



GEA Niro SPRAY FLUIDIZER™

Granulation
Agglomeration
Drying

Production of Non-Dusty Granular Products

The demand for dry products in granular form is increasing. Two of the main reasons for this are that granules are non-dusty and easy to handle, thus enabling ever stricter environmental requirements to be met.

Many products can be obtained in granular form from a solution, suspension, or a melt in a single process stage by spraying the solid containing liquid into a fluidized bed of granules.

GEA Niro Test Center has applied its extensive know-how from the closely related drying techniques of spray drying and fluidized bed drying to the development of a continuous process for producing granular products, i.e. the GEA Niro SPRAY FLUIDIZER™.



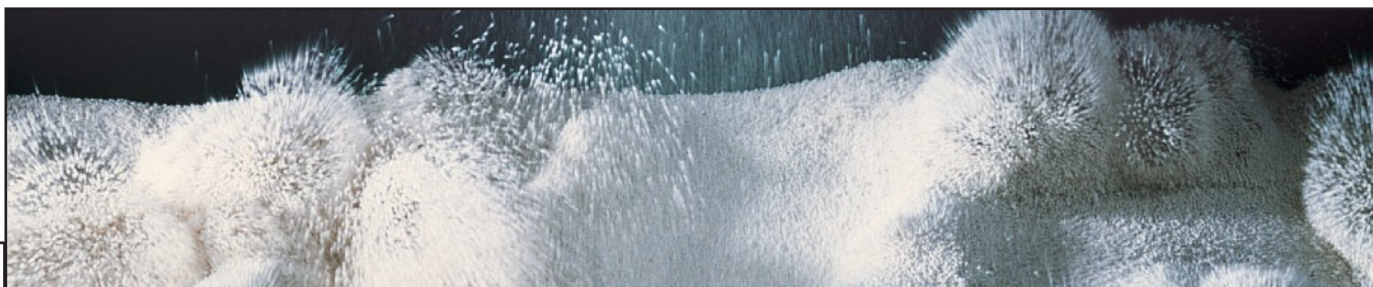
The Product



The product obtained from the GEA Niro SPRAY FLUIDIZER™ is a non-dusty, non-caking, free-flowing granulate of high mechanical stability.

The shape of the particles depends mainly upon the process parameters and product characteristics. Some products form nearly perfect spherical particles. Others are more irregular in shape.

The particle size distribution is controlled to suit individual requirements, typically ranging from .5mm to 3mm. The bulk density of the product is normally in the range of 30 to 50% of the particle density.



Applications

The field of applications of the GEA Niro SPRAY FLUIDIZER™ process is very wide. Granules of a material can be produced by this process when:

- The feed is pumpable
- The feed can be atomized
- The binding forces are sufficiently strong to build up a granule and to withstand attrition in the fluidized layer

Types of materials fulfilling these criteria include:

- Solutions or melts of crystalline materials, either organic or inorganic.

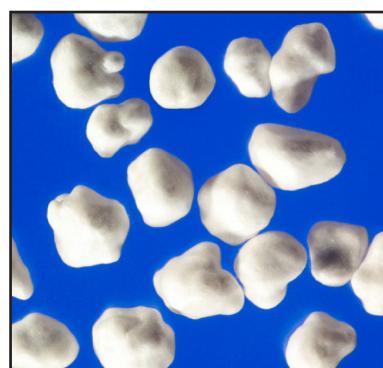
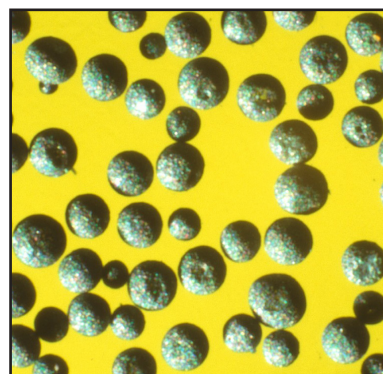
Examples are:

- Sulphates e.g. sodium, magnesium, zinc, iron
- Chlorides e.g. sodium, calcium
- Bromides e.g. sodium, potassium, ammonium
- Organic salts
- Organic acids

- Solutions or suspensions of materials

Examples are:

- Sludge
- Sulphite wastes
- Ceramics
- Solutions or suspensions mixed with binders



Other Applications

Processes where the feed is totally or partly in solid form.

Examples include:

- Agglomeration
- Coating
- Encapsulation
- and Wetting

An example of industrial application of the GEA Niro SPRAY FLUIDIZER™ is the N.A. patented process for the production of granules in the porphyzied (two colored) tile manufacturing. For this product a two stage process is required in order to satisfy the very strict product requirements concerning particle size distribution and moisture content.

The Process

The principle of operation is based on the simultaneous use of a fluidized bed as a dryer and granulator.

Feed System

The material to be granulated is supplied as a pumpable solution, suspension, or melt. The feed is atomized by means of either pressure or two-fluid nozzles and sprayed into a fluidized product layer. The type and number of nozzles are determined by the feed characteristics and the capacity of the unit.

Drying Air System/Fluid Bed

The drying air is supplied by a fan and heated to the optimal temperature in either a direct or an indirect heater. The selection of heater type is based on local available heating media and product requirements. The hot drying gases enter the fluid bed unit in the lower part acting as a plenum chamber. A carefully designed distributor plate assures uniform distribution of the gases, thus maintaining the granules in a state of vigorous fluidization.



Product Recovery and Recycle

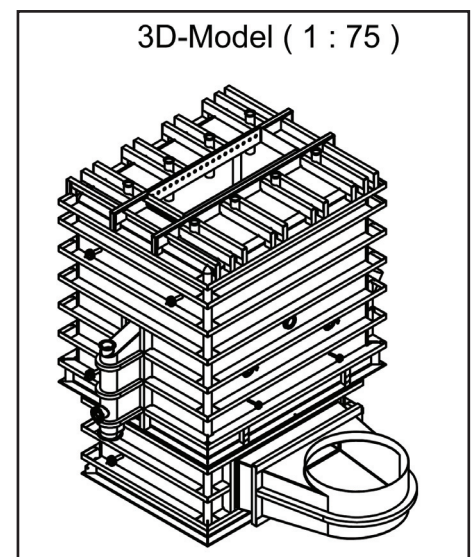
The granules are withdrawn continuously from the fluid bed through a rotary valve maintaining a constant level of the fluidized layer. By subsequent screening, granules of desired particle size are discharged from the unit, while the oversized is milled and recycled together with undersize and fines recovered in the cyclone and/or bag filter. Thus, all product is discharged from the plant having the desired particle size.

Exhaust Air System

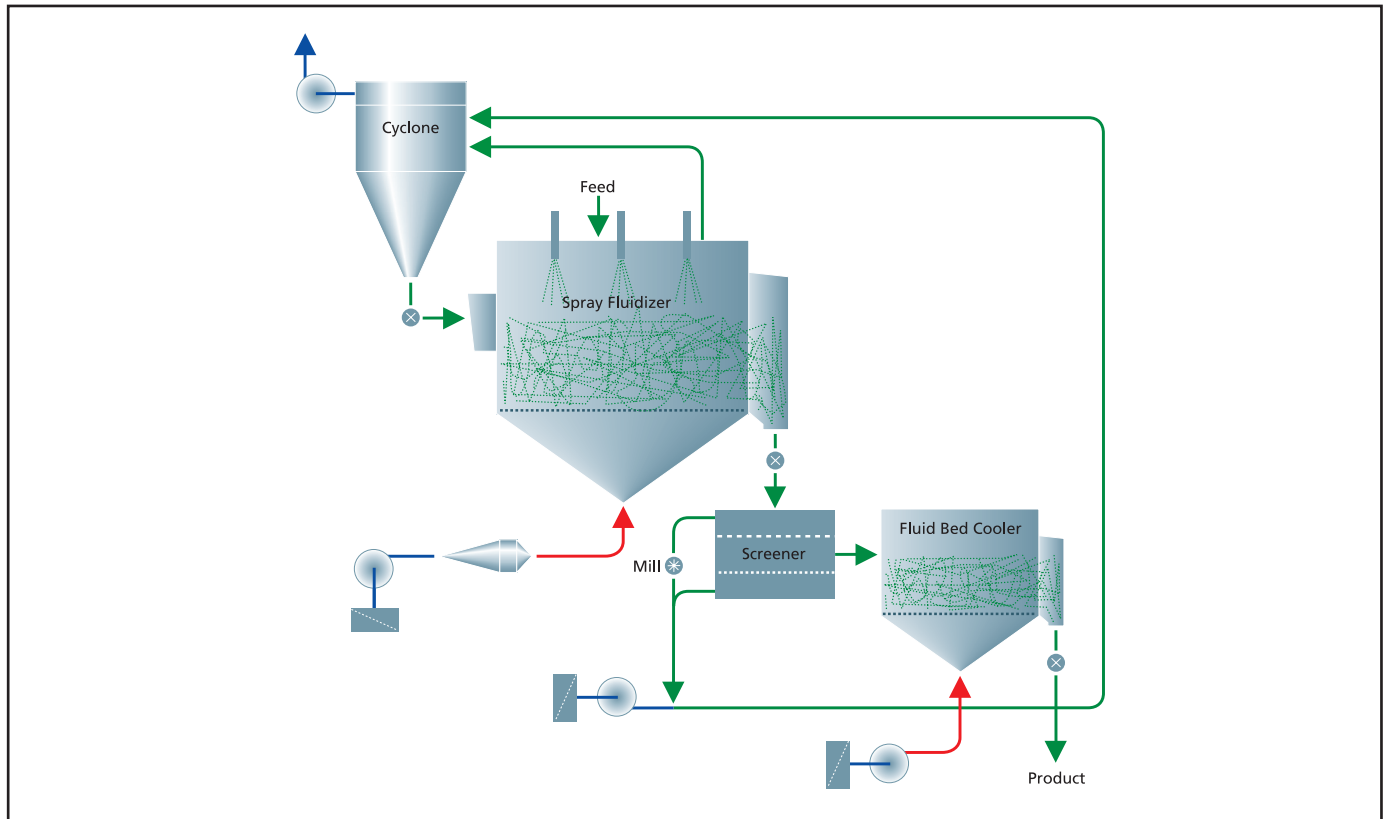
The exhaust gases from the fluid bed unit may be passed through a high efficiency cyclone or a bag filter, thereby recovering the small particles from the fluidizing gases. These particles may be returned to the fluid bed. Further cleaning of the exhaust gases may take place in a wet scrubber in order to meet antipollution legislation and to recover solids.

Process Control

The process may be automatically controlled. This assures a constant product quality obtained with low labor and process supervision costs.



Process Advantages



The major advantages of granular material production in the continuous GEA Niro SPRAY FLUIDIZER™ can be summarized as follows:

- Combined drying and granulation in a single stage operation
- Consistent product qualities such as particle size distribution, bulk density, moisture content. All assured by automatic control.
- Non-dusty products meeting the increasing demands of environmental requirements.
- Ease of storage and handling with subsequent cost reductions
- High thermal efficiency can be achieved; specific heat consumption as low as 700 kcal/kg evaporated water.
- Low process supervision costs as process can be fully automated.
- Low space requirements due to a compact design, thus minimizing civil engineering costs.

Pilot Plant Facilities



Due to the fact that most materials behave differently in the GEA Niro SPRAY FLUIDIZER™ pilot plant tests are often necessary in order to determine the optimum drying conditions and other process parameters

A complete continuous pilot plant with an evaporative capacity of up to 100kg per hour is available for this purpose at the GEA Niro Test Center in Copenhagen.

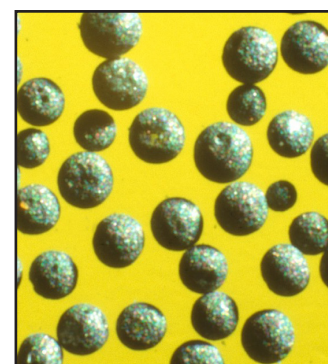
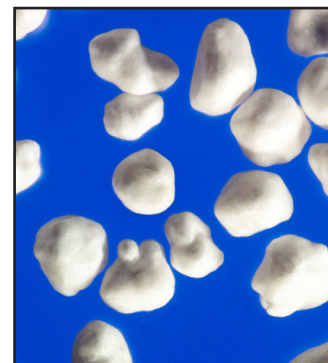
In this plant, materials can be processed under conditions similar to large scale industrial operation. The results of such investigations are applied in preparing the design, engineering, and construction of complete spray fluidizer installations.



Proppants

A process for producing high strength sintered proppants usable as fracture agents in oil or gas wells. Produced using a continuous GEA Niro spray-granulation process.

A granular material must fulfill several conditions to be suitable for use as a propping agent. The material must have high strength to avoid crushing of the particles when exposed to high pressure during their application. The shape of the individual particle should depart as little as possible from spherical and the particle size distribution should be within defined, relatively narrow limits to insure sufficient gas and oil permeability of fractures propped with the propping agent. Moreover, the particles should be able to resist the corrosive conditions to which they may be exposed at their application. The GEA Niro SPRAY FLUIDIZER™ is useful in the production of these products.





Excellence Passion Integrity Responsibility GEA-versity

GEA Group is a global mechanical engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX Europe 600 Index.



GEA Niro

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