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Danish Dairy & Food Industry

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The new Niro Integrated Filter Dryer IFD™

Health & Safety • Enjoyment & Variety of Dairy & Food Products
Hygiene • Analysis • Processing • Ingredients • Packagings

The new Niro Integrated Filter Dryer IFD™

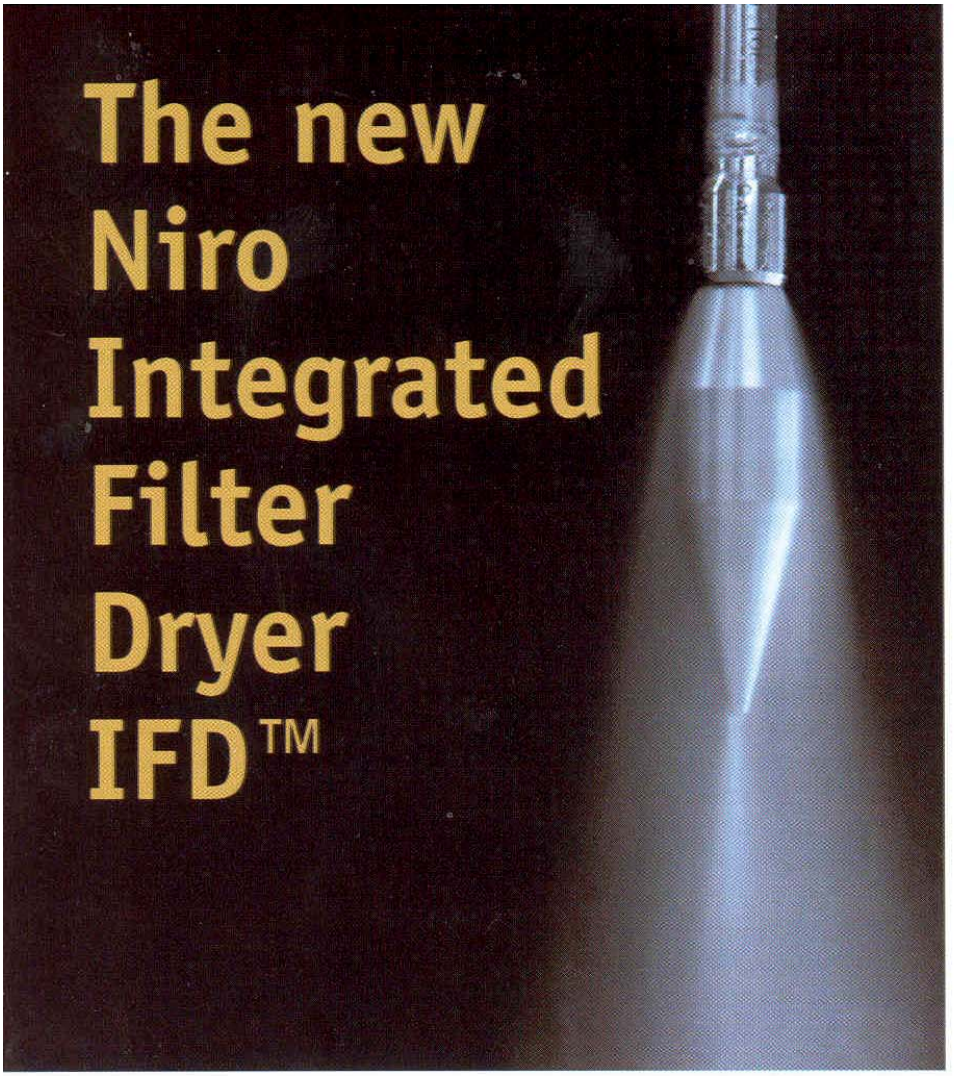

Figure 2: Jet nozzle.

Niro A/S Denmark – member of the GEA Group – have developed a new spray dryer – the Integrated Filter Dryer IFD™ in their continued efforts to improve plant design, product quality, environmental aspects, space requirements, and energy consumption. (See Figure 1)

A new semi-industrial plant has been designed and constructed based on pilot plant testing in Niro's research laboratories, where integrated filter dryers ranging from 1 kg/h to 50 kg/h water evaporation have been developed and tested (see figure 3). The plant performance is now being tested on food and dairy products in the Danish/Swedish dairy giant Arla Foods' Videbæk factory ARINCO in Denmark in an environment where hygiene has top priority.

By Vagn Westergaard,
Product Manager,
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The IFD™ Dryer

The Integrated Filter Dryer plant design is based on proven spray dryer unit operations, such as:

- Feed system with concentrate preheating, filtration and homogenization.
- Atomization by either pressure nozzles or rotary atomization.
- Drying air filtration, heating, and distribution using an air disperser suitable for rotating or vertical air streams.
- Drying chamber designed to ensure hygienic operation conditions and to maintain lowest possible heat loss, the latter by means of dismountable insulation panels featuring air-filled sandwich panels.
- Integrated fluid bed designed as a combined back-mix bed for the drying and plug-flow bed for the cooling. The new-patented Niro Bubble Plate™ is used. Its special features are:
  - The air is directed downward towards the plate surface, therefore particles will be kept moving on the plate, which has few, but large holes and can therefore operate longer time between cleaning. Further, it has demonstrated a very good emptying effect.
  - The manufacturing method prevents crevices. The Bubble Plate™ is therefore sanitary, and as such accepted by USDA.

Exhaust system

The dryer exhaust air system is new and though the idea is revolutionary, it is still based on the same principles as applied in Niro's SaniCIP™ CIP-able Bag Filter. The fines collection system operates with particulate filters integrated in the drying chamber. The filter bags are supported on stainless steel cages mounted in the ceiling around the circumference of the drying chamber. These filter elements operate with blow-back air cleaning systems similar to

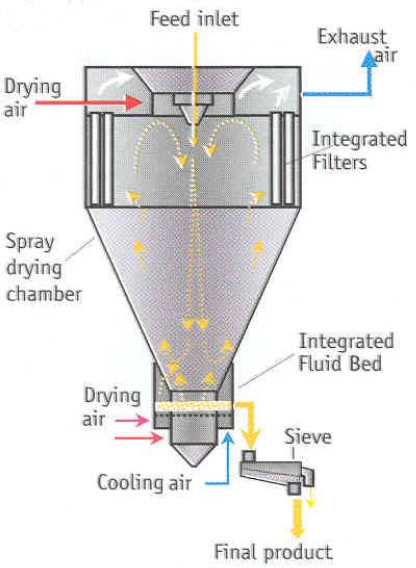


Figure 1: The Integrated Filter Dryer IFD™.

Figure 3: Bag filters integrated in spray drying chambers.

those used in the SaniCIP™ CIP-able bag filter.

The bags are purged one by one by compressed air blown into the bag using the reverse jet air nozzles (see figure 2). This gives a regular and frequent release of powder into the integrated fluid bed.

The selection of filter material follows procedures already known from the SaniCIP™ bag filter and with the same air-to-cloth ratio.

The reverse air jet nozzle has a dual function: During operation it is used for purging, and during CIP it is used for the wet cleaning of the bags from the inside towards the dirty outside. Clean water is injected through the reverse air jet nozzle and atomized by compressed air into the inside of the bag and pressed out on the dirty side. This patented feature is extremely important, as it is otherwise difficult, if not impossible, to extract this entrained powder from the outside only.

To clean the underside of the chamber ceiling close to the bags, a specially designed nozzle is used, also with a dual-function: During the drying operation the nozzle is purged with air to keep the area free of deposits and during cleaning it is used as a normal CIP nozzle. The clean air plenum is cleaned using a standard CIP nozzle.

Advantages of the IFD™ plant

Product:

- Higher yield of first-grade powder.
- Less mechanical handling of products in ducts, cyclones and bag filter and no external recycling of fines is necessary, since the air flow pattern inside the dryer ensures an optimal primary and secondary agglomeration.
- Improved product quality, as the IFD™ plant can operate at low exhaust air temperature compared to a conventional spray dryer.

Safety:

- Simpler safety protection installations, as there are fewer components to protect.

Projecting:

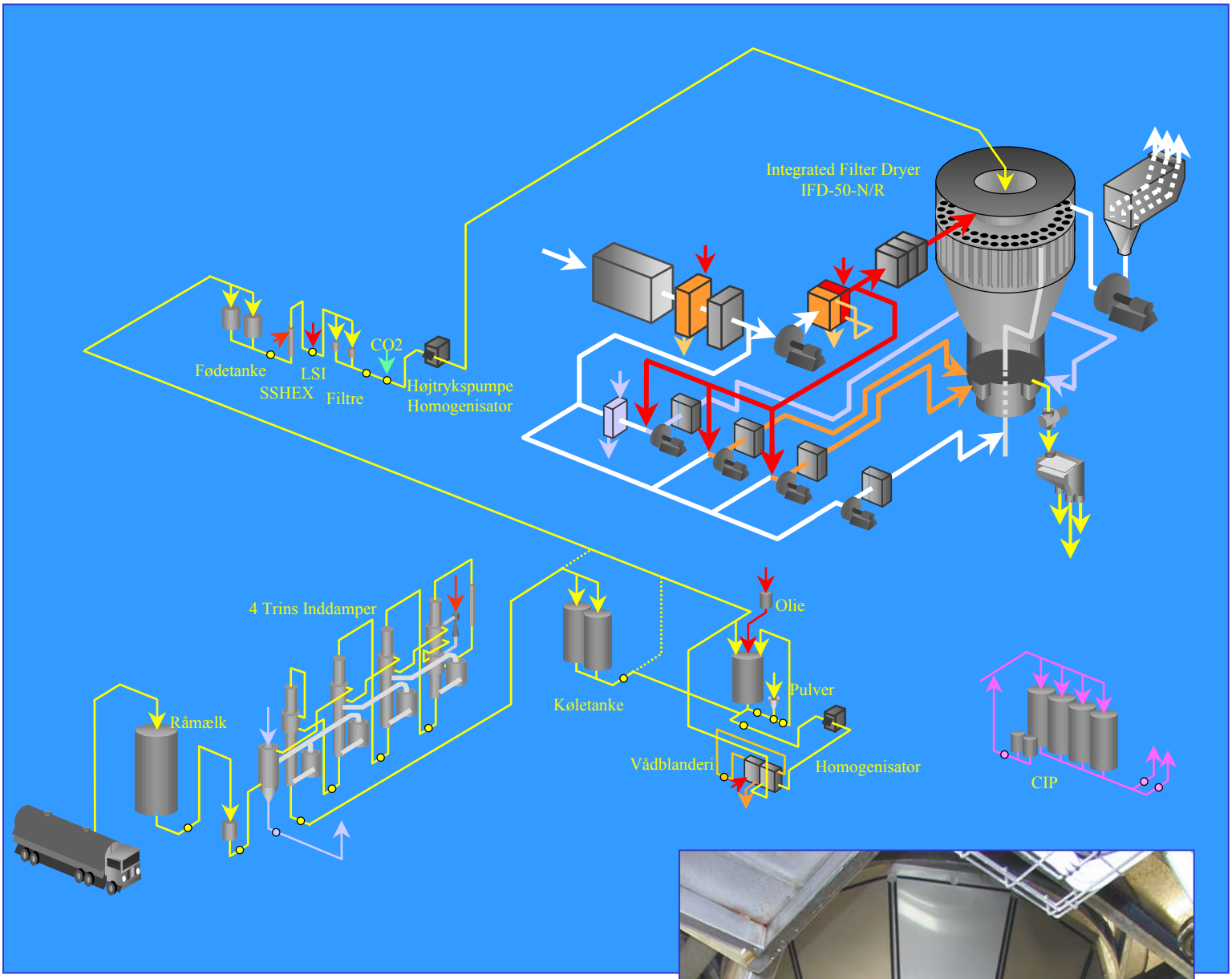
- Simpler plant layout with reduced building size of minimum 15%.

Environmental aspects:

- Reduced possibility of powder leakage into working area
- Easier cleaning operations as surface area in contact with the product is reduced.
- Less effluent discharge during CIP.
- Powder emission down to 10–20 mg/Nm3.
- Reduced energy consumption, saving up to 15% of the power consumption.
- Reduced noise level, due to reduced pressure drop over the exhaust air system.

Production and product testing

The new plant at Arla includes, besides the dryer, also a modern wet mixing plant to mix liquids and powders for compounded products. The plant will be available for commercial product tests for clients by the beginning of January 2003, as well as for contractual small-scale commercial production. □



The Integrated Filter Dryer - IFD™ installed at Arla Foods' factory, Videbæk, Denmark.
Photo shows lower part of drying chamber and the integrated fluid bed.

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