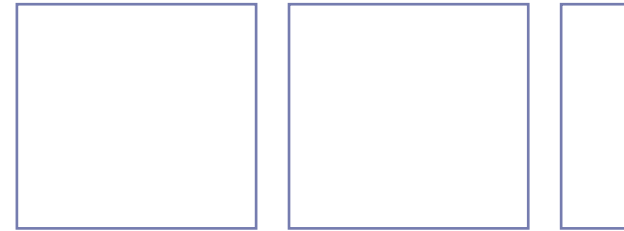


Process Configurations



SWIRL FLUIDIZER™

From paste to powder in one efficient step

Configuration of a SWIRL FLUIDIZER™ plant is actually quite easy, despite the substantial variety of applications. All plants are built up around standardised design modules that are configured with the options required for product-specific parameters. For instance, this could be a cooling system for heat-sensitive products, special features for particle size control or the fundamental choice of an open system versus a closed system.

Open cycle system

In the open system atmospheric air is used for drying. This system can be applied even in cases where the product to be dried poses a potential dust explosion hazard, as the plant can be provided with pressure release or suppression systems.

Closed cycle system

In the closed cycle system the oxygen content of the gaseous drying medium is either kept below a certain level or eliminated by operating the plant in an inert mode using nitrogen as drying gas. Suppression of the oxygen content is often used where the product poses a severe dust explosion hazard, whereas the inert nitrogen atmosphere is essential when drying products containing a flammable solvent.

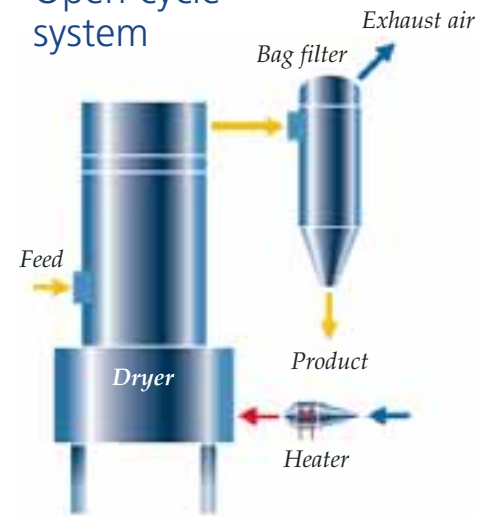
Process applications

Recognized for its flexibility, the SWIRL FLUIDIZER has been used for a large range of applications in the chemical industry. These include:

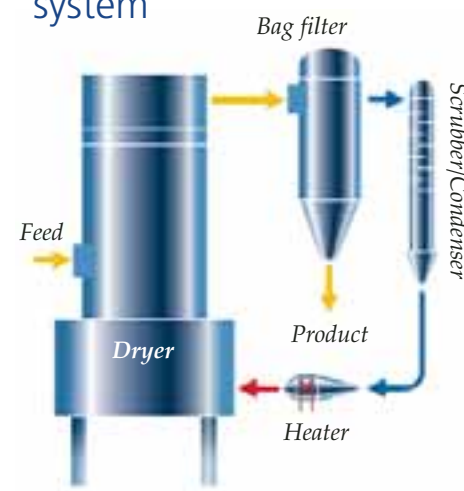
- Agrochemicals – typically various herbicides and fungicides
- Ceramics – silica, bentonite, kaolin, etc.
- Dyestuffs/pigments – iron oxides, titanium dioxides, phthalocyanines, zinc phosphates, etc.
- Inorganic chemicals – metal carbonates and hydroxides, calcium phosphates, zeolite, etc.
- Organic chemicals – optical brightener, flame retardant, polymers, etc.
- Waste products – sludge, sediments, etc.

The SWIRL FLUIDIZER is also well suited for pharmaceutical and food industry applications. Regardless of the industry or application, Niro's comprehensive pilot plant facilities are available for testing, trial and production. Customers are also free to draw on Niro's overall expertise in the field of drying and the experience gained in supplying more than 10,000 plants worldwide since the company's founding in 1933.

Open cycle system



Closed cycle system



The SWIRL FLUIDIZER™

For drying of pastes, filter cakes and viscous liquids

When it comes to drying of pastes, filter cakes and highly viscous liquids, the Niro SWIRL FLUIDIZER™ offers a cost-effective solution for obtaining a fine, homogeneous and non-agglomerated dry product – in one compact process step.

That makes it superior to most conventional processes. Contact dryers, band dryers, drum dryers and tray dryers are all drying processes characterised by long processing time and the need for costly post-treatment such as milling.

Further, the SWIRL FLUIDIZER'S ability to handle even the most viscous liquids makes it an attractive alternative to spray drying for applications where dilution is needed for obtaining a pumpable and sprayable feed.

The SWIRL FLUIDIZER offers the following main process advantages:

- Ability to handle non-pumpable products.
- One stage combined drying and product treatment.
- Continuous operation.
- Compact layout requiring a minimum of space.
- Effective heat and mass transfer.
- Negligible heat loss.
- Maintenance-friendly design.

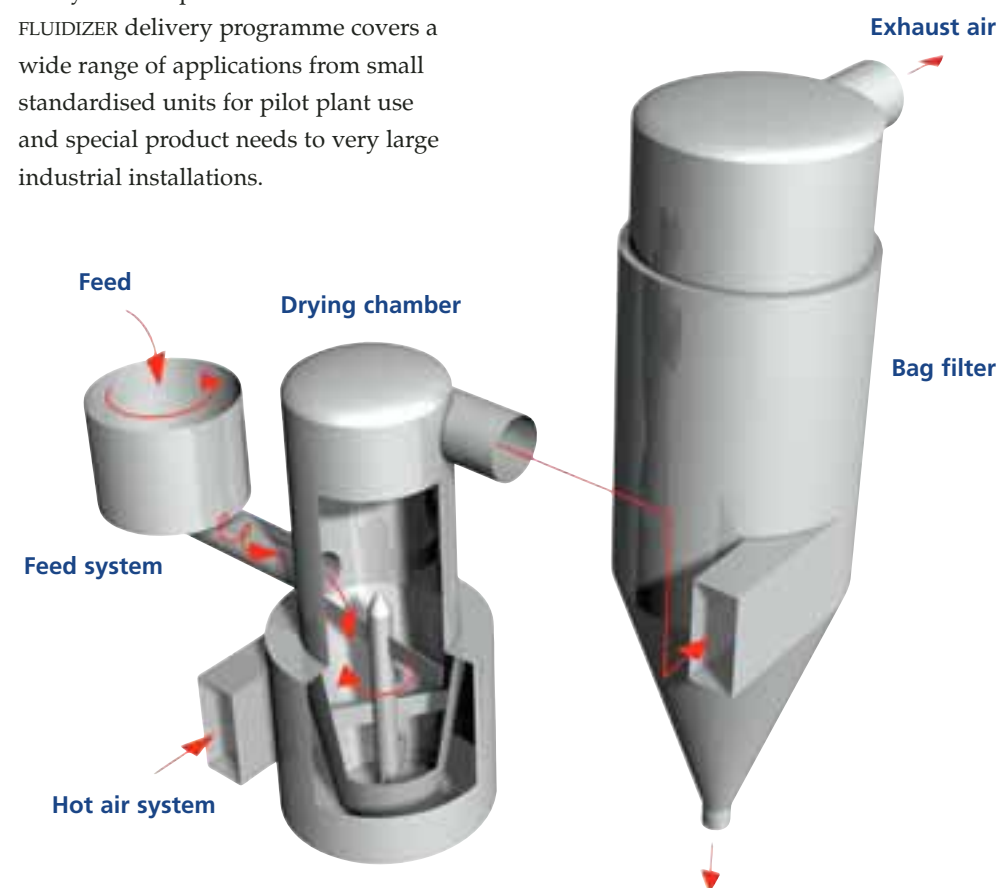
Extensive R&D work aimed at making the process suitable for an even larger range of applications has resulted in a "new generation" SWIRL FLUIDIZER, mainly characterised by a conical lower portion of the drying chamber, an even

more compact design as well as a number of easily implemented optional features for special applications.

Comprehensive modelling and testing as well as industrial scale installations are behind the new, flexible design, which offers the following process advantages:

- Improved tolerance towards changes in feed properties.
- Improved product load capacity.
- Ability to handle very high drying temperatures.
- Drying of even very heat-sensitive products.

Today our comprehensive SWIRL FLUIDIZER delivery programme covers a wide range of applications from small standardised units for pilot plant use and special product needs to very large industrial installations.



Process Concept



Drying chamber

The heart of the process concept is the drying chamber, in which feed disintegration and evaporation take place. From here, spent drying air containing the dried particles flows to the combined exhaust air cleaning and product recovery system through the product/air outlet placed in the top of the chamber.

For most applications the feed is introduced into the middle of the chamber, which consists of an upper cylindrical and a lower conical part. This design leads to an internal product flow pattern that ensures uniform drying/disintegration and keeps the air disperser as a product-free zone.

The air disperser, surrounding the lower portion of the drying chamber, is provided with a tangential air flow, creating the intense, controllable swirling air flow entering the drying chamber from the bottom.

The arrangement of the lower part of the drying chamber and the air disperser is ideal for implementing effective cooling of hot internal surfaces. This optional cooling system allows for drying of even very heat-sensitive products.

The vertical rotary disintegrator, provided with blades, is fitted at the base of the air disperser.

Feed tank

The cylindrical feed tank is equipped with a slowly rotating agitator, driven from the bottom, which ensures a steady feed supply to the bottom-mounted, frequency-controlled dosing screw, transferring feed to the drying chamber at a continuous and controllable rate.

Hot air system

Hot drying air is supplied to the air disperser at a controllable rate in order to ensure optimum thermal efficiency of the drying process.

Any available energy source can in principle be applied.

Powder recovery and exhaust air cleaning system

A bag filter is typically selected for dried product collection and cleaning of the spent drying air.

The Niro design cylindrical bag filter with tangential air inlet is normally recommended for this task.

