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info@ce.eco

mining
CYANIDES

how to heal a serious wound made to our planet
obtaining something useful

01/07/2025 *(dd/mm/year)*
technology introduction

something about us

We study and develop, on industrial-scale, systems capable of transforming the causes of pollution into a source of wealth.
Our patents range from the denaturation of asbestos to the treatment of almost every type of waste, from water purification to the production of aluminum without waste.
What's the point of devastating the environment around us to collect a few crumbs of resources when we can use our technologies to live great and achieve anything in a sustainable way?

Our goal

Since we don't have a second home were to go, we need to make our planet more livable without stopping technological development!
Our goal is to make our planet more livable without stopping development.
For this reason we have developed industrial systems that transform the causes of pollution into an immediately usable source of opportunities: low-priced raw materials ready to be reused through further sustainable processes.
Let's protect nature without stopping progress!

Smartly sustainability

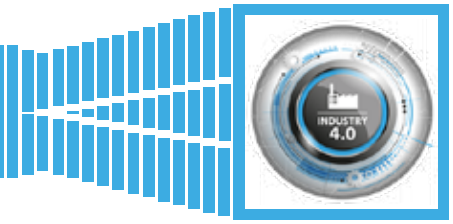
Mission:

- **Social progress**
- **Clean environment**
- **Wealth production**
- **Sustainable Development**

introduction

The current evolution of mining passes thorough the abandonment of methods that are dangerous for man and the environment, such as the use of mercury and cyanides, to get to Borax, a modern and harmless method, which also allows a better yield in recovered gold.
Therefore, we have followed two guidelines: looking for better a system to solve the breakdowns of the old technology and developing an innovative systems with almost no environmental impact.
All while the first goal was trying to improve the conditions of workers and of the environment.
With regard to cyanide, we have developed a continuous cycle system able to erase all of it while producing a salable, ammonium carbonate, marketable on the market or isolate and and put the individual elements in cylinders if the plans don’t concern the creation of a chemical processing plant.
This system completely avoids the formation of cyanide lakes near the mines.
In another instance, the same system can help, on a case-by-case basis supported or not by other machinery, to eliminate the already existing cyanide lakes.
The elimination of the cyanide lakes also involves our teams of geologists in the first instance, as it will be crucial to verify, by taking the necessary remedies and implementing the necessary precautions, if the surface waters have polluted the underlying aquifers.
We are able to provide, if necessary, a complete soil washing to be carried out on specific contingent needs.
We can also deal with radioactives tracers.

who we are...



We born close to the COVID pandemic. We immediately became a meeting point for numerous professionals, research institutions and production companies. All this started in Italy and is now spreading to other countries.

Often our projects precede the times of several years.

Our proprietary technology is totally innovative **but consolidated** and is essentially based on: cavitation, gasification and Coanda effect.

After having implemented and made the above more effective, we have adapted it to everyday life by creating complete processes whose application increases both the quantity and quality of the products obtained, decreasing energy requirements but paying great attention to the creation of a greater number of jobs compared to those eliminated by mechanization.

In addition to the real innovations, we are specialized in engineering and then applying improvements of technologies, mature in their field, to other areas often obtaining, this way, several real technological leaps simply because we had the courage to do what was before under everyone's eyes but no one dared to put it into practice.

We develop technology both independently and in collaboration with Universities (Sassari, Perugia, Amsterdam, Algarve, etc.) or with other public institutions (for example the National Research Center - CNR, Fundación Circe etc.).

We boast a vast proprietary product portfolio with several pilots viewable, by appointment, and several completely innovative process lines.

Some of our products have been defined extremely innovative and promising at international events by panels composed of scientists from all over the world. Our technology and our demo site have been deemed valid and usable in several Horizon Europe projects.

Our patents and innovations have made us immediately designate as members of technology suppliers within the Italian Biogas Consortium.

We have a framework agreement with RINA Consulting - Centro Sviluppo Materiali S.p.A. which allows us to request their supervision and therefore also to certify the production and engineering phase of our products wherever we choose to produce them. Therefore, choosing us also gives access to all the wealth of experience and technology gained in over 70 years by Centro Sviluppo Materiali which, I remember to everyone, was since its establishing the research and development department of IRI (Institute for Italian Industrial Reconstruction, among the top 10 companies in the world by turnover up to 1992).

Numerous specialized industrial plants, centres of excellence on their specific sectors, have made the production slots we need available to us; we are equipping ourselves with proprietary factories to carry out final assembly and to start specific productions.

We are present with companies in numerous European countries. We are opening companies in several African countries and in Asia. We have projects underway in various European, African and Asian countries. Our international staff represents our essence: motivated people with a wealth of personal experience who believe in what they are doing and who come from many different countries. In every nation in which we appear we respect local customs and traditions, bringing a bit of Italianness to the place and "*stealing*" part of their culture to ensure that no one is a ***Stranger in a Strange Land***.

Dr. Bruno Vaccari

… and what we do

- BIOZIMMI
- EMPOWERING DEVICE
- ZEB
- BIODIGESTERS
- FROM HEAT TO ENERGY
- THERMOELECTRIC PANELS
- ASBESTOS DENATURATION
- GASIFICATION & PLASMA
- INERTIFICATION
- WEEE
- UREA & AMMONIA
- FOOD PROCESSES
- HOSPITAL EQUIPMENT
- SOIL WASHING
- WATER TREATMENT
- WTE & WTC
- DESALINIZATION

OUR MAIN GOAL: environment and workers' conditions respect

our core team

Bruno Vaccari

CEO

Sabrina Saccomanni

LAWYER

Fabrizio Di Gennaro

CMO

Antonio Demarcus

CTO

Paolo Guastalvino

CIVIL WORKS

Gianni Deveronico

LEAD ELECTRICAL ENGINEERS

Faris Alwasity

ENGINEERING

Massimiliano Magni

ENGINEERING

Antonio Piserchia

COMMUNICATIONS EXPERT

Barbara Spelta

LAB

Papa Ndiamé Sylla

COO Senegal

Noel Sciberras

COO Malta

Appiah Fofie Kwasi

COO Ghana

Eugen Raducanu

COO Romania

Awa Khady Ndiaye Grenier

COO Guiné-Bissau

Giorgio Masserini

Marketing

Pantaleo Pedone

Italian energy-intensive

Gianluca Baroni

Hospital Stuff

Stefano Diambu Nkazi

Marketing

Sarr Alioune Badara

Marketing

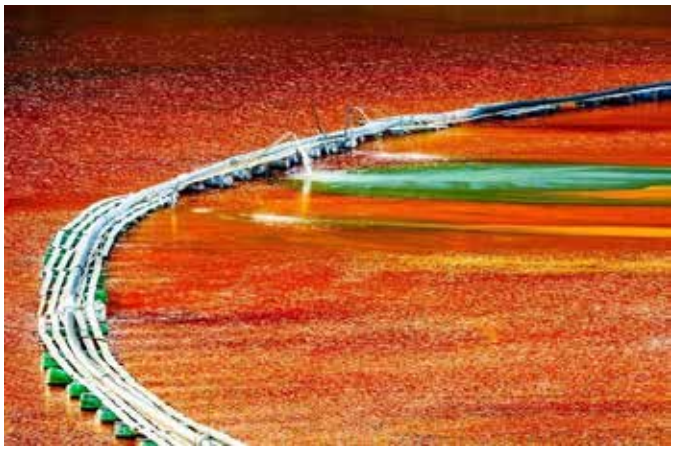
Jérémie Saltokod

CCIMRDC Italie

how we remove cyanides

We followed two guidelines: look for a system to solve the failures of the old technology and develop innovative systems with almost zero environmental impact. All trying to increase the yield for the owners and improve the conditions of the workers.
Our cavitation device, the **EMPOWERING DEVICE**, triggers an oxidation reaction of cyanides typical of processing in gold mines, by mixing the waters by cyanides with CO_2 and compressed air, inside a special controlled cavitation system that allows the molecules to come into contact with each other, with the others with great ease and speed.
If should be a case where the aforementioned reaction could not self-sustain, then in the presence of particularly difficult to treat pollution, the liquids will be further added with pure oxygen, taken from the atmospheric air through a package sub-system membranes connected to the cavitator. The nitrogen will be separated, taking advantage of the different elution speed of the two molecules making up the air, and subsequently recovered to be used in maintenance, in safety devices and the remaining, if bottled, could also be sold on the market.
In extreme cases, a mixture of ozone will be introduced into the cavitation device which, thanks to the nascent oxygen, will completely oxidize any residual cyanides.
In sequence, the chemical reactions obtained within our apparatus are the following:

- the mixed air in intensive mode, with priming of a small initial amount of CO_2, evaporates the HCN and oxidizes it in the much less toxic HOCN;
- with further supply of air / oxygen / ozone, the reaction continues to form other CO_2, necessary to self-sustain the reaction, and ammonia;
- lastly these two molecules react by producing ammonium carbonate and causing the disappearance of cyanides in the water.



Ammonium carbonate is a crystalline salt that is neither dangerous for man nor for the environment, not explosive, easily separable in a desiccator / crystallizer - even a simple vibrating tape with hot air blowing - and is subject to safe sale on the market being an intermediate for the chemical industry.
The progress of the reaction and therefore how much cyanide is still present in the waters are kept under control and followed by titrating the samples taken with sodium permanganate.
The success of the water purification polluted by cyanides is practically total.
The whole plant can be installed in containers to be easily transported to the edges of cyanide ponds.
In inaccessible areas, difficult to be reached, a little gasifier fueled by pawlonia to be planted nearby can excellently provide part of the electrical energy necessary for the operation of various devices as well as the production of CO_2, in the desired quality, directly on site.
The other plants (bottling, extraction of gas from the atmosphere, production of electricity, bagging of salts produced, etc.) will be entered in other specially designed containers.

“soil washing”

The so-called “*soil washing*” consists in excavating the contaminated soil and treating it in a plant to reclaim it, possibly without moving it.
The technique is based on the principle that the contaminants are conveyed through the finest particles present in the soil fractions and espacially to these is carried out a real washing with water, aqueous solutions of surfactants, biosurfactants, or with organic solvents.
In the worst case scenarios, the soil can be treated within gasifiers or plasma torches.
In other cases, but it is a practice that exposes to risks of different nature, it is possible to use genetically modified micro organisms capable of attacking and therefore eliminating a specific kind of problem.
With regard to the washing of polluted soil, a careful study of the problem of the soil to be worked in order to determine the most correct reaction to be applied will be conducted in the laboratory.
The soil will be introduced into our apparatus where it will be treated, transformed into aqueous slurry, with specially developed Chemicals (alkaline phosphate solutions) with a ratio of 4 gr of soil and 40 ml of extracted solution.
The reactants will subsequently be separated from the solution by centrifugation and filtration.
With this initial process it is possible to recover any arsenic present.
By lowering the pH of the Chemicals used and increasing the concentration of the extraction solution, other metals such as Copper, Zinc, Lead, Nickel, Aluminum, Manganese, and Iron can be extracted.
Once the preponderant part of the polluting agents has been eliminated, the soil is **reactivated by specially selected microorganisms**, which complete the purification revitalizing it, and making it usable again.
If traces of cobalt artificially radioactive are found in the ground, the ground will be treated with a plasma torch, specially shielded for radioactivity. Here cobalt will lose its radioactive charge and can be recovered and then reused in the foundry.
The same plasma torch can be used, in any case, for the recovery of gold from sands, instead of using ovens, with clearly improved results.

EMPOWERING DEVICE

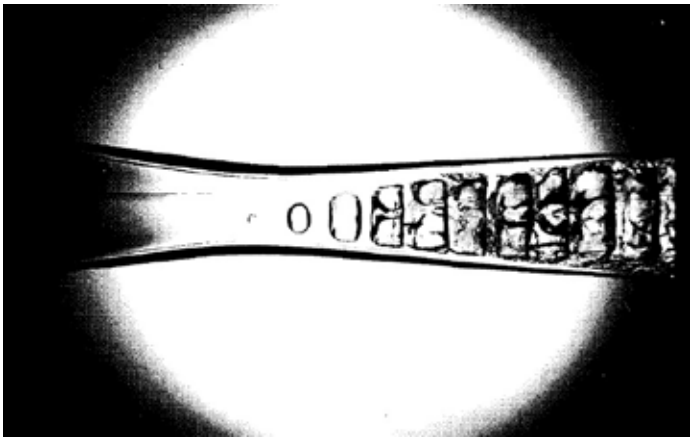
EMPOWERING DEVICE has been fully conceived, developed and implemented by our team and is able to simultaneously manage different types of controlled cavitation, of which 5 of a different nature but which coexist harmoniously to the point that no significant vibrations are detected.
The summation of the effects produced by each cavitation further implements the efficiency of the chemical, physical and biological processes that take place within the apparatus, resulting in a subsequent cut in the already low energy consumption as well as a sharp reduction in processing times.
A prototype with a special set-up, prepared for experimentation and of 1:1 size, has been used by us since the beginning of 2017 to conduct the required tests on the samples of materials brought by our customers.
Our machinery is equipped with test certificates and international operating certifications with different types of liquids on different chemical, physical and biological processes.
What makes our system, today, unique compared to what the market offers in the field of controlled cavitation is the fact that although it is already extremely difficult to control a cavitation, in our system there are controlled cavitation's numerous and of different kinds, at least one of which is sonic.
The machine body has an element, with the functions of a static mixer, called by us "Il Cedro" (the Cedar) for the peculiar conformation of the "leaves" that make up its design.

This special monobloc mixer, in the presence of processes that involve the formation of crystalline chemical elements, has the ability to favor the formation of Crystallization Germs, with further acceleration of chemical reactions.
Another significant improvement compared to what has existed so far is represented by the evident lower pressure drops compared to machines equipped with motors of similar installed power, with a sensible and consequent energy savings during operation: the **EMPOWERING DEVICE** requires only a fraction of the electrical energy used by the other cavitators.
This is due to the fact that the machine body of the **EMPOWERING DEVICE** is structured to form a true "diffuser", with the consequent recovery of a percentage of the outlet

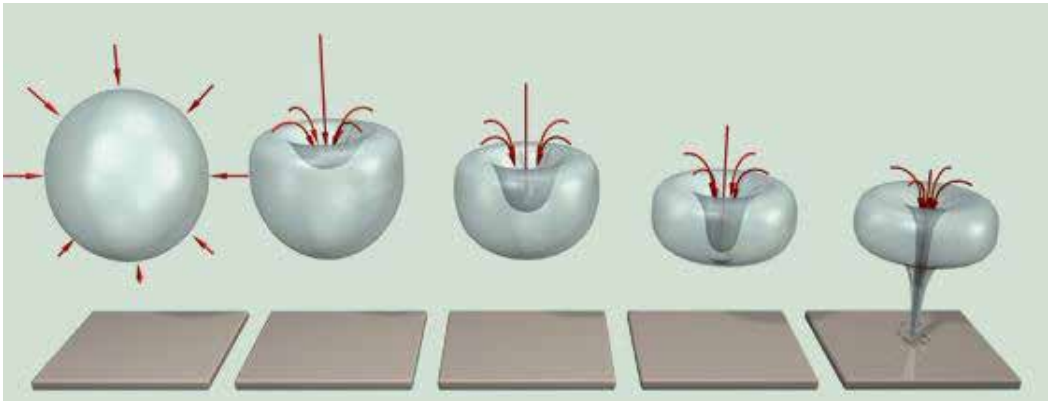
pressure.
Furthermore, it has been designed to be easily and quickly reconfigured according to the use: some of its parts can be removed if very dense and / or viscous liquids have to be treated and / or with extensive granularity or they can be added, inlet or outlet, accessory elements suitable for almost any use.
Moreover, in the presence of organic matter, cavitation leads to the consequent partial physical destructuring, a lysis of the cell walls and the consequent release of the intracellular content.
This action translates into a greater availability of cellular juices, an acceleration of hydrolysis processes and, consequently, an acceleration of the anaerobic digestion process as a whole.
In our cavitator, based on experiments conducted and certified by third parties, the rate of bacterial degradation can accelerate from 4/5 times to over 10 times compared to conventional treatments.
The certifications performed by the Rina Group show that the COD of the waste water from a gasifier is reduced by 90% in just 15 minutes.
By using the supplied inverter system, at the start, consumption is less than the 25kWh of rated installed power, similarly during full use; in the absence of an inverter, at least 36kWh would be required to start.
The standard version can treat up to 60 cubic meters of fluid per hour.
Compactness, simplicity of installation and use, are undoubtedly some of the peculiarities of our cavitation apparatus but it is the total flexibility of use that makes it unique.

SAMPLE	COD mg/L
AS IS material	15.380
after cavitation material	1.508
COD reduction percentuage	90,2%

cavitation



Water has the ability to convey many substances thanks to its particular chemical and physical properties: very high solvent power, high chemical reactivity and considerable specific heat. Moreover, its molecular capacity, two hydrogen atoms bound to an oxygen atom, allows it to behave like a crystal: not only in the solid state (ice) but also in the liquid state.
Cavitation applied to water acts mainly on this characteristic.
Through the violent implosion of the bubbles, it causes the release of nascent oxygen, allows the elimination of viruses and bacteria present; furthermore, it supports the magnetic conversion of calcite (responsible for the formation of scale) insoluble in soluble aragonite and not able to aggregate in the formation of limestone.
Finally, since the molecular structure of water is not uniform, the distance between the molecules is never the same, nor is the reciprocal attraction force; there are therefore areas or points of emptiness or pockets of gas (oxygen, nitrogen) and foreign bodies, sometimes not totally wet.



As the pressure decreases, the air pockets expand, the liquid evaporates and the steam fills them. The subsequent phase of implosion violates the oxygen, which can thus exert all its oxidative action on the surrounding organic substrate, mimicking the action of hydrogen peroxide.
Another fundamental aspect of cavitation with respect to all other water purification and filtering treatments consists in the fact that with cavitation they are the same water molecules that, after the implosion phase, assume a homogeneous crystalline configuration, which gives the water the original characteristics of the formation from the source.
Therefore, unlike the other treatments applicable to water, nothing is added or removed, such as ion exchange resins for inserting and subtracting ions or magnetic filtering to subtract iron, but on the contrary it is amplified and enhances the natural ability of water to biodegrade and break down pathogens by oxidation.
Furthermore, our equipment also includes an ozonator that further enhances the oxidation of any pollutants present.

gasifiers

Our system consists of a fluidized bed rotary furnace combined with a plasma placed in the queue for the vitrification of the aggregates. Schematically the rotating tube can be divided into three zones: in these three different reactions can take place. Furthermore, the system that supplies the oxidant for the reactions can be installed at will in one area or another allowing the differentiation of application mentioned above. The type of oxidizer can be air, oxygen or water vapor and the entire tube can be brought to operating temperature using gas torches.

If a process based on **combustion** was necessary, we would place the system that provides the oxidant for the reactions in the first part of the tube thus providing an excess quantity of air and thus favoring the combustion of the organic material - understood as a substance carbon base. Depending on the needs, the system that supplies the oxidant for the reactions could instead be placed in the final part of the tube: by heating the tube it allows pyrolysis to be obtained in the first part, reduction in the central part and combustion in the final part. The resulting products of the entire process are ashes which will be vitrified and then inertized using a plasma placed at the end. The heat generated can be used for the production of electricity. If the air is supplied in the first part, all the heat is supplied by the material to be treated.

If a process based on **pyrolysis** is necessary, the tube will be heated using gas torches and brought to a temperature of 500-600°C depending on the material to be treated. The resulting products are bio-oil (similar to diesel produced with the Fisher-Tropsch reaction), coal and gas, the latter can be used to heat the system. In this case there is no oxidizing agent and the organic molecules are split thermally.

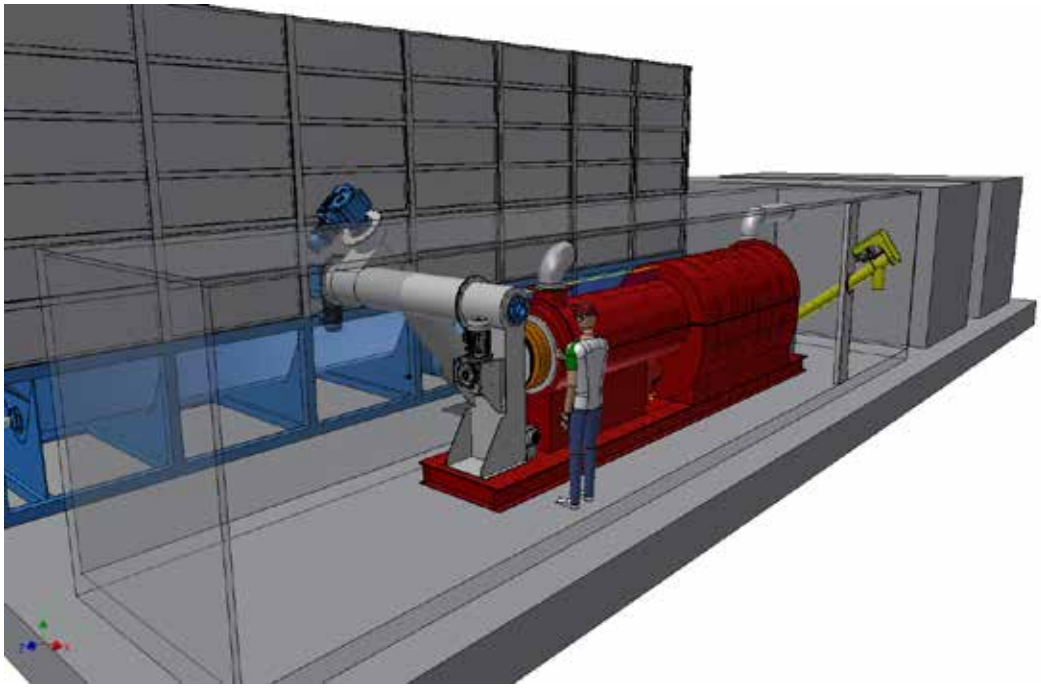
If a process based on **gasification** is necessary, the system that supplies the oxidant for the reactions will be positioned in the central part, the quantity of oxidant will be stoichiometric, the tube will be heated to the reaction temperature, i.e. above 900°C.

With this treatment process the main product obtainable is syngas.

The degree of purity of the gas depends on the oxidizer used. By using air, the gas that will form will have a high percentage of nitrogen which will lower its calorific value; using steam, the gas that will be formed will have both high calorific value and purity, allowing easy use of the gas for the synthesis of chemicals; using oxygen instead, the gas formed will have median values.

In the first part of the tube we will have pyrolysis of the material, in the central part there will be partial oxidation and in the final part there

will be a reduction of the gas produced.
The system is particularly flexible, this allows it to treat multiple materials and the ashes produced are vitrified and inertized through a plasma which transforms them into lava. In addition to eliminating the ash problem, this purifies the syngas and increases the percentage of hydrogen present through dry reforming of the methane present in the mixture.
The bed is fluidized by the rotation of the cylinder and by the particular geometry of the system which provides the oxidant for the reactions which, exploiting the Coanda affection, creates a vortex which in addition to pushing the gas forward, offers a more intimate contact with the oxidant itself and, therefore, better efficiency of the system. The rotating drum and the dispenser guarantee the fluidity of the system, ensuring temperature homogeneity; in fact, temperature gradients could create serious problems such as the creation of harmful substances such as, for example, dioxins and furans.
Unlike other systems that can be used for treatments, these are systems of decidedly small dimensions but with very high energy efficiency: in fact the combination of various jumps and the use of high efficiency turbines, as well as the use of our thermoelectric system for the recovery of waste heat allows obtaining an electrical efficiency of up to 65%.
The small dimensions, far from representing a limitation of the rotary kiln, are one of its strong points: since the systems are modular, only the equipment necessary for the treatment will be used.
The system developed by us, when compared with other systems, has numerous advantages. First of all, each plant is containerized and therefore modular and expandable according to treatment needs; at the same time, however, it can be used for small quantities of material, maintaining high efficiency from both an energy and environmental point of view. During chemical reactions we have a very high control which guarantees the formation of unwanted molecules.
The gasifiers take advantage of the molecular dissociation, called pyrolysis, used to directly convert the organic materials present in the waste into gas, by heating, in the presence of small quantities of oxygen.
The processed materials are completely destroyed because their molecules are dissociated. This process allows, if compared with the direct burning, a number of significant



advantages:

- increased fuel usability;
- use of relatively simple and tested technological solutions;
- higher energy efficiency;
- definitive Destruction of such waste;
- No contributions in special landfills;
- No harmful emissions;
- Production of steam and then of demineralized water from its condensation, with easy addition of saline charge additives for water purification;
- Possible production of Chemicals, primarily methanol, usable in automotive engines or sold on the market;
- Low visual impact.

The synthesis gas, even when of a low calorific value, once filtered and purified, can be used for the feeding of a cogenerator, thus enhancing the calorific value of the organic matrix used and can be contain costs simultaneously producing electrical and thermal energy, or it can be used for the production of reusable chemicals.
We also have **small size gasifiers**, with a lower system capacity than the one of a single standard reactor. These represent the ideal size for the needs of the so-called **circular economy**.
Our gasifiers have been developed in collaboration with the **RINA Consulting - Centro Sviluppo Materiali spa**, a subsidiary of RINA Group, also on the basis of their previous studies. In their industrial area in Rome - Italy -, there is a pilot that can be visited, fully equipped also with a plasma torch.
Our gasification system involves the use of drying systems for pre-treating the incoming material or matrix. The dryer is fed through the process' heat and allows to bring the input humidity of the matrix by the value of the conferral (normally value between 70% and 30%) to, approximately, 10%.
The matrix is dried in this way, is transported inside the reactor, where it is raised to temperatures ranging from 400 to 650° C, by recovering the heat generated by the same syngas and by the same gasification process that takes place in the last part of the reactor where the temperature rises up to 1,200° C. The matrix / waste is thus subjected, rapidly, to total drying, pyrolysis and consequent gasification.
Said produced gas (syngas) will be sent, after having been properly washed and purified, to the turbine. In the absence of a plasma torch it is not possible to reach the zero emissions level but, in any case, these will be below the levels allowed by the various national regulations.
The use of syngas will produce thermal kW and electric kW. Part of the produced electricity will be used for the process.
Thermal energy can in turn be partially transformed into electricity.
Once the gasification process has taken place, the only resulting waste product is the ash, on average about 5-10% of the matrix entering the gasifiers.

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Via La Louviere 4, 06034 Foligno (PG) — Italy — IVA: IT11188490962