

“Continuous Decontamination Plants for Spices and Herbs”



Ventilex

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INTRODUCTION

Ventilex is a manufacturer of drying/cooling and de-dusting equipment. Our design has proven to have a long life time, to be cost efficiency and to have low maintenance cost. We have improved the control system to a perfect system.

Ventilex supplied in the last 4 years several sterilizing units at ambient pressure for among others walnuts, wheat, egg shells, flax seeds and almonds. Our cost effective equipment can treat products with common contaminations like salmonella (see also www.nutpasteurization.com).

Due to the potential presence of pathogens, the industry must utilize procedures to pasteurize raw seeds. Research demonstrated that, under established operational parameters, treatment in the Ventilex unit can deliver the required pasteurization of natural products (seeds and nuts). In the past Ventilex recognized the urgent need for new equipment and technologies that can be used for pasteurization of raw natural products and developed the offered system.

The offered equipment/technology has proven to sufficiently reduce pathogens while maintaining the integrity of the product (raw natural, stability, etc).

The following is characteristic for the Ventilex unit:

- The equipment can deliver a 5-log reduction for Salmonella.
- The treatment is relatively homogenous for the entire surface of every kernel.
- The process does not alter the general characteristics of the raw product.
- The system can have in-line process control, monitoring, and documentation devices.
- The process does not generate negative health and safety concerns for consumers.
- The pasteurizer is economical and easy to operate.



Pasteurization system for almonds

ON THE SAFE SIDE

Effective decontamination of spices, seeds and herbs with a continuous steam sterilizing system for “ultra pasteurization”.

Introduction:

The first continuous decontamination plant was installed in Japan in 1974 for the decontamination of curry powder with steam of a high temperature during a very short time of approx. 45 seconds. Japan was also the first country at that time where sterilization with ethylene was banned.

Since then over 12 companies in the spice industry have selected the sterilizing system that was based on the Stork “Bokfard” patent for the continuous sterilization of powders with high-pressure steam. The first unit was installed close to Ventilex at the **Euroma** factory which sells their decontaminated products under the name “Prima Pura”. Another unit is installed in Germany at the “**Krauter-Mix**” company who operates the process under the name “Care-Mix”.

Background reasons for sterilization

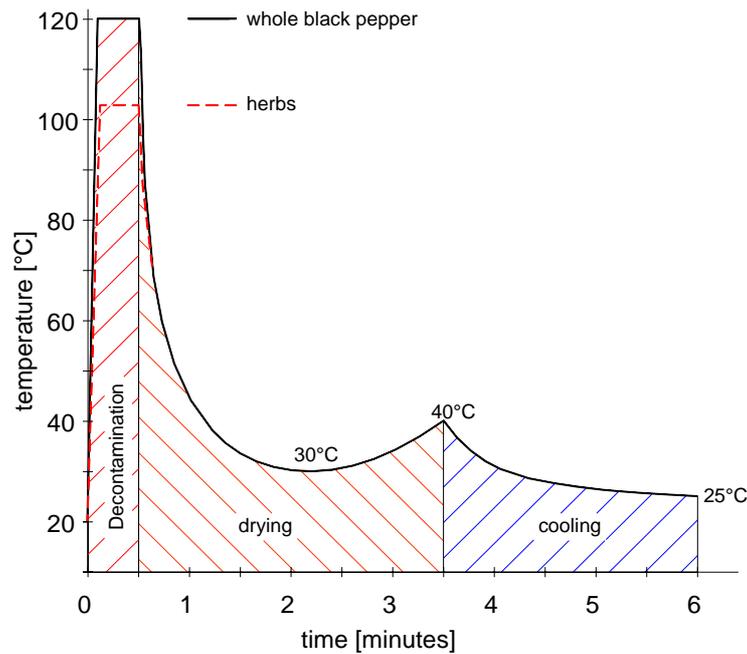
The sometimes ideal conditions for growth in foodstuffs can easily lead to spoilage. The presence of pathogens, e.g. salmonella can never be excluded despite frequent checking and was the main reason for sterilization and irradiation in the past. The commonly used ethylene oxide has been banned in the European Community as well as several countries outside of Europe because the risk for cancer development in the human body while irradiation still meets adverse consumer-acceptance. Also, food-technological aspects such as the inactivation of enzymes e.g. amylase and lipase could not be solved by irradiation or E.O. treatment; Enzymes cause a breakdown of fat and starch components in sauces, salads and ready-made meals.

General description steam sterilization process:

The continuous steam sterilizing process results in simultaneous reduction of the microbiological load and the ample inactivation of enzymes in spices, herbs and seeds. These raw materials are heavily contaminated with yeasts, moulds, enterobacteraceae and sporeformers from the soil because of the simple treatments and the drying at low temperatures in the countries of origin.

Description Ventilex continuous sterilization process:

Only the application of saturated high pressure steam with the continuous inflow sterilization process provides the ideal combination of inactivation of enzymes and the elimination of undesired micro-organism while causing the minimum harm to the organoleptic characteristics of spices and herbs.

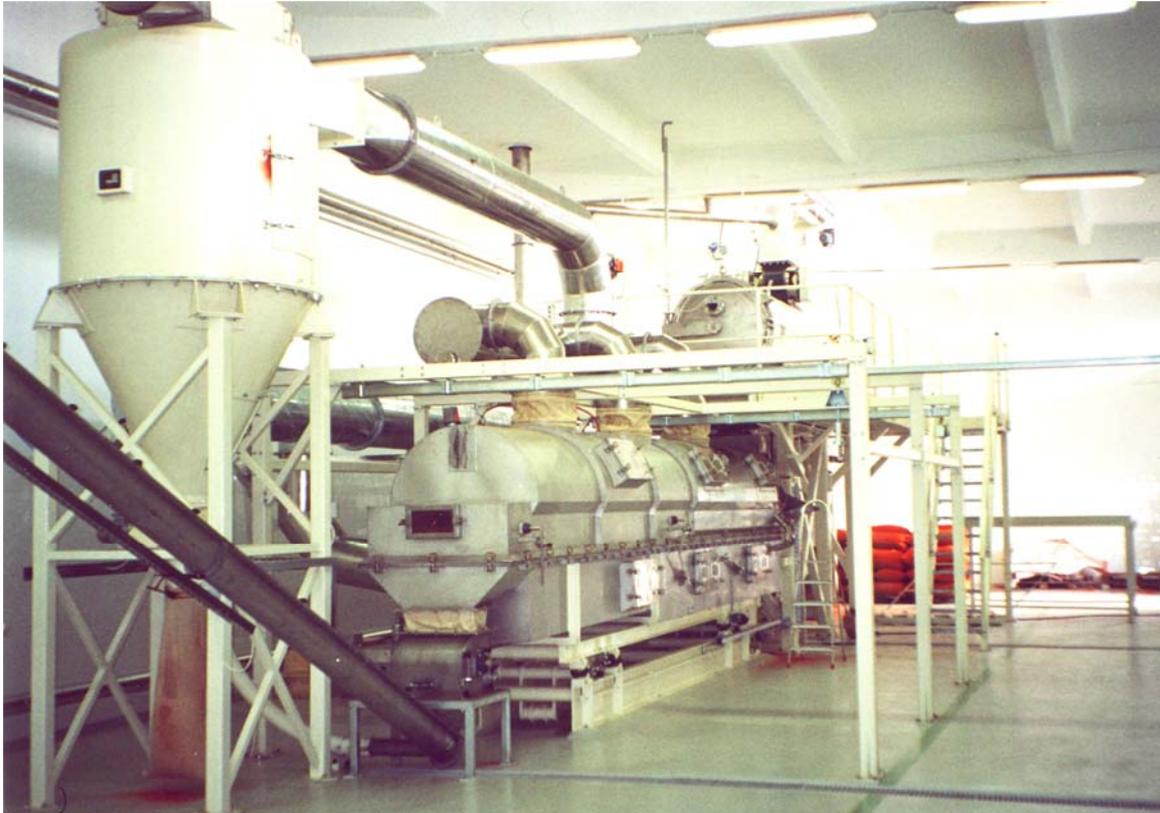


The positive effect of “inflow” sterilization on the quality of liquids such as milk, baby food and fruit juices is well known and can be easily realized with pump-able liquids.

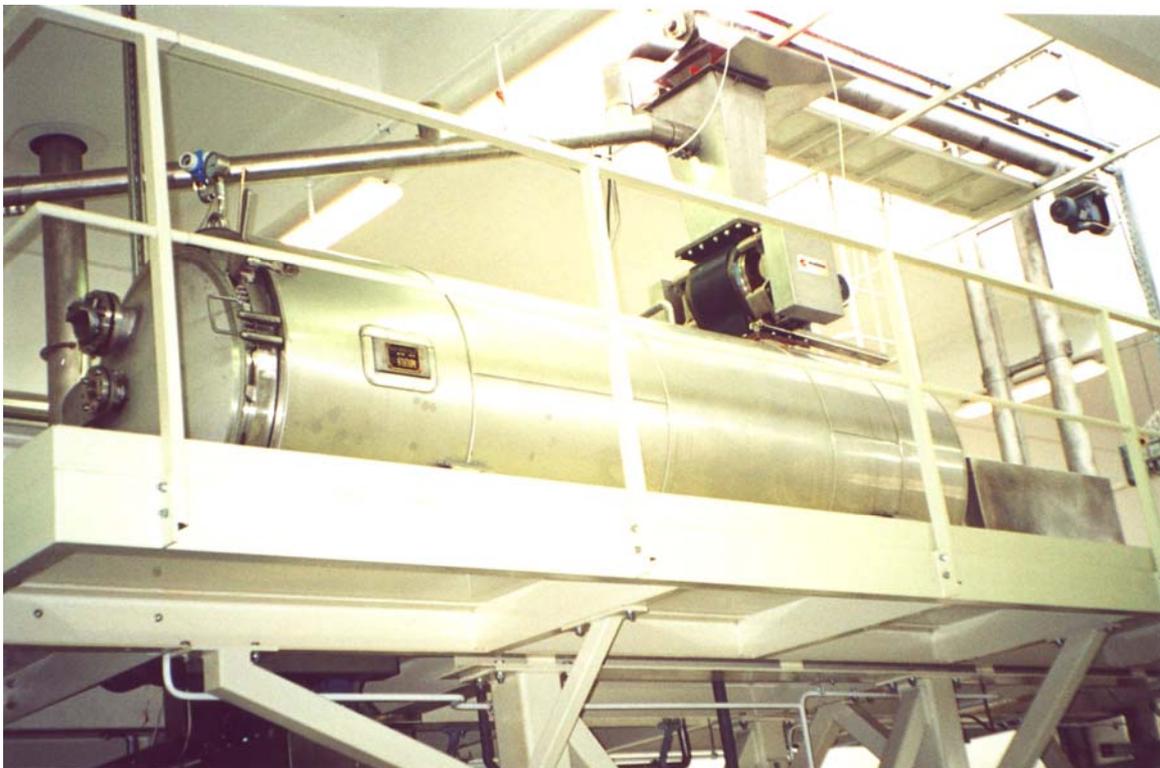
The sterilization of powders in an “inflow” Short-Time /High-Temperature sterilizing process could only be realized with a continuous sterilizer having self-cleaning rotary pressure valves for product feed and discharge as well as the unique **shakerbed** product conveyor in the sterilizer: The Shaker bed guarantees a minimum deviation of treatment-time of the entire product flow of less than 4 % and makes automatic cleaning in place of the sterilizer easy.

Since the treatment time of the product is controlled within very narrow limits, it is not necessary to apply longer treatment times than the minimum time for a safe product at the selected sterilizing temperature.

Treatment temperatures may vary between 107 and 123 degree C. corresponding with a steam pressures of 1.3-2.2 bar(a) while treatment times may vary between 25 and 50 seconds depending on type of contamination, particle size and final application of the treated product. The decontamination system is controlled from a central control panel offering accurate reading and recording of the chosen process parameters. This also makes it possible to treat the same product with exactly the same process parameters the next time.



Decontamination plant shows: dust separator, dryer/cooler and sterilizer



Side view of Bokfard sterilizer with rotary product inlet valve

More about STEAM as a sterilizing medium:

Steam is a most ideal gas as it is non toxic, it is cheap and there is unlimited supply. Steam offers the following advantages:

- Fastest possible way of product heating to an exact preset temperature.
- Steam condenses on the product and provides the water activity required for effective sterilization while the steam that condensed on the product surface will protect the product against burning.

The steam condensed on the product enables flash cooling of the product when it leaves the sterilizer via a self-cleaning rotary discharge valve and meets a large flow of sterile air in the fluid bed dryer/cooler, to evaporate spontaneously.

Hence the system concept complies with the condition that the product is subjected to the minimum heat load for adequate decontamination with a minimum adverse effect on flavor, color and loss of volatile oil.

Microbiological quality of products treated with the Ventilex continuous system:

| | |
|-----------------------|---|
| + total count: | less than 10.000 and often less than 1.000 |
| + enterobacteriaceae: | less than 10/gram |
| + salmonella: | absent |
| + yeasts and moulds: | Less than 100/gram |
| + bacteria spores: | Bacillus Cereus less than 100/gram Clostridium Perfringers less than 100/gram Stafylococcus Aureus less than 100/gram |

Example of changes before and after treatment

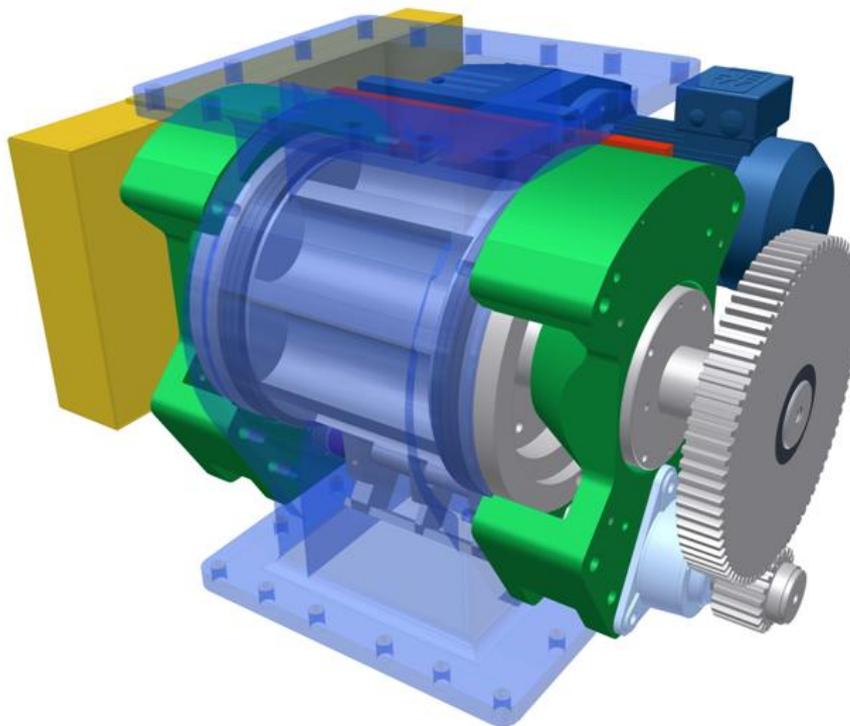
| Product | Total count Mesophile Aerobe bacteria's Cfu/g | Yeasts Cfu/g | Moulds Cfu/g | Ebtero Bacteriaceae Cfu/g | Aerobe-sporeformer Cfu/g | Bacillus Cereus Cfu/g | Color-Value ASTA units | Volatile Oils MI/100g |
|--------------------------------|---|--------------|--------------|---------------------------|--------------------------|-----------------------|------------------------|-----------------------|
| Sweet Paprika before treatment | 1300000 | 400 | 200 | 7000 | 1300000 | 10000 | 95 | |
| Sweet Paprika after treatment | 1000 | absent | absent | absent | 1000 | < 100 | 93 | |
| Rosemary Before treatment | 360000 | 1000 | 20000 | 56000 | 280000 | Not checked | Not checked | 0,7 |
| Rosemary After treatment | <100 | absent | absent | absent | absent | Not checked | Not checked | 0,7 |

DESCRIPTION OF THE CONTINUOUS STERILIZER

The continuous sterilizer has been designed for decontamination of powders and small particles during short sterilizing times at high temperatures between 106 and 123 °C.

The system mainly comprises a stainless steel pressure vessel with an internal shaker bed conveying (fluidizing) system. The speed of the conveyor is infinitely variably adjustable. Sterilization is effected by saturated steam under pressure.

The pressure vessel is further equipped with two rotary pressure valves of self-cleaning design.



One rotary valve serves product feed into the pressure vessel while the other valve at the bottom of the pressure vessel serves product discharge out of the pressure vessel.

The pressure vessel is equipped with a steam jacket and thermal insulation in order to avoid development of condensate on the inner surface of the pressure vessel.

The pressure vessel is further equipped with connections for the discharge of condensate and/or water that has been used for the cleaning after production. The rotary valves provide for continuous de-aeration of the pressure vessel in addition to their function as pressure lock and hence guarantee that the sterilization is effected with pure saturated steam, which is free of air. The rotary valves allow steam to escape and an exhaust system with wet scrubber serves for the removal of steam escaping from the rotary valves. The wet scrubber is combined with a cleaning in place system for the interior of the sterilizer. The sterilizer is equipped with three spray points for the interior cleaning. Cleaning can take place immediately after termination of the production.

DESCRIPTION OF THE FLUID BED

DRYER/COOLER

The unit serves fast cooling and drying of decontaminated products with sterile air from an air filter unit. A long closed shaking vessel is divided in a top and a bottom section by means of perforated plates of special design. A slightly higher air pressure in the bottom section creates airflow through the perforation. The vessel is supported by springs that allow for a shaking movement that results in forward transportation of the product over the perforated bedplates to the discharge end of the system.

The rotary discharge valve of the sterilizer is arranged right above the product inlet side of the dryer/cooler. The down flowing product that leaves the rotary valve, meets a flow of warm drying air and cools instantly to a low temperature so to limit the loss of volatiles to the minimum.

The top section of the shaking vessel can be lifted and moved sideways over the rails on a frame in order to make it possible to replace the bedplate by another type of bedplate with smaller or larger perforation or for cleaning of the interior of the system.

From the discharge end of the dryer/cooler, the product can be conveyed to a silo or to the hopper of a bag filling station. A finisher can be provided at option, if products will be treated, that tend to form agglomerates.

The product is fluidized by the shaking movement and air flowing through the perforations of the bedplates. The product supplied to the shaking bed first meets slightly heated air during the first part of the unit followed by air of ambient temperature when passing the second part.

The "sterile" airflow for drying and cooling is realized by means of pre-filters and very fine "bio cell" post filters that stop particles larger than 2 micron. Part of the airflow is blown through a thermally controlled heater and transported via large air ducts to the drying section, while the remaining part of the airflow continues to the cooling section.

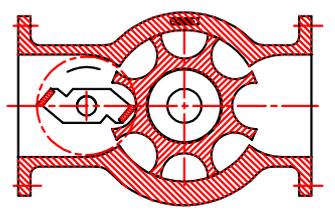
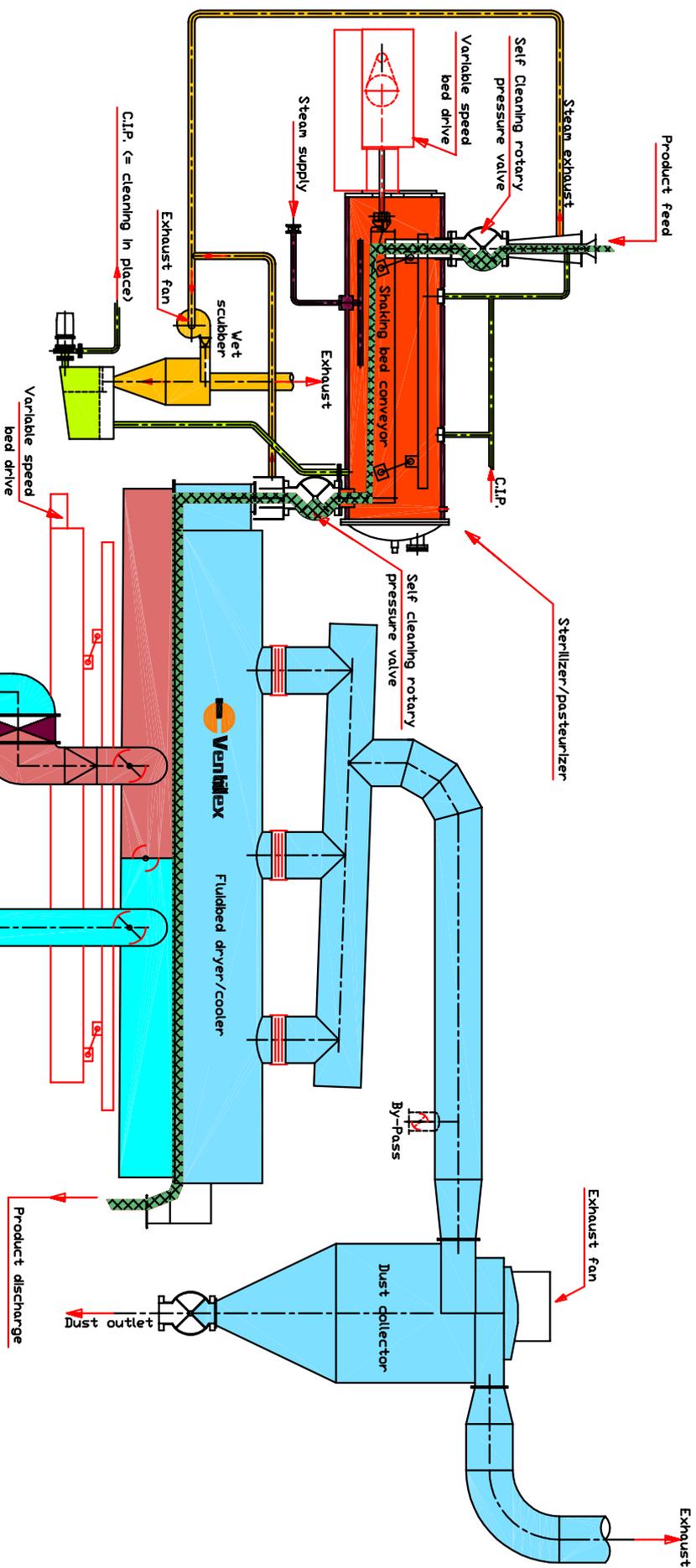
The top of the shaking vessel is equipped with large air ducts that convey drying air and cooling air to a dust collecting system.

The hopper underneath the dust collector is equipped with a rotary valve. In order to avoid recontamination, the collected product dust should not be mixed with the treated product, but added to the untreated product entering the pressure vessel if required.

REFERENCE LIST

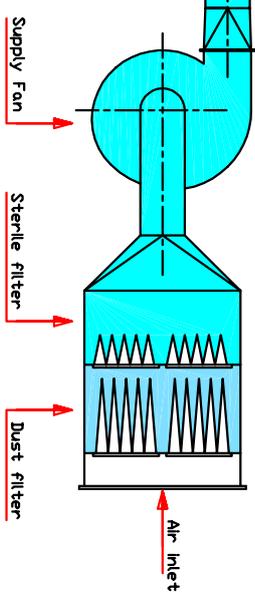
“Continuous Decontamination Plants” and “Continuous Pasteurizing Plants”

| CLIENT | COUNTRY | NUMBER | PRODUCT |
|---------------------------|------------|--------|------------------|
| Euroma B.V. | Holland | 1 | Spices & herbs |
| A.V.T. - McCormick | India | 1 | Spices & herbs |
| Gyma | France | 1 | Spices & herbs |
| P.B.P.-Son Ha Spices Co. | Vietnam | 1 | Spices & herbs |
| Spice Tec | U.S.A. | 1 | Spices & herbs |
| S&B Foods | Japan | 1 | Spices & herbs |
| House Food | Japan | 1 | Curry powder |
| Pepper Marketing Board | Sarawak | 1 | Pepper |
| Kräuter Mix | Germany | 1 | Spices & herbs |
| Kalocsa spice Paprika Co. | Hungary | 1 | Paprika & spices |
| MAN Spice Processing | Vietnam | 1 | Pepper & spices |
| Ottogi Corporation | Korea | 1 | Spices & herbs |
| Kamis Przyprawy S.A. | Poland | 1 | Spices & herbs |
| Fuchs Agro Brazil Ltda | Brasil | 1 | Paprika powder |
| California Nut Co. | USA | 1 | Almonds |
| Paramount | USA | 1 | Almonds |
| Sanfilippo, John B. | USA | 1 | Almonds |
| CRM | USA | 1 | Seeds |
| Linwood Bakery and Dairy | N. Ireland | 1 | Organic seeds |



PRINCIPLE of the Rotary pressure valve

| | |
|--|------------------------------|
| | = Product flow |
| | = Exhaust air |
| | = Clean supply air |
| | = Clean heated supply air |
| | = Steam supply |
| | = Sterilizer steam |
| | = C.I.P. (cleaning in place) |
| | = Steam exhaust |



Continuous Decontamination System for Spices, Seeds and Herbs