SPXFLOW

Anhydro Spray Drying

FOR THE PHARMACEUTICAL INDUSTRY

Anhydro®

SPX Flow Technology Danmark A/S is an international engineering company with a consistent goal to provide our customers with the optimal processing technology and the highest plant performance standards. We have specialised in supplying the optimal design and engineering with respect to production performance, flexibility, energy efficiency and environmental protection.

SPX FLOW offers a wide range of Anhydro spray drying technologies for handling numerous applications for the pharmaceutical industry that give high-quality end-products in the most efficient and economical way.

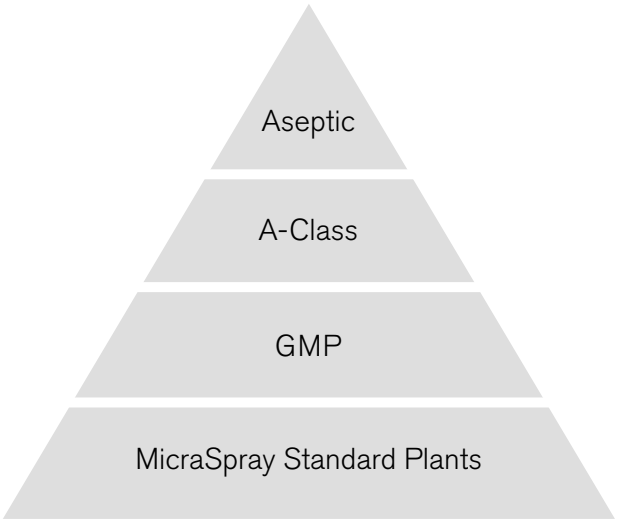
SPX FLOW, Inc. (NYSE:FLOW) is a leading manufacturer of innovative flow technologies, many of which help define the industry standard in the market segments they serve. From its headquarters in Charlotte, North Carolina, it operates a sales and support network, centers of manufacturing excellence, and advanced engineering facilities, throughout the world. Its cutting-edge flow components and process equipment portfolio includes a wide range of pumps, valves, heat exchangers, mixers, homogenisers, separators, filters, UHT, and drying technology that meet many application needs. Its expert engineering capability also makes it a premium supplier of customized solutions and complete, turn-key packages to meet the most exacting of installation demands.

Incorporating many leading brands, SPX FLOW has a long history of serving the food and beverage, power and energy, and industrial market sectors. Its designs and engineered solutions help customers drive efficiency and productivity, increase quality and reliability, and meet the latest regulatory demands. In-depth understanding of applications and processes, state-of-the-art Innovation Centers, and advanced pilot/testing technology further assist in optimizing processes and reducing timescales to reliably meet production targets.

To learn more about SPX FLOW capabilities, its latest technology innovations and complete service offerings, please visit www.spxflow.com.

Anhydro Spray Drying Technologies

Based on a four-tier model incorporating the most comprehensive range of continuous spray drying solutions available, SPX FLOW customises high-performance, cost-effective processing solutions to individual pharmaceutical needs.



BENEFITS THAT MAKE A DIFFERENCE

With thousands of spray drying plants sold worldwide, SPX FLOW offers decisive competitive edge in pharmaceutical spray drying:

- The most comprehensive spray drying solution range available today
- Compact processing of more drug products than with other processing technologies
- Dedicated customisation based on world-leading experience and expertise
- Multiple processes including API processing, spray encapsulation, spray agglomeration and spray cooling
- Scalable design space
- Predictable path forward and control space
- Complete control over particle size distribution
- Consistent precision and performance
- Maximum uptime with straightforward cleaning and maintenance.

Precision, Control and Scalability

Anhydro spray drying solutions enable cost-effective production of powders with tailored particle engineering in a controlled environment and under scalable conditions.

Pharmaceutical companies across the world use Anhydro spray drying solutions for a wide range of applications in the fields of:

- Pharmaceuticals
- Nutraceuticals
- Biopharmaceuticals and biotherapeutics
- Aseptic applications and processing

VALIDATION

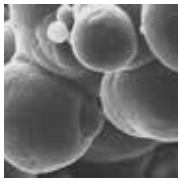
Anhydro spray drying solutions for the pharmaceutical industry feature FDA 21 CFR Part 11-compliant process control and data acquisition to accommodate individual customer requirements. Anhydro supplies the necessary process control and data acquisition solutions to facilitate successful validation.

Typical Product Applications

With the Anhydro spray drying equipment you can produce a wide range of pharmaceutical powders.

Free Flowing Powders
Continuous single-stage spray drying of APIs, excipients and final formulations into free flowing powders.

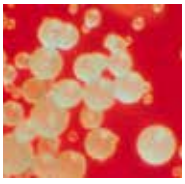
Agglomerated Powders
Spray bed drying combining spray drying with fluidized bed technology for single-step production of agglomerated powders.



Encapsulation
For various formulations enabling special properties such as microencapsulation for various compounds enabling taste masking or controlled release functional coatings.

Fine Powders
Isolation of amorpous compounds, improved bioavailability through the production of amorphous powders by forming solid dispersions, molecule or powder stabilisation.

Spray Cooling
For various compounds enabling taste masking or controlled release.



Anhydro MicraSpray - Customizable, Adaptable and Scalable

The Anhydro MicraSpray series is the result of more than 65 years of spray drying experience and expertise gained from thousands of installed spray dryers and innumerable drying tests conducted on a huge variety of different products.

Anhydro MicraSpray dryers feature a series of cutting-edge technology developments within key process components, opening new doors for particle engineering and plant sanitation. Anhydro MicraSpray dryers can be customized and scaled to virtually any requirement within primary as well as secondary pharmaceuticals.

ANHYDRO MICRASPRAY STANDARD SERIES

MicraSpray Standard dryers follow a design concept based on a basic dryer with a wide range of optional modules. This enables the customer to configure the dryer for special application and processing needs.

The standard MicraSpray is available in six different sizes with gas rates of:

35 - 150 - 400 - 750 - 1,250 - 2,500 kg/h

(77 - 331 - 882 - 1,653 - 2,756 - 5,512 lb/h)

ANHYDRO MICRASPRAY GMP SERIES

Anhydro MicraSpray-GMP dryers are typically used for primary pharma applications including APIs, excipients and some antibiotics. The MicraSpray GMP dryer quality standards comply with FDA guidelines and the dryers are used in R&D work as well as in actual API production.

FEATURE BENEFITS

- Enhanced plant surface finish
- Material certificates
- eCustomized automation
- CIP (Clean-In-Place) and sanitation in place capability
- Process gas filtration
- Supply of documentation enabling equipment qualification.

Anhydro MicraSpray 150

ANHYDRO MICRASPRAY A-CLASS SERIES

Anhydro MicraSpray A-Class dryers are designed for secondary pharmaceuticals, typically final formulation, spray congealing for taste masking, increased bio-availability drugs, micro-encapsulation, and powders for inhalation.

The Anhydro MicraSpray A-Class series eliminates inspection doors and unnecessary flange connections in the process vessels in order to provide optimum surfaces and even vessel surface temperatures.

FEATURE BENEFITS

- Cutting-edge technology air distribution systems
- Atomization systems
- Powder separation systems
- Mirror-polished surfaces
- Comprehensively documented qualification services
- Special verification systems enabling tracking and documenting complex parameters in order to verify process consistency over time.

ANHYDRO MICRASPRAY ASEPTIC SERIES

The Anhydro MicraSpray aseptic series is the first and only truly aseptic spray dryer series available. Anhydro MicraSpray aseptic dryers are designed for peptides, proteins, vaccines and other biopharmaceutical products requiring aseptic processes.

The MicraSpray aseptic series is based on the same equipment standard as the MicraSpray A-class series together with a range of special features to ensure a truly aseptic process.

Anhydro MicraSpray 150 Aseptic

Anhydro MicraSpray dryers are available in different sizes, classes and configurations.

MICRASPRAY DRYER MODELS	MS 35	MS 150	MS 400	MS 750	MS 1250	MS 2500
STRANDARD	■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
GMP	■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
A-CLASS	■	■ ■	■ ■	■ ■	■ ■	■ ■
ASEPTIC	■	■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
SINGLE STAGE	YES	YES	YES	YES	YES	YES
MULTI-STAGE	NO	YES	YES	YES	YES	YES

■ **Atmospheric** ■ **Single pass** ■ **Closed cycle**

Anhydro MicraSpray 750 GMP

Anhydro MicraSpray 150 closed cycle GMP

Anhydro MicraSpray 35 GMP

Other Anhydro Spray Dryer Options

ANHYDRO ATMOSPHERIC AIR DRYERS

Applications: Aqueous based products to be dried under non-aseptic conditions.

Configurations: Single-stage execution (producing fine particles) and multi-stage execution (for agglomerated powders, typically applied for direct compressible powders).

ANHYDRO INERT GAS SINGLE-PASS DRYERS

Applications: Sterile conditions, when spent gas composition and product contact are incompatible R&D work on a very infrequent basis for either solvent-based products or potent compounds.

Configuration: Single pass employing inert gas as the drying medium without recirculation of the spent drying gas.

ANHYDRO INERT GAS CLOSED CYCLE DRYERS

Applications: Solvent-based (water, ethanol, acetone and methylene chloride) pharmaceuticals.

Configuration: Additional powder recovery and solvent recovery systems, as well as explosion proof electrical controls.

SMALL-SCALE PLANTS

Anhydro small-scale plants are designed for scientific test work, industrial research and development, as well as for small-scale production. Anhydro small-scale plants offer high uptime and yield, adaptability, repeatability, full process control, scalability, and compliance with the strictest factory standards.

Global Services for Individual Needs

SPX FLOW is committed to helping our customers all over the world to optimise product quality and plant availability, and to minimise operating costs on their Anhydro spray bed drying plants. Our solutions range from feasibility studies to full scale turnkey projects.

PROCESS DEVELOPMENT

SPX FLOW helps you to find the best solution for your long-term needs. We offer a close partnership based on personal commitment and documented Best Practice from the initial needs analysis and planning stage until the end of the service life of your Anhydro spray bed dryer many years later.

Together with you we analyse the available options based on your product and throughput requirements. If required, we can run pilot tests at our test facilities to ensure that the process will meet your expectations on a production scale.

3D computer design, global sourcing of equipment, and local manufacture, where appropriate, are part of our standard project execution.

SPX FLOW INNOVATION CENTER

SPX FLOW's state-of-the-art test facility close to Copenhagen in Denmark enables customers to test new products and to evaluate process conditions to secure precise synergy between optimisation of the plant concept ad reproducible product quality.

Alternatively, we can install small-scale test plants at your site for a limited period for demonstration purposes or pilot-scale production.

Anhydro Spray Drying for the Pharmaceutical Industry

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