

Mobile Nozzle-Type Spray Drying Plant for Materials Development and Production of Pilot Batches

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DORST TECHNOLOGIES/DE has added a compact and mobile device to their current product portfolio of nozzle-type spray drying plants. Going by the name *SMART Lab Atomizer*, this small but effective device now available to materials developers in both the industrial and the research sector will allow them to make qualified predictions for the subsequent scaled production on a larger plant without having to use large test quantities.

For more than 40 years, water-based processing of ceramic suspensions for transforming them into powders and granulates capable of being pressed has been one of the core activities of DORST TECHNOLOGIES. Their fields of application range from tiles and silicate ceramic materials to oxide and non-oxide technical ceramics and even cermets and hard metals.

DORST TECHNOLOGIES offers permanently installed manufacturing plants with an evaporative capacity of 10–8000 kg of water per hour, which are only projected and built upon individual customer request. Depending on size, the systems come with a 2-fluid nozzle, a pressure nozzle or the Vario nozzle, which is a combination of the other two atomizing processes. All stationary spray drying plants use the counter-current process with the suspension being fed according to the fountain principle.



Fig. 1 *SMART Lab Atomizer* in operating position

For economic reasons, the plants are mainly powered by natural gas.

Design and structure of the plants are primarily adapted to the needs of continuous bulk production under process conditions that are as stable as possible.

Yet, these manufacturing plants are less suitable for processing small sample quantities under laboratory conditions. In the development sector, a longer initial phase until a significant spraying process has stabilized is hardly possible. Another problem is often that materials laboratories simply lack the space to operate permanently installed plants. Numerous changes of materials, which require easy and effective cleaning of the devices used, are one of the core char-

acteristics of a development environment. Other prominent criteria are a high operating comfort and easy access.

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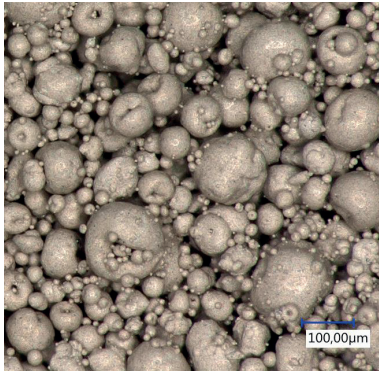


Bild 2 Microscope image of SiC granulate, 2-fluid nozzle

These are all reasons that led to the development of a fully independent solution for the development of materials and the production of sample quantities that is perfectly adapted to this purpose.

An innovative spray drying plant for various fields of application

The new *SMART Lab Atomizer* bridges the gap between a small laboratory device and a manufacturing plant. One of the key objectives was to provide the sector of materials development with a device that, on the one hand, meets the requirements of everyday laboratory operations and, on the other hand, can deliver scalable and significant results for the subsequent production on a larger plant.

The produced granulate is intended to have similar, transferable flow and pressing properties typical for the material used as if it had been produced on a manufactur-

ing plant. Series of tests with aluminum oxide, titanium oxide, silicon carbide and silicon nitride suspensions having the usual weights per liter and viscosities resulted in an attainable width of the grain's center of gravity D_{50} of 60–120 µm for the operation with two-fluid nozzle in the tower fraction. The morphology of the granulated materials is equivalent in form and size to the grains produced on a large manufacturing plant. The attainable residual moistures are identical.

Water-based spray granulation of hard metals and cermets was also successful. In this special case in particular, the *SMART Lab Atomizer* makes it possible to develop the appropriate material-specific binder system without using large quantities of material and to create test batches capable of being pressed. This will considerably quicken the process and thus make it significantly less expensive to enter into water-based atomization of hard metals.

Unique features and technical equipment

The *SMART Lab Atomizer* was designed as a functional "all-in-one" system. All necessary components such as electric air heater, process air fan, cyclone dust separator and dry dust filter including the entire plant control system are installed to be ready for use and integrated at the drying container.

For delivery and transport, the fully insulated double-walled drying container made of special steel can be rotated hydraulically by 90° along with all its modules.

This unique and outstanding feature of the *SMART Lab Atomizer* makes it possible to move the entire spray drying plant by hand on its undercarriage, to store it in a space-saving manner and to gain easy access to its top and bottom for cleaning and maintenance work.

The spray drying plant in its tilted position has been dimensioned in such way that it will fit through doors of normal height and width in industrial buildings.

For commissioning, only electricity, an exhaust air duct and compressed air for operating the 2-fluid nozzle are required. The standard scope of supply of the spray drying plant always includes a storage trolley made of special steel with all accessories such as a nozzle holder, various pipes, washing lance (optional), seals, hose material and a peristaltic slip pump.

Granulate collecting tanks for tower and cyclone fraction made of special steel or glass are available as an option.

Process variants and efficient cleaning

The *SMART Lab Atomizer* offers a range of interesting operating variants as standard for the development of materials:

- Atomization in counter-current process;
- Atomization in current process;
- Granulate separation via tower and cyclone;
- Granulate separation only via cyclone.

The pipe sections and nozzle holders necessary for the individual operating methods are included as standard.

The conversion is very simple since all connections are equipped with manual quick release fasteners. Any mounting tools are not necessary.

Cleaning the spray drier is just as easy and convenient. A large door at the reactor provides access to the interior. All pipes can be disassembled quickly and both the spiral air baffle and the cartridge filter housing can be removed by hand after releasing the clamping levers. An optional washing lance allows automatic pre-cleaning of the plant.

Prospects

The aim of a functional, cost-effective compact solution tailored to the requirements has been achieved and the product succeeded in convincing interested customers from the very beginning. Continuous tests



Fig. 3 Smart Lab Atomizer in transport position

with most diverse technical ceramic materials, cermets and hard metals have shown the broad application range of the device regarding water-based suspensions.

Future developments will focus on expanding to pressure nozzle atomization and on enhancing the operating convenience in the control system for process data acquisition and logging.

It remains to be seen if it will be possible to apply the concept of a compact nozzle-type atomizer based on the model of the lab atomizer to larger, stationary manufacturing plants up to an evaporative capacity of 30 kg of water. This would significantly reduce costly and time-consuming on-site assembly work.

Summary

With the mobile nozzle-type atomizer *SMART Lab Atomizer*, DORST TECHNOLOGIES has added a compact unit for the development of powders and granulates in laboratory operations to the company's reliable range of nozzle-type spray drying plants for ceramics, technical ceramics and hard metals with an evaporative capacity of 10–8000 kg of water.

The sophisticated conception and unique handling provide materials developers in both the industrial and the research sector with an interesting alternative to similar systems that have so far been available on the market.

Due to the device's complete ready-to-use equipment, it is possible to simply "plug & spray" at the very day of delivery after no more than a short briefing. Owing to the protected concept of a tiltable drying reactor, very little effort is necessary to make the device both mobile and space-saving.

The *SMART Lab Atomizer* will be shown in original at POWTECH 2019, Hall 3/3-142 in Nuremberg/DE. Apart from this, there is always the possibility to see this innovative nozzle-type spray drying plant in operation at DORST TECHNOLOGIES, in the company's own in-house Technology Center in Kochel am See, or to book it for a customer-specific test.