



ENVIRONMENTAL SOLUTIONS FOR THE MANUFACTURING, MUNICIPAL, OIL & GAS AND REMEDIATION INDUSTRIES

SPECIALIZED IN WASTE TREATMENT



3V Green Eagle provides environmental solutions for the Manufacturing, Municipal, Oil & Gas and Remediation Industries.

FROM CHEMISTRY TO ENVIRONMENT

3V Green Eagle was developed 15 years ago within 3V Group, which has almost 60 years of experience in sophisticated chemical production, advanced chemical engineering and manufacturing process systems & equipment. 3V Green Eagle therefore is a unique company in the environmental sector, offering single-source full service solutions.

ZERO DISCHARGE TECHNOLOGIES: TOP® & DUAL TOP® - WET OXIDATION

3V Green Eagle has developed its own Zero Discharge technologies: TOP® & DUAL TOP® - WET OXIDATION, currently recognized as a Best Available Techniques (B.A.T.) for industrial wastewater and sludge treatment by the European Union IPPC Commission.

Wet Oxidation treatment has the following specifics:

- Oxidating wastewater by a combined action of high temperature (300° C), operating pressure (150 BAR) and pure oxygen injection.
- Transforming 100% non-biodegradable waste into highly biodegradable waste
- Reducing C.O.D. content by 70%, remaining 30% is highly biodegradable
- Destroying contaminants
- Total detoxification

The big advantage of Wet Oxidation treatment compared to commonly used treatments for industrial wastewater & sludge is that Wet Oxidation is a Zero Discharge process with no air emissions, odors and solid or liquid waste.

ITALY'S LARGEST ENVIRONMENTAL CENTER FOR THE TREATMENT OF INDUSTRIAL WASTEWATER & SLUDGE

Treating up to 5.000.000 tons/year

Our center is authorized to treat up to 400.000 tons of highly contaminated wastewater and sludge from third parties per year, plus it receives approximately 4.500.000 tons of wastewater per year from the nearby 3V Chemical production plant. Wastewater streams from more than 200 clients are conveyed by means of tank trucks (about 10-12.000 per year) to storage tanks. The center treats 290 different waste categories and an average of 6.000-8.000 tons of COD per year.

WHAT WE CAN OFFER YOU

Our services, industries & technologies

Services

Treatment at our center

Wastewater & Sludge treatment

Wide range of environmental treatments

Wastewater treatment

Sludge & Sewage treatment

Oil & Solvent treatment

Liquid Off-Spec product treatment

Soil & Sediment treatment

Tar & Pitch treatment

Drilling Mud treatment

Supply of turn-key environmental plants

Design, Build, Operate (DBO model)

Management of treatment plants

Technical advisory

Process efficiency consultancy

Pilot Plant testing

Laboratory analysis's & consultancy

Feasibility studies

Supply of chemicals for wastewater treatment

Industries

Manufacturing Industry

Municipal Industry

Oil & Gas Industry

Remediation Industry

Technologies

TOP® - Wet Oxidation for Wastewater

TOP® - Wet Oxidation for Sludge

DUAL TOP® - Wet Oxidation for
Sludge & Wastewater combined

Enhanced Biological Treatment

Chemical-physical treatment

Wastewater concentration & drying

Zero Liquid Discharge (ZLD)

Oil & Solvent recovery

Soil & Sediment Washing

Consolidation

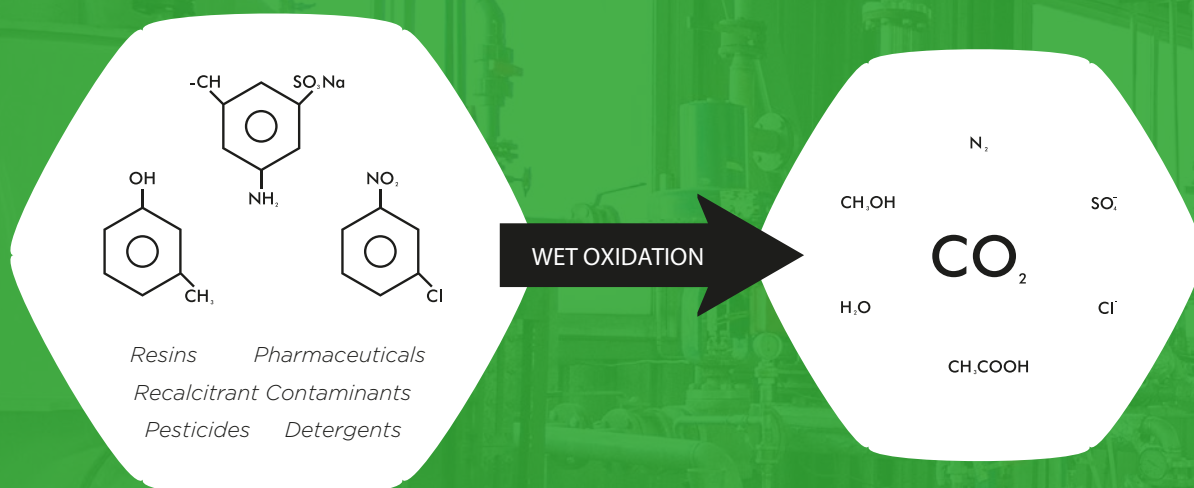
Pyrolysis

Thermal Desorption

TOP® & DUAL TOP® • WET OXIDATION

WET OXIDATION DIAGRAM

- Turning complex molecules into simple molecules
- Transforming 100% non-biodegradable waste into highly biodegradable waste
- Total detoxification



WHAT IS WET OXIDATION ?

WET OXIDATION is the oxidation of dissolved or suspended components in water using oxygen as the oxidizer. The reaction is activated by injecting pure Oxygen in a high pressure reactor, and it allows to “burn in water - flameless” dissolved compounds, including recalcitrant compounds with very low biodegradability.

3V Green Eagle's Wet Oxidation process is patented as “TOP®” process (Temperature, Oxygen, Pressure). The Wet Oxidation TOP® technology is used for wastewater treatment & the Wet Oxidation Dual TOP® technology for sludge treatment. They are currently **recognized as a Best Available Technique (B.A.T.) for industrial wastewater and sludge treatment by the European Union IPPC Commission.**



MAIN ADVANTAGES OF WET OXIDATION

- Allows dissolved compounds to “burn in water - flameless” that, under dry conditions, would oxidize at much higher temperature and pressure
- Allows the complete destruction of a wide variety of complex chemical compounds and contaminants, that are demolished in CO₂, N₂ and highly biodegradable compounds (methanol, acetic acid, etc...)
- TOP® & DUAL TOP® Technologies combined with biological treatment provide a Zero Discharge process
- Reaction occurs in water, therefore there are no air emissions and no odors (process occurs within reactors)
- Allows for almost total elimination of the organic content, producing an inorganic substance that is rich in calcium and phosphorous, and can be re-utilized in the industrial cycle as a primary-secondary material
- Treated water restored to the environment (surface water) after biological treatment, respecting the most stringent regulatory limits
- Can treat both wastewater and sludge
- Can treat “single stream” effluent and “multi stream” effluent on industrial scale
- Overall process efficiency increases with highly contaminated streams
- Low operational costs, investment costs compensated by medium to long term plant lifetime
- Ideal application with biological plant as post-treatment.

WET OXIDATION TREATMENT COMPARED WITH TRADITIONAL WASTEWATER & SLUDGE TREATMENT METHODS

Wet oxidation allows total chemical compounds destruction!

Whereas:

- Chemical-Physical water treatment usually transfers contaminants from wastewater to wastewater sludge
- Biological process is not adequately effective on high COD waters, and does not allow destruction of complex chemical, toxic or recalcitrant compounds (biologic reactors, anaerobic digestors)
- Besides solvent-rich streams, Incineration is not cost effective on liquid waste with moderate to high water content. In addition to ash, incineration can also produce additional contaminants (dioxins and other micro-pollutants)
- Sludge disposal to Landfill or Agriculture does not provide a sustainable longterm solution.

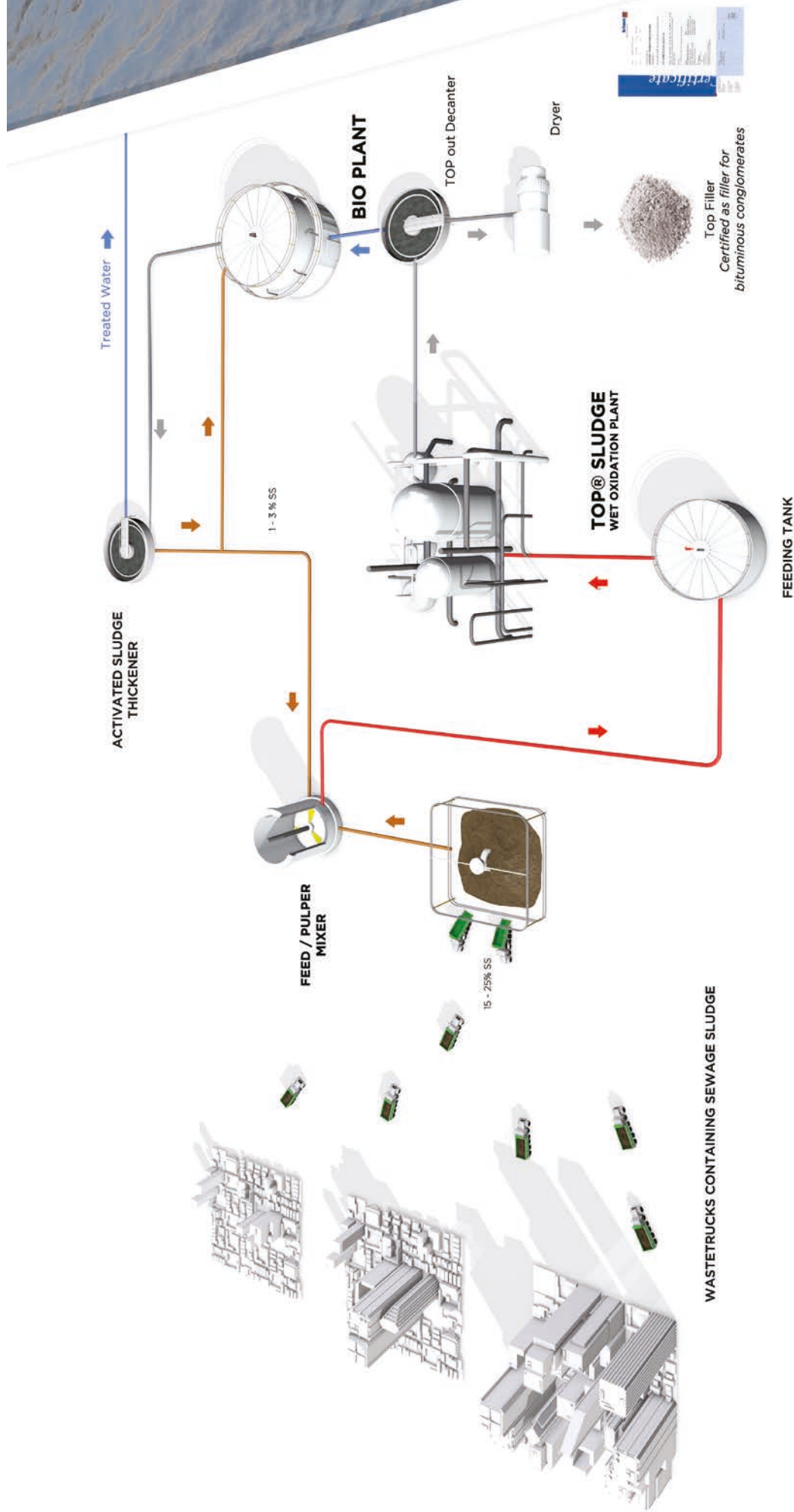
The “Wet oxidation” process treats both wastewater and sludge at the same facility, obtaining high process efficiency and profitability.

CAN WET OXIDATION BE IMPLEMENTED ON INDUSTRIAL & PILOT SCALE?

The Wet Oxidation process is implemented at an industrial scale at 3V Green Eagle Environmental Center in Grassobbio (BG) Italy. 3V Green Eagle Wet Oxidation Process is patented as “TOP Process” (Temperature, Oxygen, Pressure).

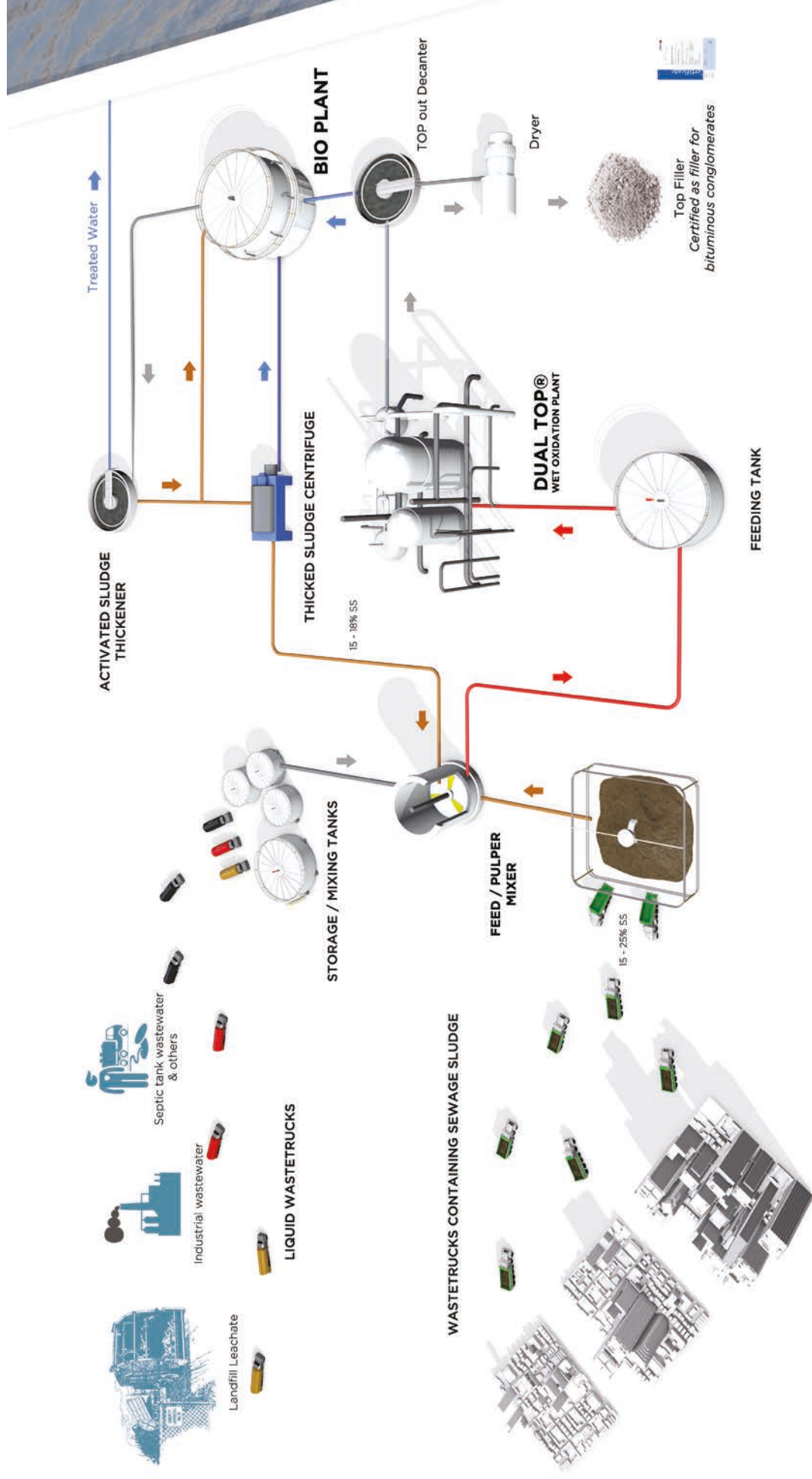
TOP® - WET OXIDATION FOR SLUDGE

PROCESS LAYOUT



DUAL TOP® - WET OXIDATION FOR WASTEWATER & SLUDGE COMBINED

PROCESS LAYOUT



LARGEST ENVIRONMENTAL CENTER FOR THE TREATMENT OF INDUSTRIAL WASTEWATER & SLUDGE IN ITALY

3V Green Eagle operates the largest Environmental Center for the treatment of industrial wastewater & sludge in Italy. The center is located in Grassobbio (Bergamo) and comprises waste treatment plants and service support facilities geared towards resolving most of the issues relating to the treatment of wastewater and sludge from biological plants.

This waste treatment service is offered to all those clients that are interested in an effective treatment process of their waste, especially those types of waste that are not biodegradable, as an alternative to incineration or, to a traditional purification in biological systems, notoriously not so successful with certain types of waste.

The center consists of:

- a wet oxidation plant: TOP® for wastewater
- a wet oxidation plant: DUAL TOP® for sludge
- a biological plant with improved performance (constant temperature of 25°C)
- a chemical-physical pre-treatment plant
- a stripping plant
- a storage plant
- an analysis and research laboratory

Advantages of the platform:

- Large treatment capacity for wastewater, especially non-biodegradable wastewater
- High capacity of segregation and storage
- Exceptionally low levels of environmental impact
- High level of system automation, with centralized control of all the various treatment phases
- High professionalism of the personnel
- 24/7 operational management of the system

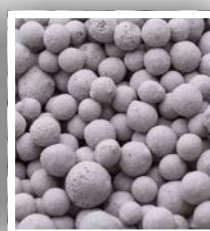
Treating up to 5.000.000 tons/year

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TREATMENT AT ZERO DISCHARGE



Inorganic residue of Wet Oxidation treatment becomes TOP Filler, a secondary raw material that can be used to build roads.



Additional processing can lead to *Sphaerapor* & *MicroPor*

LEGEND :

- High C.O.D. & Solvent Wastewater
- High C.O.D. Wastewater
- Highly Biodegradable Wastewater
- Biological Sludge
- Purified Water

STRIPPING UNIT

Through evaporation & distillation high solvent content is reduced. Stripped wastewater then goes to the Blending Tank. RE-USE
Removed solvent content can be used as fuel for cement factories, industrial ovens & incinerators.

BLENDING TANK

Different streams of wastewater are equalized & blended into the perfect mixture for Wet Oxidation treatment.

TOP® • WET OXIDATION

Oxidizing wastewater by a combined action of high temperature (300°C) and oxygen pressure (150 BAR)
 • Transforming 100% non-biodegradable waste into highly biodegradable waste.
 • Reducing C.O.D. content by 70%, remaining 30% = highly biodegradable.
 • Destroying contaminants up to 99.9%.
 • Total detoxification. Residue after wet oxidation treatment is ash/powder.

LIQUID/SOLID SEPARATION

Through filtration the ash/powder is separated from the wastewater. Wastewater goes to the Biological Plant. RE-USE
Ash/powder becomes TOP Filler, a secondary raw material that can be used to build roads.

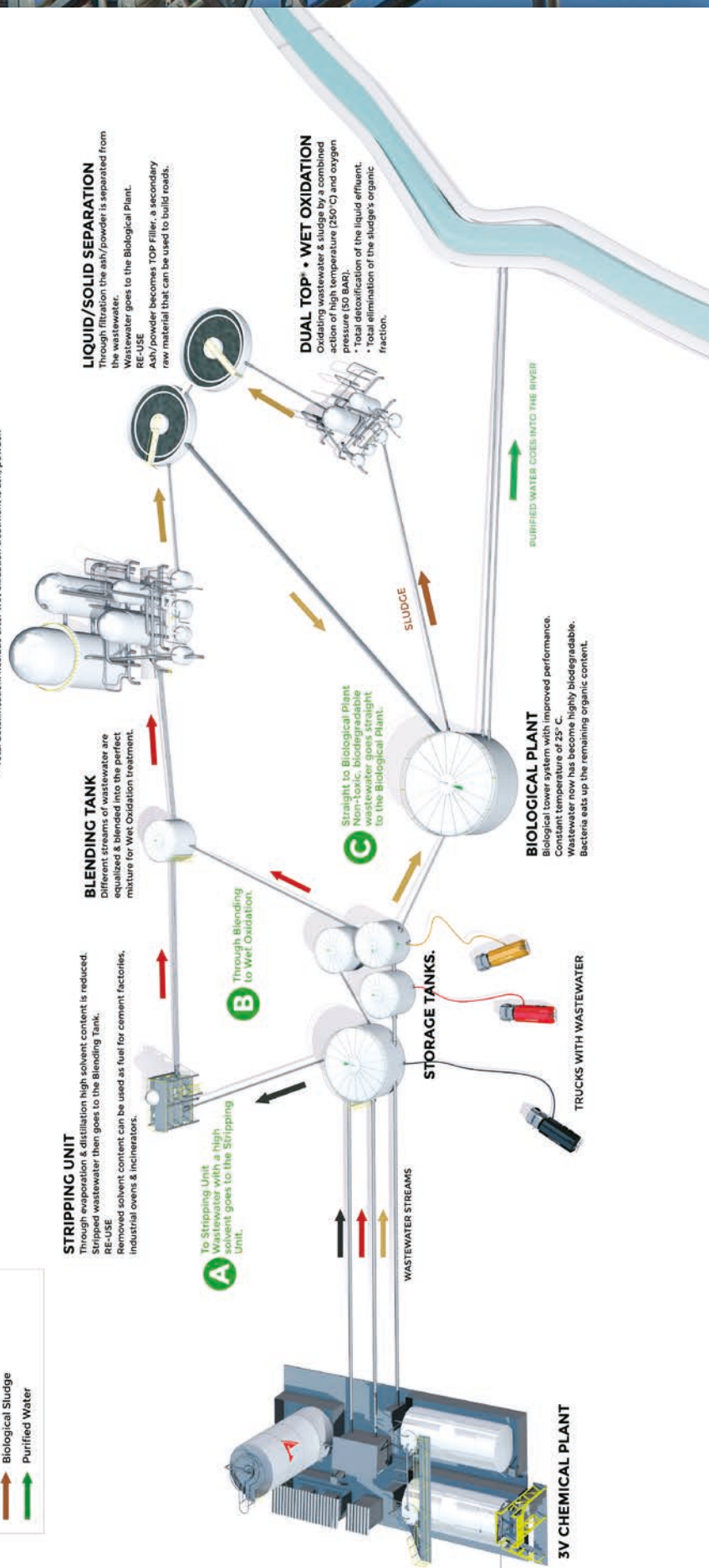
DUAL TOP® • WET OXIDATION

Oxidizing wastewater & sludge by a combined action of high temperature (250°C) and oxygen pressure (150 BAR).
 • Total detoxification of the liquid effluent.
 • Total elimination of the sludge's organic fraction.

BIOLOGICAL PLANT

Biological tower system with improved performance. Constant temperature of 25° C.
Wastewater now has become highly biodegradable. Bacteria eat up the remaining organic content.

PURIFIED WATER GOES INTO THE RIVER



SUPPLY OF TURN-KEY ENVIRONMENTAL PLANTS DESIGN, BUILD, OPERATE (DBO MODEL)

PART OF 3V GROUP

3V Green Eagle is part of 3V Group, which has almost 60 years of experience in advanced chemical engineering and manufacturing process systems & equipment. This gives 3V Green Eagle the unique possibility to be a single-source, full service partner for all of its clients. 3V Green Eagle can design and implement complete process systems with all of the necessary technology and manufacturing expertise drawn from within 3V Group. Where most of our competitors are only able to offer a single system & service, we can offer the complete system with full service.

Some of our realisations:



SOLVENT RECOVERY PLANT



**DOUBLE STAGE AGROCHEMICALS
CONCENTRATION PLANT**



**MULTI-PURPOSE SOLVENT
RECOVERY PLANT**

PLANT MANAGEMENT

For almost 15 years, 3V Green Eagle has been managing the largest industrial wastewater and sludge treatment plant in Italy. The treatment plant has different integrated technologies operating 24 h per day and 365 days per year. The combination of different professional specializations allows us to fully control all operations of an environmental treatment plant.

3V Group has built and manages the following industrial plants, some of which for over 50 years:

- 3V Green Eagle's Treatment Center in Grassobbio (BG). Italy
- 3V Sigma Chemical plant in Mozzo (BG). Italy
- 3V CPM Chemical plant in Marghera (VE). Italy
- Italsigma Chemical plant in Marghera (VE). Italy
- 3V Inc Chemical plant in Georgetown (SC). Usa

3V Group's wide experience in management of complex environmental and chemical plants, as well as her considerable industrial background allows 3V Green Eagle to be able to face accurately the management of all industrial systems even more in the environmental field.

RESEARCH & PILOT TESTING

We are constantly seeking ways in which to innovate and invest substantially in research and development. We operate our own 2,000 m² testing facility where pilot plant trials can be carried out. In this way we do not have to depend only on simulations but can test equipment and plant under real conditions ensuring the client's requirements are fulfilled in every way.

If clients prefer testing at their own site instead of at our pilot plant facility they can rent one of our mobile pilot units which are designed to be easily transported and installed. 3V Green Eagle can of course provide personnel to assist & certify the correct equipment installation and give process support in the realization of the tests.









3V Group was founded in 1958 in Italy and is active in the following fields:

- Fine chemicals production
- Advanced chemical engineering
- Manufacturing process systems & equipment
- Environmental Solutions & Technologies
- Waste treatment operation and management

Number of Employees: 637 (As per 30/10/2013)



STRENGTH OF A GROUP



3V Group is divided in 3 parts:

1

3V TECH: Manufacturing Process systems & Equipment

3V Tech is a leading provider of advanced process systems and equipment for the process industries. The company is specialized in Separation equipment, Reaction equipment & Glasslined equipment.

2

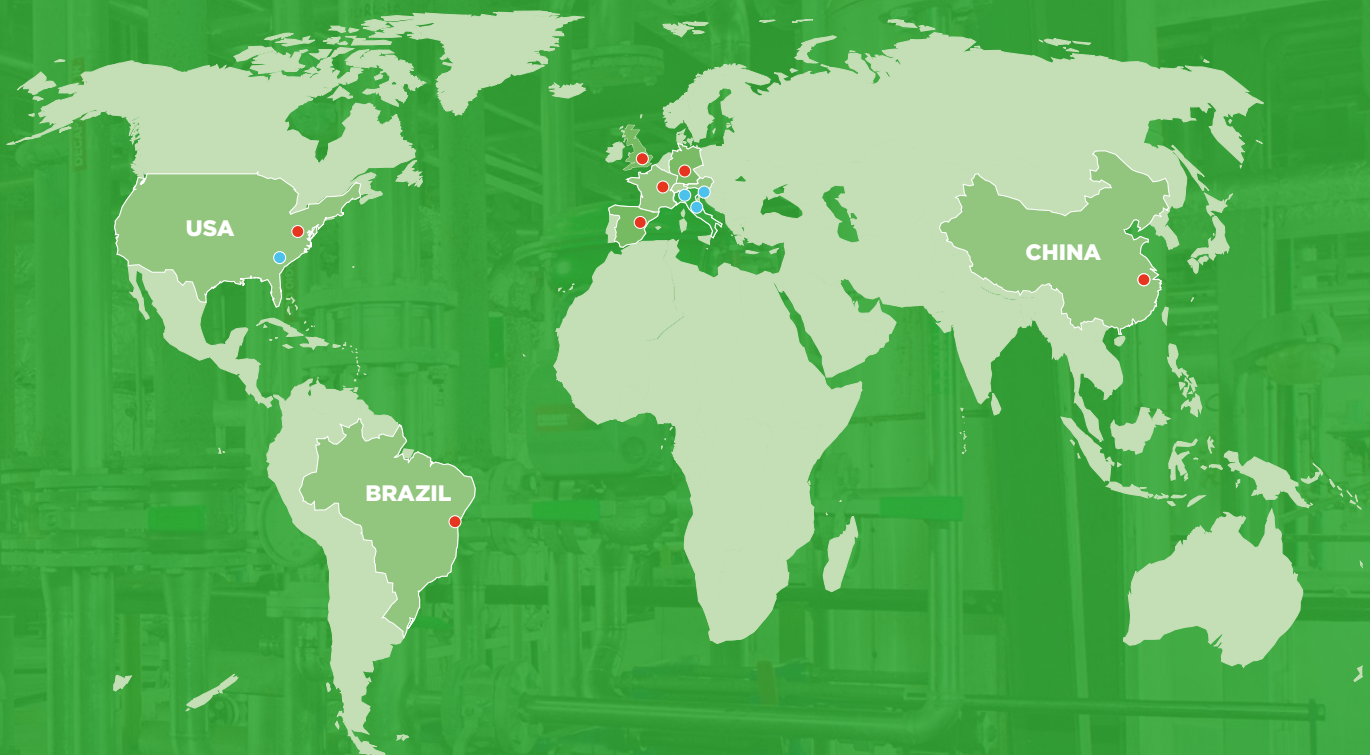
3V CHEMICAL: Specialty Chemical Production

3V Chemical produces fine chemicals that are used in paper, detergents, cosmetics, water treatment, plastics, surface treatments, refinery and oil & gas applications. The company's products include Rheology modifiers, UV stabilizers, Antioxidants, Radical scavengers, Suspending agents, Preservatives and Optical brighteners.

3V Green Eagle is specialized in waste treatment and provides environmental solutions for the Manufacturing, Municipal, Remediation and Oil & Gas Industries.

GLOBAL PRESENCE

3V Group has global market presence, operating from Europe, America & Asia.



- **3V GROUP** Sales & Service Offices
- **3V GROUP** Manufacturing Plants

For more info please visit our website:
WWW.3VGREENEAGLE.COM

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