

**Themis**

Biotechnology & Life Science

The future of Innovation and Sustainability.



**WASTE  
RECOVERY  
TECHNOLOGY**

BIOREACTOR FOR WASTE ENHANCEMENT



**Themis**  
Biotechnology & Life Science



**THEMIS WRT**  
*WASTE RECOVERY TECHNOLOGY*

WE ARE MEMBERS OF



Certificate no. IT21-14108C



Certificate no. IT21-14108B



Certificate no. IT21-14108A

“ *Imagine a world  
where waste  
can become a resource,  
where the earth wakes up  
and nature returns to bloom  
thanks to innovative  
and sustainable solutions.* ”

**All this is possible  
thanks to Themis WRT.**

Every day we work  
to make this dream a reality,  
to turn our impact on the planet  
into a real opportunity for change.  
Because every step towards  
a more sustainable future  
is a step towards a better world  
for future generations.





# Focus on...

The difficulties in managing industrial waste and organic matrix treatment

.....

## Main issues

- Comply with increasingly pressing environmental regulations
- High operating costs
- Environmental and social impacts
- Difficulty of treatment to achieve the imposed discharge limits
- Need for dewatering and stabilization of the waste before disposal
- Difficulties of re-use in agriculture due to the risk of contamination
- Need to identify circular economy solutions for by-product exploitation
- Lack of efficient technologies for secondary raw material recovery
- Risks of sanctions for violation of environmental regulations
- Negative impact on corporate reputation in case of mismanagement
- Growing attention from consumers and stakeholders on the issue of sustainability



## The solution to these problems exists:

**Themis WRT**, an innovative system capable of optimizing the treatment of wastewater, sludge, and processing waste, transforming waste into resources while ensuring sustainability and operational efficiency.

**THE GREEN REVOLUTION STARTS FROM **HERE**.**

# The challenge of sustainable waste management

## A necessary commitment in the Circular Economy

Nowadays, waste management has become an increasingly crucial issue for companies in every sector. This is not just a regulatory issue, but a real opportunity to improve business sustainability, reduce costs and respond effectively to growing demands for environmental responsibility.

Typical waste to be disposed of, such as:

- sewage sludge
- sludge from chemical or pharmaceutical industries
- Industrial waste of various types
- Waste from agri-food production
- waste from agricultural cultivation
- FORSU (Organic Fraction of Urban Solid Waste)

are not only a growing expense item in the company's balance sheet, but also a daily challenge for those who face increasingly stringent and complex environmental regulations.

With the introduction of stricter regulations and tighter controls, disposal costs are steadily rising, forcing companies to find more effective and efficient solutions. But there's more: **waste, while representing a burden, can hide untapped potential.**

The high presence of water in many of these types of waste should not be seen only as an obstacle, but also as a unique opportunity! If properly treated, water can be recovered, significantly reducing the overall volume of waste and lowering disposal costs.

This process not only brings economic benefits, but also contributes decisively to the reduction of environmental impact, resulting in a decrease in CO<sub>2</sub> emissions and an overall improvement in the management of natural resources.

However, in order to fully exploit this opportunity, it is necessary to move away from outdated traditional technologies which are not able to meet today's challenges. The on-the-market current solutions have high costs, long processing times and often an environmental impact that is not fully mitigated.

**The real challenge is to find a technology that can:**

- **Drastically reduce disposal costs** by eliminating waste and optimising the waste management process;
- **Ensure greater efficiency in water removal and material recovery**, creating a virtuous cycle that minimises the volume of waste destined for final disposal;
- **be economically sustainable**, with significantly lower operating costs than traditional solutions, which often cannot justify the initial investment;
- **Avoid the negative side effects of obsolete systems**, such as secondary pollution or excessive energy consumption.

**Themis WRT is the ideal answer to this need: an innovative technology that reduces and recharges waste at low operating costs, without compromising treatment efficiency.**

A perfect example of the **Circular Economy**, which transforms waste from a problem into a valuable resource, drastically reducing the volume and recovering useful materials, with concrete benefits for the environment and the company.

**Choosing Themis WRT means meeting regulatory needs, lowering operational costs, and taking a concrete step towards sustainable and efficient waste management aligned with future environmental challenges.**



# **WRT: the new frontier in waste treatment**

A unique system for the drastic reduction and valorization of waste

## Innovation for waste treatment

**Themis WRT** is a cutting-edge technology designed to **revolutionize waste management**, with a unique versatility that enables it to treat different types of matrices, mainly organic but not only. With its combination of **innovation, speed and efficiency**, it represents a benchmark in the environmental technology landscape

With **Themis WRT**, the results are amazing: a **reduction of the original volume by up to 90% and the transformation of the input matrix into valuable resources**. The multi-step process includes evaporation, drying, granulation and mixing, ensuring unprecedented optimization.

## Economic and environmental efficiency

The strength of **Themis WRT** is its ability to **minimize operating costs** by exploiting waste heat from existing thermal streams, such as hot water or condensate returns, at zero cost. This approach reduces energy waste and allows access to incentives such as *White Certificates*, maximizing economic and environmental value.

## Sustainable waste management

**Themis WRT** drastically reduces sludge and waste volumes, both organic and non-organic, **lowering operating costs**. With **zero emissions into the atmosphere**, it offers a concrete answer to sustainability challenges, allowing both water and solid materials to be recovered, in line with the principles of the Circular Economy.

## Custom made design and smart management

Each **Themis WRT** system is custom-developed to meet the customer's specific operational needs. The integrated Genesis software fully automates the process and allows monitoring of every operational parameter in real time, even remotely.

## Limitless versatility

Thanks to its flexibility, **Themis WRT** is ideal for processing different matrices and finds application in **multiple manufacturing sectors**, providing customized solutions to address the most complex challenges

# The technology

Exclusive know-how for state-of-the-art treatment

Our technology represents an integrated solution that addresses economic, technical and environmental challenges in waste treatment.

It uses a **volumetric concentration process** that exploits the condensation of generated vapors, transforming the treated material into a **stabilized and aggregated end product**.

Depending on customer needs, optional processes can be activated to achieve specific results:

- lowering the boiling point of water **significantly reduces the energy consumption** of the machinery,
- **condensing vapors avoids the emission of substances into the atmosphere**, a common problem in many drying technologies. These factors make it possible to simplify the process from both a technical, managerial and administrative point of view.

The **reactor** is equipped with a **mixing system** that ensures the efficiency of heat exchange and ensures optimal handling of the material inside.

This treatment, in addition to facilitating drying, also allows **stabilization of the treated material**.

In addition, the **targeted addition of biotechnological solutions** can further improve the quality of the final product.

## Main technologies:

- ✓ **VACUUM EVAPORATION**
- ✓ **CONDENSATION OF VAPORS**
- ✓ **MIXING SYSTEM**
- ✓ **BIOTECHNOLOGICAL ADDITIVATION**

The installation of a Themis WRT system in your treatment system is simple and highly effective.

The machine works in Plug & Play mode, easily integrated into the last phase of the production process, where it receives the waste to be treated.

It can operate both in batch and continuous mode, depending on specific needs.

The system is fully automated and managed through the Genesi software, which allows real-time monitoring and remote monitoring.





# The benefits of Themis

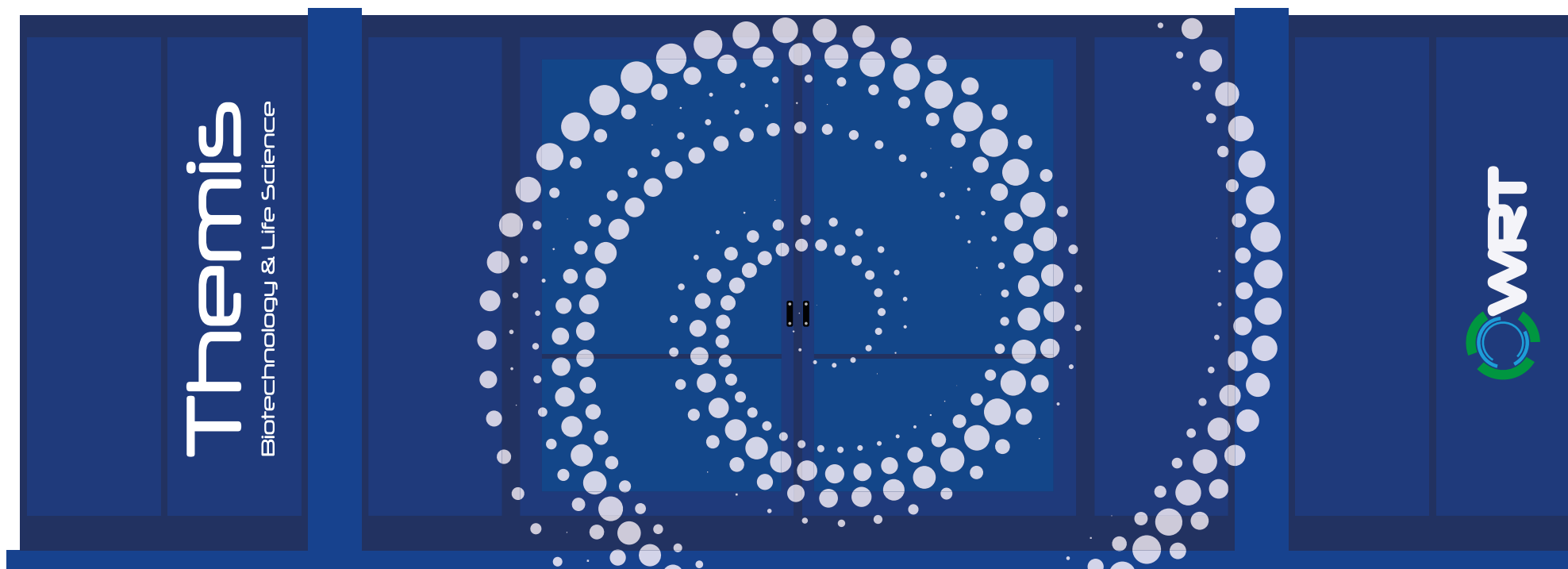
Multi-process technology: superior performance, minimal operating costs



## ABSOLUTE AND PATENTED INNOVATION WITH UNIQUE PERFORMANCE

THEMIS WRT is at the same time an evaporator, dryer, mixer, granulator and vacuum concentrator.

The system can dry different solid or colloidal matrices to the desired degree not only to reduce their volume, but also to enhance the final product.



## AUTOMATION REMOTE CONTROL IOT INDUSTRY 4.0 BENEFITS

THEMIS WRT is managed by our “Genesis” software which allows it to be controlled even remotely. Operation is fully automatic and does not require the presence of a dedicated or specialized operator.

The machine meets all requirements for obtaining tax benefits according to “Industry / Transition 5.0” standards.



## SANITIZATION, STABILIZATION AND HIGH QUALITY

THEMIS WRT generates sanitized and stabilized output, ensuring a high-quality end product.



## VERSATILITY “TAILOR-MADE” DESIGN

THEMIS WRT is extremely versatile and can handle a variety of matrices. In addition, there is no standardized version of the machine, as the design is “ad hoc” to respond to each specific problem statement.



## MINIMUM OPERATING COSTS

THEMIS WRT operates under vacuum and requires simplified and scheduled mechanical maintenance. The energy requirement of the machinery is limited (especially in situations of connection to energy sources already available but usually dispersed such as hot water or steam flows) so that “opex” are clearly reduced.



## HIGH PROCESS SPEED

THEMIS WRT: the process takes extremely short time. The advantage in terms of execution speed differs depending on the nature of the matrix being processed, but in any case the time taken to obtain the final result is significantly less than that taken by any other technology currently available.



## REDUCED SIZE AND “PLUG & PLAY” MODE

THEMIS WRT can be easily installed even in confined spaces thanks to its limited size and skid-mounted structure.



## RECYCLING OF WATER AND TREATED PRODUCT

THEMIS WRT is the perfect application of the concept of Circular Economy: the machine transforms the original waste into distilled water that can be reused in various ways and into a treated product that can also be reused for different applications.

The benefit in terms of environmental sustainability is obvious, as is the economic benefit from the zero-emission of the material to be disposed of.



## ZERO EMISSION

THEMIS WRT operates in total absence of harmful emissions to the atmosphere, nor of sewage or unpleasant odors.



## DRASTIC REDUCTION OF DISPOSAL COSTS

THEMIS WRT ensures a drastic reduction in the volume of waste destined for disposal (in the order of 70%-90%) thus allowing to obtain enormous economic savings relative to the costs of landfill. Reducing the volume of waste generated also brings significant management and operational benefits.

# Why choose WRT ?

**A smart choice that ensures extraordinary results:** the ultimate solution for waste valorization, with cutting-edge technologies that set us apart from all other solutions on the market.

Choosing **Themis WRT** means relying on a **unique technology** that not only turns waste into a resource, but does so in a customized, sustainable and extremely efficient way. This is not only a plus in terms of disposal, the plant also enables **product valorization** through **multi-process treatment** - **evaporation, drying, granulation and blending** - that minimizes operating costs with the use of existing thermal carriers, thus ensuring access to rewarding regulations such as “*White Certificates*”.



## Ttraditional technologies

### ENERGY EFFICIENCY OF THE TREATMENT PROCESS

High energy consumption, especially in conventional dryers (rotary drum, fluid bed, belt) operating at high temperatures and with significant energy costs.

### REDUCTION OF WATER CONTENT

The effectiveness changes as traditional technologies reduce humidity but with high energy consumption, high temperatures and a final product of difficult valorization.

### OPERATING AND MAINTENANCE COSTS

Traditional technologies have high operating costs due to high energy consumption and maintenance need for periodic inter and the use of chemical additives further affect operating costs

### ENVIRONMENTAL IMPACT

Increased environmental impact due to high energy consumption and the use of high temperatures, which result in a waste of resources and inefficient thermal management. In addition, the management of the final residue can be complex and limit the possibilities for recovery.



## Themis

Optimized for energy savings thanks to low temperature operation. Leverage the recovery of heat vectors already available in the plant, reducing waste and operating costs.

High humidity reduction capacity without high temperatures, obtaining a residue with high dry contents, lower operating costs and optimal characteristics for valorization.

WRT technology ensures low operating costs thanks to low energy consumption and no chemicals. The maintenance requirement is minimal, thanks to an optimized design to reduce the wear of the components to a minimum. In addition, the high level of automation reduces human intervention, contributing to further optimization of operating costs.

Increased sustainability thanks to optimized energy consumption and no chemicals in the process. Operating at low temperatures reduces the overall environmental impact and allows for a more efficient use of waste, turning it into a resource rather than waste.



## Ttraditional technologies

### OPERATIONAL FLEXIBILITY

Limited to specific types of products, with the need for pre-treatments and adjustments to adapt to different matrices. Some technologies require dedicated settings for each type of material, increasing operational complexity.

### REUSE AND EXPLOITATION OF THE FINAL PRODUCT

The reuse of waste is often complex. The final product is generally regarded as waste rather than a resource, limiting the possibilities of recovery. In many cases, disposal is an additional cost.

### POSSIBILITY OF FINAL PRODUCT ADDITIVATION

Conventional technologies do not include the possibility of additive processing of the residual part during the treatment process. Any changes in material characteristics require subsequent treatments, increasing costs and operational complexity.

Traditional facilities are generally large, with complex installations requiring dedicated space and significant civil works. Any relocation or adaptation to new operational needs is costly and difficult.



## Themis

**Maximum flexibility in the treatment of liquid, semi-solid and solid matrices. The system is designed to adapt to different types of materials with minimal operational adjustments, ensuring greater versatility and management simplicity.**

**It promotes a circular approach, allowing the recovery of active elements and the valorization of the dry residue, transforming it into a by-product that can be reused for different applications, reducing waste and disposal costs.**

**WRT technology allows direct additive of the residual part during the treatment process, allowing the integration of enzymes, micro-organisms or other active agents. This feature improves the properties of the final material and expands its possibilities for use in various industrial and environmental applications.**

### SCALABILITY AND EASY INSTALLATION

**WRT technology, thanks to its modular and containerized structure, offers a simple and fast installation, facilitating the relocation and expansion of the plant. The system is easily adaptable to different production capacities and requires minimal infrastructure interventions, ensuring maximum operational flexibility.**



# Application sectors

WRT: custom-made solutions for every challenge

Themis WRT technology stands out for its exceptional versatility, making it the ideal solution for a wide range of applications. Thanks to its ability to manage different types of materials and processes, **WRT** is an indispensable ally for sectors that require innovative and sustainable solutions.



### SLUDGE AND INDUSTRIAL SOLID WASTE

Themis WRT optimizes sludge treatment from sewage plants, allowing a more efficient and sustainable management. The system is designed to reduce volumes and improve material stability, turning an environmental problem into a potentially exploitable resource.



### TANNING INDUSTRY

The WRT technology offers a valuable support to the tanning industry, successfully addressing the management of washing water. Thanks to its efficiency, the system contributes to the reduction of the environmental impact of a notoriously complex sector by recovering resources and minimizing waste.



### WASTE WATER

WRT technology is perfectly suited for waste water treatment, offering flexible solutions for energy recovery and reducing environmental impact. It is an ideal choice for public authorities, companies and industrial plants.



### LIVESTOCK

- **Digestate:** WRT optimizes digestate management, enhancing its energy and reducing environmental impact.
- **Farm waste:** WRT offers farms a sustainable solution for effluent management.



### DAIRY INDUSTRY

In the field of organic waste management, WRT is particularly effective at treating food waste. Because of its ability to extract value from waste, it allows waste to be transformed into energy resources or fertilizers.



### PHARMACEUTICAL INDUSTRY

In the pharmaceutical industry, WRT proves to be an indispensable technology for treating processing residues and contaminated wastewater, ensuring compliance with environmental regulations and reducing operating costs.



### FOOD INDUSTRY

The agribusiness sector, particularly the meat and fish industry, benefits from the adoption of WRT for processing waste management. The system helps improve operational efficiency and reduce environmental burdens linked to disposal.



### REFINERIES

Refineries generate complex wastewater with high concentrations of hydrocarbons, heavy metals, sulfides and other pollutants that are difficult to treat with conventional methods. Themis WRT technology solution allows these critical issues to be addressed by ensuring effective and sustainable treatment.

## INPUT MATRICES

THEMIS WRT deals with different types of matrix from various industrial sectors. For example: digestate, food waste such as whey and cooking broths, fish waste, sludge, DAF, waste water, leather processing and washing water, farm sewage.



## TYPES OF OUTPUT PRODUCTS

Treated matrices are processed into dry product of various sizes, which can be pelletized at the customer's request. Distilled water, that can be reused in various industrial processes, is also extracted.



# Research and innovation

The pillars of our business

**Themis WRT** technology represents an innovation designed to meet the specific needs of each customer. Our approach is based on a deep knowledge of the context and operational needs, ensuring optimal and customized solutions.

## A structured path towards excellence

We begin with an inspection of the customer's site, gathering detailed information on the type of waste and treatment methods which are already in use. These preliminary data allow us to virtually model the process thanks to our advanced proprietary software, that simulates waste treatment using **Themis WRT** plant. The simulation provides a predictive performance assessment, giving the customer a clear picture of possible operational benefits.

## Custom-made tests to confirm results

We then propose a practical test session using our pilot plant. This crucial step allows the virtual results to be validated, giving the customer the opportunity to directly verify the effectiveness of the system. During the testing phase, we process a waste sample, returning processed products such as distilled water and a small amount of treated solid residue, ready for analysis.

## Themis LAB support

The entire process is supported by our in-house laboratory, **Themis LAB**, a facility specialized in waste treatment-specific analysis and testing. Thanks to this laboratory, we offer an integrated consultancy and design service for waste management, helping customers optimize their disposal processes in operational and economic terms.

## Solutions for a sustainable future

Thanks to **Themis LAB** we are dedicated to the research and development of cutting-edge techniques for waste management and treatment. Here we analyze, test and refine innovative solutions with the aim of optimizing disposal processes and turning waste into resources.

**We don't just offer efficient treatment: we lead our customers towards more responsible, sustainable and cost-effective waste management ensuring concrete and measurable results.**

# Biotechnological Innovation

Enzymes and sustainability in waste treatment

**Enzymes** are highly specialized natural proteins capable of catalyzing essential chemical reactions with extraordinary precision and efficiency. In the biotechnology context, they are key tools for accelerating complex processes in a sustainable way, reducing energy consumption and the use of harmful chemicals.

Because of their peculiarity, enzymes can be selected to degrade or transform organic materials into useful compounds, playing a crucial role in many industrial sectors from food production to waste management.

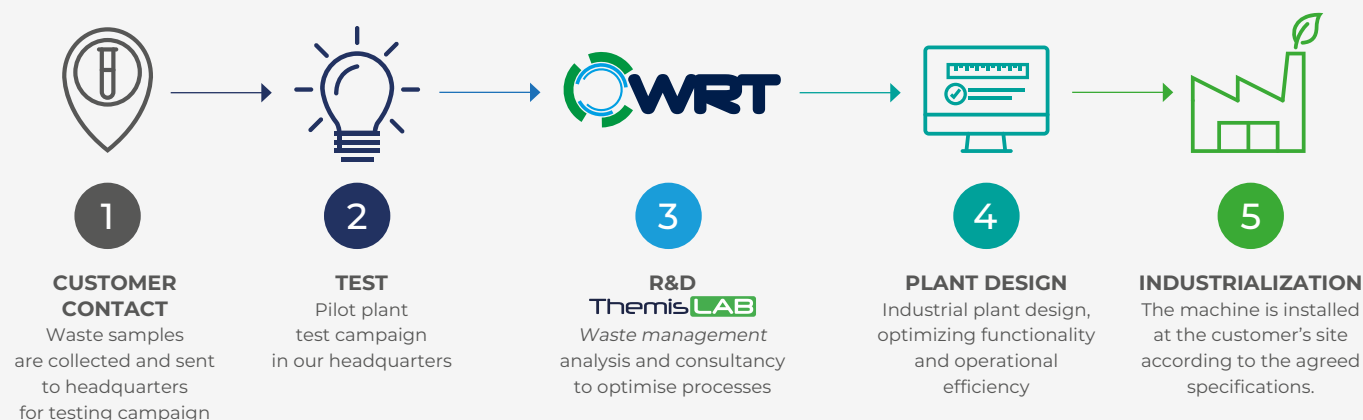
In organic and industrial waste treatment, enzymes facilitate the decomposition of complex substances, speeding up treatment processes and optimizing the **recovery of valuable resources**.

Their ability to selectively break down fats, proteins and carbohydrates accelerates the **transformation of waste into valuable resources**, improving recovery efficiency and reducing the environmental impact of by-products.

**In our patented Themis WRT technology, the enzymatic additivition takes place directly during the treatment process.**

This integration further improves the quality of final outputs, making them more stable and ready for **sustainable applications** such as the production of fertilizers and biostimulants.

Choosing advanced solutions such as those offered by Themis means not only optimizing industrial processes, but also actively participating in building a more sustainable future.







# Processes & data sheet

INDUSTRIAL WASTEWATER

COMPLEX WASTEWATER

SLUDGE AND INDUSTRIAL SOLID WASTE

DATA SHEET





# Industrial wastewater

APPLICATION  
SECTORS



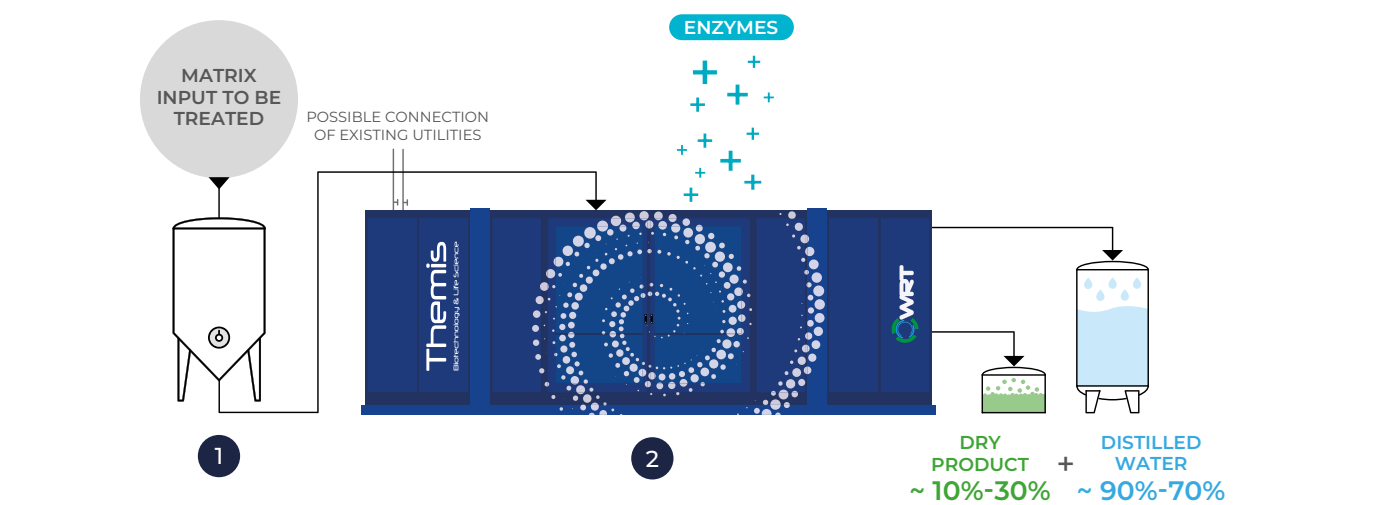
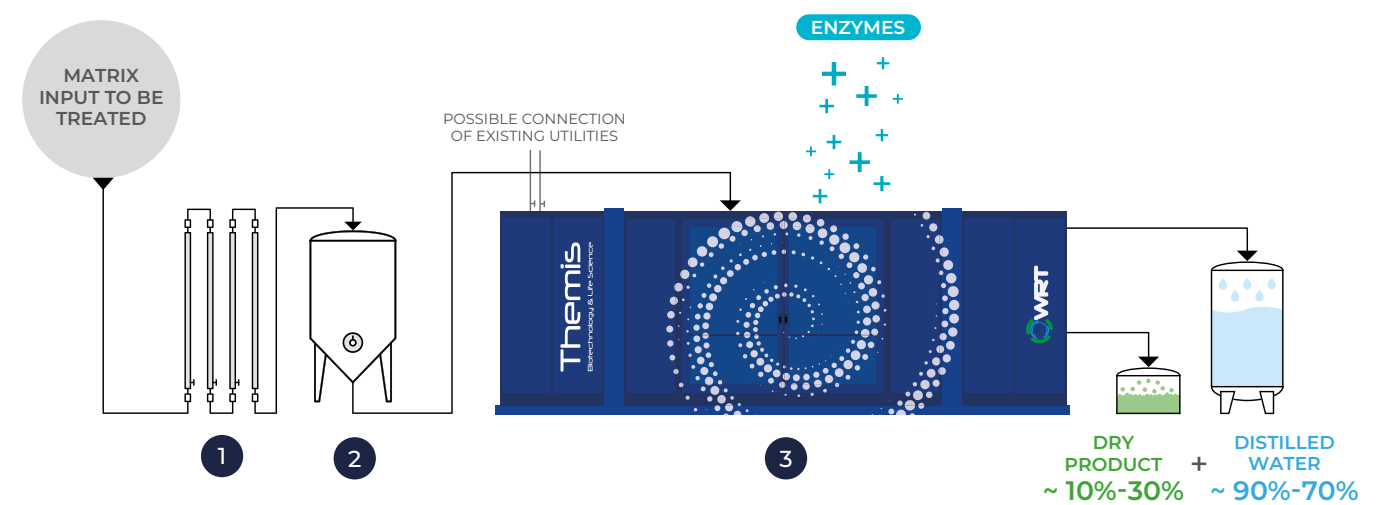
Themis' technological solution combines advanced filtration, evaporation, and concentration-controlled systems BY WRT, enabling recovery of treated water and optimization of wastewater management. In industrial settings, the system is set up according to a Zero Liquid Discharge (ZLD) approach, eliminating wastewater discharge and transforming residues into reusable by-products for a sustainable production model.

# Complex wastewater

APPLICATION  
SECTORS



Themis WRT technology solution can treat high salinity waste, chlorinated compounds, emulsified oils and persistent organic contaminants that conventional systems struggle to manage or fail to effectively treat. The system allows to reduce the volume until absolute dryness, with the possibility of recovering salts and by-products. Stage evaporation is optional, integrated only when necessary to optimize the process and reduce the volume entering the WRT system.



## PROCESS STEPS

- STEP 1 **FILTRATION SYSTEMS**  
Ultrafiltration (UF)  
Superfiltration (SF)  
Reverse osmosis (RO)  
UF and SF are used to remove suspended solids and contaminants. RO is used to refine the permeation for reuse.
- STEP 2 **STAGED EVAPORATION SYSTEM**  
for the reduction of concentrates coming out of filtration systems.
- STEP 3 **WRT SYSTEM**  
for dehydration and transformation of waste into distilled water and granulated dry material.  
+ **ENZYMATIC ADDITIVES** (optional)  
to transform the final granulate into a high added value product.

## ADVANTAGES

- RECOVERY OF PURIFIED WATER FOR INDUSTRIAL USES
- MINIMIZATION OF WASTE AND REDUCTION OF DISPOSAL COSTS
- MODULAR AND SCALABLE PROCESS, ADAPTABLE TO DIFFERENT INDUSTRIAL REQUIREMENTS
- SUSTAINABLE SOLUTION THAT IMPROVES ENVIRONMENTAL IMPACT

## PROCESS STEPS

- STEP 1 **PRE-TREATMENT WITH STAGED EVAPORATION**  
for the reduction of the input volume into the WRT system (optional).
- STEP 2 **WRT SYSTEM**  
for the drying of water to absolute dryness.  
+ **ENZYMATIC ADDITIVES** (optional)  
to transform the final granulate into a high added value product.

## ADVANTAGES

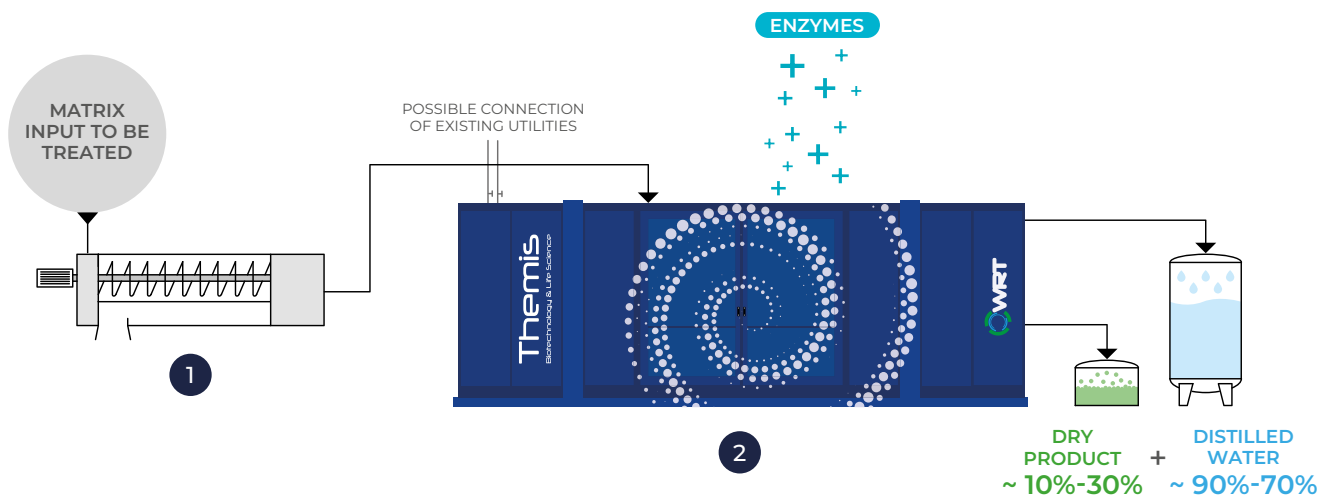
- ADAPTABILITY WITH OR WITHOUT PRETREATMENT AS REQUIRED
- RECOVERY OF SALTS AND OTHER USEFUL ELEMENTS
- MAXIMUM REDUCTION IN WASTE VOLUMES
- ENSURES RESULTS WHERE OTHERS FAIL (FILTRATION SYSTEMS NOT APPLICABLE, INSUFFICIENT OR FAILING BIOLOGICAL TREATMENTS)

# Sludge and industrial solid waste

## APPLICATION SECTORS



The Themis WRT technological solution allows sludge and industrial solid waste to be treated, reducing their volume and transforming them into easy-to-manage products. The system also allows the addition of elements to improve the features of the output product, favouring its exploitation as a resource. Thanks to this approach, the treatment contributes to the *End of Waste* process, enabling the valorization of residues for reuse in industrial, agronomic, and energy applications or in other contexts where the by-product can be valorized.



## PROCESS STEPS

- STEP 1** PRE-TREATMENT WITH SOLID-LIQUID SEPARATION SYSTEMS *(optional)*  
Screw-press  
Spin dryers  
Filter presses  
etc.
- STEP 2** **WRT** SYSTEM for dehydration and transformation of waste into distilled water and granulated dry material.  
**+ ENZYMATIC ADDITIVES *(optional)*** to transform the final granulate into a high added value product.

## ADVANTAGES

- VOLUME REDUCTION AND SIMPLIFIED SLUDGE AND WASTE MANAGEMENT
- OPERATIONAL FLEXIBILITY IN TREATING PRODUCTS WITH DIFFERENT CHARACTERISTICS
- SUSTAINABLE SOLUTION THAT REDUCES ENVIRONMENTAL IMPACT AND PROMOTES ENERGY RECOVERY
- ENHANCEMENT OF BY-PRODUCTS FROM AN END-OF-WASTE PERSPECTIVE

# Data sheet

		RANGE OF <b>WRT</b> SYSTEMS				
PARAMETER	UM	WRT 500	WRT 1.200	WRT 5.000	WRT 10.000	WRT 15.000
Total volume of the bioreactor	[ L ]	500	1.200	5.000	10.000	15.000
Treatment cycle duration per batch	[ h ]	8	8	8	8	8
Dry matter in the input product	[ % ]	20	20	20	20	20
Dry matter in the output product	[ % ]	80	80	80	80	80
Evaporated water per batch*	[ kg ]	30	80	300	520	600
Dry product obtained per batch	[ kg ]	50	120	500	1.000	1.500
Operating vacuum pressure	[ mbar ]	60	60	60	60	60
Thermal jacket temperature	[ °C ]	90	90	90	90	90

\* The performances shown in the table are indicative and refer to evaporative processes of water with leakage detector at a temperature of 80°C. The density variation, the viscosity and degree of dry matter of the treated material affects the actual performance of the plant.

# TOGETHER WE CAN.

With **Themis WRT**, innovation and sustainability come together for a better future.

Choosing **Themis WRT** means choosing a greener world: every act counts, every choice can make the difference.

*Themis WRT:  
because the future belongs  
to those who can transform it.*

**MAKE IT**  
*green*  
**AGAIN**





**Themis**  
Biotechnology & Life Science

Themis S.p.A.

Via Brescia, 13 | 20025 Legnano (Milan - Italy)

+39.0331.456228

[info@themis-industries.com](mailto:info@themis-industries.com)



[themis-industries.com](https://themis-industries.com)



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