NETZSCH

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CASE STUDY

Protein Shifting and Enrichment with the use of Dry Grinding and Classifying

FOOD & CONFECTIONERY | a Business Field of NETZSCH Grinding & Dispersing

Protein Shifting and Enrichment with the use of Dry Grinding and Classifying

Introduction and state of the art

Worldwide, the food supply chain is being faced with change. On the one hand, the increasing growth of the worldwide population creates an increasing need for foodstuffs, including a supply of proteins. This increasing need cannot be covered by animal proteins/products alone, due to the land requirements of livestock. On the other hand, the growing demand by consumers for sustainable production methods must be taken into account. The criticism of the sustainability of animal products in particular is expanding: The land usage and water consumption as well as greenhouse gas emissions of these products, in comparison to those of cultivated crops, are many times higher. Alternative sources of protein are being sought, and they play an important role for meeting future population needs. In addition to plant products, mushrooms, algae or insects, can be placed in this category.

Currently, soy is the most common of the crops used as a meat substitute based on plant material. They are processed into isolates with high protein contents of > 80%. The typical method for obtaining these is wet extraction. The use of large amounts of water, chemicals and energy for drying, makes this method a laborious, complex and resource consuming process.

The solution from NETZSCH

An alternative process is dry fractionation - a process that has been used to process flour for quite some time. NETZSCH has successfully been able to carry over the experience obtained from this process to the processing requirements of crops.

The goal of the application is to achieve a protein rich fraction in which the portion of protein is considerably higher than that of the initial material, by means of grinding and subsequent separation.

Fine Grinding – Fracturing of united cell structures with the aim of separating the starch granules from the proteins. The result are singular starch and protein granules as well as cell fragments gained from protein granules that partially contain starch granules.

Classifying – Efficient separation of the starch-protein-mixture into a coarse fraction with a high starch content and a fine fraction with a high protein content.

Processing

Effective impact-grinding with the NETZSCH Classifier Mill Type CSM

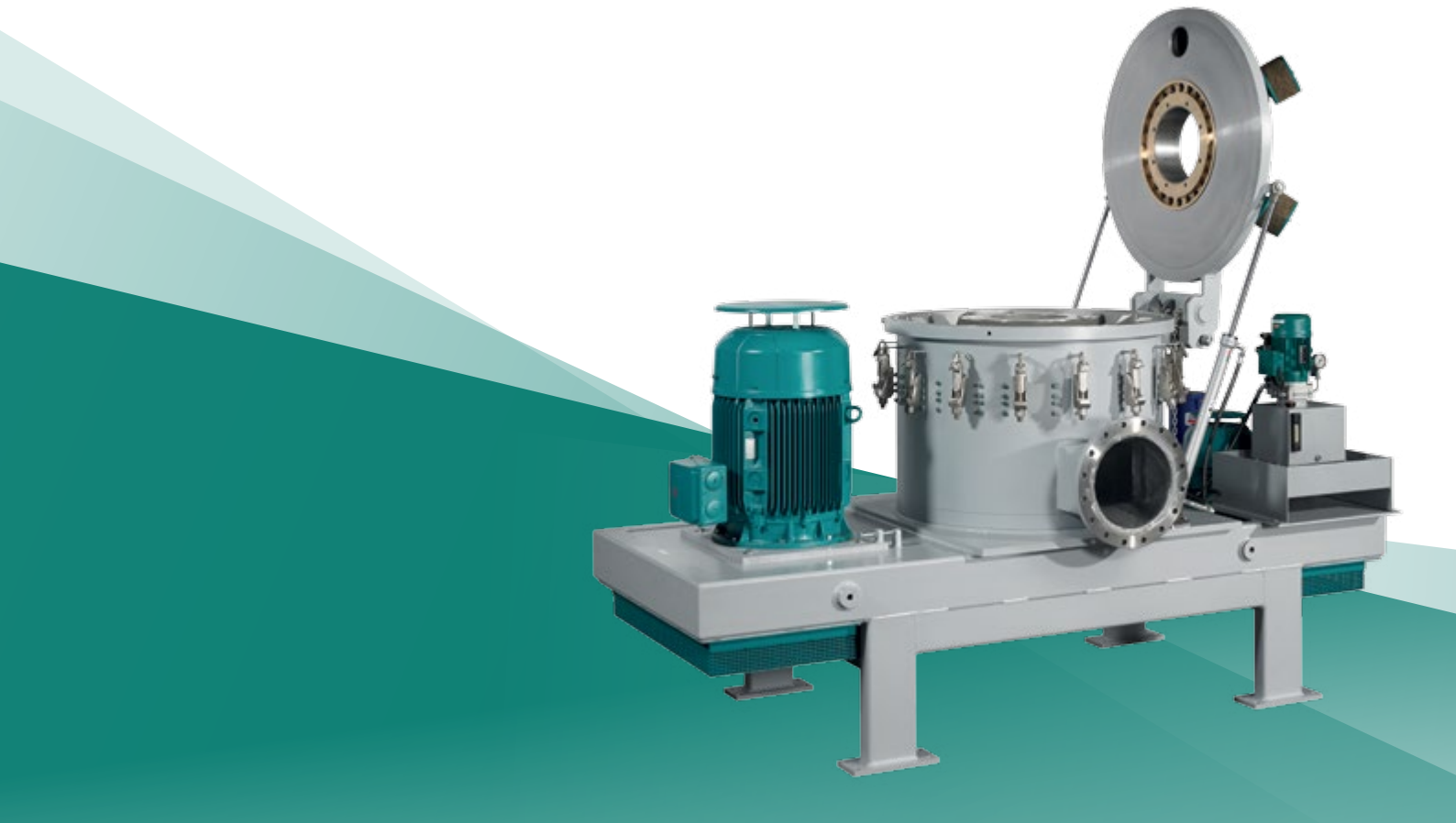
The beans or grains of a chosen crop are cleaned and dehulled, and afterward passed on for dry grinding, the objective of which is to break up the cells and to separate the starch granules from the proteins and fibrous cell parts. The most energy-efficient method for achieving this, is impact grinding using the NETZSCH classifier mill type CSM.

The integrated classifier of this mill type assures that only coarse cell fragments remain in the grinding chamber until the starch particles have been separated from the cell fragments and ideally only starch and protein fragments remain. Only in this manner, can a high yield be achieved in the subsequent separation step, with an optimum amount of energy expenditure.

It is decisive for the separation step, that during the grinding process, the size difference between the protein fragments and the starch granules remain as large as possible. Depending on the type of crop, the particle size of the proteins (for example peas) range from < 3 µm, whereas the starch granules ranging from 40 µm are considerably larger. The force applied to the starch in the NETZSCH Classifier Mill, is far more gentle than that of a pin mill, whereby to the greatest possible extent, the starch particles are preserved and the protein fragments are considerably smaller. This enables highest degrees of efficiencies in the following separation.

Focus on Your Advantages

- Quick adaptation to varying product characteristics
- Wide product spectrum
- Ready access for rapid product rotation
- Precision setting of product fineness



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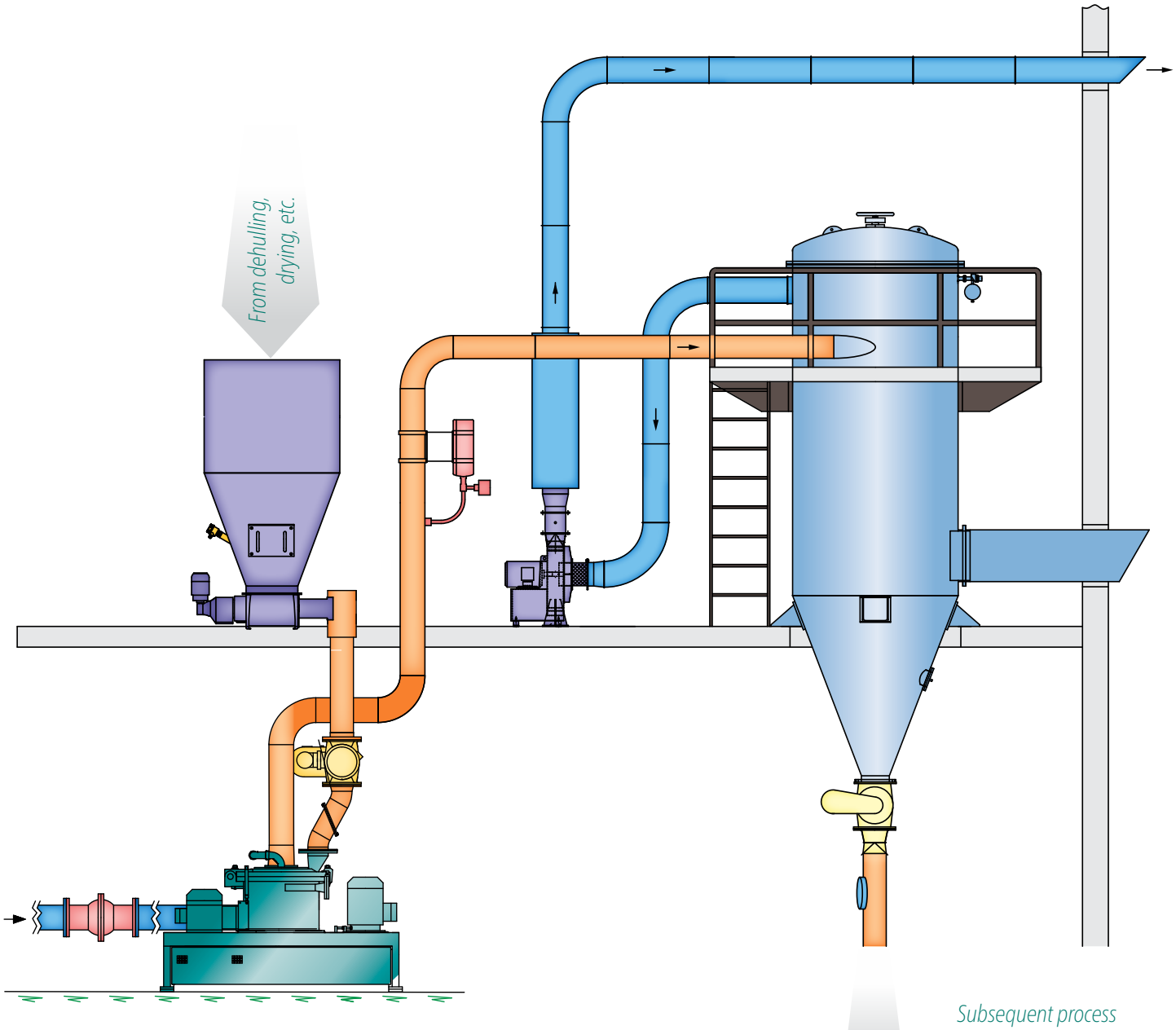
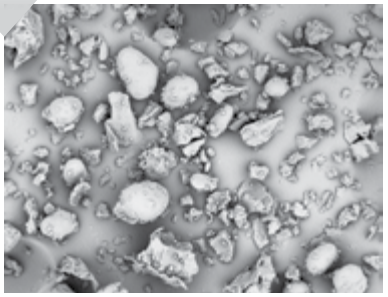


Subsequent process separation



Separation

Efficient separation with the NETZSCH High-Efficiency Fine Classifier Type CFS/HD-S

Separation is achieved using the NETZSCH High-Efficiency Fine Classifier CFS/HD-S.

This classifier uses a stream of air to disperse the solid particles. Only through effective dispersion is it possible to optimally separate all of the particles and classify them according to size and/or weight. For this purpose, the ground product is passed into a ring gap, charged with air. The ring gap accelerates both particles into a circulatory motion, and the additional centrifugal forces separate them from one another. The particles are separated considerably more effectively, and thereby higher protein values and yields achieved, as compared to other design forms of classifiers.

Therefore, dry fractionation offers possibilities for cost effective, sustainable processing of premium quality products that have a high protein content. In addition, the NETZSCH process offers the invaluable advantage of flexibility, through its ability to adapt processing parameters to the varying characteristics of raw materials and a diversity of crops.

Focus on Your Advantages

- For high protein contents up to approx. 60%
- Compact design
- Effective dispersion
- Adjustable for high yields

Application example Yellow Peas

- Fines yield 25 - 35%
- Protein fraction of fines in the range of 55%
- Throughput rate up to 4 t/h

Combination of machines		Throughput
Mill	Classifier	[t/h]
CSM 360	CFS 170 HD-S	0.5
CSM 560	CFS 340 HD-S	1.3
CSM 720	CFS 510 HD-S	2.3
CSM 900	CFS 750 HD-S	4.0

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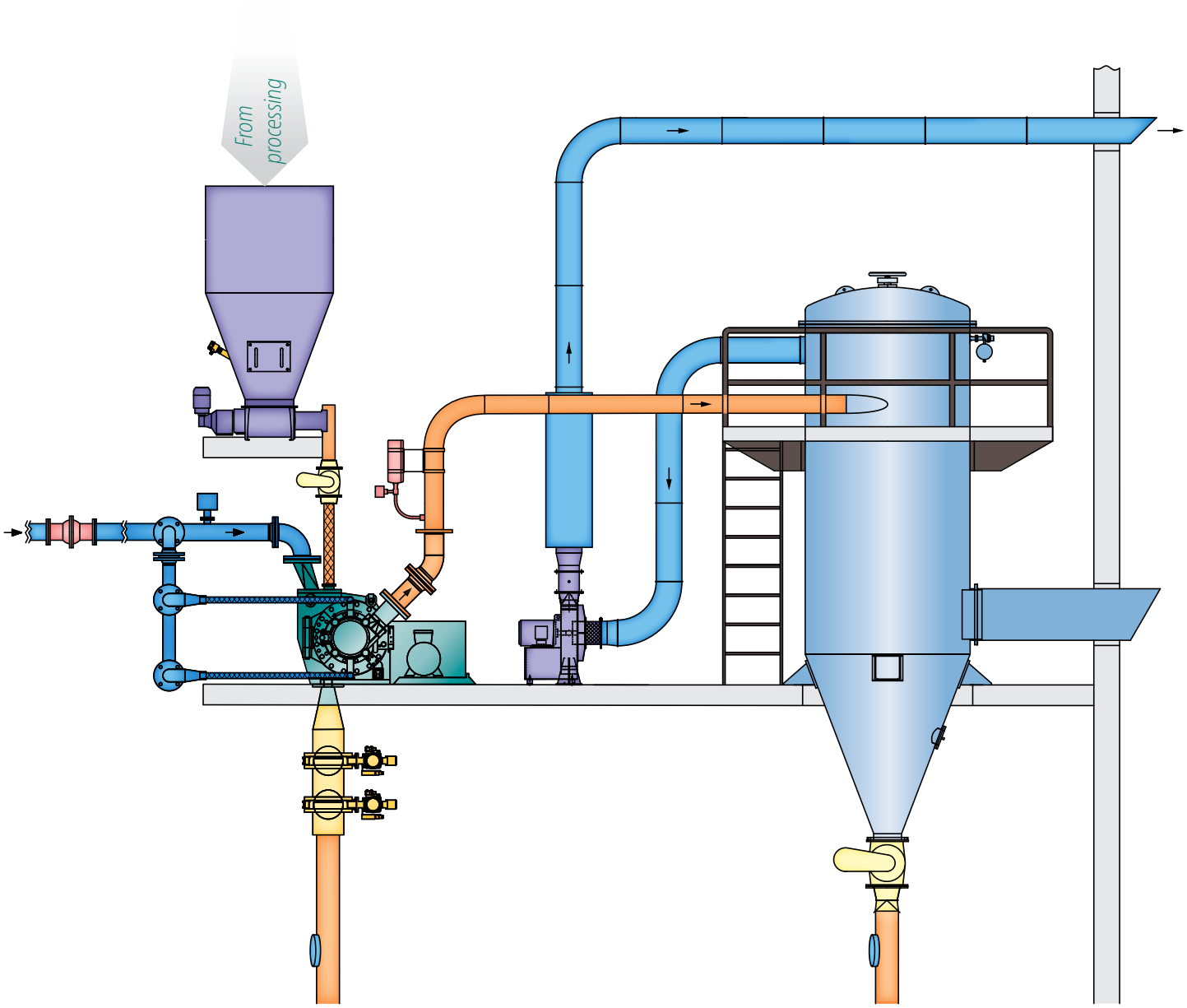
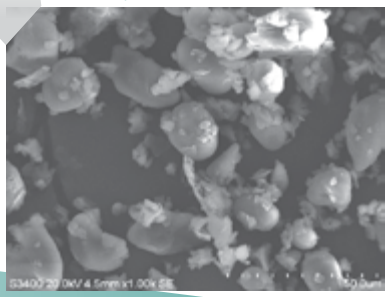
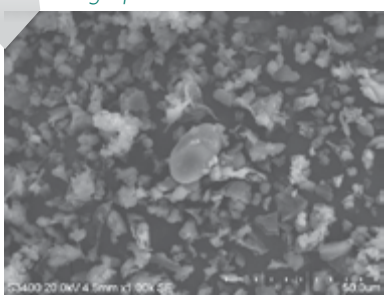


Low-protein fraction



High-protein fraction



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Our performance standards are high. We promise our customers Proven Excellence – exceptional performance in everything we do, proven time and again since 1873.

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G&D · Protein Shifting · EN · 07/2022 · Technical specifications are subject to change.