTING

Laboratory tests are done to check preliminary technical Feasibility.
We are optimally equipped for testing in different fields at:

- Our facilities
- Customer site



PILOT PLANT TESTING

Pilot tests are run typically after laboratory tests to investigate:

- Process parameters
- Process scale-up
- Process reliability



PHYSICAL-CHEMICAL ANALYSIS

Development and testing activities are fully supported by the internal analytical laboratory equipped to run wet and instrumental analysis on different kind of samples:

- Water
- Wastewater
- Sludge
- Chemical products

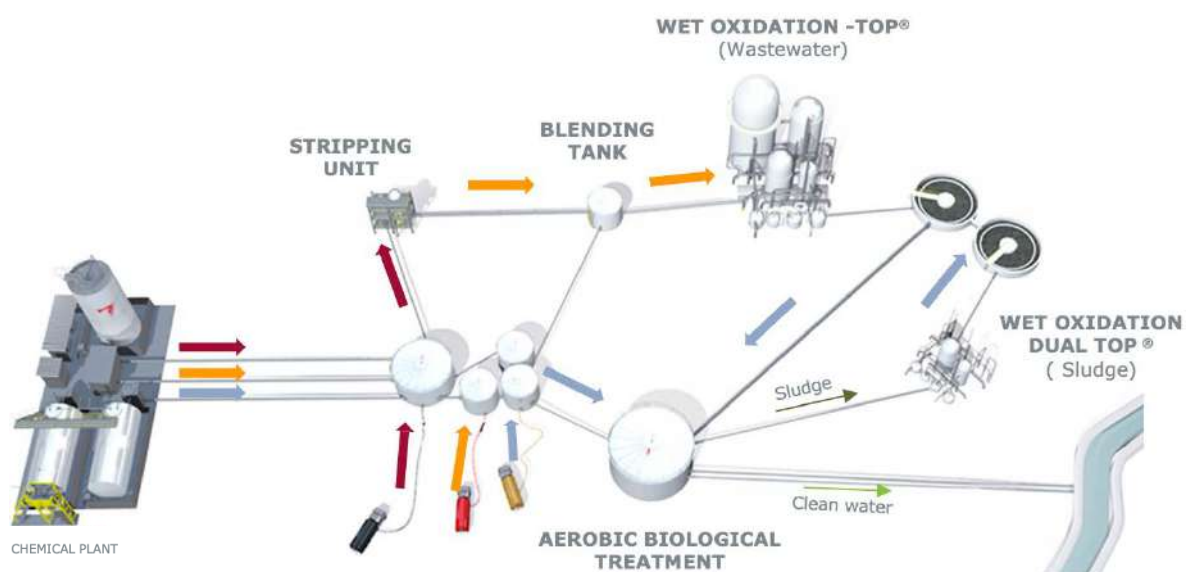




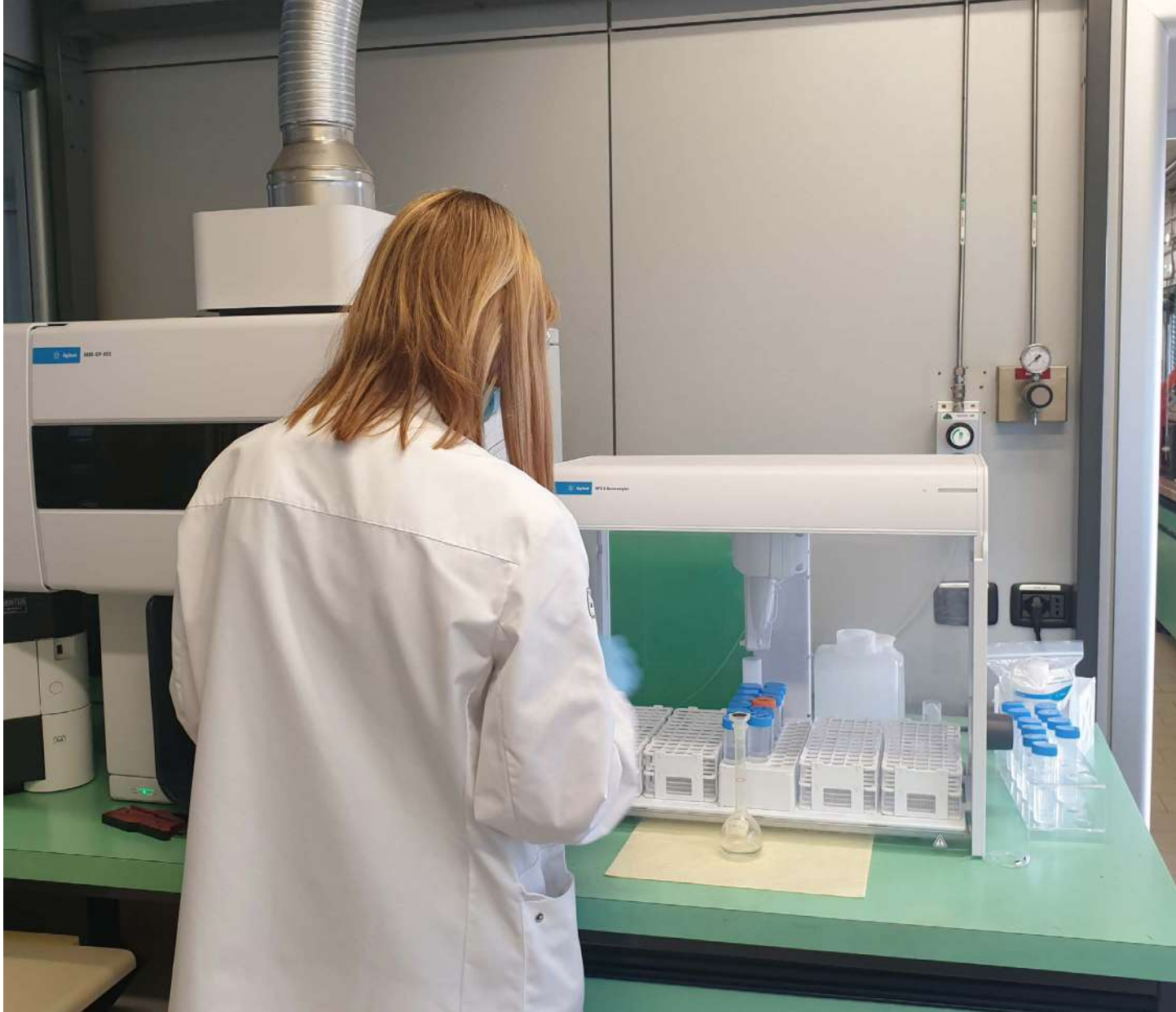
3V GREEN EAGLE TREATMENT CENTER

SPECIALIZED IN INDUSTRIAL WASTEWATER
AND SLUDGE TREATMENT

We offer an **outside service for wastewater collection and treatment** for those who don't want to invest in its own treatment plant.



WW=wastewater → WW-High C.O.D. & Solvent → WW-High C.O.D. → WW -Highly Biodegradable



Production Plant Capacity

- Authorized to treat up to 400.000 m³ /year of liquid waste as per AIA
- Over 295 different codes EWC (European Waste Catalogue)
- 250 CER Codes
- 6.000 - 8.000 tons of COD/year
- Over 200 customers from different industries
- 24/7 for 365 days/year

Analytical Laboratory

- Characterisation of water, wastewater, sludge
- Process control
- Wet & instrumental chemical analysis
- More than 50,000 analysis per year
- 20,000 waste samples per year

Certifications

- ISO 45001:2018
- ISO 14001:2015
- ISO 9001:2015





WE MAKE
PROGRESS
BY THE
PROCESS.



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