

Novel Potato Dehydrates Produced by Using the LARSSON Whirl Flash® Dryer

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Dehydrated potatoes offer performance of real potatoes, just with the water removed. In a more convenient package dehydrates deliver all the flavour, nutrition and versatility of fresh potatoes. Most consumers easily recognize them as instant mashed. Yet, this is only one form of preparation. Dehydrates are the perfect ingredient in baked goods, frozen foods, ready meals, soups, sauces, snack foods and hundreds more.

Modern potato-processing plants operate almost all year round in an environmentally safe and energy efficient manner and produce consistent quality dehydrates. They use state-of-the-art technology to retain texture and flavour of fresh natural potatoes and ensure food safety, purity, cleanliness and hygiene.

The Starch World Europe presentation “Novel Potato Dehydrates Produced by Using the LARSSON Whirl Flash® Dryer” describes how Larsson Sweden’s latest innovative dryer can be used to produce novel potato dehydrates during a single drying step. Potato based Whirl Flash® Granules are characterized with help of Rapid Visco-Analyzer (RVA) and (polarized-) light microscopy. Recommendations for further process optimization and fine tuning of cell-wall toughness are included.

Standard potato flakes are among the most well-known and widely used products. Made from premium potatoes, standard flakes are bright white to yellowish in color and when reconstituted, have the dry, mealy texture and delicious flavor typical of freshly cooked mashed potatoes. Being only drum-dried and grinded potato flakes are more fragile than other dehydrated potato forms and require careful handling to prevent overmixing.

Standard flakes can be ground to various sizes, all the way to finer grinds that resemble flour. Finely ground flakes are not suitable for making mashed potatoes and are more typically used as an ingredient in (snack-)food manufacturing and baking.



Fig. 1 – Potato flakes (left) and potato granules (right)

Standard Potato Granules are heartier than flakes and reconstitute exceptionally well, with less risk of overmixing and a higher tolerance for boiling liquids. Extra steps create a dried granular texture that increases bulk density in shipping, giving potato granules appeal as an economical choice. Granules also reconstitute exceptionally well, due to the toughening of the cell walls that occurs because of the process to create a granular texture. Again, this makes them the product of choice for institutions. The color, flavor and texture of reconstituted potato granules are very similar to fresh mashed potatoes.

The steps for preparing potato granules deviate from making flakes from the mashing stage. Cooked potatoes are transferred through a T-bar mixer which runs slowly and provides gentle mixing of 10% fresh mash with 90% dry add-back granules. As the two are mixed the dried material absorbs moisture from the cooked potatoes which is cooled, breaking down gradually into individual potato cells. The mixture proceeds to a conditioning belt for further cooling. At this stage the starch within the cells begins to shrink. The potato material passes into another stage of mixing and screening to remove any large clusters. The initial drying stage for granules is done with an air lift drier in which potato material is fed into a cylindrical tube with hot air blown through the bottom. As the drying occurs the potato cells become lighter, rising in the tube and exit into the next drying stage consisting of hot air penetrating through a porous plate. The dried material is screened and processed through a final drying to reduce total moisture to approximately 8%.

The **LARSSON Whirl Flash®** dryer is specially designed for continuous drying of filter cakes, slurries, pasteous and fibrous products. Unlike other comparable dryer types on the market the LARSSON Whirl Flash® Dryer is ideal for both vegetable- and animal-based proteins and other more difficult products that require gentle drying. Backmixing is rarely needed but optional in case this step adds features to a product.

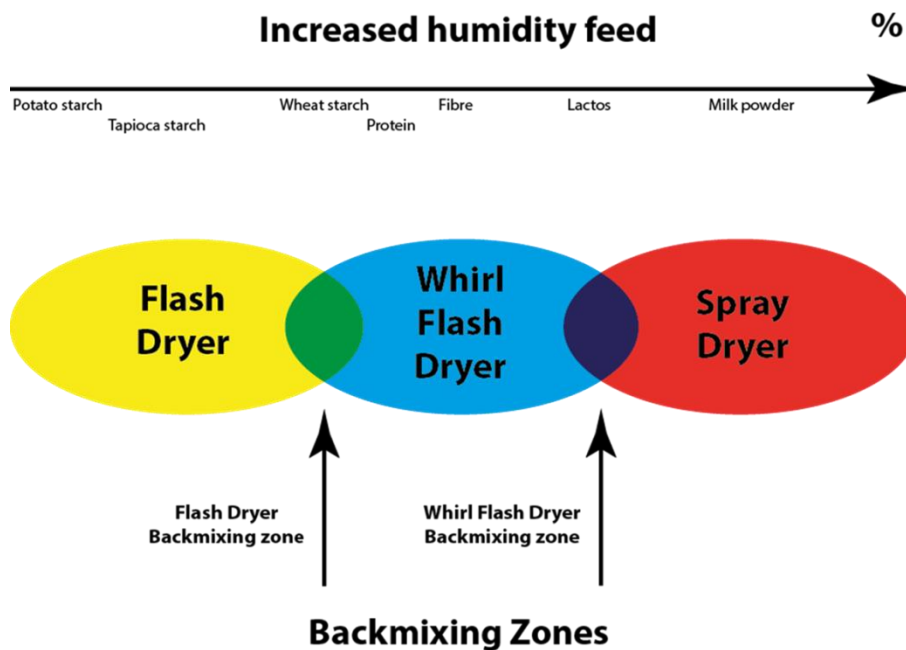


Fig. 2 – Positioning of Whirl Flash® Dryer against conventional Flash Dryer and Spray Dryer.

Experience has shown significant energy savings when using the LARSSON Whirl Flash® Dryer. The instant drying of the product considerably reduces the heat degradation of the product. This feature allows for significantly higher process temperature, resulting in smaller dryer geometry, less investment costs and reduced energy consumption.

Mashed potatoes enter the buffer tank provided with a slow-rotating agitator which feeds the product into a twin screw conveyor system, see figure 3. This system ensures smooth feeding to the drying process, which is accurately controlled by a combination of a buffer tank equipped with load cells and the variable speed of the twin screw. One of the key success factors is the perfect dispersion of the wet mash by fast moving rotor blades into the hot air. In this way the product surface area is very much increased and water can be flashed off

instantly. Due to the superb degree of dispersion, a higher air drying temperature is achieved in comparison to other types of flash dryers. Energy cost savings are achieved due to the high differential temperature (inlet/outlet) in combination with the reduced airflow. Another remarkable feature of the rotor blades, in combination with controlled residence time in a balanced fluid bed, is the possibility to create a semi-milling effect that reduces aggregation of potato granules. Size uniformity of granules can be controlled directly in the Whirl Flash[®] Dryer itself without the use of post-milling equipment.

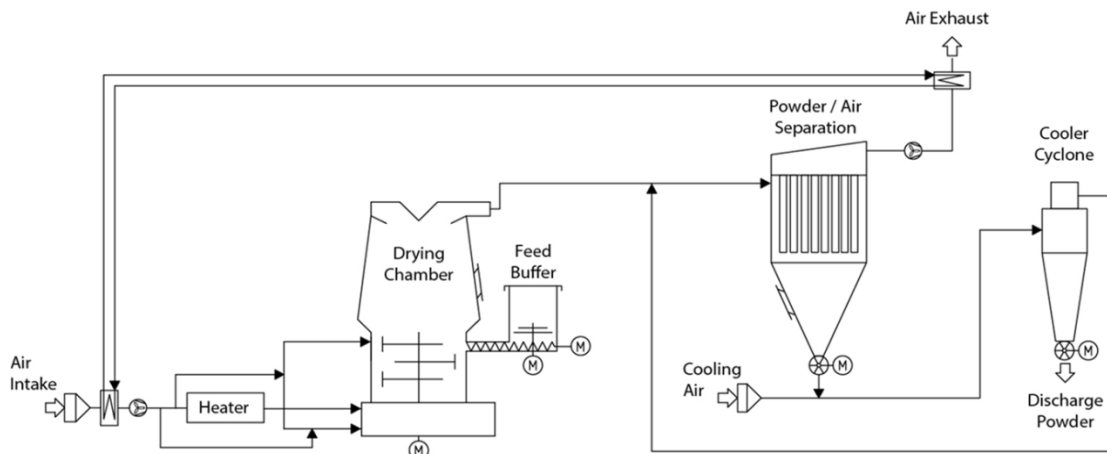


Fig. 3 – Principle process flow diagram

The semi-dry granules move from the disintegration zone to the fluidization zone, where the desired moisture level is achieved at lower temperature – 2nd stage drying. In the fluidization zone, secondary air is fed which surrounds the particles with dry air of moderate temperature, ensuring a gentle drying of the particles. In the bottom section of the drying chamber a stationary air distributor is placed which distributes the dry air evenly up into the rotor zone. Thus, an intense contact between wet mash/granules and dry air is created.

Granules and air are taken out through a classifier, which exercises certain particle-size control, and are then fed into a powder separation system based either on cyclone or filter. Often a powder cooling step is introduced at this point in order to flash cool the powder prior to bagging.

The LARSSON Whirl Flash[®] Dryer can be customized based upon requirements and preferences of heating technologies and emission standards. Further, the dryer's components can be designed and customised to fit in existing facilities.

Gentle 2-stage Drying is achieved as follows. The LARSSON Whirl Flash[®] drying chamber is divided into two zones. In zone 1, disintegration and drying takes place, and in zone 2 (fluidization zone) a gentle post-drying occurs, as in a fluid bed. The fact that there are two stages for the drying process means that the drying takes place at lower temperature than in a single-stage dryer and therefore, is more gentle to the potato granules. Degree of granule-aggregation and thus particle size can be adjusted during operation by letting the effect of the disintegrator control the velocity of the air coming into the system. This feature is particularly effective in a conical chamber, like the one found in the LARSSON Whirl Flash[®] Dryer.

Whirl Flash[®] Potato Granulate has been produced by drying fresh Swedish mashed potatoes in the Whirl Flash[®] Dryer in a single drying step, without back-mixing. The latter however remains optional in case toughening of cell walls, which occurs because of up to 90% back-mixing in conventional drying processes, is required. Whirl Flash[®] Potato Granulate produced without back-mixing is cold swelling and develops in the Rapid Visco

Analysed a viscosity comparable to regular potato granulate, the latter however requires heating before any viscosity develops.

Whirl Flash[®] Potato Granules retain texture, taste and flavour of fresh natural potatoes and have similar colour as fresh, natural potato mash.

It is obvious that besides mashed potatoes also other mashed products from either vegetable - or animal origin can be dried. Products either mashed or grinded from vegetable- or animal origin that may be dried with help of the novel LARSSON Whirl Flash[®] Dryer technology, include but are not limited to vegetables (carrots), fruits (bananas), cereals (wheat, corn, (sweet-)rice, oat, barley, rye, buckwheat), beans, cassava, sweet-potato, yam, taro, meat, poultry and seafood.

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