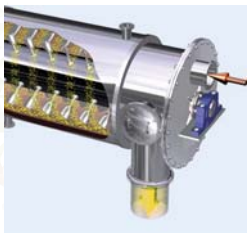
GEA
Process Engineering
Division

Niro

The TIXOTHERM™ Drying Process

Cost-Effective and Compact Production of Non-Hygroscopic Whey Permeate



NIRO POWDER TECHNOLOGY

A New Breakthrough...

The TIXOTHERM™ Drying Process

While the price of permeate powder is low, the costs of producing this in a non-hygroscopic form can be high. With the new TIXOTHERM™ drying process non-hygroscopic permeate powder can be produced in a simple and cost-effective way.

There are many ways to dry permeate, but only two methods produce a non-hygroscopic powder.

Traditional Wet Process

This method involves a series of stages:

- Evaporation
- Flash cooling
- Pre-crystallization
- Pre-heating of concentrate
- Spray drying
- After-crystallization
- Final drying/cooling

All of these stages require significant investments in production space and process equipment, and the energy consumption is high.

The TIXOTHERM™ Process

Niro has developed a new process, TIXOTHERM™, which offers low capital investment, low energy consumption, and greatly reduced space requirements.

Non-Hygroscopic Permeate

Most of the solids in whey permeate is lactose. When permeate is concentrated, the product exhibits a thixotropic behaviour, a phenomenon which is regarded problematic in many unit operations. In the new process, however, it is used to its full extent to create a thick paste.

Cost-Effective, Compact, Simple

Based on a simple, yet sophisticated design, the TIXOTHERM™ process line only requires:

- **Evaporation**
- **Paddle drying/curing**
- **Final drying/cooling**

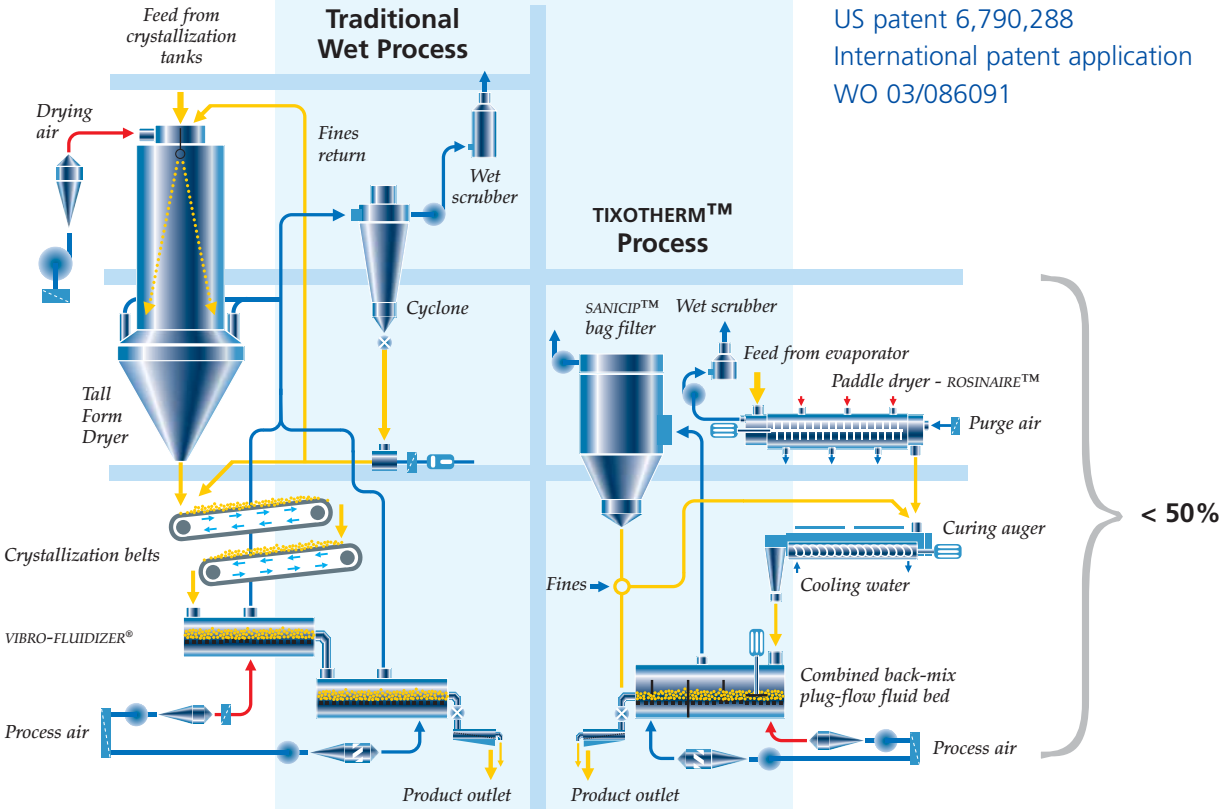
Size Matters

The new process eliminates the need for a separate crystallization process between the evaporator and dryer, and the need for a tall spray drying tower with its attendant demands for a large supply of hot air, a drying chamber, a high-pressure spray nozzle system, and cyclones. In short, it enables you to process your permeate in less than 50% building volume.

Pilot Plant in Operation

The TIXOTHERM™ process line enables your operators to produce whey permeate powder more easily and at much lower cost. Niro already has a pilot plant in operation to demonstrate the low energy consumption and space requirements.

US patent 6,790,288
International patent application
WO 03/086091



Energy consumption (kWh) for a 2,500 kg/h plant:	Traditional Wet Process	TIXOTHERM™ Process
Evaporation	*the same*	*the same*
Flash cooling	*45*	*-*
Pre-crystallization	*125*	*-*
Preheating of concentrate	*80*	*-*
Spray drying	*1715*	*-*
After crystallization	*20*	*-*
Paddle drying/curing	*-*	*1150*
Final drying/cooling	*375*	*690*
Total energy kWh	*2360*	*1840*
Total kWh/kg powder (excl. evaporation) corresponding to more than 20% saving.	***0.94***	***0.74***

Hygroscopic or Non-hygroscopic

TO EASILY DETERMINE IF A POWDER IS NON-HYGROSCOPIC, PLACE IT IN OPEN AIR OVERNIGHT. IF THERE IS NO "CRUST" ON THE POWDER, IT IS NON-HYGROSCOPIC

Three industrial plants available:

1,000 kg/h final powder ~ 400,000 litres of permeate/day
2,500 kg/h final powder ~1,000,000 litres of permeate/day
5,000 kg/h final powder ~2,000,000 litres of permeate/day

The TIXOTHERM™ Drying Process

Niro is a world leader in industrial processing, with evaporation, spray drying, freeze drying, and fluid bed processing as core technologies. The Niro companies are part of the Process Engineering Division of the GEA Group.

GEA Niro A/S
Process Engineering Division

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