



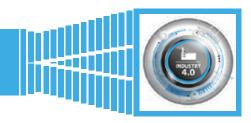
SUGAR

EMPOWERING DEVICE





something about us



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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?



Smartly sustainability

Mission:

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

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!

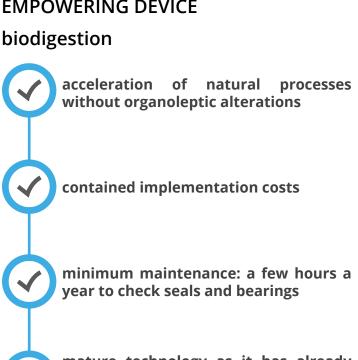


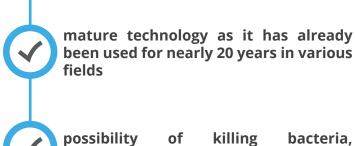
introduction



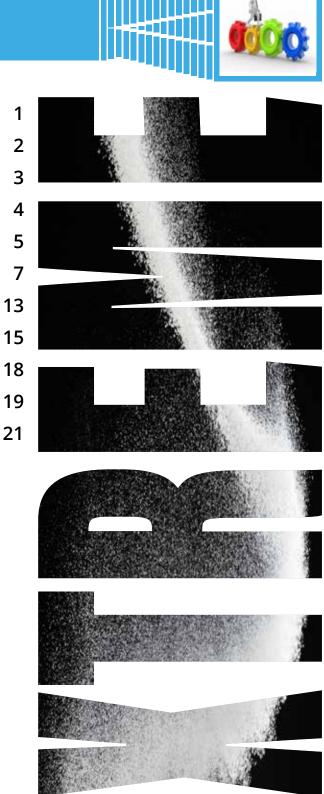
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something about us
introduction
who we are
and what we do
our core team
the process
crop cycle
why is it so innovative?
cavitation
EMPOWERING DEVICE
biodigestion





microorganisms, viruses and pathogens



who we are...

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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**.

Brun Vaccanii

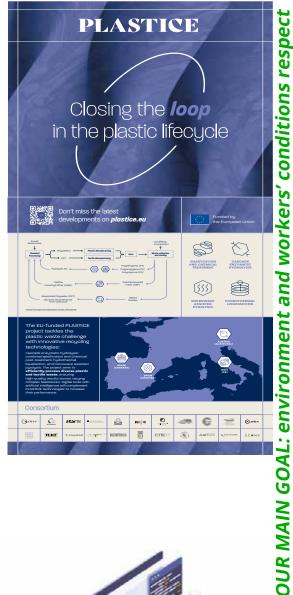


... and what we do



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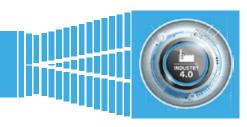
- BIOZIMMI
- **⇒** EMPOWERING DEVICE
- → ZEB
- **→ BIODIGESTERS**
- → FROM HEAT TO ENERGY
- → THERMOELECTRIC PANELS
- ASBESTOS DENATURATION
- → GASIFICATION & PLASMA
- INERTIFICATION
- → WEEE
- UREA & AMMONIA
- **→** FOOD PROCESSES
- → HOSPITAL EQUIPMENT
- **SOIL WASHING**
- → WATER TREATMENT
- **→ WTE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







our core team



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Bruno Vaccari



Sabrina Saccomanni



Fabrizio Di Gennaro



Antonio Demarcus



Paolo Guastalvino
CIVIL WORKS



Gianni Deveronico



Faris Alwasity

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Appiah Fofie Kwasi



Sarr Alioune Badara

MARKETING



Eugen Raducanu

COO ROMANIA



Jérémie Saltokod

CCIMRDC ITALIE



Awa Khady Ndiaye Grenier



Giorgio Masserini

MARKETING





Pantaleo Pedone

ITALIAN ENERGY-INTENSIVE



the process

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Sugar beets are harvested from the fields and delivered to the sugar refinery, where the batches received at the plant are assessed for their composition. The approximate values are as follows: water 75%, dry matter 25%, total soluble substances 20%, sucrose 16%, non-sugar soluble substances 4%, nitrogenous organic matter 1.8%, non-nitrogenous organic matter 1.4%, mineral substances 0.8%, total insoluble substances 5%.

Processing plants are designed for economies of scale, extracting sugar from large quantities of product. Therefore, the industrial complexes are of significant size, as evidenced by the aerial views of this industrial plant located in Italy.

Sugar beets are harvested from the fields and delivered to the sugar refinery, where the batches are assessed for their composition. The approximate values are as follows: water 75%, dry matter 25%, total soluble substances 20%, sucrose 16%, non-sugar soluble substances 4%, nitrogenous organic matter 1.8%, non-nitrogenous organic matter 1.4%, minerals 0.8%, total insoluble substances 5%.

The sugar extraction process from sugar beets begins with the classification of the different batches. It begins with the formation of piles and initial washing operations to remove soil impurities and any residual grass. After separating the product to be processed from the waste, the product undergoes the processing cycle, while the by-products are treated separately.

The processing cycle operations can be classified as follows:

- Cutting the root into strips and immersing the strips in hot water;
- Separation of the juice from the plant pulp and boiling the juice to remove the water;
- Crystallization process and centrifugal separation of the sugar crystals from the molasses;
- Drying sugar crystals with hot air and refining the raw sugar;
- Packaging sugar for marketing.

Every step of the process is crucial to producing high-quality sugar that meets industry standards. From cutting the roots to packaging, every detail is carefully managed to ensure the final product is pure and refined. The combination of traditional techniques and modern technology results in a superior, market-ready sugar product.

A process analysis reveals the intricate sequence of elementary operations in the industrial process to obtain first raw sugar and then refined sugar, with facilities specifically designed to produce the marketable product.

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However, the importance of organizing the facilities required to process by-products intended for livestock farming, as well as for the generation of thermal and electrical energy and services, should not be overlooked.

Therefore, a detailed description of the sugar production line facilities will be provided initially, while only a brief overview of the facilities for the production of livestock products and those for the generation of energy and services will be provided.

Upon exiting the washing plant, the roots are sent to a large container where they await cutting into strips. From the bunker, the beets are then sent to cutting machines to be cut into thin strips called ribbons.

Cutting beets into ribbons is a very delicate operation that requires specially designed cutting tools.

The ribbons are cut using rotating drums equipped with numerous knives (cutters) on the periphery that cut the tubers into thin strips (ribbons).

The cutters must perform a cut that reduces the beets into V-shaped ribbons, 0.5-1 mm thick, 2-3 mm wide, and a specific surface area of 2.5-3.5 m2/kg.

After cutting, the ribbons are transported via a conveyor belt to a "traditional sugar factory" for the diffusion plant, where the sugar is dissolved and extracted. The treatment is performed in continuous equipment with a rotating drum.

The strips are inserted into the end of the drum, while water at 70-75°C enters from the other end. The water temperature is carefully controlled to avoid exceeding 80°C. At this temperature, not only sugar but also unwanted substances would dissolve. To allow the sugar to diffuse into the liquid, the strips must remain in the diffuser for over 2 hours, achieving a 99% yield.

In our case, we will exploit cavitation to extract the sugar; this physical phenomenon is widely used for extracting oil, the active ingredients of medicinal plants, brewing, and so on.

The advantages are:

Reduction in plant size; a traditional diffuser is 25 m long and 5 m wide.

• Temperatures do not exceed 36°C; it is essentially a cold extraction.

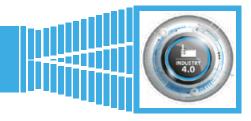
 Residence times are much less than 2 hours.

Once the sugar has dissolved, the spent pulps are pressed to remove part of the water and sent to the biodigester.

The liquid exiting the cavitator (raw juice) has a concentration of 11-13° Brix, is yellowish, cloudy, and darkens in air. The next step is to purify the raw juice from unwanted substances, which, in addition to making







sugar crystallization difficult, would contaminate the final product.

This process, also called "defecation," is performed by adding milk of lime to the juice in a quantity equal to 0.3-0.5% of the CaO content. Increasing the pH allows the suspended colloids to precipitate, and excess lime is then eliminated by saturating the liquid with CO_a.

Both the calcium oxide and carbon dioxide required for the process are obtained within the same plant by thermally decomposing high-purity limestone in furnaces.

In our case, if the plant is equipped with a biodigester for biomethane production, the carbon dioxide stripped from the biogas can be used for acidification, so only calcium oxide is obtained.

The suspension is sent to a Dorr decanter (or a drum filter) from which the sludge, also known as "sludge," is extracted.

The clear liquid is sent to a second CO_2 saturator to eliminate the residual lime, filtered, and sent to the concentration section.

The concentration of the light juice is generally performed using a multiple-effect evaporator system consisting of 4-6 evaporators arranged in series.

The first, fed with low-pressure mains steam, operates under low pressure (2-3 atm) and at a temperature of approximately 120°C.

The pressure and temperature gradually decrease until the last evaporator operates under low pressure at a temperature of approximately 80°C. Three phenomena occur during the concentration

process:







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- 1. Decomposition of the amines, amino acids, and proteins contained in the starting juice, producing NH₃;
- 2. Reaction between these nitrogenous compounds (or their decomposition products) and sucrose, forming dark-colored substances called melanoidins;
- 3. Reduction of the pH of the solution (alkaline retrogradation), with the resulting risk of sugar inversion.

To combat these phenomena, we try to minimize the time the juice spends in the evaporators by using devices with large exchange surfaces and adding a certain amount of sodium carbonate to the juice to adjust the pH.

During the concentration process, approximately 85–100 kg of water per quintal of beets is evaporated, resulting in a juice with a concentration of 60–65° Brix, known as a thick, dark-colored juice.

To prevent these undesirable effects, we concentrate the juice using cold-processed spiral filter membranes. These can be regenerated, resulting in not only a better product but also a smaller footprint and energy savings.

The next step is to decolorize the thick juice, which is accomplished by treating the juice with reducing agents (carbon, SO_2) or with ion-exchange resins and then filtering the product. Depending on the size of the system, a cavitator can be added to speed up the reaction with the reducing agents. The clear, thick liquid thus obtained is called standard syrup and must be conveyed to the crystallization plant.

This operation (called cooking) is generally performed with single, batch-operated evaporators called "cooking bubbles," operating at 0.2–0.3 atm and a temperature of approximately 60°C. The syrup is sent to the first cooking bubble and remains there until the concentration reaches 90° Brix, after which it is discharged by gravity and passed into the crystallizer, where it is cooled with running water.

The same process can be performed using spiral membranes, achieving the same result but at a lower temperature, saving energy and reducing the plant's footprint.

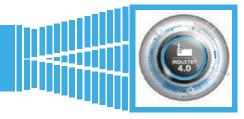
After crystallization, the suspension passes into a centrifuge where the crystals are separated from the liquid (mother liquor), called green runoff, which contains uncrystallized sucrose and non-sugar.

The sugar crystals are washed in the same centrifuge with water or steam, producing the white runoff, which is added to the syrup entering the spiral membrane (the white runoff, in addition to the small amount of green runoff removed from the surface of the crystals, contains a lot of redissolved sucrose).

The resulting white sugar is dried in a drum dryer with a current of hot air, sifted, and packaged or stored. The green runoff exiting the centrifuge is sent to a second spiral membrane, crystallized, and centrifuged. The green runoff from this second centrifugation constitutes molasses; the white runoff is added to the liquid entering the first membrane, while the raw sugar is dissolved again in pure water and sent to the first spiral membrane.

This operation is called "remelting."





The sucrose yield in a traditional plant depends primarily on the sugar content of the beets, as losses do not vary significantly. Approximately 2.1 kg of sugar per 100 kg of beetroot is lost in by-products, pulp and molasses, while approximately 0.6 kg is lost during storage, washing and transport of beetroot.

The use of ion exchange resins and the recovery

The use of ion exchange resins and the recovery of sugar from molasses can reduce losses. Typically, the amount of molasses obtained after the process is about 3% of the treated sugar beets. The overall sucrose yield is about 85-88%, meaning that the byproducts, particularly molasses, still contain 12-15% of the initial sugar. Limestone consumption to produce CaO is approximately 3.5-5 kg per 100 kg of sugar beets, while 7-10 kg of coke is required per 100 kg of limestone.

Water consumption should theoretically be zero, given the high water content of sugar beets (over 75%). In fact, water is needed during transportation and washing and to compensate for losses from the cooling towers. Overall, approximately 0.3-0.5 m³ of water is required per ton of sugar beets. In practice, at the beginning of the processing season, the plants are supplied with water that is then recycled.

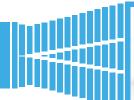
Washing and transport water, as well as evaporation condensate, due to the dissolved organic compounds, must be sent to the biological treatment plant before final discharge. Energy requirements can be divided into steam, used as a heating fluid for the process, and electricity, for all plant uses. Typically, the heating plant produces superheated steam at high pressure (60-100 bar). This is first expanded in a turbine to produce electricity and then, at 2.5-3 bar, used as a heating fluid, primarily in the concentration phase, which consumes approximately 20-25 kg of steam per 100 kg of beets.

Once the extraction process is complete, the sugar is ready to be packaged in bags for delivery to the food industry, where it is used in the preparation of many products. It is also packaged in 1 kg bags for sale in shops and supermarkets, aimed at artisans and pastry chefs.

Producing biogas from sugar beet waste is a sustainable and environmentally friendly alternative to traditional fossil fuels. Sugar beet waste is rich in cellulose and other organic materials that can be easily broken down by bacteria in anaerobic digestion to produce biogas. The biogas produced from sugar beet waste can be used to generate heat and electricity, reducing greenhouse gas emissions and reliance on non-renewable energy sources. This process also helps manage organic waste by converting it into usable energy.

Using sugar beet waste for biogas production also offers economic benefits to farmers and bioenergy producers. Instead of disposing of sugar beet waste as waste, it can be

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converted into biogas, providing an additional source of income. Furthermore, producing biogas from sugar beet waste can help reduce the environmental impact of agriculture by promoting the principles of the circular economy. Biogas production residues can be used as fertilizer, closing the nutrient cycle and improving soil health.

However, there are challenges in producing biogas from sugar beets, such as the need for appropriate equipment and expertise in anaerobic digestion. Furthermore, the availability and cost of sugar beet waste can vary depending on seasonal factors.

To overcome these challenges, research and development efforts are needed to optimize the process of producing biogas from sugar beet waste and make it more economically viable. Overall, the use of sugar beet waste for biogas production holds great potential to meet the growing demand for renewable energy sources and reduce the environmental impact of agriculture.

Analysis of the location of sugar beet extraction plants allows us to draw encouraging conclusions regarding the environmental sustainability of the crop's production cycle and the related industrial processing of sugar beet.

This crop, traditionally used as a renewal crop in crop rotation, has a widely recognized soil-improving effect, which benefits subsequent crops in the crop rotation.

The industrial processing has also proven to be technologically advanced, producing high-quality refined sugar with systems that demonstrate a balanced energy balance and proper respect for the environment.

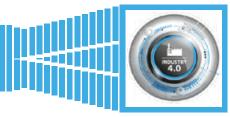
This allows for the reuse of both the thermal energy produced to concentrate the juice at lower entropic levels in the plants' in-house thermal power plants, and the electricity supplied by the plants' in-house power plants, which powers all the electric motors that drive the industrial process' machinery and distributes any surplus energy to the plant's external power grids.

Specific research has highlighted that, in general, sugar factories achieve positive energy consumption balances. Furthermore, conditions of efficient use of production factors have been found, both from an agronomic and physiological perspective, within a framework of general sustainability that has been carefully assessed by the Agriculture Commission.

The positive results for sugar beet cultivation, as identified in the aforementioned evaluation by the Agriculture Commission, allow us to foresee further improvements with the ongoing diffusion of low-energy and environmental input production methods and with a more careful allocation of crops to areas characterized by the greatest productive vocation.



crop cycle



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Sugar beet is considered a replacement crop in crop rotation for several reasons, one of the main ones being its need to be grown in thoroughly and carefully tilled soil. Its widespread cultivation as a replacement crop is therefore linked to the soil-improving effect for which sugar beet is known, benefiting subsequent crops in the rotation.

Sugar beet cultivation involves the following cultivation operations:



The main tillage is carried out to a plowing depth of 40-50 cm, to maximize the use of rainwater accumulation; this operation is performed simultaneously with the incorporation of crop residues and organic fertilizers by turning the tilled soil.



Complementary tillage is performed to break up clods and obtain soil reduced to small clods ready for successful sowing.



Correct sowing, with the distribution of monogerm seed and combined operations performed with auxiliary means, such as localized phosphorus fertilization in the sowing furrow and the distribution of a herbicide, which must be localized in a strip along the row after planting and covering the seed.



Rolling the soil with rotating cylindrical bodies towed by the tractor, which lightly compact the soil, breaking up clods so that the seed adheres better and thus smoothes the surface layers of the soil. This ensures good sowing and high germination, but also ensures the drainage of excess rainwater and irrigation water, especially in clay soils.







Hoeing the soil with hoeing machines equipped with special rotating tools or small earthing tools, similar to plow bodies, which carry out the operation of returning a portion of the soft surface soil towards the plant.



A rational application of pesticides and herbicides, applied at different times, using spray booms that are properly monitored for nozzle wear, pressure gauge functionality, and anti-drip device, and equipped with a suitable filter for proper sealing. These operations require proper adjustment of the spray boom.



An effective irrigation system, in terms of water quantity, droplet size, and timing, can be achieved using mobile irrigation systems or fixed installations. This can range from a self-propelled machine (reel) with a single sprinkler or boom, to mini-sprinklers, drip lines, or even sub-irrigation from drains or underground drip lines.



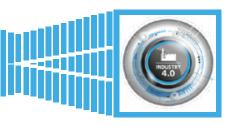
The harvesting process involves trimming, uprooting, removing excess soil, and loading the beets onto a machine for storage in suitable containers, followed by direct unloading onto trailers or trucks.



The final transportation of the beets from the field to the processing plant involves removing the leaves and tops from the roots through trimming.



why is it so innovative?



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The enormous forces staked during the cavitation phenomenon allow an extremely effective mixing and far better than that the one obtained with conventional technologies as the reduction in microscopic parts of what is present inside the fluid subjected to cavitation increases the area surface contact.

Furthermore, the forces released by the cavitation process are far greater than those present in normal mixing and, therefore, the results obtained are on enormously higher scales than those normally measurable by the application of traditional technologies.

Controlled cavitation can be applied to all processes of extraction of natural substances and treatment / conservation of emulsions or liquids, without damaging the original active ingredients of the original substance unlike what happens with other conventional methods of extraction, pasteurization and fermentation.

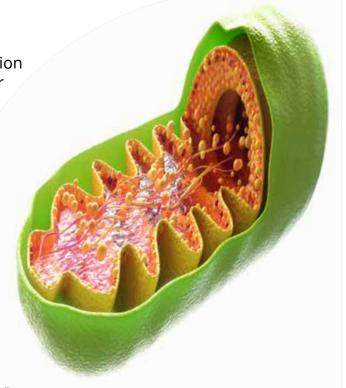
With our equipment we are able to provide an evident economic advantage on all possible chemical processes and therefore on:

- Process intensification
- Gas / Liquid Mixing
- Liquid / Liquid Mixing
- Liquid / Solid Mixing
- Hydration of Gels and Rubber
- > Emulsification
- > Homogenization

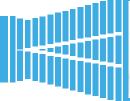
Pasteurization

This is made possible because the alternation between low and high pressure is responsible for an intense mechanical and thermal activity that is exerted on each element present in the solution.

In the presence of organic materials, cavitation results in 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 the hydrolysis processes and, consequently, an acceleration of the anaerobic digestion process as a whole. In this case, the rate of bacterial degradation can accelerate up to over 10 times compared to conventional treatment.



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Therefore, the destruction / rupture of cellular structures leads to a marked improvement in the biodegradability of organic matrices.

Our apparatus, in addition to being able to work completely independently, can be easily inserted online in any pre-existing industrial cycle: our apparatus can replace a pre-existing chemical process or multiplies a pre-existingit process by accelerating and strengthening it by over several times.

Having said all this, the areas of application of our apparatus turn out to be all those in which there is the presence of a chemical process of any kind.

The advantage for the users of our machinery can be summarized as follows:

- cut in production costs;
- → reduction of costs related to the expansion of production;
- → reduction of process times;
- → increase in the quantities of treatable matrix;
- → reduction of costs related to disposal.

With regard to **hydration**, this thanks to cavitation can be continuous, consistent and competitive, at the same time reducing the amount of matrix necessary to obtain the same desired level of viscosity. With regard to aeration, this is always uniform with both small and large volumes of gas and, therefore, it is optimal for both viscous liquids and rubber.

With regard to **pasteurization** and **homogenization** cavitation prevents the formation of incrustations on the walls of the apparatus, cutting the downtime required for cleaning. Furthermore, the lower degradation of the proteins present allows the lengthening of the storage periods and even the creation of entirely new products.

With regard to **emulsification**, cavitation prevents the formation of air pockets trapped inside the fluid thus maintaining the quality of the products always constant. In addition, the possibility of continuous processing allows easy control of the degree of emulsification.





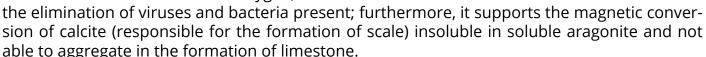
cavitation

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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.

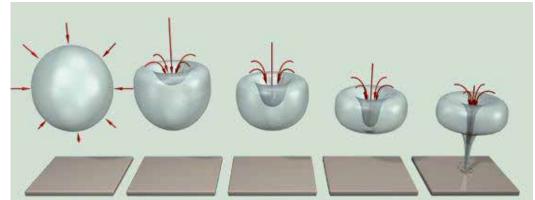
Cavitation applied to water acts mainly on this characteristic.

Through the violent implosion of the bubbles, it causes the release of nascent oxygen, allows



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 oxi-



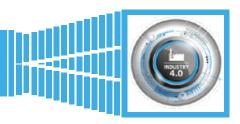
dative action on the surrounding organic substrate, mimicking the action of hydrogen peroxide. Another fundamental aspect of cavitation with respect to all other water purification and filtering treatments consists in the fact that with cavitation they are the same water molecules that, after the implosion 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.



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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 pro-

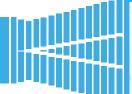
cesses that involve the formation of crystalline chemical elements, has the ability to favor the formation of Crystallization Germs, with further acceleration of chemical reactions.

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%





biodigestion

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The preparation of the substrate consists in obtaining the physical-chemical characteristics considered optimal for introduction into the digester.

This occurs through the introduction of the matrices, possibly diluted by sludge and / or water, with a correct degree of humidity inside the Empowering Device which will homogenise all the matrices entered and pre-treat the result obtained, also contributing to the increase of the its temperature.

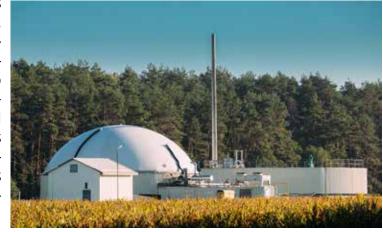
The permanence time of the matrix inside the biodigestor, normally 14/40 days (mesophilic reactors) or 14/26 days (thermophilic reactors), thanks to the pretreatment in the Empowering Device this permanence can be reduced to about one day and therefore reactors can be of extremely smaller dimensions than in the past can be made.

These are fed and, alternatively, emptied in cycles of 6 hours. They are equipped with biogas collection systems. During the pemanence, the material is continuously stirred through an innovative helical device that is moved only by exploiting the rise of the gas from the bottom to the top, without consuming additional electricity. This allows to avoid the presence of dead zones, to homogenize the temperature and the release of the biogas and to avoid the sedimentation of the mud and the formation of superficial films and above all it facilitates the contact between bacteria and substrate.

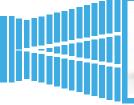
The biogas obtained can be either upgraded to biomethane or, once purified, used for the low yield production of thermal or electric energy. It is a gaseous mixture composed mainly of methane and carbon dioxide, but also containing small quantities of hydrogen and occasionally traces of hydrogen sulphide.

The material exiting the digester is a liquid sludge (Solid Fraction: 5-25%) not completely stabilized (the organic matter is not completely degraded). It is stabilized through a second passage in the Empowering Device, which remove its bacterial load and accelerates its oxidation; subsequently, excess moisture is drained by means of a belt press. Any excess nitrogen can be eliminated chemically, via bacteria or naturally with the compost rest. The liquid fraction thus obtained, having already undergone treatment within the Empowering Device, can be used immediately for irrigation purposes or to be returned to the cycle by finding new use in

the biodigestor. The dry fraction is used as a biological fertilizer (high quality compost). The electricity produced by anaerobic digestion is considered totaly green energy because the gas is not released directly into the atmosphere and carbon dioxide derives from an organic source characterized by a short carbon cycle, the biogas with its combustion does not contribute to the increase of atmospheric CO₂ concentrations and, therefore, is considered a low environmental impact energy source.



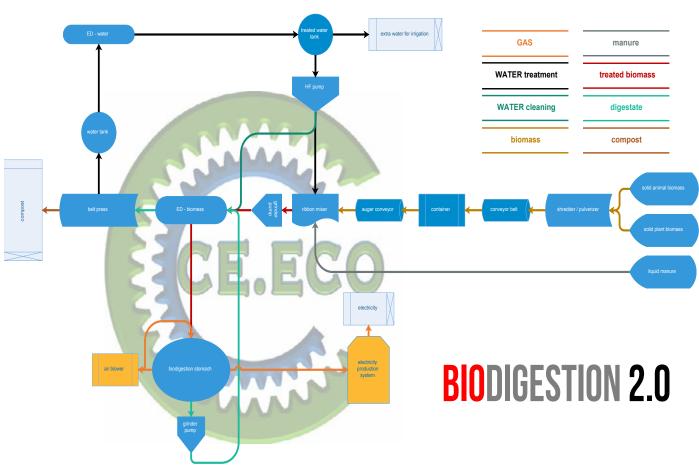






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