



NP-bioTech

best-in-class technology for
biowaste management

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Why the initiative

With a world to 8 billion people and growing. Wastewater treatment requirements increases continually worldwide.

WWTP (WasteWater Treatment Plants) produces 2 mass flows:

1. Clean water, the main product, and
2. Sewage sludge, inevitable waste.

Sewage sludge is a threat to public health and the environment. As produce bad odors, toxic reactions, greenhouse emissions, water waste and pathogenic agents. Just to name a few.

But **sewage sludge** contains phosphorus, potassium, nitrogen compounds, micronutrients and organic matter, also. All these components are very important for agricultural and anti-desertification policy.

Can we continue with impunity to withdraw resources, transform them and then dispose of waste by incinerating or burying it, according to the **linear economy** approach, typical of an irresponsible consumerist system?



Why the initiative

This means economic, environmental and social costs for all citizens. So far the available technology did not properly meet these challenges. And did not fully achieves the goals for **Circular Economy**.

Which also requires a **cultural** and **mindset** changes.

So we need solutions able to drive game change. To push forward the *Circular Economy*. But, **HOW?**

NP-bioTech! The best of the expected solutions

NP-bioTech is a biotech solution that took this challenge with an eco-innovative approach leading a zero-waste, fully natural, sustainable, accessible, reliable, profitable, and environmentally-friendly technology.



CIRCULAR ECONOMY

Why the initiative

The result of the initiative is a patented industrial product and process. It is a disruptive **waste-to-fertilizer** technology.

Best-in-class among the available techniques to properly manage critical biowaste, such as Sewage sludge

It is a zero-waste industrial process, with incomparable features. Such as, no odors, nor pollutants emissions, and low consumption of primary resources. Along with low investment costs and many others advantages.

The heart of the innovation is a fully natural, biological catalyst, containing microorganisms that also work under unfavorable conditions.

NP-bioTech technology dramatically reduces all costs. And has been successfully tested in operations run with some of the most problematic sludges; Urban & industrial sludges and digestate. Since 2014, it runs process in industrial ambient.

On top that, when the sludge does not contains high rate of metals, the final product is a high-value fully natural fertilizer, ready for the market.

Today, NP-bioTech is able to globally provide game-changing solutions.



The advantages for customer & market

Industrial:

- Plant simplicity and reliability at the start of the process.
- Modular approach => easy expansion of the productive capacity and a wide application flexibility.
- Industrial process resilience and consequent wide spectrum of application
- A breakthrough innovative technology, the heart of the process is a biotechnologic catalyst, recovered and returned to the production process.
- Pre-treatments on incoming biomass are not required.
- Possibility to apply the technology also to existing plants.
- Strong weight reduction, even over 90% of the incoming biomass.
- Stabilization Process is much faster than existing technologies.
- Process control in remote.
- IP - the technology is covered by national and international patents

Social:

- The absence of significant odor emissions improves social acceptability.
- Technology fits into the industrial ambient, where biowaste is produced, making the production cycle zero-waste. This makes it consistent with the concept of Circular Economy.

Economic:

- Low investment cost (CAPEX)
- Low O&M costs (OPEX), such as energy, personnel, consumption of primary resources.
- Product with low humidity (15÷40%) depending on market requirements.
- Excellently biostabilized and pasteurized that allows a wide application (agriculture, energy, etc).
- Easy placement of the product on the market as an organic fertilizer or as a secondary solid fuel (CSS), achieving a Waste-to-Fertilizer conversion
- Recovery of critical raw materials such as phosphorus for agricultural uses

Environmental:

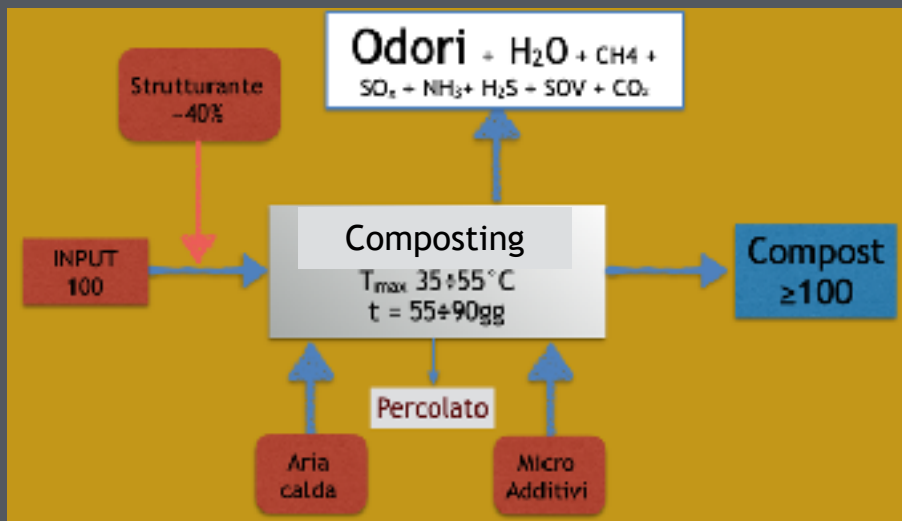
- Significant reduction in odor emissions, well below legal limits. Absence of waste production, such as leachate
- No significant emission of pollutants, well below the legal limits, without device to air purification systems.
- Degradation of organic pollutants, including persistent micro-pollutants (POPs) such as PCBs (polychlorinated biphenyls), dioxin-like.
- Total destruction of pathogens
- Fully coherent with EU Regulation of fertilizing products

NP-*bio*Tech - NARDO Process BioTechnology

NP-BioTech is a very fast fermentation process achieving pasteurization conditions ($T > 70^{\circ}\text{C}$)



Traditional Composting vs. NP-bioTech

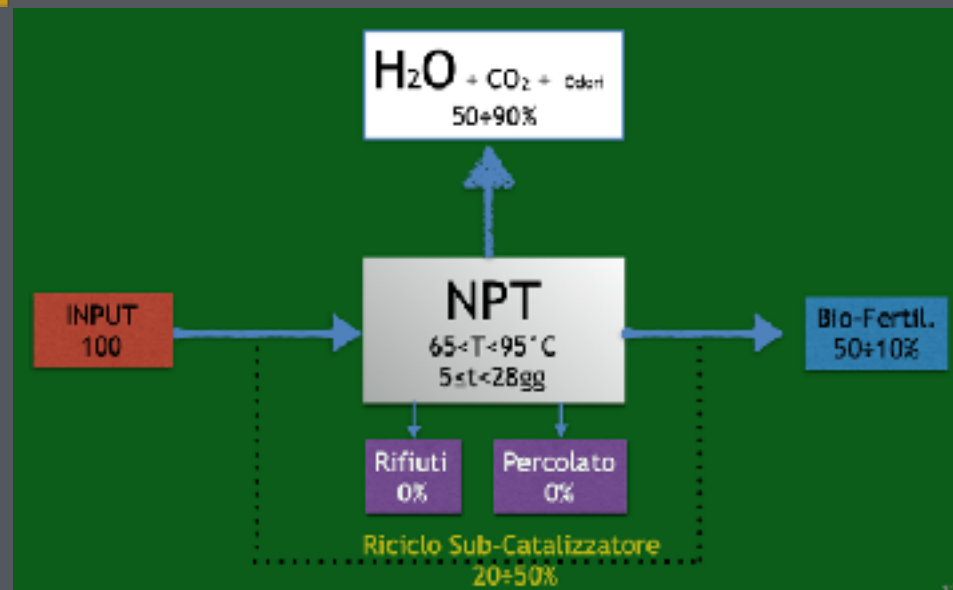


Open issues and constraints of traditional composting process:

- Input Biomass humidity <65%
- Need to add structurant/bulk
- Unwanted leachate production
- Stink emission
- Overall long fermentation time (usually 1÷5 months)
- No biomass weight reduction
- Unsatisfactory degree of biostabilization of the final product

NP-bioTech fix all issues:

- Input biomass humidity <95%
- No structurant/bulk needed
- No leachate production
- No odor emission
- Overall fermentation time 7÷30 days
- Biomass weight reduction ~80%
- Final product well-stabilized and pasteurized
- Bio-Catalyst is separated from product and recycled into process



The advantages for the customer & market

The distinctive features of the competitive offer of NP-bioTech

- The proposed technology is unique in its kind (patents)
- It is a technology capable of giving the customer an industrial, economic, environmental and social advantage that is difficult to fill
- Puts out existing technologies
- Combines economy and extraordinary effectiveness.
- It solves most of the problems attributed to biowaste
- NP-bioTech can be sold turnkey, it can be rented for a long time, it can be inserted in existing plant contexts, too!
- Process assistance contracts or management for third parties (supply and operation) are offered

The competitive environment

- The presence of national and international patents is already synonymous with a unique process of its kind.
- Experience gained since 2014 in industrial ambient for citrus fruit scrapes and sewage sludge deriving from the WWT.
- Technology applied to materials that are difficult to manage by nature.
- Experience from 2018 on sewage sludge of various kinds (urban, industrial and anaerobic digested) at an authorized waste management platform, documented by laboratory tests and certificates.
- It pushes the transition from the linear economy to a circular economy accordi a biowaste-to-fertilizer conversion.
- Application of flexible and modular technology.

The claims contained in the patents concern the plant approach, the fermentation process, the catalyst and the product

- First Italian Patent released in February 5 2015, n. 0001419537 (application submission date August 5, 2013) in the name of dr. Industrial Chemist Fabrizio NARDO
- US Patent No. 10,167,237 B2. Date of Patent January 1 2019 in the name of dr. Industrial Chemist Fabrizio NARDO
- Second Italian Patent No. 102016000100382 released in March 4 2019 (Date of application Oct. 6, 2016) in the name of dr. Industrial Chemist Fabrizio NARDO Fabrizio NARDO, dr. Chemist Engineer Bruno. C. NARDO.
- International patent application WIPO PCT/IB2014/001469 (filing date 29.07.2014) in the name of dr. Industrial Chemist Fabrizio NARDO
- EPO Application No./Patent No. 14777766.8 - 1375 (filing date 27 Jan. 2016). Approved and on going to release in the name of dr. Industrial Chemist Fabrizio NARDO



Thanks!



A simple, low-cost, accessible, reliable and natural tool able to transform the way we live in produce and consume

NP-bioTech transforming waste into solutions