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unopex® is a division of BAKON



Unopex Spray Dryers for the Pharmaceutical Industry



Spray Drying for the Pharmaceutical Industry

Pharmaceutical ingredients and excipients are typically produced by extraction or chemical syntheses. In most cases, the material is subsequently crystallised, mechanically separated, and dried.

In the drying stage, many pharmaceutical manufacturers enjoy the advantages of spray drying technology.

Spray drying not only allows for precise control over moisture and residual solvent levels in powdered products but also enables the development of materials with customized particle size distribution and morphology resulting in products with better performance characteristics.



Unopex is a leading manufacturer of customized solutions and complete, turnkey packages for handling numerous applications for the pharmaceutical industry that give high-quality products in the most efficient and economical way.

Unopex Pharma Spray Dryers are developed and manufactured for clinical production of pharmaceutical formulations and healthcare products.

The design and construction is guided by FDA and cGMP regulations.



Unopex Pharma Spray Dryers are designed for safe and sanitary, reproducible spray drying of aqueous and non-aqueous formulations and suitable for drying heat-sensitive pharmaceuticals with minimal loss of activity.

With Unopex Pharma Spray Dryers it is possible to make microencapsulation, complex formulation, modification of biopharmaceutical properties, dry powders for inhalation.

Comprehensive Partnership for Your Long-Term Success

Unopex is dedicated to identifying the most effective solutions for your long-term needs.

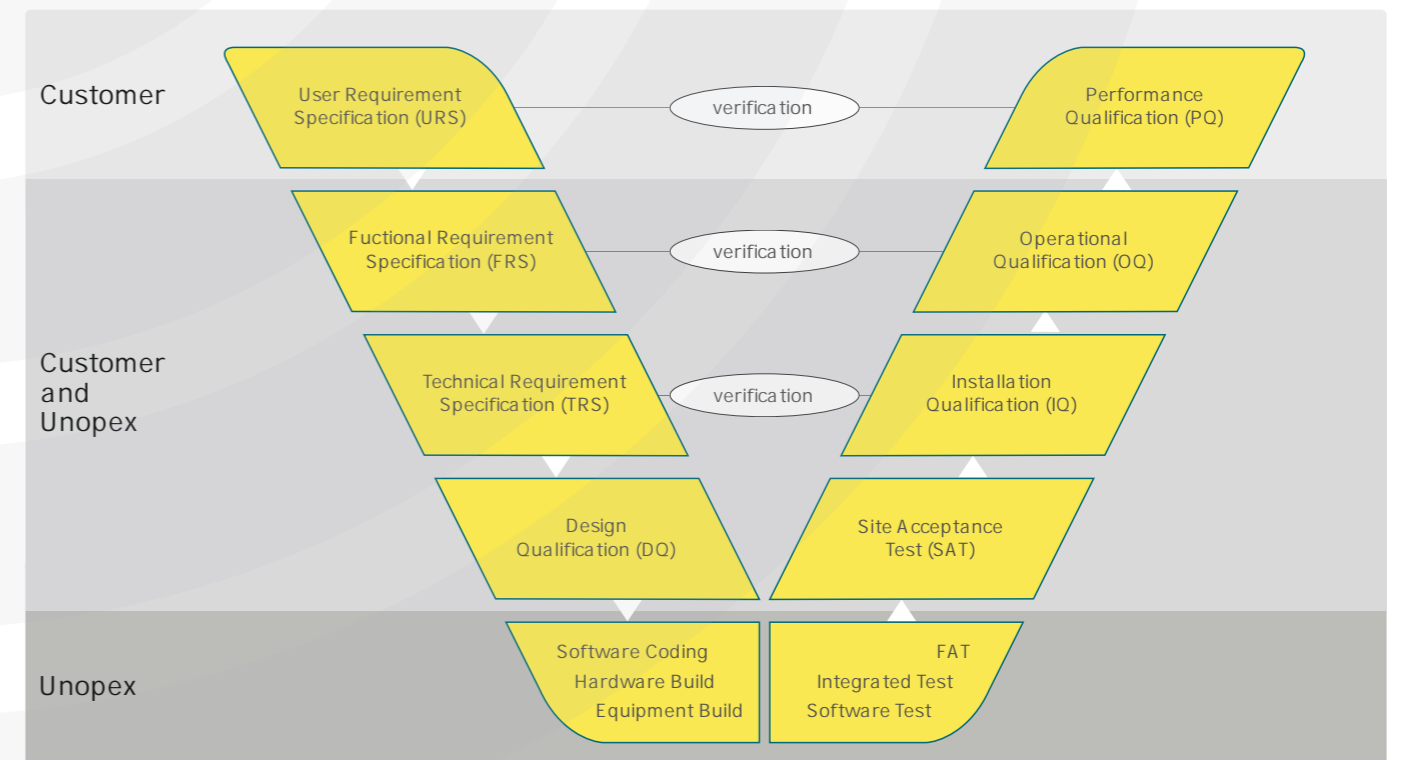
From outlining your specifications to overseeing the commissioning and validation of your equipment, our experienced team is with you every step of the way.

We collaborate closely with your team to design and develop the components and systems required for a successful and validated plant.

Our equipment validation process is carried out in accordance with a well-established plan and detailed documentation, reflecting our deep expertise and commitment.



As Unopex, we stand by you through every phase to ensure your long-term success.

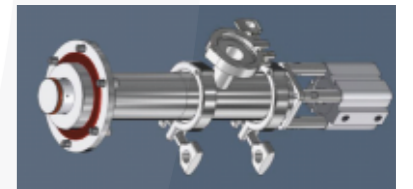
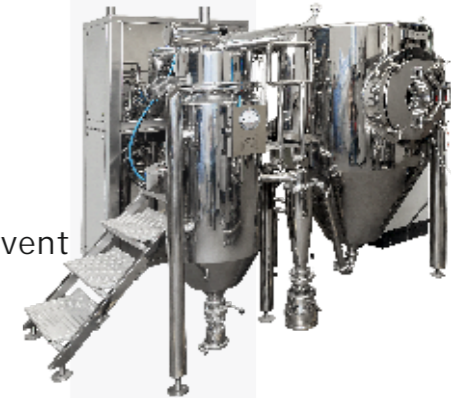


Advantages of Spray Drying for Pharmaceutical Industry

- 1 **Instantaneous Liquid to Particle Conversion**
Spray drying quickly converts liquid formulations into particles. This rapid transformation enhances the solubility and bioavailability of pharmaceutical compounds, crucial for effective drug delivery.
- 2 **Safe Processing of Heat-Sensitive Compounds**
Ideal for heat-sensitive pharmaceuticals, spray drying ensures droplet temperatures remain safe, preventing degradation of active ingredients and preserving biological activity and efficacy.
- 3 **Easily Scalable for Pharmaceutical Manufacturing**
The scalability of spray drying allows processes developed at small scales to be reproduced commercially. Unopex ensures smooth scale-up with optimized processes, reducing costs and enhancing viability for large-scale production.
- 4 **Stable and Consistent Production**
Spray drying is a continuous process with stable parameters. Automated control and continuous monitoring ensure uniform product quality, high efficiency, and product safety.



- 5 **Rigorous Validation for Pharmaceutical Standards**
Precise control of parameters guarantees consistent product specifications, ensuring uniformity and regulatory compliance.
- 6 **Enhanced Shelf-Life of Pharmaceuticals**
Spray drying enhances shelf-life by transforming liquid formulations into dry powder, reducing moisture to prevent microbial growth and chemical degradation, ensuring product stability.
- 7 **Improved Dosage Accuracy**
Spray drying process allows for precise control over particle size, essential for accurate dosing in pharmaceuticals. This ensures each dose contains the exact amount of active ingredient needed.
- 8 **Versatility in Formulation Development**
The versatility of spray drying makes it suitable for various formulations, including tablets, capsules, inhalable drugs. This flexibility supports innovative drug delivery systems.
- 9 **Cost-Effective Production**
As a cost-effective method, continuous nature and efficient material use of spray drying reduce production costs, improving economic viability.
- 10 **Environmental Benefits**
Spray drying offers environmental benefits by efficiently using energy and materials, minimizing waste, and reducing the need for preservatives and packaging, enhancing sustainability.



Retractable CIP nozzle



Clean-In-Place (CIP) Systems

Ensuring plant hygiene is essential in the pharmaceutical industry to comply with regulations and maintain productivity.

Clean-In-Place (CIP) systems play a crucial role in maintaining cleanliness and safety standards in pharma spray dryers.

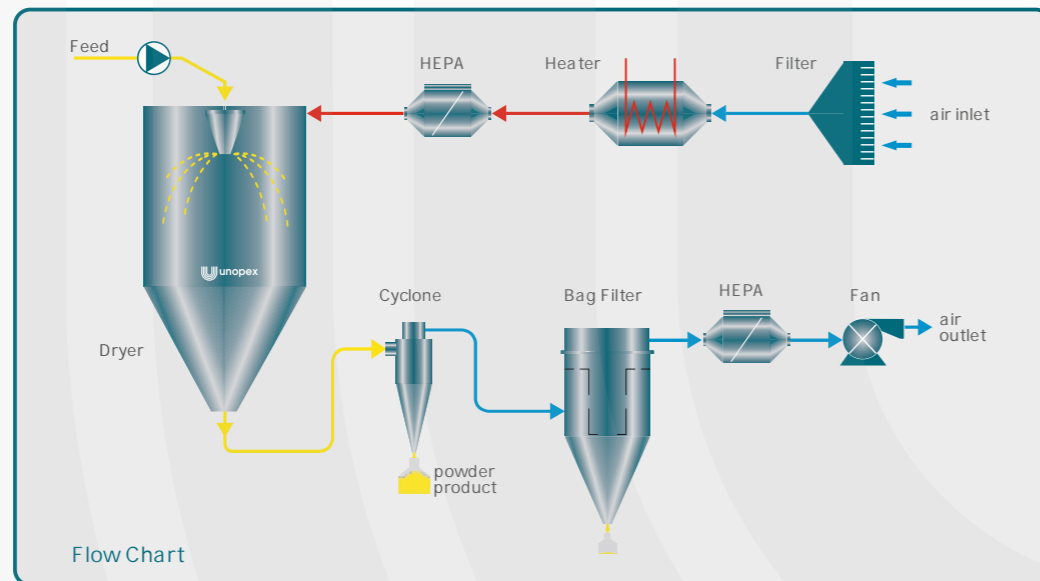
Unopex offers a variety of CIP solutions tailored to different cleaning requirements for producing high-quality pharmaceutical products

Unopex Pharma Spray Dryers

Tailored for Pharmaceutical Industry

Unopex Pharma Spray Dryers are available as single pass (open mode) or closed cycle systems and customized specifically to meet the high requirements of the pharmaceutical industry including GMP production, advanced control systems, special surface treatment, process validation etc.

Single-Pass Pharma Spray Dryers



Drying process occurs in a single pass without recirculation of the drying gas. Either ambient air or inert gas is used as the drying medium, and after passing through the drying chamber, the gas is typically treated or discharged.

Unopex Pharma Spray Dryers are designed for safe and sanitary, reproducible spray drying of aqueous and non-aqueous formulations and suitable for drying heat-sensitive pharmaceuticals with minimal loss of activity



A tomization

Selection of the right atomization method in spray drying plant configurations is very important since it plays a critical role in the structure and quality of the final powder and in process efficiency.

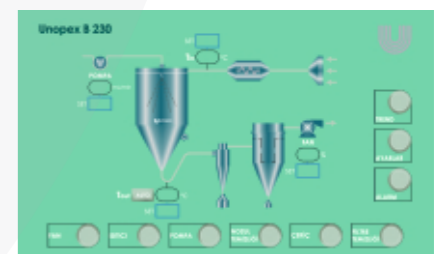
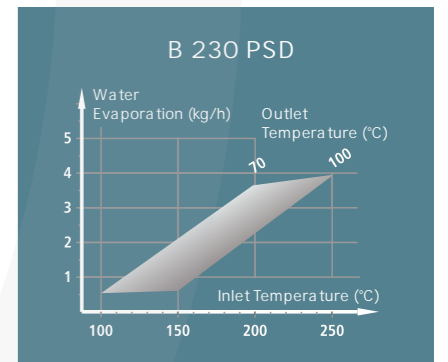
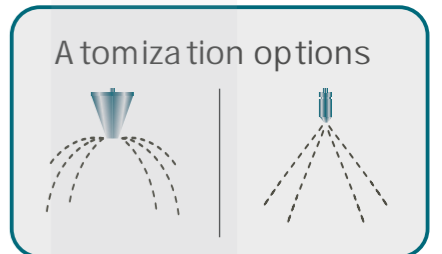
Spray dryers for pharmaceutical applications are often equipped with rotary atomizers or two-fluid nozzles.

In rotary atomization, the liquid feed undergoes centrifugal acceleration within the atomizer wheel, followed by discharge into a stream of hot drying gas. The degree of atomization and the morphology of particles are influenced by variables such as peripheral speed, feed rate, liquid properties, and atomizer wheel design. Particle size can be finely tuned by adjusting the peripheral speed. Rotary atomizers are known for their flexibility and suitability across a wide range of products

The two-fluid nozzle utilizes high-velocity compressed air or gas to impact the liquid feed, atomizing it into fine droplets. Particle size control is achieved by adjusting the ratio of atomizing gas to liquid feed. Co-current configuration positions the nozzle tip near the outlet of the ceiling air disperser, making it ideal for drying heat-sensitive products that require gentle handling and precise control over particle size distribution.

Each atomization method brings unique benefits, catering to diverse powder production requirements in pharmaceutical manufacturing.

Unopex Pharma Spray Dryers are equipped with the right atomizer type to meet your pharmaceutical product requirements.



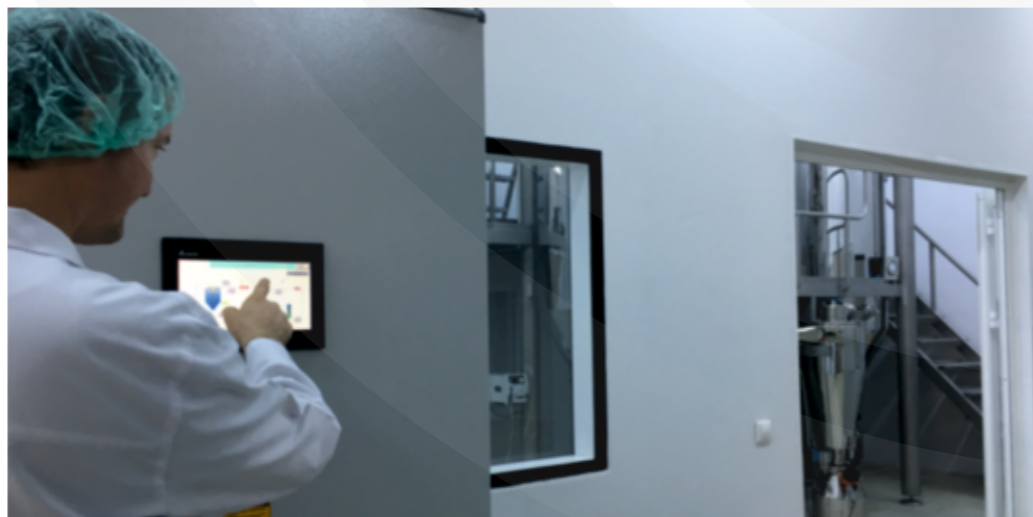
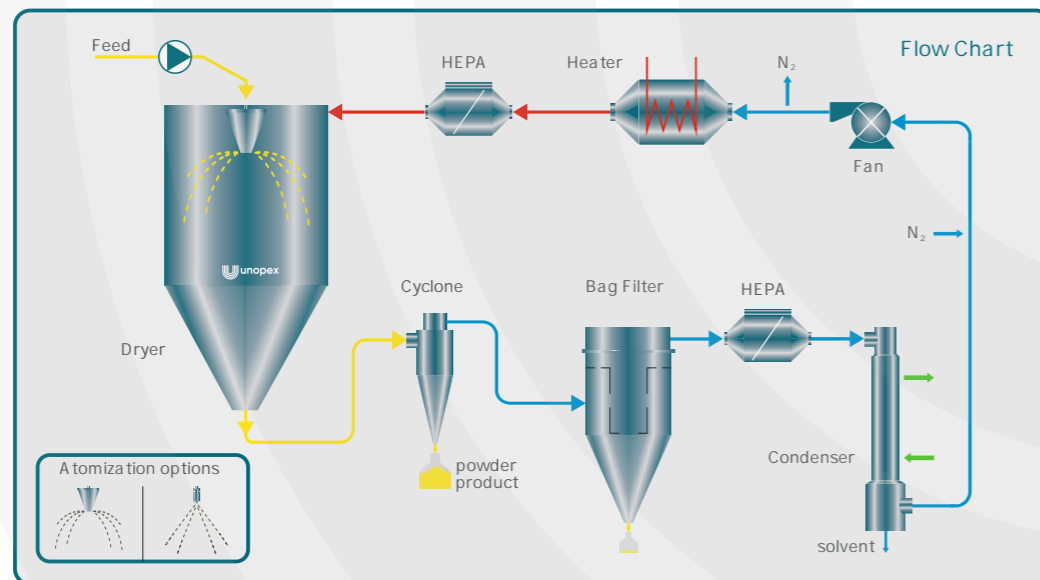
Closed Cycle Pharma Spray Dryers

Unopex Closed Cycle Pharma Spray Dryers are particularly used for spray drying of feeds containing organic solvents or where the product must not contact oxygen during drying.

Drying takes place in a closed loop with recycling of drying gas and recovery of solvent, in a safe inert non-oxidizing atmosphere.

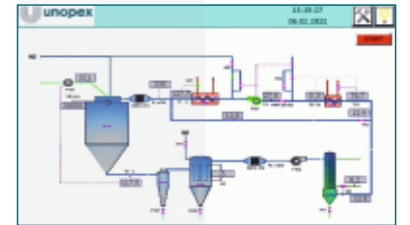
Nitrogen is used as the drying gas. It passes through the drying chamber and is filtered, cooled, and then reheated before being reintroduced into the chamber. Closed cycle systems help in conserving energy and minimizing environmental emissions by containing the process within a controlled loop.

Unopex Closed Cycle Pharma Spray Dryers are gas and powder tight and are designed according to the strictest safety standards.



Process Control

Unopex Pharma Spray Dryers feature FDA 21CFR Part 11 compliant process control and data acquisition. Process data and alarms can be logged and an audit trail is available.



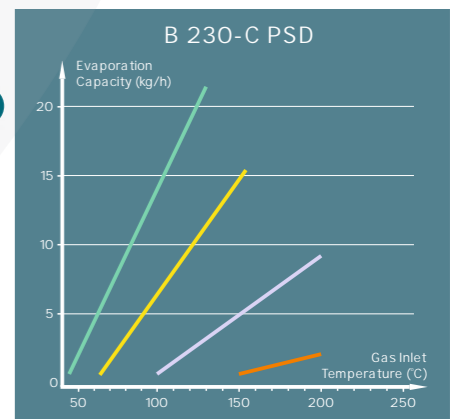
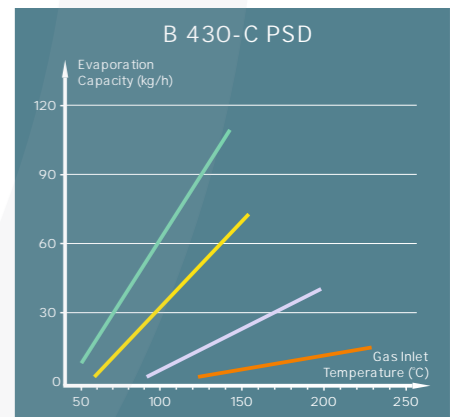
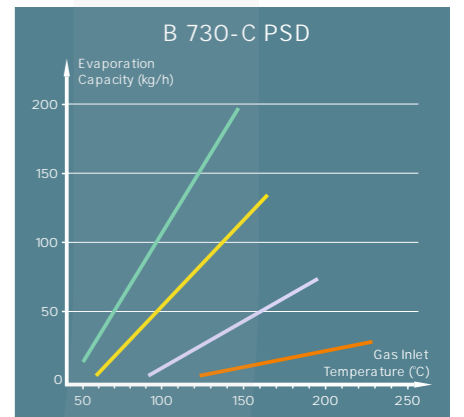
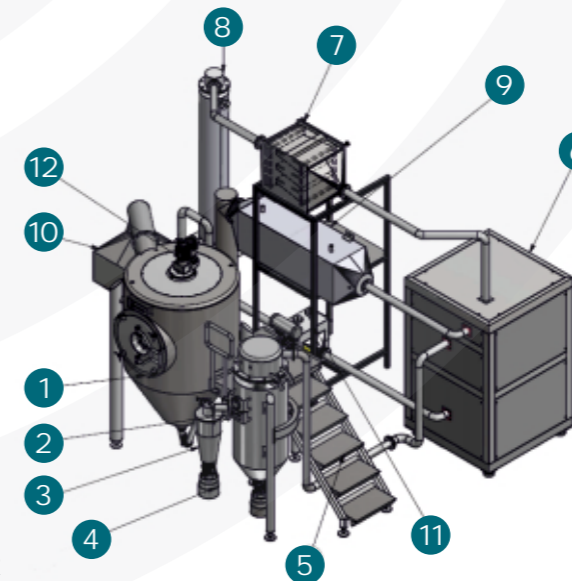
Benefits

- enables to work with 100% organic solvents
- enables to work with water/solvent mixtures
- safe operation under inert conditions
- minimal inert gas consumption due to closed cycle
- safe and explosion free working conditions
- due to real time oxygen control
- consistent precision and performance

Closed cycle configuration options

- HEPA filters
- Rotary atomizer
- Mirror polished surface
- Explosion protection systems
- Insulated cyclone
- Fan noise attenuation
- Remote access and control
- EE x-classification
- CIP (clean-in-place)
- GMP compliance

- 1 DRYING CHAMBER
- 2 BAG FILTER
- 3 CYCLONE
- 4 PRODUCT VESSEL
- 5 PLATFORM
- 6 FAN CABINET
- 7 HEPA FILTER
- 8 CONDENSER
- 9 MAIN HEATER
- 10 HEPA FILTER
- 11 PRE-HEATER
- 12 ROTARY ATOMIZER



Typical Product Applications

Unopex Pharma Spray Drying solutions enable cost-effective production of powders with reliability and repeatability in a controlled environment and under scalable conditions.

- Pharmaceuticals
- Nutraceuticals
- Biopharmaceuticals

Free flowing powders

Continuous single-stage spray drying of active ingredients, excipients, and final formulations result in free-flowing powders suitable for various dosage forms. This process ensures uniform particle size and enhances dissolution properties, crucial for effective drug delivery systems.

Fine powders

Spray drying process is adept at isolating amorphous compounds and improving their bioavailability. By forming solid dispersions or stabilizing powders, this method enhances the solubility and absorption of active ingredients, leading to enhanced efficacy and reduced dosages.

Agglomerated powders

Spray drying with fluidized bed technology produce agglomerated powders. Agglomeration improves powder characteristics such as flowability and compressibility, essential for efficient tableting and encapsulation in pharmaceutical manufacturing. The controlled particle size distribution achieved enhances product consistency and performance.

Encapsulated powders

Spray drying technology facilitates the encapsulation of pharmaceutical formulations, enabling the creation of specialized products with enhanced properties. This includes microencapsulation techniques that provide benefits such as taste masking and controlled release profiles, ensuring optimal therapeutic outcomes and patient compliance.

Spray chilled products

Spray cooling achieves rapid solidification of formulations, maintaining product integrity, controlling particle size distribution, and enabling taste masking capabilities. This technique is particularly valuable for temperature-sensitive drugs and formulations that require precise release characteristics.

Unopex B 15 for Laboratory Spray Drying

Unopex offers the perfect solution for the first trial spray dry processing, feasibility studies, process development and product researches in pharmaceutical industry.

Unopex B 15 Mini Spray Dryer is a laboratory instrument for quick and gentle drying of products from water or organic solvent based feeds.

Technical Specifications

Evaporation Capacity	max. 1.5 L/h (water)
Drying air inlet temperature	max. 220 °C (± 1°C)
Drying air flowrate	max. 60 m ³ /h
Heating power	3 kW, PID controlled
Atomization system	2-fluid nozzle
Particle diameter range	5- 25 µm
Operation conditions	open, closed cycle
Dimensions (LxWxH)	800x600x1400 mm



Scale Up

Scale Up from Research to Pilot and Industrial Production Scale



Unopex B 15



Unopex B 230

A small spray dryer is particularly useful for initial trials.

Unopex B 15 Mini Spray Dryer is an ideal instrument for research and product development purposes.

The results from a successful spray drying test conducted on the Unopex B 15 Mini Spray Dryer can be utilized in the scale up procedure to Unopex pilot scale spray dryer and to industrial production.