

Thermic processes

Separates, washes, dries and checks

Safe production with the help of a PAT-compliant centrifuge dryer

Solid-liquid separation with the help of centrifuge dryers is common practice. To date, the necessary parameters for efficient product processing have had to be laboriously tested in a series of experiments. However, if the system is equipped with Process Analytical Technology (PAT), the ideal process settings are determined considerably more quickly, are even checked during the process and subsequently modified.

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The known production sequences in a centrifuge dryer are as follows:

The suspension is filled into the filter drum via the drive shaft. In the centrifugal field, the solid is retained on the multi-layer filter tissue and the mother liquor filtered through the product cake. The filter cake is then washed. After washing, the centrifugation for the mechanical dehumidification starts. In the next process step, efficient and general drying commences in the form of packed bed drying and/or fluidised bed drying.

Problems with high solid content

Products with a broad grain size spectrum and a high proportion of fine grain and/or with a bimodal distribution cannot be centrifugated or dried, or only with considerable effort. This is where a new production process begins: during drying, the counter impulse procedure does not dislodge the product cake. The shot nozzles inject into offset openings on the drum base with each revolution of the drum. The gas flows inwards through the moist product ring, in the opposite direction to the centrifugal process. As this is done at higher speeds, the product ring is kept upright at all times, thus ensuring that the material is loosened over the entire drum circumference, increasing its porosity and facilitating processing again.

The dried product is then removed. As the interior of the centrifuge has been kept free from any fixtures, the system can be emptied without any encrustations and free of any residual layers – it is immediately available for the next load.

Continuous measurement instead of random samples

The American health authority FDA propagates the use of PAT with the synthesis of pharmaceutical products. This initiative aims to analyse in detail and understand the manufacturing processes on the basis of empirical scientific data and with this knowledge to facilitate new and innovative manufacturing processes. Whereas up to now, sample final checks have ensured the same level of product quality, in future the critical quality and performance parameters are to be checked by measurements during production and be assessed against the background of a comprehensive process understanding immediately in real time and the corresponding settings changed where necessary. Only through measurements as an integral part of the process ('Quality by Design') – this is how the FDA sees it – is the quality of the product ensured, and not through subsequent production checks. The centrifuge dryers of FIMA Maschinenbau meet these requirements, and according to the company's own information actually exceed them. With the assistance of integrated

online and/or also at-line PAT measurement and analysis techniques, the parameters relevant for the product quality are automatically determined in the process steps filtration, washing and drying in the centrifuge dryer. Among others, the following parameters are measured: product temperature, gas entry and gas exit temperature, pressure in the drum, axial pressure of the liquid ring, residual moisture in the filter cake, filtrate quality and height of the filter cake. During the production process, samples can be taken online and the production monitored by means of a video camera and the procedure visualised. The data acquired in this way are used to modify the production parameters of the centrifuge dryer in accordance with the desired characteristics and to enable the operator to manage the individual process steps himself. Particularly with manually operated experimental and pilot systems and for validation with production systems, the PAT system is a valuable tool for rapid and successful optimisation of the production process.

Specially for toxic products

The TZT centrifuge dryers can be equipped with CIP and SIM modules in addition to the PAT systems. The centrifuge dryer is therefore also suitable in particular for toxic products in high-containment systems. The hygiene design is GMP-compliant and prevents any cross-contamination; all sealing systems are compliant with FDA regulations. To date, TZT centrifuge dryers have primarily been used in the pharmaceutical and chemical industry in the production of APIs; most recently, however, there has been growing interest from other areas, for example, the fine chemistry, mineral or colour pigment industries. Depending on the application, systems are available for technical schools and production. The fill volume ranges from 37 to 800 litres of suspension, which corresponds to a cake volume of between 20 and 400 litres. The project and process engineers at FIMA advise customers on the planning of the system, integration in the existing production process, the selection of the control unit and software and in the layout of the periphery.

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Further information

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The centrifuge dryer TZT in detail

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