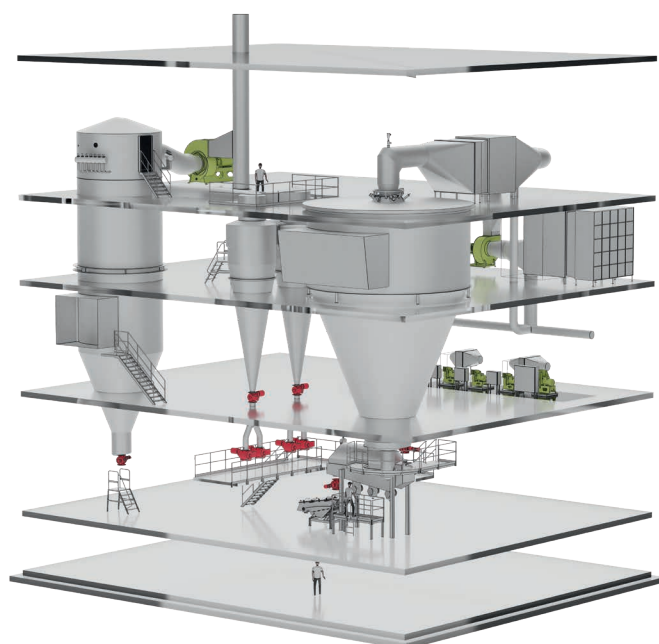




# PROCESS OPTIMISATION AND ENVIRONMENTAL COMPLIANCE

**Convert Single to Multi-stage Dryer – Optimise Process  
Parameters – Emission Control – Automation Upgrade**



# UTILISING THE FULL CAPACITY OF YOUR DRYER

## Making Good Processes Even Better

Whether new or old, nearly every drying operation can stand to benefit from optimisation. At SPX FLOW, we have found the following to be the most effective optimisation initiatives for customers:

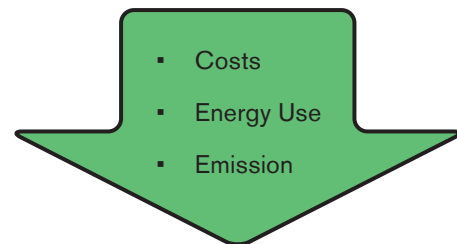
- Adding stages to the drying process
- Fine tuning process parameters
- Implementing environmental controls
- Upgrading automation

SPX FLOW has extensive experience enhancing spray dryer processes for better performance, yield, and quality improvement.

It starts with an onsite assessment where we send a team of experts to observe your operations and identify opportunities for improvement. We then recommend an optimisation strategy that includes projected payback time.



**Convert Single to Multi-stage Dryer**  
**Optimise Process Parameters**  
**Emission Control**  
**Automation Upgrade**



# CONVERT SINGLE TO MULTI-STAGE DRYER

## Why Add Stages?

While a single-stage spray drying operation is adequate for some applications, multi-stage optimisation often improves powder quality. By providing greater flexibility to adjust powder properties to meet requirements, this enables production of more varied and demanding products and applications.

Three-stage drying adds an External Fluid Bed (EFB) section and/or Internal Fluid Bed (IFB). An External Fluid Bed System (EFB) generally has at least a minimum of two sections.

The final adjustment of the powder moisture occurs in the first section while the second section is dedicated to the cooling of the final powder. In both the IFB and EFB systems, a fine powder separation takes place.

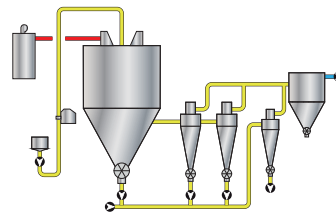


## How Multi-Stage Designs Improve Agglomeration

In a multi-stage process, a fines return system can move the fine powder heading to the main air cyclone or bag filter, to a wet-feed atomiser zone for re-agglomeration. This facilitates the formation of stable agglomerates as well. If an IFB is present, it will also reduce the primary drying temperature and thus save energy.

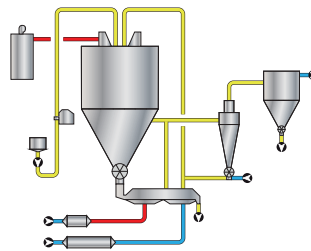


# COMPARING SINGLE AND MULTI-STAGE DRYING APPLICATIONS



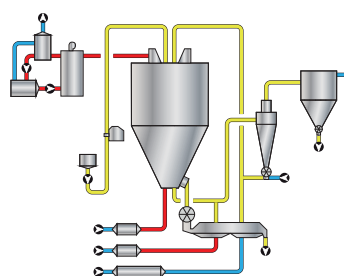
## Single-Stage Spray Drying Plant

Suitable for many food products, plants extracts, flavours, pharmaceuticals, and fine chemicals where a medium particle size of 40-125 microns is required.



## Two-Stage Spray Drying Plant

Two-stage drying combines spray drying and fluid bed drying to extend the time the powder sits in the fluid bed. This gentle process improves drying economy by as much as 15% while also yielding a product that is superior to single-stage dried products.



## Three-Stage Spray Drying Plant

Three-stage spray drying involves both an internal and external fluid bed to deliver advantages over both single- and two-stage drying. An extremely gentle process, powder is agglomerated and free flowing. This reduces energy use by as much as 20% and results in maximum improvement of powder properties.

## Benefits

- More capacity and flexibility to optimise process and plant
- Improve overall product quality
- Increase capacity up to 15 - 25%
- Reduce energy consumption by as much as 20%

# OPTIMISING PROCESS PARAMETER



**SPX FLOW** has extensive product, process, and industry experience necessary to fine tune process parameters for ideal powder properties.



## Improving Powder Properties

While the dryer stage design is critical to achieving optimal powder properties, especially agglomeration, the final output depends on informed management of other process conditions such as free moisture, bulk density, and particle size, flowability, wettability, dispersibility and solubility.

Every end product, whether chemical, food or dairy, has unique process parameters which must be clearly understood to achieve the desired end properties.

Trust SPX FLOW to provide the depth of product and industry knowledge necessary to address all parameters.

We have identified 3 different ways to optimise the processes:

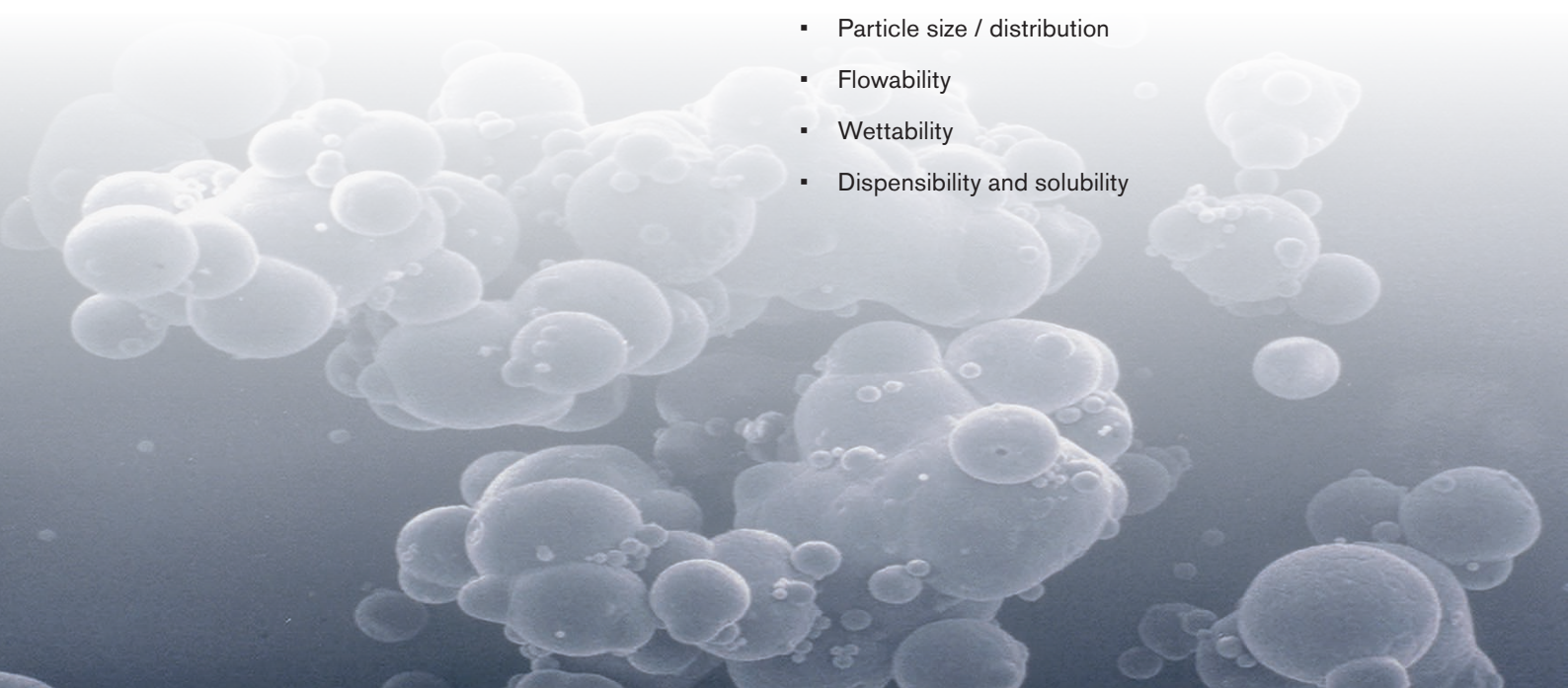
- Multi-stage
- Switching from centrifugal to nozzle atomisation
- Dehumidification of the process air

## Impacting Process Parameters

In addition to adding multiple stages, spray dryers with centrifugal atomisation can easily upgrade to nozzle atomisation - preferably a double-feed system that integrates CIP. Doing so enables 24/7 stability at maximum production. SPX FLOW Predictive Controls software can then automate dehumidification of processing air during the operation.

## Most important Process Parameters

- Agglomeration and stability of powder
- Free moisture
- Bulk density
- Particle size / distribution
- Flowability
- Wettability
- Dispersibility and solubility



# OPTIMISING EMISSION CONTROLS

## Treating Spray Dryer Exhaust Air

Separating product from spray drying outlet air impacts both safety and yield. While retaining valuable product is the primary objective, it must be accomplished without volatile emissions or odors. The cyclone retains most of the process air content of minor powder particles, but now it may be augmented with a bag filter. For products that are water or solvent soluble, an air-washer, such as SPX FLOW Venturi Scrubber, helps clean the exhaust air.

### Cyclone System

Particle loss from the cyclone is generally 50-200 mg/Nm<sup>3</sup>.

### Bag Filter

Environmental compliance often requires a bag filter. We normally install this filter after the cyclones, which minimises costs and collects residual powder. Doing so also reduces emissions after the filter to 20 mg/Nm<sup>3</sup> cyclones on average.

### Scrubber

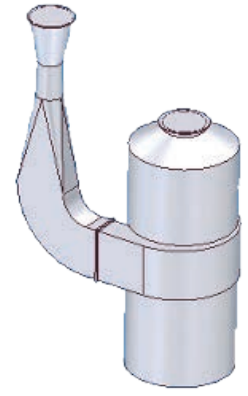
The concentrations in separation with droplet mist is between 30-150mg/Nm<sup>3</sup> of exhaust air.



**Anhydro High-efficiency cyclone**



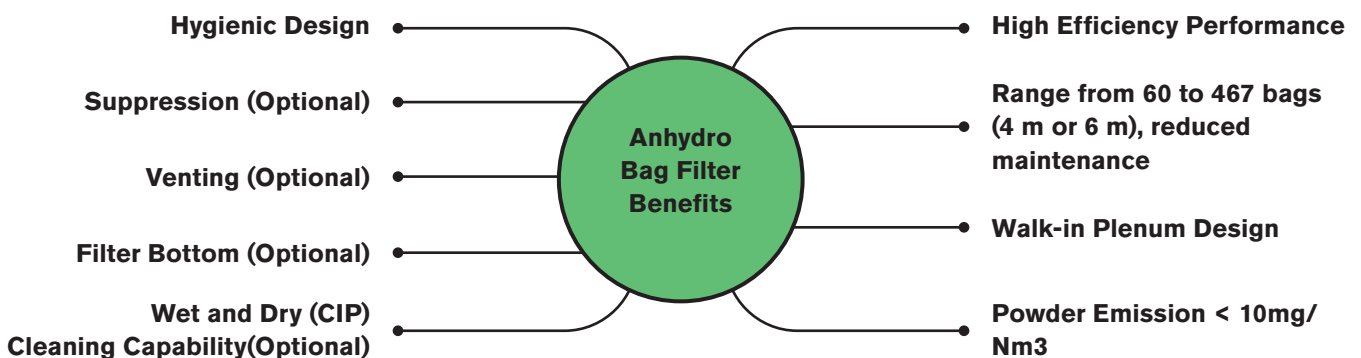
**Anhydro Bag filter (CIP optional)**



**Anhydro Venturi Scrubber**

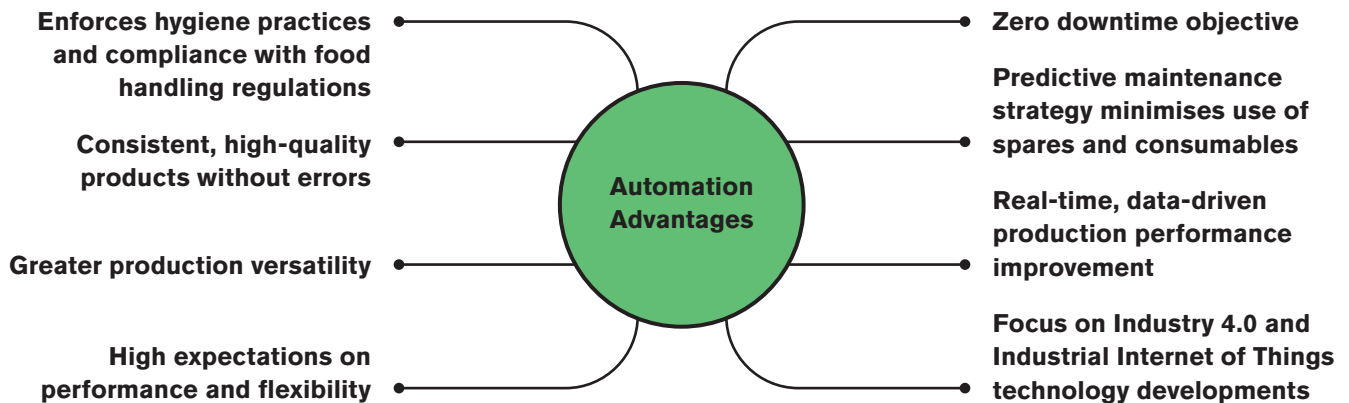
### Benefits

- Hygienic design
- High efficiency performance
- Range from 60 to 467 bags (4 m or 6 m), reduced maintenance
- Walk-in plenum design
- Powder emission < 10mg/Nm<sup>3</sup>
- Wet and dry (CIP) cleaning Capability (optional)
- Filter bottom (optional)
- Venting (optional)
- Suppression (optional)



# AUTOMATION UPGRADE

Automating steps for startup, production, and shut down can optimise processes while reducing costs. SPX FLOW automation experts review the functional description for your production and CIP process to discover opportunities for cost and efficiency improvements.



## FULL SPECTRUM AUTOMATION SOLUTIONS

### Hardware

- Controls – PLC / SCADA based systems
- Electrical panel design
- Field cabling systems design
- Motor control centre design
- Product development – valve control units, SPX FLOW integrator
- Electrical field bus systems – profibus, profinet, ethernet

### Software

- Information systems – database design, web-based reporting
- Remote access systems
- Machine safety
- PLC and SCADA programming
- MES - Manufacturing Execution System
- ERP Integration

### Integration

- Instrumentation integration
- Enterprise integration

- Third party systems integration
- Infrastructure – networks, client / server architecture
- Cyber security
- Uptime / flexibility
- Obsolescence planning

### Benefits

- Enforces hygiene practices and compliance with food handling regulations
- Consistent, high-quality products without errors
- Greater production versatility
- High expectations on performance and flexibility
- Zero downtime objective
- Predictive maintenance strategy minimizes use of spares and consumables
- Real-time, data-driven production performance improvement
- Focus on Industry 4.0 and Industrial Internet of Things technology developments

# WHY PARTNER WITH SPX FLOW?



## Years of Experience

- We have been in the spray dryer business since 1948
- Implemented 6,000 different types of spray dryer plants around the world
- Extensive experience rejuvenating spray dryers for safety, efficiency, optimisation, and sustainability
- Developed a proven process for matching strengths to market opportunities
- Long and successful track record in project development and execution



## Our Mission

SPX FLOW combines extensive experience and proven technologies to help you capitalise on market trends with:

- Maximum utilisation of your existing assets
- Maximum return on new investments
- Maximum environmental protection

We help you find the best solution for your long-term needs. We work with you to evaluate market opportunities and provide the modernisation, upgrade, or repairs necessary to capitalise on them.



## Your Account Team

Your SPX FLOW project manager selects the ideal team for your specific project based on the following criteria:

- Customer support
- Process and design
- Mechanical engineering
- Supply chain optimisation
- Installation and commissioning



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