

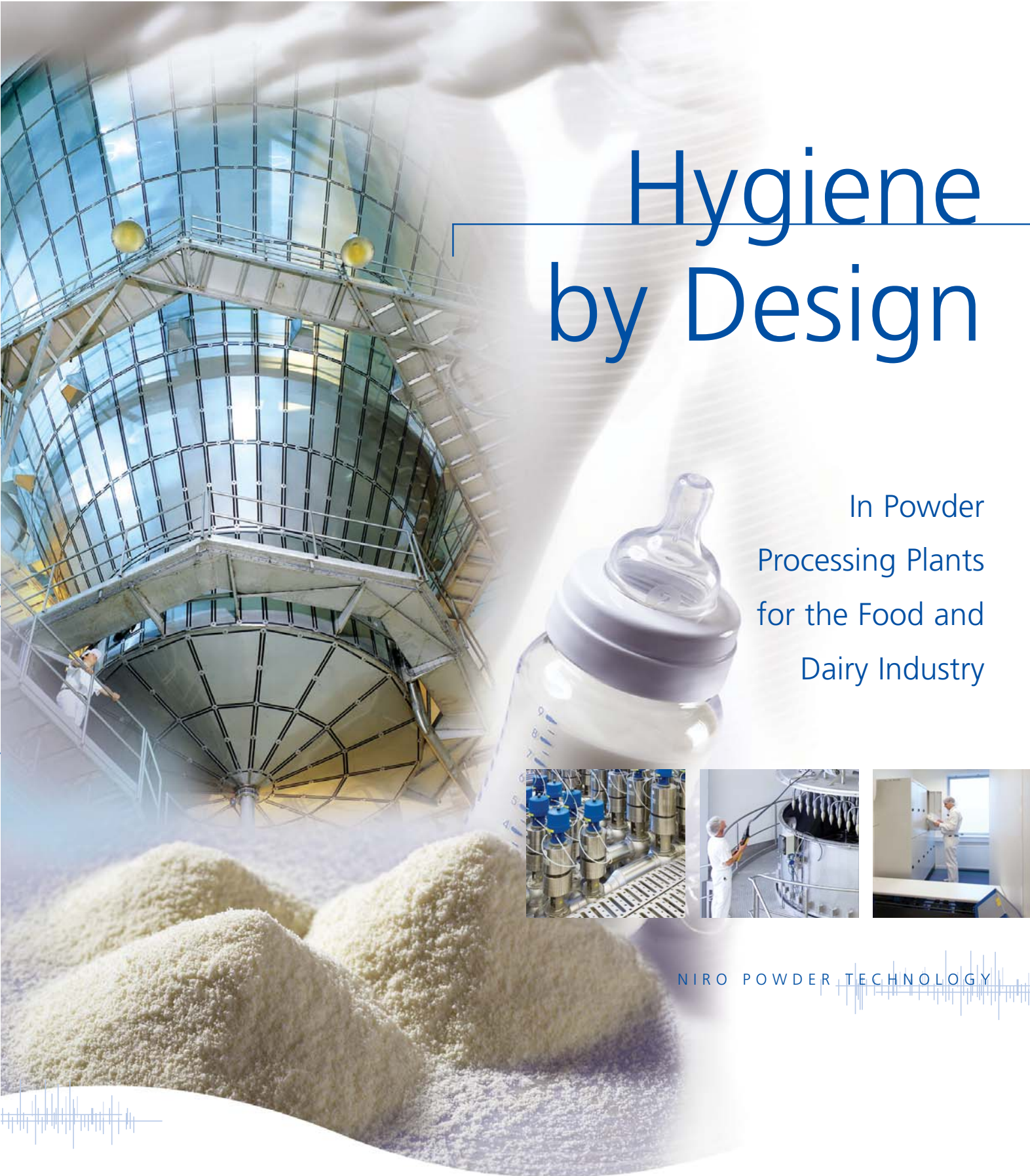


Process Engineering
Division

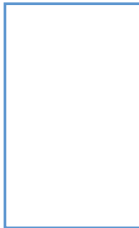
Niro

Hygiene by Design

In Powder
Processing Plants
for the Food and
Dairy Industry



NIRO POWDER TECHNOLOGY





Raw Material Reception and Pre-treatment



Evaporation



Drying



Powder Handling and Packing



Hygienic Design

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Hygienic Installations

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Liquid Processing

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- Raw Product Reception and Storage
- Pasteurization
- Mixing of Liquid and Powder

Liquid Concentration

8

- Efficient Vaporizing Process
- No Recirculation of Product
- Minimized Non-evaporative Product Contact Surface
- Low Hydraulic Operating Volume

Feed Treatment and Installations

10

- Designed to Meet Hygienic and Sanitary Demands
- No Product Contamination
- Minimum 20 Hours of Operating Time
- Easy Cleaning of Atomizer Units

SANICIP™ bag filter and VIBRO-FLUIDIZER®

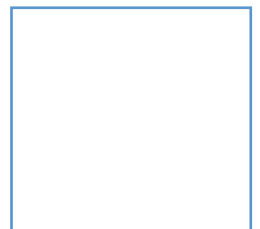
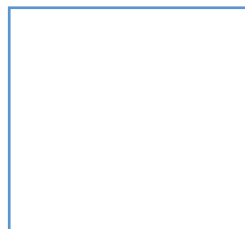
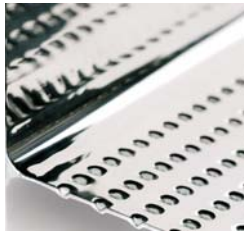
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- Pneumatic Conveying
- Compatible with 3A Requirements
- No Condensation or Powder Deposits

Powder Handling and Silo Storage Filling and Bag Packing Systems

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- Fully Welded Connections
- Modified Atmosphere Packing Systems
- Removable Filling Heads
- Large surface Area Vacuum Probes
- Quick-release Components for Tool-Free Disassembly





Hygienic Design

For maximum plant hygiene

Increasing Hygienic Standards

To fulfill today's increasing demand for dairy-products to meet physical, chemical and bacteriological requirements, there is an increasing focus on designing processing lines that meets the strictest hygienic standards.

And for the suppliers of processing equipment, the challenge is not only to stay on top of current requirements, but also to take into consideration tomorrow's hygienic standards.

Constant Improvements

During the last decades each unit operation, including milk reception and pre-treatment, evaporation and spray drying, powder handling and storage and packing, has undergone major changes in order to improve all aspects of hygienic design.

Enhancing Performance

The GEA companies all constantly seeks to improve technologies and equipment to enhance efficiency of our unit operations and complete processing lines and make sure they comply with even the strictest international requirements valid today - and tomorrow.

We are proud of setting the standard for hygienic design of powder plants for food and dairy products.



Hygienic Considerations

More than just state-of-the-art-technology

Every components of a Niro powder processing line is designed with strict focus on hygiene and safe operation.

Track and Trace



In each link of the production chain it must be possible to trace from where the product is coming and to where it is sent



The "Lock" where people entering the hygienic area must change clothes and footwear to avoid contamination of the process area



Focus on Safety

Today, there is an increased focus on food safety, pollution control, and health and safety requirements. Directives such as Hygiene of Foodstuff (incl. HACCP), Integrated Pollution Prevention Control (IPPC), ATEX, and other local regulations all require careful analysis and interpretation when designing a complete processing line.

At Niro, we can assist you in finding the most cost-effective design to meet all relevant directives. Our engineers are specialists - they know the directives and how they are implemented.

Factory Layouts

A complete powder processing line designed in compliance with current hygienic standards has to have a clear separation of dry and wet processing areas, of pasteurized and non-pasteurized products and a clear zoning of non-hygienic and hygienic areas. Clear separation helps avoid any cross contamination between the products and the environment.

At Niro, we implement these considerations in our arrangement drawings in close co-operation with our clients.

Track and Trace

Track and trace enables the producer to follow the product through the processing and identify all ingredients - and their origin - at any step from reception until final packing of the powder.

Niro offers track and trace as an integrated part of our control systems.



Our plants meet the strictest requirements to food safety, pollution control, and to health and safety precautions



Milk reception. Flexible food-grade hoses are used to ensure fast emptying of the tankers by gravity into large silos in the basement. From here various tests of the milk for quality and batch tracking can be made



Liquid Processing

Milk reception, cooling, storage, separation and pasteurization

Hygienic design is an integrated part of everything from milk reception and onwards.

The Heart of Engineering

To GEA Liquid Processing Scandinavia hygienic process design is the heart of engineering and it requires a basic understanding of

food microbiology. Hygienic design simply must be taken into account early on in the design phases of the project and carefully followed throughout project execution and installation.



To ensure a first-class quality of the products, it is important to cool the raw milk before storage and further processing. This is done in the raw milk coolers



Pasteurization plant with pressure differential control ensures that pasteurized milk is not contaminated with unpasteurized milk in the regeneration section



Double Seat Valve matrix secures minimum dead space and prevents mixing of product and CIP liquid



The Liquid Process

In a dairy and food powder plant, the liquid processing typically includes:

- Raw milk reception
- Raw milk storage
- Milk/cream pasteurization
- Other liquid ingredients reception, egg, oil, glucose
- Mixing of liquid and powder ingredients
- Pasteurized milk/cream
- Storage
- CIP plants

Every part of the processing line is designed to minimize product deposits and contamination, and to support CIP systems.

Integration of CIP Systems for Hygienic Design

Automated cleaning-in-place systems (CIP systems) are an important part of hygienic design. Automated CIP system - true CIP- ensures a repeatable, efficient, thorough and documented cleaning of the processing line.

Today, CIP systems are designed so the CIP-forward flow and temperature are regulated to meet specific requirements. And to ensure optimum cleaning of all pipelines a turbulent flow is used.

When the CIP cycle is completed, production can be resumed. If the CIP is not completed according to the programme, an interlock will hinder production-start.



Today, CIP systems in milk powder plants are divided into separate zones, one for the milk tanker, another for the unpasteurized process section, and a third for the pasteurization process and dryer

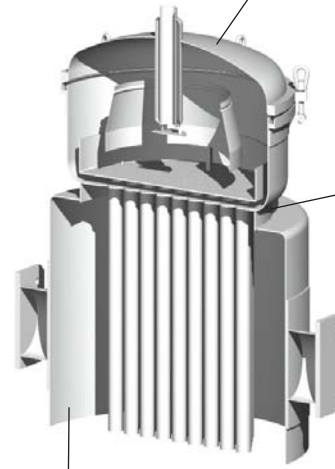
section. This design eliminates the risk of cross contamination. The heating of the CIP solution is achieved using external indirect heaters

Evaporation

An evaporator calandria with 16-18m tubes. Coverage of each tube is improved and fouling/deposits are reduced. CIP is fast and effective



Liquid Distributor and heat surface pipes



No sharp corners

Heating media chest can be equipped with CIP spray balls

Wrap-around separator with rounded corners improves efficiency. The products' contact to the evaporator's surface is reduced and CIP is done easily

Flash regenerative vessels with no heat transfer surface reduces steam consumption. When the same principle is used instead of traditional tubular pre-heaters, 20 hours continuous production is possible with low mesophile and thermophile growth



Hydro-cyclone. A self-cleaning in-line filter removes sludge during CIP and gives full protection against blockage of the distribution system



Tangential swirl heater for controllable direct steam injection to final heating temperature makes 20 h continuous operation possible



Vertical holding tubes makes CIP and inspection easy

Liquid Concentration

In falling film evaporators

Concentration of dairy products requires efficient falling film evaporators, designed to meet both product- and energy specifications.

Hygienic Design is Essential

Hygienic design of falling film evaporators is not only about surfaces and component details. The design of the Niro evaporators takes hygienic design a step further. All components are mounted for optimum functionality and drainage, and for a minimum of surface exposure to the product.

CIP Systems

CIP is an essential part of Niro's hygienic evaporator-design - both in the mechanical execution as well as in the design of control software and logging of operating data. To eliminate the need for opening and inspection afterwards, CIP is performed while the evaporator is under vacuum.

Design Features:

- Low mesophile and low thermophile concepts for product pre- heating
- Regenerative direct contact product heating
- Tangential swirl heater unit, for controllable direct steam injection to final heating temperature
- Culinary steam re-boiler concept available as partial or total steam supply
- No recirculation of product
- Low hydraulic operating volume
- Minimized non-evaporative product contact surface
- Shell & tube execution of condenser
- No sharp corners, dead legs etc.

Spray Dryer Feed Treatment

*Feed tank system, concentrate pre-heating
and high pressure pumps*

**Functionality and flexibility
are important factors when
designing a feed system for a
spray drying plant.**

Continuous Operation

Our hygienic design is developed to allow for 20 hours or more continuous operation without adverse effect on the product quality. In addition, the feed system is designed for fully automatic CIP.



Two feed tanks fully enclosed with CIP spray balls and automatic changeover from one to the other. One is in use while the other is being cleaned



Concentrate heat treatment in a tubular heat exchanger with no moving parts and a corrugated heat transfer surface. The heating is achieved using hot water in a counter-current flow. This results in a low Δt and minimum 20 hours of operation even at high temperatures



Cleaning of nozzle lances and/or rotary atomizer is performed in a specially designed CIP stand, which is included in the CIP circuit for the feed line. Disassembly of nozzle lances and the high-pressure feed line/flexible high-pressure hose is therefore unnecessary

The feed pump is often a combined homogenizer and high-pressure pump. The Niro Soavi high-pressure pumps comply with the 3A standards. They have a smooth and polished surface and rounded edges on all parts that are in contact with the product. Cleaning requires no disassembly



Spray Dryer Design Details

*Process air filtration, fan room,
chamber design and insulation*

Focus on Details

Production of sensitive food and dairy powders requires the spray dryer and all other associated equipment to be carefully designed in accordance to strict hygiene requirements.

Every part of the plant is designed to avoid product deposits and contamination. All materials are carefully selected focusing on the surfaces' ability to improve the performance, and design includes automated CIP.



In all details, the plant is designed not to compromise the hygienic conditions

Removable insulation allows regular inspections of the chamber's outer surface at any time. Cracks in the chamber wall can be discovered in time so prompt actions can be taken. Product contamination is therefore avoided

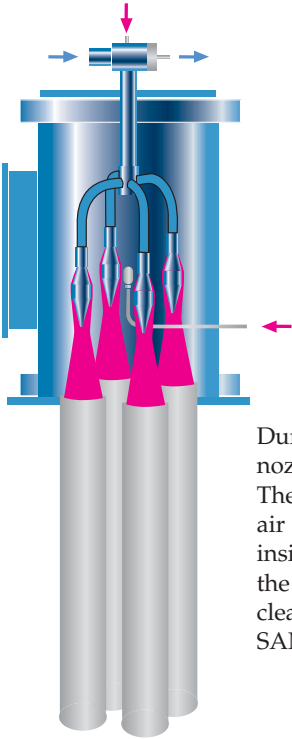


A plant layout with separate fan rooms isolated from the production areas helps avoid contamination from the outside. Process air is filtered after passing fans and heaters



The removable insulation is an air-filled sandwich panel mounted close to the drying chamber's surface. No insulation material is needed

Reverse jet nozzles are used during operation to keep the bags clean. During CIP they act as two fluid nozzles



During wet cleaning all reverse jet nozzles are supplied with CIP liquid. The fluid is atomized by compressed air and forced through the bags from inside out (the opposite direction of the process air stream). The patented cleaning principle is unique for the SANICIP™ bag filter



SANICIP™

bag filter

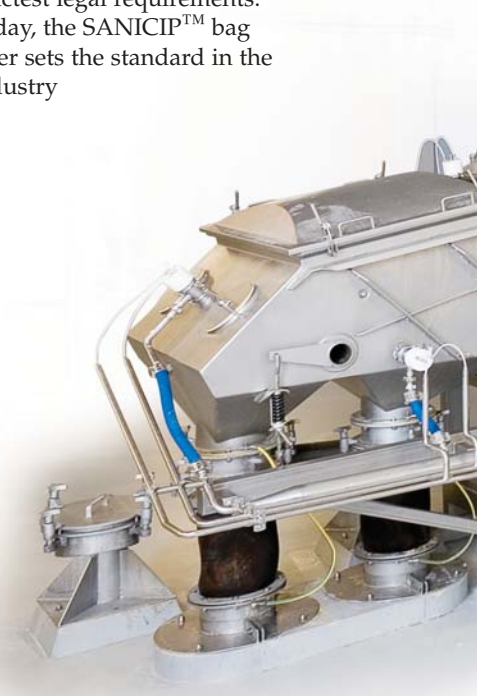
Improving Product Recovery

Niro's SANICIP™ bag filter is designed in accordance with the strictest standards. Emissions from a spray drying plant of less than 10mg/Nm³ can be achieved by replacing traditional cyclones with a SANICIP™ bag filter.

Reliable Cleaning Technology

With SANICIP™ CIP-able bag filters a complete plant CIP can be done automatically. This reduces downtime, and ensures a repeatable, thorough, and documented cleaning.

The SANICIP™ CIP-able bag filter complies with the strictest legal requirements. Today, the SANICIP™ bag filter sets the standard in the industry



The VIBRO-FLUIDIZER® is equipped with Niro's patented BUBBLE PLATE™ for superior air distribution and powder transport. The fabrication technique means the BUBBLE PLATE™ conform to the 3A requirements, as there are no crevices

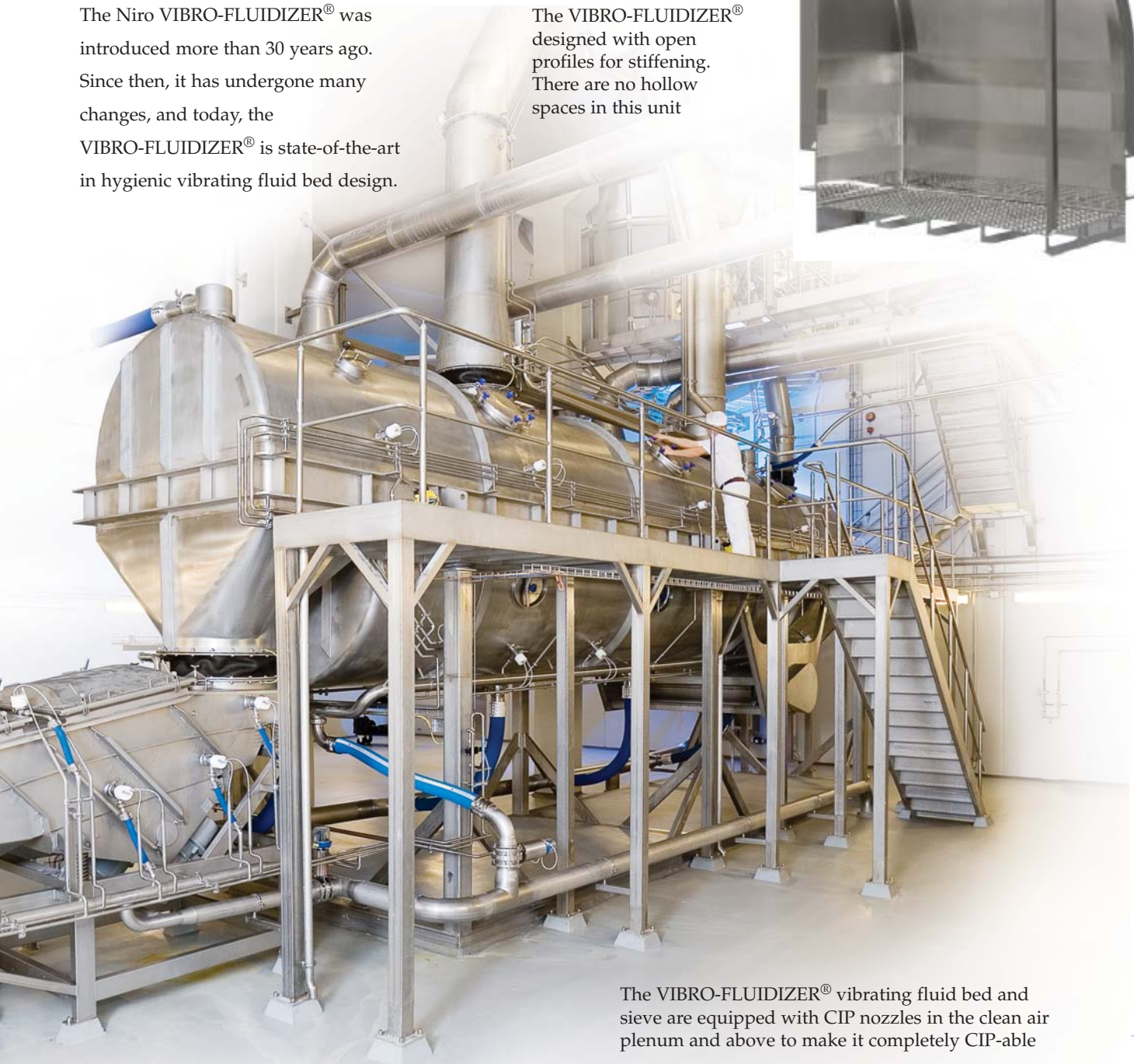


VIBRO-FLUIDIZER®

30 Years of Hygienic Performance

The Niro VIBRO-FLUIDIZER® was introduced more than 30 years ago. Since then, it has undergone many changes, and today, the VIBRO-FLUIDIZER® is state-of-the-art in hygienic vibrating fluid bed design.

The VIBRO-FLUIDIZER® designed with open profiles for stiffening. There are no hollow spaces in this unit



The VIBRO-FLUIDIZER® vibrating fluid bed and sieve are equipped with CIP nozzles in the clean air plenum and above to make it completely CIP-able

Top of the powder silos
and the air filters for
the conveying air. The
silos can be CIP cleaned



Powder Handling

And silo storage

**Hygienic plant
design includes
focus on powder
handling and
storage.**

Colby Powder Systems

There is an increasing concern about contamination of powders during handling and storage. This includes contamination by bacteria. Colby Powder Systems are designed to avoid any contamination, and to meet strict standards worldwide. The systems are developed for tool-free disassembly and easy access. Individual items are manufactured to high tolerances and standards of

finish ensuring a long life with reduced cleaning costs.

Colby Powder Systems makes extensive use of demountable unions, clean designs and modern materials such as food grade and engineering plastics to achieve lightweight construction. This allows for easy inspection and cleaning of individual components and complete machines.



Powder transport by HEPA filtered air to avoid contamination of the powder



Powder diverter valve enabling remote control of the powder flow



For conveying of powder to the bagging off line or retail packing, the bottom of the powder silos are equipped with pipework

Bagging-off

Plant for 25 kg bags

A Clean Step for Hygiene

Avalon Engineering takes hygienic design a step further in bag filling and handling by providing smart methods that enables producers to keep bag filling and handling systems clean and properly serviced:

- Quick-release auger spouts
- Removable filling heads
- Sliding joints on dust extraction system
- Large surface area vacuum probes
- Full CIP design for wet cleaning
- Quick-release components for tool-free disassembly
- Open chain type conveyor belts and flat bed conveyors
- Food grade lubricants

AVAPAC™ bag filling machines are easy to disassemble and CIP clean

AVAPAC™

The AVAPAC™ range of bag fillers are designed to meet the stringent requirements of hygienic standards compliance worldwide. All AVAPAC™ fillers are designed to meet the requirements:

- USDA and 3-A Sanitary Standards (3A)
- Ministry of Agriculture & Fisheries (MAF)
- European Hygienic Design Group (EHEDG)

And many more.

Avalon Engineering supplies hygienic packing systems for a wide range of food and dairy powders.

The AVAPAC™ Inline-800 bag filler offers a flexible and reliable straight line packing process



Metal detector and check weight ensures rejection of the bag if any metal is detected



The palletizer and shrink-foil wrapper present the bags in the best possible way on the pallet

Hygiene by Design

In Powder Processing Plants

Niro is a world leader in industrial processing with evaporation, spray drying, freeze drying, and fluid bed processing as core technologies.

GEA Liquid Processing Scandinavia, Avalon Engineering and Colby Powder Systems holds similar positions in liquid processing technology, bag filling and handling, and powder handling and storage.

The companies are all part of the Process Engineering Division of GEA Group.



GEA Niro A/S

Process Engineering
Division

A company of GEA Group

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