TECHNOLOGICAL BREAKTHROUGH AND INNOVATION IN THE PRODUCTION OF WHEY POWDERS,
WITH 30-40% REDUCTION IN ENERGY COSTS

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Key Words: Concentration, whey, energy cost.

There are two essential stages in the elimination of water for the production of whey and permeate powders: concentration by vacuum evaporation followed by spray drying. These two operations alone represent 25% of the energy consumed by the French dairy industry, the major part of which is due to the drying stage. Indeed, 96.7% of the whey water is removed during the vacuum evaporation/concentration stage, whereas drying, which removes only 3.3% of the water, requires 31% of the total energy used over the entire process.

One possible way to reduce energy consumption would be for the product to enter the drying tower at a higher level of dryness. We therefore propose replacing the drying tower with rotating evaporators, i.e. equipment adapted to highly viscous products able to pass from a liquid state to a granular state by a continuous process. The process begins as normal with the concentration of the whey/permeate from 6 to 60% dry matter in vacuum evaporators, followed by crystallisation of the concentrate in a tank. However, instead of passing through a drying tower, the concentrate then undergoes 60–80% superconcentration in a rotating fine layer evaporator. This highly viscous superconcentrate is then granulated in a second fine layer evaporator to recycle the powder created by the previous process. The granules thus obtained are then dried on a fluid bed to 96-97% dry matter.

The patented PST process (Poudre Sans Tour/Towerless Powder – n° FR1457413) constitutes a true technological breakthrough in the manufacture of whey powders, with physical and rehydration properties comparable to those obtained with a drying tower. It has been validated on pilot equipment producing 50kg.h⁻¹ powder and consuming significantly less energy. On the basis of theoretical calculations, the energy cost is 7.2 MJ/t of powder with the PST process compared to 11.9 MJ/t with the classical process, i.e. an energy saving of 40%. Setting up of the equipment does not require location investment such as the construction of a building to accommodate a tower, thus providing an additional saving of approximately 40% on the costs of installation. We are beginning a pre-industrial phase using the process in order to optimise and develop its application to other food powders (maltodextrin, sugars, etc.).

Note: This patent is very new (since 1st January 2016) and some scientific papers are been written