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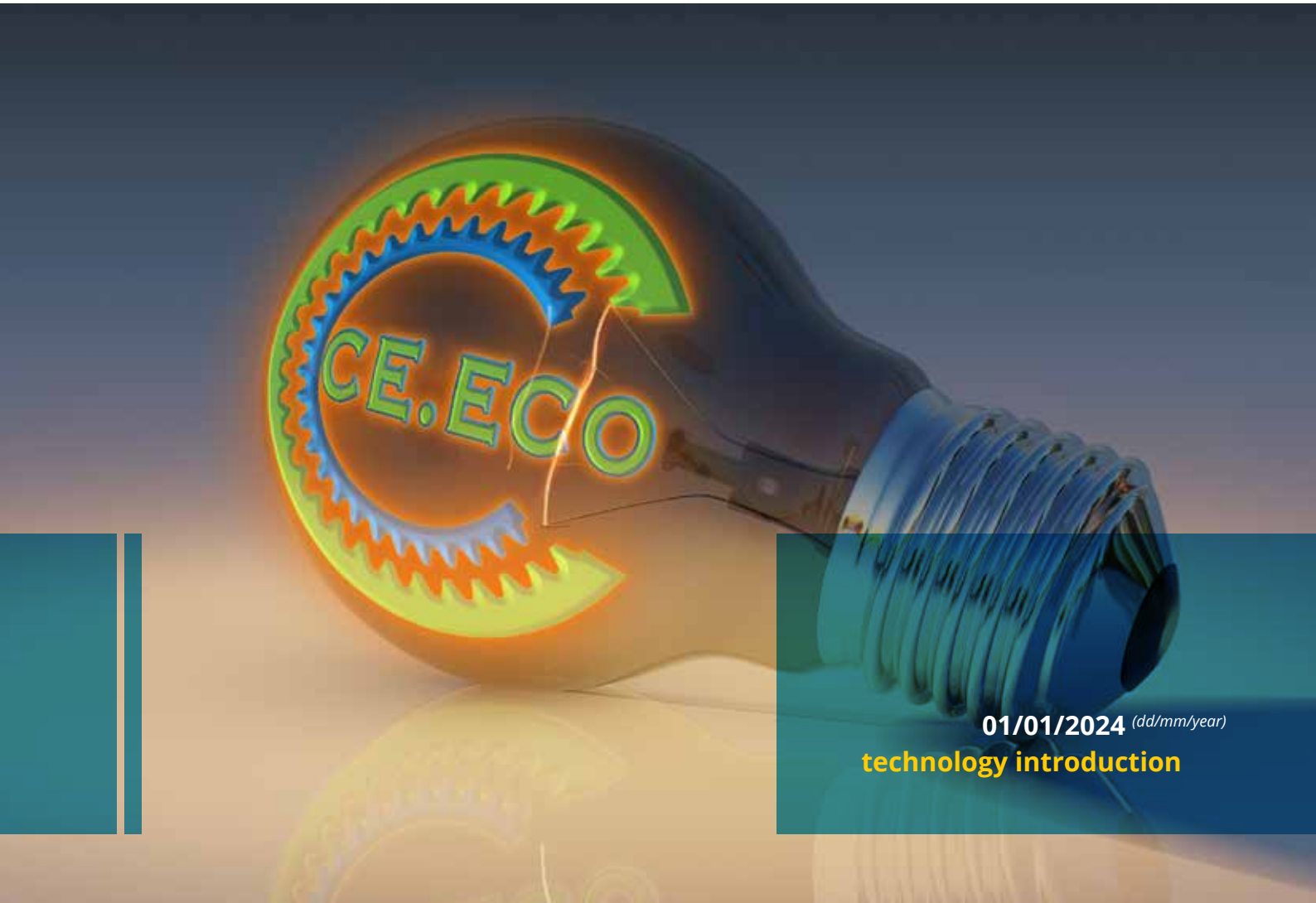
JUICES & SAUCES

EMPOWERING DEVICE



01/01/2024 *(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

index

- acceleration of natural processes without organoleptic alterations
- contained implementation costs
- minimum maintenance: a few hours a year to check seals and bearings
- mature technology as it has already been used for nearly 20 years in various fields
- bacteria, microorganisms, viruses and pathogens removal at room temperature

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

Jennifer Martinel

ACCOUNTING

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

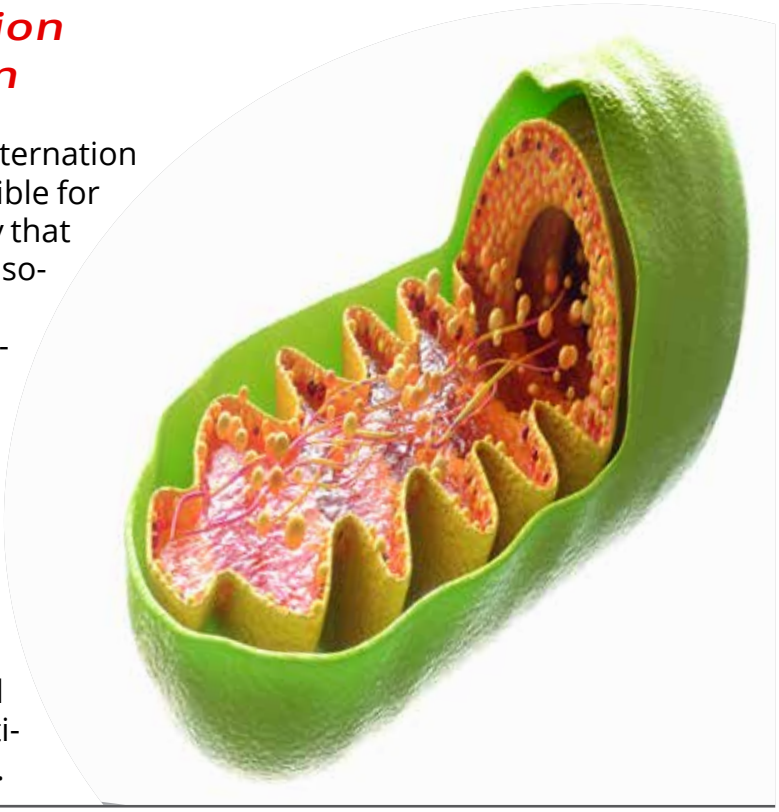
Jérémie Saltokod

CCIMRDC Italie

why is it so innovative?

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.

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.

production process

Starting from the assumption that the farmer has chosen the best crops and has provided them in the most eco-sustainable way in order to obtain a raw material free of elements harmful to humans and an exaltation of flavors, colors and organoleptic properties, also a single wrong step in the process could nullify any previous effort.

It should also be borne in mind that the reduction of stress suffered during mechanical harvesting and transport to the processing plant in the shortest possible time increases the total quality level and allows for a product that approaches or achieves excellence.

To obtain an excellent final product and the goal of each transformation, to do this it is necessary to control and optimize all the production phases.

The industrial transformation process of agricultural products into juices and sauces can be schematically divided into three phases: preliminary, product and processing specification, packaging.

The **preliminary phase** consists in the receipt of the raw material, its qualitative evaluation, weighing, unloading operations, sending to the lines, washing and sorting; receiving the packaging materials and ingredients and sending them to the packaging lines.

The **specific phase** varies for each individual product and for the required final result and starts after the washing and sorting operation.

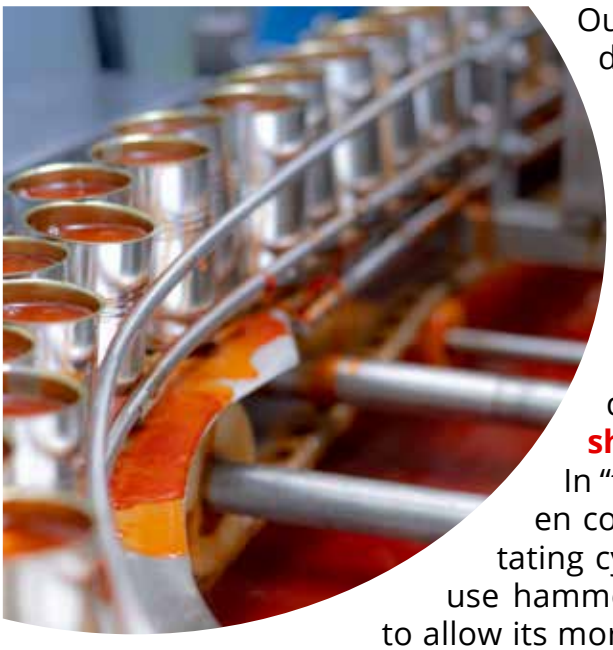
The **final phase** concerns the packaging in the desired shape (drums, cardboard, glass, etc.), labeling of the containers used and their storage pending sale.

preliminary phase

The preliminary phase is in turn divided into the following steps:

1. **Reception of agricultural products**. These usually arrive for processing in bulk on boxes or in bins.
2. **Evaluation, weighing**. Agricultural products are visually assessed and the relative sugar residue is assessed with sample tests: these parameters help to determine the definitive value. At the end of the evaluation we proceed to the weighing.
3. **Discharge**. Once the bins and boxes have been unloaded, the agricultural products are either temporarily stored or sent immediately to the production lines after washing.
4. **Sending to production lines**. Agricultural products can be washed either individually on a conveyor belt or immersed in special pools from which they are then recovered by lowering special bulkheads. Automatic tippers are used to empty the bins. The fall is slowed down by the inclination of the inlet plane until reaching small pools previously filled with water in order not to damage what is dropped into them.
5. **Washing**. Foreign substances are eliminated and, by insufflation from the bottom of cavitated water, the agricultural products immersed in the pools are agitated in order to allow a more thorough cleaning and the elimination of fungi or bacteria that could compromise the product. From here they are transferred to a subsequent tank, filled with purified water and sterilized by cavitation, from which they are taken by a conveyor belt to move on to the next sorting phase. The water will be constantly **recycled, purified and sterilized** by means of an **EMPOWERING DEVICE** with filters for any impurities.
6. **Sorting**. Altered agricultural products, especially if moldy or rotten, would risk compromising all production and finished products by altering both the color, the flavor and the scent. The duration of the finished product would also be significantly affected. Therefore, anything unsuitable and escaped from the preliminary checks of the optical sorters, pass under the watchful eye of the staff in charge of the final sorting.
7. **Receipt and storage of packaging material**. Metal boxes, glass containers and plastic bottles arrive on sealed pallets. The material for aseptic filling arrives in polylaminate coils (brik) or in closed cartons (aseptic bags).
8. **Sending to the lines of the packaging material**. The containers are removed from the pallets in an area adjacent to the packaging area and then sent, via belt conveyors, to the areas of use.
9. **Receipt of ingredients**. Any salt or sugar required by the production process are usually delivered in bags. The ingredients such as herbs, spices, meat or fish products, reserved for second processing productions, arrive in the appropriate ways for each product. All the ingredients will be stored in warehouses suitable for their perfect conservation over time.
10. **Sending the ingredients to the packaging lines**. From the preparation tanks (dissolvers) the solutions are sent, by pumping within stainless steel pipes, to the mixing tanks equipped with cavitators which improve their mixing while guaranteeing cold pasteurization.

specific phase



Our technology can be successfully applied to the production of sauces or concentrates, obtaining significant savings in terms of energy used and evident advantages in terms of homogenization, stabilization and sterilization of the product.

It cannot currently be used for the production of peeled tomatoes. Obviously, for some agricultural products, a pitting sub-phase or, possibly, a pre-treatment will be added to eliminate a too solid bowl.

At the end of the sorting, the product is rinsed with drinking water under pressure, then subjected to **shredding**.

In "traditional" productions, this is forced to pass between combs, housed in the plant and other places on a rotating cylinder that fit perfectly into the former, or you can use hammer mills that allow a much finer shredding such as to allow its more rapid heating, reasoning in terms of conventional process, or offering a greater surface to the action of cavitation, based solely on our process.

In the traditional process, once the product was finely shredded it was sent to the **blancher**, where it was heated. The purpose of the heat treatment was to facilitate peel detachment in the subsequent juice extraction phase. The heat, in fact, activates the action of pectolytic enzymes, causing a rapid detachment of the bonds between the peel and mesocarp of the fruit. The maximum activity of pectolytic enzymes occurs at a temperature of about 70-75 ° C.

Based on the temperature applied in traditional processes, the characteristics and appearance of the concentrate are determined:

- ***Cold-break technique.*** It operates at a temperature between 60 and 75 ° C, and has the aim of safeguarding the organoleptic and qualitative principles as much as possible. A more fluid juice is obtained, because this treatment facilitates the strongest reduction of the pectins of the fruit.
- ***Hot-break technique.*** It allows to obtain the maximum yield in the extraction by exceeding in the shortest possible time temperatures between 45 ° and 80 ° (where the activity of pectolytic enzymes is maximum) and reaching 100 ° C; the product obtained is therefore more dense and viscous than that obtained with the cold break system.

With our process based on cavitation, the fine shredding and blanching phases are performed simultaneously within the **EMPOWERING DEVICE**.

The chopped agricultural products are placed in the cavitator, equipped with a rotor geometry such as to obtain a double physical and mechanical effect; with hydrodynamic cavitation there is a very fine grinding and the activation of pectidic enzymes **at only 35 ° C**, allowing easy cold

detachment of the peel and pulp of the product.
The system has the advantage of having reduced dimensions and reaction speed, all at a low temperature which guarantees the maximum protection of the organoleptic substances, giving a high quality product.
The tomato then passes into the pulper / refiner unit in order to separate the skins and seeds from the juice.
In this case, the shredded mass is forced to pass through the centrifugal action caused by a rotating system of metal bars suitably modified to be able to take advantage of the cavitation effect in this case as well and keep the product sterile.
Through cylindrical or truncated conical perforated sheets, with sieves with progressively smaller and smaller holes (from 1.2 to 0.5 mm). In the first sieve (sieve) the 1.2 mm holes allow the removal of the seeds, the petioles, the consistent green parts and most of the skins. The bars are mounted in such a way as to give the shredded product a continuous advance, always keeping the surface of the sieve clean. In the refiner, the sieves, with passage gaps of 0.8-0.6 mm, allow the elimination of fragments of seeds and skins and other particles that escaped the previous transit in the press.
The juice is then collected in a stainless steel tank, which serves as a "lung" to continuously feed the next phase. To avoid alteration phenomena of the juice due to excess parking at ideal temperatures for microbial growth, which can cause an increase in acidity in the finished product, the tank will be sized according to the quantities absorbed by subsequent processing.
The juice, which initially contains about 95% of water, in traditional processes was generally concentrated in large containers, called "concentrators" or "evaporators", until the desired concentration was reached; these systems (which can be double or multiple effect) work at reduced pressures (vacuum), to damage the organoleptic characteristics of the product as little as possible.
Live vapor, which undergoes a condensation process in the heating section of the evaporator, transfers the remaining heat to the next stage, adding it to the heat generated by the solution. The steam produced is used again by sending a second evaporator to the heating section, which, with an even lower working pressure, operates at lower temperatures. The system can be pushed up to four successive effects, with temperatures ranging from 40 ° to 90 ° C.

Our process based on cavitation involves **a concentration at room temperatur**e using our own design membranes that allow the elimination of water, keeping the organoleptic characteristics of the product unaltered and ensuring high product quality.

packaging

The juice, concentrate or puree obtained in the second phase can be added, if necessary, with the other production ingredients previously prepared and, if necessary, diluted with water.
The packaging, after a further passage in the cavitator in order to obtain a cold pasteurization and therefore guarantee the sterility of the product and its longer conservation over time, will take place using the container chosen for that particular final product.
Consequently, it is possible to use tin cans, metal drums, tetrapak briks, plastic or glass bottles and plastic bags indifferently: just add the packaging module of your choice.
For example, part of a possible production of tomato concentrate could be chosen to pack it in an aseptic environment using metal drums, in which a bag made of a suitable material is inserted, and destined for subsequent processing in another industry.
Before being placed in the packaging line, the containers are washed with a cavitation water shower in order to sterilize the internal walls.
An aseptic filling of the containers can take place using the cavitator.
After sterilization, the filling phase begins inside a special chamber, absolutely isolated from the possibility of external contamination.
The feeding nozzles are introduced into the appropriate inlet hole of the chosen container to close it hermetically.
This practice which, by not putting the product in contact with oxygen, definitely helps the preservation of the quality of the product.


ISOLATE BEFORE REMOVING COVER

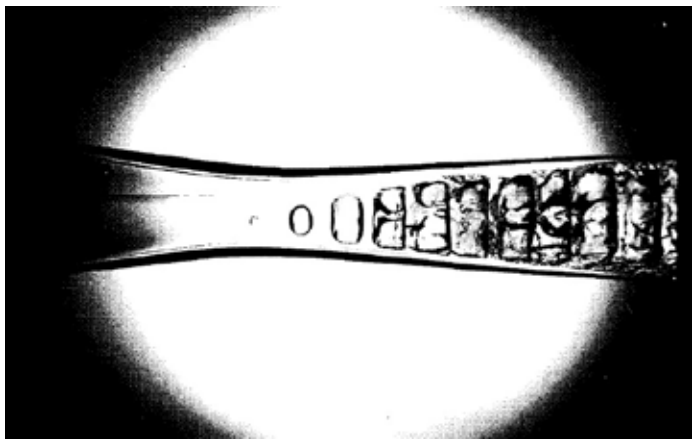
pasteurization

The persistence of microbiological activity in food liquids is one of the critical aspects of the production processes, given the considerable risk of development not only of metabolites with negative impact on the organoleptic and qualitative properties, but above all for the potential release of compounds toxic to human health.
The microbiological stabilization process of food drinks therefore requires extreme care and attention in order to break down the totality of microorganisms such as yeasts or bacteria present in solution.
Thanks to recent studies conducted by the main government bodies, cavitation has proven to be the simplest, most flexible and controllable technology as well as the most energy efficient, while the potential advantages of its application to the pasteurization and homogenization of food liquids, aimed at their introduction to the consumption, derives not so much from energy efficiency, comparable with that of an ordinary electrical resistance, but from the homogeneity of the heating obtained. The combined effect of the average temperature of the liquid and the localized, diffuse and homogeneous release of large quantities of thermal and mechanical energy, allows to reach the required food safety parameters, at average temperatures significantly lower than those of traditional processes. As a direct consequence, there is a marked energy saving and superior ability to control critical issues in the food process and product quality.
A research conducted by the Italian CNR has aimed to inactivate Saccharomyces cerevisiae, the yeasts most commonly used in the food industry for the fermentation of wine and beer, but at the same time responsible for the alterations and deterioration of the juices fruit and milk, as well as among the microorganisms most resistant to thermal and mechanical shocks.
Cavitation applied in food areas has several benefits:

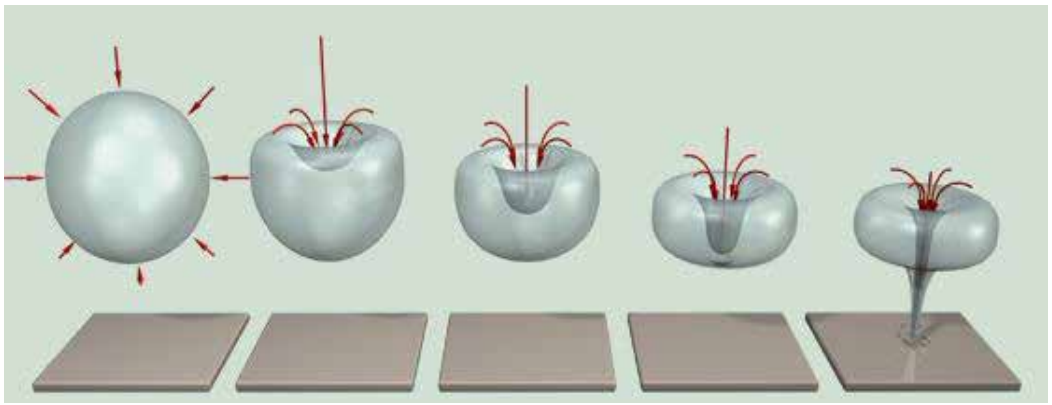
- bacteria and microorganisms are eliminated at lower temperatures than traditional systems;
- less energy consumption for the same results obtained;
- preservation of the organoleptic and nutritional qualities of the products.

It can be applied at the entrance, at the exit or on the whole process. The use in the queue also minimizes any risk of oxidative processes.
The synergistic application of thermal and cavitation processes allows the temperature associated with the mortality of yeasts to be lowered by several degrees in an aqueous solution, therefore, in addition to the obvious benefits in terms of the quality of liquid foods, energy savings are quite significant: at least 2.7% for every 1 ° C drop in the maximum process temperature.

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.

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%

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MAIN PARTNERS: