

Radial Multi-zone Dryer

Publieke samenvatting / Public summary

Aanleiding

The Radial Multi-zone Dryer (RMD) is an intensified spray drying technology which combines a very short residence time in a central zone with high temperature injection with rapid transfer to a peripheral zone with mild-temperature injection. This trajectory yields better product properties than powder produced in conventional spray dryers. Furthermore, high temperature drying improves energy efficiency, thus reducing the specific energy consumption of drying and so the carbon footprint of dried (dairy and other) products. Improved product properties relates to e.g. nutritional value (mild processing) as well as to functionality (e.g. solubility) of the product. Due to intensified drying, the size, viz. footprint, of the dryer will be smaller than of conventional spray dryers, thus reducing investments in equipment, building and operation. In addition, centrifugal forces in the dryer efficiently separate powder particles from the drying air, meaning integration of particles separation in the dryer chamber and so further reduced investments in equipment to separate particles from the drying air downstream of the dryer.

Doelstelling

The RMD project aims at getting an understanding of these phenomena by combining experimental research, CFD modelling and energy optimization scenarios.

Korte omschrijving

During research to the fundamentals of a vortex chamber dryer the concept of a new drying technology, the so-called radial multi-zone dryer

Projectinformatie / Project information

Innovatiethema('s) / Innovation themes

1 Warmte.

Subsidieregeling / Subsidy scheme

TKITOE-ISPT

Stroomschema-onderdelen / Flow chart parts

Projectnummer / Project number

TKITOERMZD-1

Subsidiebedrag / Grant amount

€ 1.018.365,00

Algemene informatie / General information

Projectconsortium / Project consortium

- **PETTEN**
Energieonderzoek Centrum Nederland
- **AMERSFOORT**
FrieslandCampina Nederland B.V.
- **AMERSFOORT**
Stichting TKI-ISPT
- **Louvain-la-Neuve**
Université catholique de Louvain
- **ENSCHEDÉ**
Universiteit Twente

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(RMD), has been defined, tested and patented. The technology was extensively studied on a small lab scale dryer and Computation Fluid Dynamics (CFD) models were developed. Despite the fact that the principle of the technology has been proven on this small scale many fundamental questions remain that have to be answered to come to a working prototype. It concerns questions with respect to control of product quality, specific energy consumption, particle trajectories in relation to drying properties, wall contamination and fouling of the atomization nozzle.

The scale of the experimental dryer depends on the relevant particle size, atomizer and particle trajectory needed to match the desired drying behavior. Design and construction of such a dryer will be part of the project. Milk powder has been selected as a model system. Product properties will be carefully analyzed and compared with those obtained with a reference drying technology.

Resultaat

Preliminary results suggest that studying the RMD concept on an experimental unit a drying capacity of 100-250 kg water evaporation per hour will be needed to be able to study the nature of the wall contamination and flow dynamics and to get an indication on product properties. This unit will also give insight in design rules and operation window for pilot plant and production units and will make it possible to make a proper analysis on potential energy saving compared to reference drying technology. One of the deliverables will be a conceptual pilot plant design (e.g. 500 kg/hour water evaporation capacity) which meets the requirements with regards to capital investment, operational costs, product quality and energy efficiency. Finally, collaboration with an equipment manufacturer will be initiated in preparation of the design and construction of a pilot plant unit.