



*Solutions for Granulating, Coating and
Drying Small Particles*



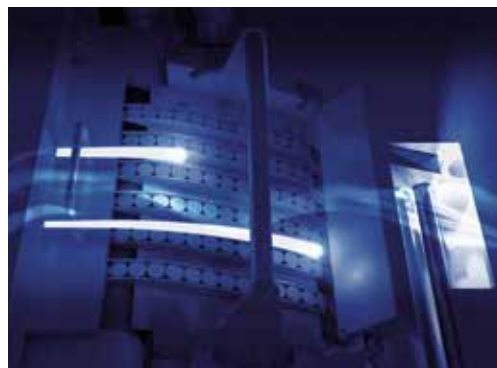
Beyond Technology

The new business model from Romaco sets valuable incentives for meeting customer requirements. For the design of innovative solutions, Romaco relies on its unique knowledge portfolio.

With its diverse brands, Romaco focuses on important technological fields of competence. The single product lines offer the optimum

prerequisite for the development of comprehensive solutions.

Romaco promises its customers professional project handling, fast delivery times and a reliable service. Through this, Romaco provides its customers with a considerable boost to their earning and financial power.



Creating Value – best price/performance ratio

Romaco wins over its customers by offering an outstanding price/performance ratio over the entire life cycle of its products. In this way, customers can systematically optimise their cash flow. With efficient production and service management, Romaco prepares its customers for future long-term commercial success.

Delivering Solutions – high application expertise

Romaco offers integrated solutions for the growing markets of pharmaceuticals, cosmetics, food and industrial applications. Here, the customer benefits from the synergetic effects that result from the close collaboration of all the Romaco brands. This internal technology transfer imparts a considerable development potential and is the basis for comprehensive solutions.

Exploiting Technologies – strong brands

Romaco is synonymous with European engineering on the highest level. With its eight brands, the company is widely recognised around the world. Continuity and progress are the keys to a strong positioning on the market. Romaco relies on the profound knowledge and the long-time experience of its employees.



» As an innovation leader for granulation, coating and drying, Romaco Innojet offers a range of high-efficiency processing solutions for the pharmaceutical, food and chemical industries.«

Dr. h.c. Herbert Hüttlin, Romaco Innojet

Delivering Solutions

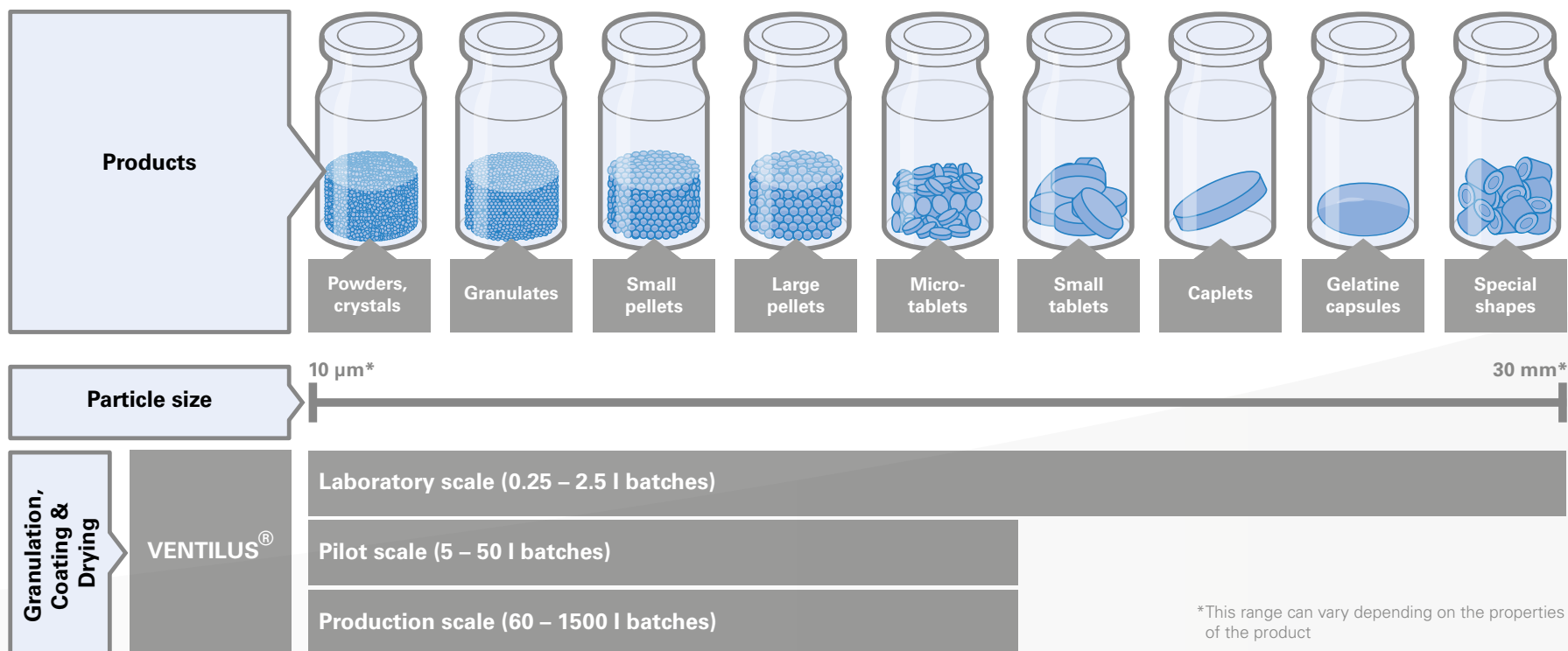
Granulation and Coating in a Single Batch Process

The machines in the Romaco Innojet VENTILUS® series were specially developed for coating and granulating small, fine particles. The product is either agglomerated with an adhesive medium or coated with a liquid film, depending on the type of spray selected. These two process steps can also be combined whenever this is required by the application. The ability to granulate and coat in a single batch process is a novel technical

feature, which saves the customer valuable production time and costs.

Wide Range of Applications

- Granulation, agglomeration, coating, drying and mixing of free-flowing bulk materials
- Application of spray liquids within a wide viscosity and temperature range
- Numerous hot melt applications using wax or hard fats with a melting point up to 90°C



Granulation of Powdery Substances

- Improved flowability and compaction properties
- Preparation for tableting
- Dust binding
- Raw materials combined without segregation
- Optimised release kinematics

Direct Applications for Granulates

- Ready-to-use formulations (stick packs) for administration without water
- Instant beverages

VENTILUS®-Compatible Starter Materials

- Powders, crystals, granulates, pellets, capsules or micro-tablets
- Special amorphous shapes

Typical Substances

- Pharmaceutical carriers and APIs
- Acids, salts, sugar, aromas
- Minerals, vitamins and amino acids
- Probiotic bacteria
- Fertilisers
- Seeds

Coating in the Pharmaceutical, Food and Chemical Industries

- Improved stability and shelf life
- API coatings
- Controlled API release
- Taste masking
- Multilayer coatings
- Crop protection coatings
- Microencapsulation
- Moisture protection
- Enteric coatings



Delivering Solutions

The Magic of Hovering

All Romaco Innojet solutions for granulating, coating and drying small particles are based on the air flow bed technology originally developed and internationally patented by Dr. h.c. Herbert Hüttlin. This method optimises the core processes of the fluidised bed in order to fluidise solid particles. The flow conditions created for this purpose enable extremely gentle distribution of the product. The targeted radial and tangential flow of process air results in a spiral, orbital product flow.

This in turn causes the product to hover – and the individual particles float freely without any friction. They can thus be coated quickly, easily, gently and above all evenly, either with a liquid film or with an adhesive medium. The air flow bed technology combines shorter processing times with excellent, reproducible product quality. All machines in the Romaco Innojet VENTILUS® series consequently provide significant benefits compared to granulation and coating systems based on a conventional fluidised bed.



Linear Scale-up

- Uniform flow conditions in the container owing to the cylindrical design
- Constant ratio of the relative air flow per batch volume to the number of process air supply gaps in the container bottom
- Scalable dosing of the spray quantity because there is only one, central nozzle
- Nozzle designed with a spraying gap: the gap length can be varied but the geometry remains constant
- Stable droplet sizes regardless of the spray volume

Optimised Process Control

- Spray nozzle, container bottom and powder recovery system form an innovative function module
- Efficient product movement
- Large product surface facilitates the application of liquid coating or adhesive medium
- Cost efficient solution because spray loss is reduced to a minimum

Shorter Batch Times

- Processing times up to 25% shorter
- Multilayer coating: seamless sequence of individual spraying steps
- Granulation and coating combined in a single batch process

High Product Quality

- Continuous in-process control ensures reproducible product quality
- Reliable processing even of highly friable products
- Efficient coating of complex geometries as well as products and particles with a hollow structure
- Product filled and discharged without contamination





Laboratory Scale

Romaco Innojet VENTILUS® laboratory scale systems are specially designed for manufacturing small batches from 250 ml to 2500 ml. The lab scale version is suitable for processing virtually any product from fine powders or granulates to large tablets and capsules.

- Designed for particle sizes from 10 µm to 30 mm
- Trials with expensive raw materials
- Product container with reduction kit for very small batches or larger particles
- Process column made from glass or stainless steel
- Swivelling product container and filter dome
- Mobile housing mounted on castors
- ROTOJET spray nozzle in standard or hot melt version
- High containment: version with glove box isolator for processing sterile or toxic products



Stainless steel version

Pilot Scale

The pilot scale systems in the Romaco Innojet VENTILUS® series are intended for batch sizes from 5 to 50 litres. They are ideal for carrying out feasibility studies as well as for analysing and validating process parameters.

- Reliable linear scale-ups
- Special applications, e.g. building up pellets and coating highly friable particles
- GMP design according to pharmaceutical regulations
- Double-walled, insulated process column
- Product filled and discharged pneumatically



View inside the filter dome

Test Laboratory

The Romaco Innojet test laboratory, which is fitted out with all the most advanced equipment, is the perfect platform for all process development activities. Various laboratory and pilot scale systems in the VENTILUS®, AIRCOATER® and VARIOSCALE® series are available for trials. A highly qualified team of experts provides support and advice to customers from all over the world.

- Development of products and formulations
- Definition and optimisation of process parameters
- Test series with a variety of substances
- All the necessary equipment for hot melt applications
- Analysis and processing of measurement data
- Full documentation of all experimental results



Test laboratory trials

Exploiting Technologies

Laboratory Scale Series V 2.5

Pilot Scale Series V 10 V 25 V 50





Production Scale

The production scale systems in the Romaco Innojet VENTILUS® series are designed for batch sizes from 60 to 1500 litres. The technology is utilised in the pharmaceutical, food and chemical industries.

Quality by Design

- Cylindrical container geometry: higher productivity compared to conventional, conical product containers
- Innojet design guarantees uniform flow conditions inside the container
- No expansion zone in the process container: product distribution controlled by an air flow bed
- No abrasion of particles on the inner wall of the container

Optimised Cleaning

- WIP – washing in place: all product-contacted parts inside the system are cleaned automatically
- Significantly shorter cleaning times because there is only one, central spray nozzle
- Air flow bed technology prevents product residues from adhering to the container's inner wall or obstructing the process air supply gaps in the container bottom

Easy Operation

- Ergonomic HMI panel with touch screen
- Quick removal of the spray nozzle simply by pushing a button
- Slide-out container bottom provides excellent visibility
- Optimised process control thanks to a camera installed inside the container

Special Versions

- Development and design of machines for batch volumes greater than 1500 litres
- Development of flexible material transport systems and integration in the process
- High containment solutions with safety controls
- Implementation of PAT – process analytical technology

Modifications

- Integration of Romaco Innojet functional components to optimise conventional fluidised bed systems
- Modifications and retrofits to existing systems
- Modification of control systems

Exploiting Technologies

Production Scale Series

V 100

V 200

V 400

V 600

V 800

V 1200

V 1500

Special Versions

Modifications



Slide-out ORBITER booster



WIP – washing in place



Modified process container





ORBITER

ORBITER is the name given to the container bottom or booster through which process air is introduced. Its special design, consisting of overlapping circular plates, enables the formation of the air flow bed.

- Introduction of process air through process air supply gaps
- Formation of the air flow bed by means of controlled air distribution
- Very high, precisely defined flow velocity
- Horizontal arrangement of the air flow bed prevents small particles from escaping through the open container bottom
- Spiral, orbital movement guarantees gentle distribution of the product
- Air flow bed prevents the particles from colliding, swirling or abrading
- Uniform, abrasion-free movement of particles

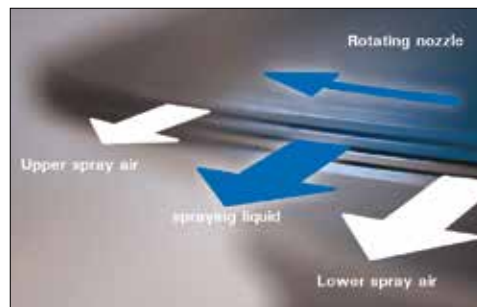


Easy-to-fit circular plates

ROTOJET

All machines in the Romaco Innojet VENTILUS® series are equipped with a single, centrally positioned spray nozzle. ROTOJET distributes the spray liquid rapidly and homogeneously.

- Bottom spraying: the spray liquid is applied directly into the product from below
- Annular spraying gap: the diameter – and hence the size – of the gap increases according to the production scale
- Dynamic spraying gap: the rotation of the spray head prevents any blockage
- Spraying and support air controls the direction of the spray liquid and prevents the formation of drops from multiple droplets
- Variable adjustment of the spraying gap allows the droplet size to be determined precisely



Dynamic spraying gap with spraying air ducts

SEPAJET

SEPAJET filters the outlet air and ensures that powdery particles are continuously returned to the process zone in the product container. Product loss is reduced to a minimum and a constant flow of process air is guaranteed.

- Filter bags arranged in a star shape separate the particles from the outlet air
- Filter bags cleaned by a blowing-air rotor
- Continuous particle recovery with clean, treated process air
- Inner core of the filter made from folded stainless steel covered with anti-static textile media, optionally also from a plastic sintered material



Inner core with anti-static filter bag

Exploiting Technologies

Functional Components





Hot Melt Systems

Innovative technology for coating and granulation with organic wax and hard fats. All machines in the Romaco Innojet VENTILUS® series are suitable for hot melt applications. A special spray nozzle is used for the laboratory scale system.

- Suitable for wax or hard fats with a melting point up to 90°C
- Melting system with GMP design: optimal accessibility and cleaning of all product-contacted surfaces
- Hot melt coatings speed up the process because there is no evaporation
- Less process energy is necessary because the process air is not heated
- Hot melt coating is the ideal solution for moisture barriers and taste masks



Hot melt configuration

Romaco Innojet TUBUS Monobloc

The Romaco Innojet TUBUS monobloc is used to treat the process air. The supply and outlet air technology is specially designed for use in the pharmaceutical industry.

- Available in several different filter classes
- Equipped with heating and cooling elements
- Cylindrical, double-walled, gas-tight design
- Weatherproof and insulated for outdoor installation
- Hygienic design with no doors, covers, corners or edges
- Convenient access because the housing elements slide out on rails
- Easy maintenance of all machine groups and filter modules



Romaco Innojet TUBUS monobloc

Romaco Innojet Control Systems

Modular and highly flexible control environments developed by Romaco Innojet are available for the VENTILUS®, AIRCOATER® and VARIOSCALE® series. These complex systems provide total process control and an advanced level of automation, meeting all the requirements of CFR 21 Part 11.

- Central control of formulations and reproducible process parameters
- HMI panel with intuitive visualisation and navigation
- Client-server architecture: interconnection of production equipment
- Full documentation of all process data
- Automatic data back-ups
- Remote online support for users world-wide

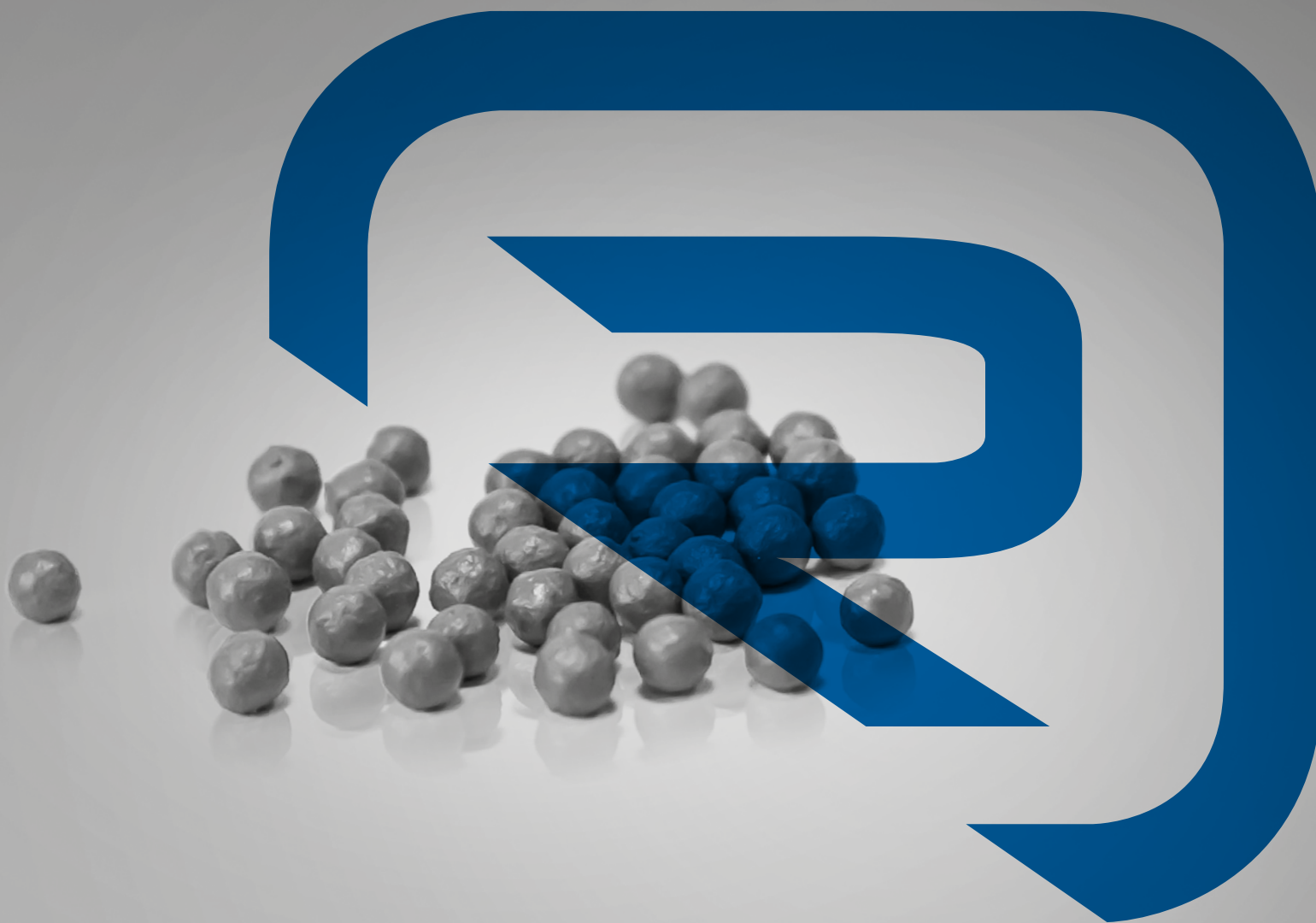


Operation via a touch panel

Exploiting Technologies

Technical Accessories





Creating Value – Romaco generates added value for the customer across the entire life cycle of its solutions

- Romaco is interested in a long-term solution partnership with its customers
- Romaco is familiar with its customers' critical success factors throughout the different life cycle phases of our jointly developed solutions
- The range of services from Romaco is specifically designed for these phases and is delivered through the appropriate modular components
- Romaco optimises the internal processes so that the customer can benefit from more secure decisions within the time gained
- In April 2014 the new business unit Romaco Systems was founded within the Romaco Group: the aim of this unit is to integrate the offering of the Romaco Group into comprehensive solutions

We understand the business model of our customers and with a diverse portfolio we offer the best price/performance ratio for generating additional cash flow.

Benefit for the customer

Across the entire life cycle

- Minimal life cycle costs and low TCO guarantee fast amortisation of the financial investment
- The wide range of customer service products ensures sustainable value creation

In the investment phase (designing value)

- Professional consulting to increase decision-making security
- Short processing and delivery times give maximum scope for investment decision and thus optimum decision flexibility
- Customised solutions development for the optimum preparation of the implementation phases (ramp-up and production)
- Reliable and customer-orientated project management according to efficient milestone principles provides professional delivery

In the ramp-up phase (leveraging value)

- The production phase is reached more quickly due to shortening of ramp-up
- Transfer of expertise provides increased security to the customer in implementing production systems at the highest level
- Minimisation of ramp-up costs

In the production phase (harvesting value)

- Maintenance of the value stream due to quick customer service response times
- Best delivery times in service, format and spare parts
- Consulting on the optimisation of the OEE
- Continuous training of the customer team
- Extension of the life span

Creating Value

Creating Value describes our constant willingness to secure our customers' – and our own – financial success.



Comprehensive Range of Services from Initial Installation and Throughout the Operating Lifespan

Maintenance

- Remote online support: prompt and reliable diagnostics using digital access
- Maintenance contracts: preventive maintenance reducing breakdowns to a minimum
- On-site service: local emergency support provided where necessary
- Quick inspection of patented parts on the Romaco Innojet premises

Consulting

- Telephone advice from experts on processing technologies, mechanical components and controls
- Technical support during scale-up tests and validations of new process parameters

Training

- Individual training for the various HMI levels with certificate of attendance
- Qualified training and seminars for maintenance personnel with certificate of attendance
- Process training at the Romaco Innojet test laboratory

Retrofit, Expansion and Relocation

- Standard packages and customised solutions for machines in all series
- Customised adaptation of the educt and product flows, including planning and installation
- Individual adaptation of the system control
- Electronic and mechanical upgrades – depending on the specification
- Plant relocation planning and execution



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