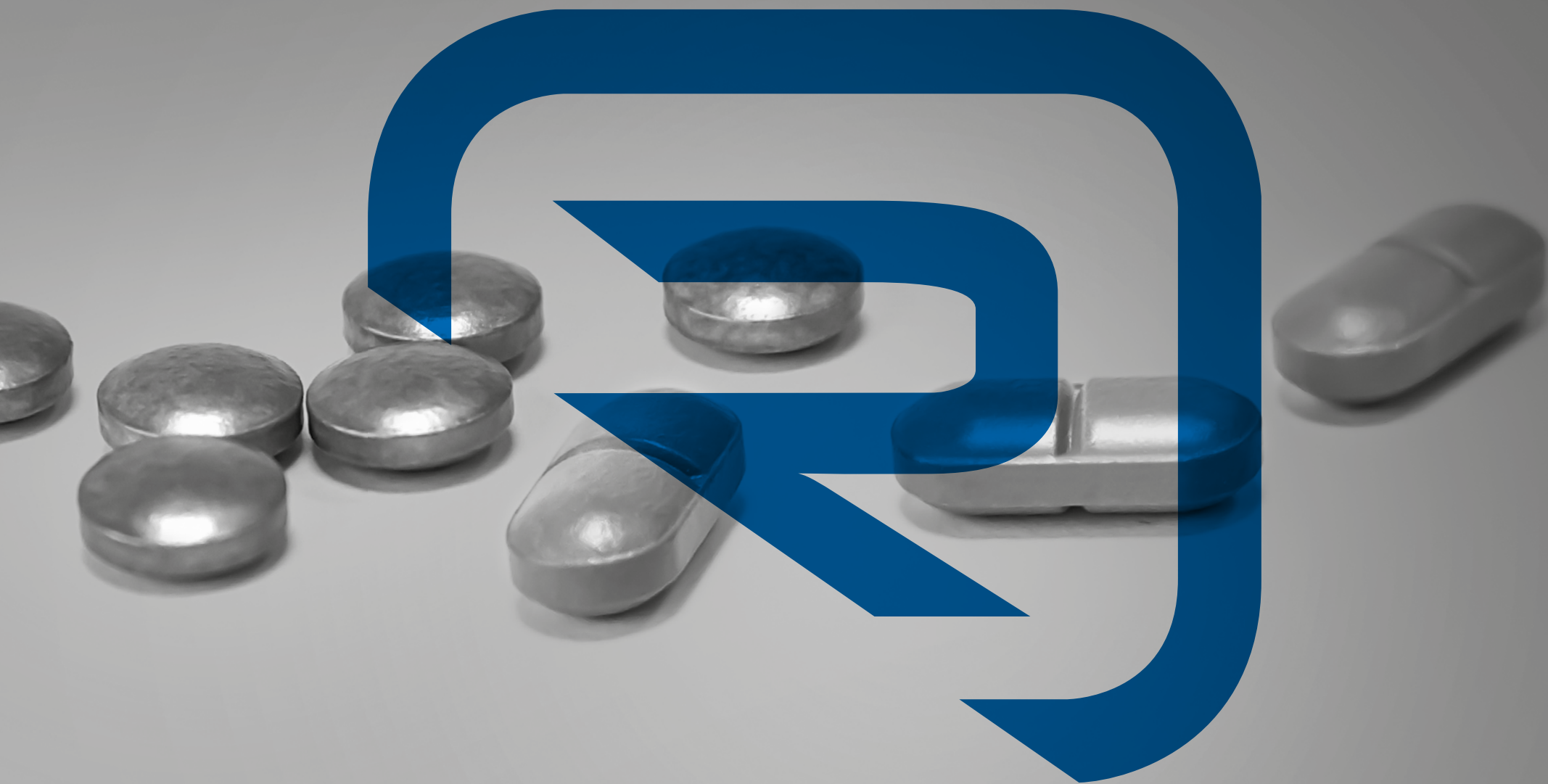




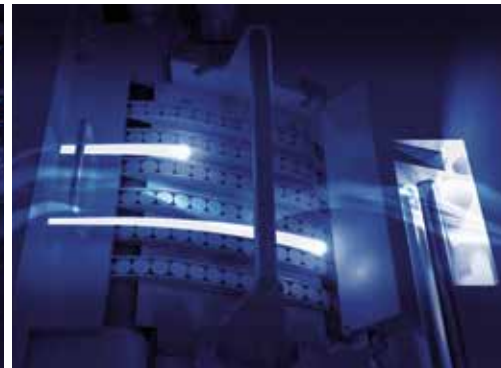
***Solutions for Coating
Big Particles***



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 coating technologies, 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

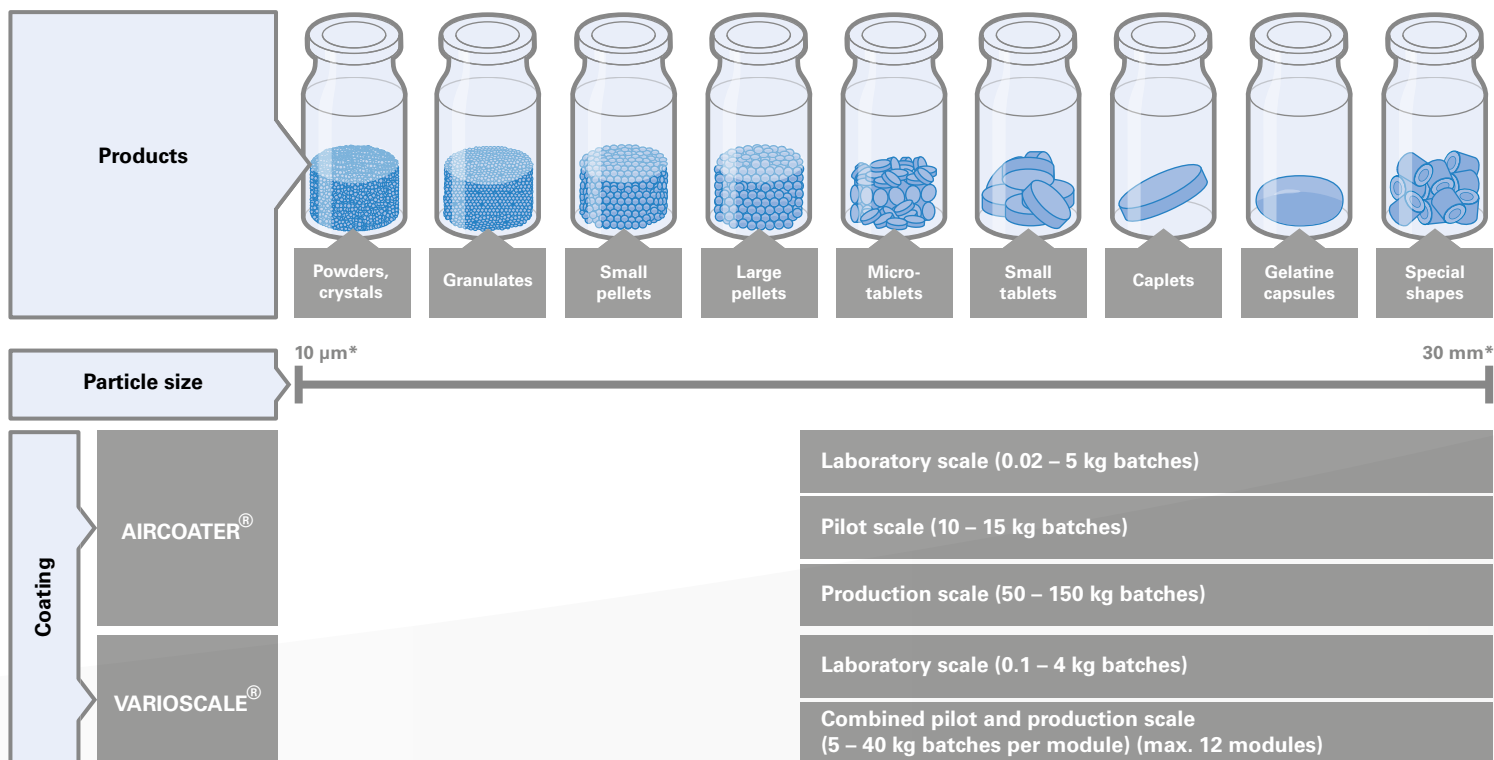
Easy Coating

The Romaco Innojet AIRCOATER® and VARIOSCALE® series were specially developed for coating big particles. Products of various shapes, sizes and densities can be processed very rapidly, easily and gently thanks to the Romaco Innojet air flow bed technology. Reliable, high quality results can also be achieved with complex geometries as well as hollow or relief structures. The same applies when it comes to coating

sensitive, fragile products. Romaco Innojet coating solutions save the customer valuable production time and costs.

Wide Range of Applications

- Coating free-flowing solid particles
- Application of spray liquids within a wide viscosity and temperature range
- Aqueous and organic film coatings: suspensions, dispersions and solutions



*This range can vary depending on the properties of the product

Coating Starter Materials

- Micro-tablets, small tablets, caplets, soft or hard gelatine capsules
- Special shapes and effervescent
- Technological products

Typical Substances

- Pharmaceuticals: carriers and APIs
- Food products: sugar pellets, crispies and croûtons
- Chemical industry: bulk materials, fillers
- Seeds

Film Coatings

- All common, „ready to use“ coating substances
- Aqueous or organic solutions, suspensions and dispersions
- Hot melt coatings

Coating in the Pharmaceutical, Food and Chemical Industries

- Improved stability and shelf life
- API coatings
- Controlled API release
- Taste masking
- Multilayer coatings
- Moisture protection
- Enteric coatings
- Easier swallowing
- Cosmetic coatings



Delivering Solutions

The Magic of Hovering

All Romaco Innojet solutions for coating big 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 rapidly, easily, gently and above all evenly with the liquid coating material. The air flow bed technology combines shorter processing times with excellent, reproducible product quality. All machines in the Romaco Innojet AIRCOATER® and VARIOSCALE® series consequently provide significant benefits compared to conventional drum coating facilities.



Linear Scale-up

- Uniform flow conditions inside the product container
- Constant ratio of the relative air flow per batch volume to the number of process air supply gaps in the container bottom
- Different nozzle lengths allow scalable dosing of the spray quantity
- 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

- Defined break-up zone in the process container results in two counter-rotating air flow beds
- Efficient distribution of the product
- Spray nozzles and container bottom form an innovative functional unit
- Cost efficient solution because spray loss is reduced to a minimum

Shorter Batch Times

- Processing times reduced by up to 75% compared to conventional drum coating facilities
- Multilayer coating: seamless sequence of individual spraying steps

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 with a hollow structure
- Product filled and emptied without dust or contamination





Laboratory Scale

In the smallest lab scale version, the Romaco Innojet AIRCOATER® A 025 processes batch sizes from 20 to 250 g; the next model up, the VARIOSCALE® VS 040, is designed for batches from 100 to 400 g. Tablets and solids with a wide range of shapes, sizes and densities are coated rapidly and gently with an aqueous or organic film. The mobile, all-in-one-box AIRCOATER® A 5 (batch sizes from 2 to 5 kg) and VARIOSCALE® VS 4 (batch sizes from 1 to 4 kg) can be used for larger-scale laboratory applications.

- Ideal for developing galenics
- Visual checks of the process through an industrial glass cover
- No moving components in the process container and thus no frictional seals
- AIRCOATER® A 025 and A 5 each equipped with the ROTOJET spray nozzle; VARIOSCALE® VS 040 and V 4 fitted with the LINEAJET nozzle.



VARIOSCALE® VS 040 desktop unit

Pilot Scale

The pilot scale systems in the Romaco Innojet AIRCOATER® series were specifically designed for batch sizes from 10 to 15 kg. Reproducible processes and simple scale-up are the hallmarks of this technology.

- Two separate air flow beds formed: counter-rotating product distribution with a high mixing effect
- Product moves in the air flow bed at the same time and at the same speed in the same direction
- Gentle processing of sensitive, fragile and highly friable products
- Efficient cleaning with WIP – washing in place



Visual checks of the process

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



Competent advice from Romaco Innojet experts

Exploiting Technologies

Laboratory Scale Series

A 025

VS 040

A 5

VS 4

Pilot Scale Series

A 15





Production Scale

The production scale machines in the Romaco Innojet AIRCOATER® series are intended for batch sizes from 50 to 150 kg. They provide homogeneous coating results and are designed to process film coatings of almost any viscosity. Several bottom spray nozzles adapted to the batch size reduce spray loss to a minimum and ensure optimal drying times.

Counter-rotating Air Flow Beds

- Two product cycles reduce the distance travelled by the product as it is distributed
- Shorter batch times save time and money
- No spray liquid residues on the inner wall of the container

Unique Design

- Cylindrical product container with no rotating components
- No frictional seals inside the container
- Optimal view of the batch process from above

Optimised Processes

- Gas-tight operation of the system under vacuum
- Gravimetric filling (gentle on the product)
- Pneumatic discharge in a closed system
- Automatic cleaning with WIP – washing in place

Industry-specific Versions

- GMP compliant pharmaceutical design
- Explosion proof ATEX version for specific products and spray solutions
- Cost efficient standard version for the food industry

Exploiting Technologies

Production Scale Series

A 75

A 150

Special Versions



Suitable for use in the food industry



Safe and simple discharge



ATEX design for industrial and chemical applications





VARIOSCALE®

Thanks to its modular design, the Romaco Innojet VARIOSCALE® permits totally variable batch sizes by combining pilot and production scale applications. The machine is designed to process bulk materials weighing anything from 5 to 500 kg. The spray and motion geometry is always identical regardless of the batch size, in other words, the product quality remains consistent no matter what the scale of the process.

Modular Architecture

- Rectangular product container: 600 mm long and 500 mm wide
- Several product container modules can be installed in-line for larger batches
- Maximum filling volume: approx. 40 kg per product container
- Batch variability from 5 to 100%: freely movable compartments integrated in the product containers



Diagram of a VS 200 with 5 modules

Continuous Process

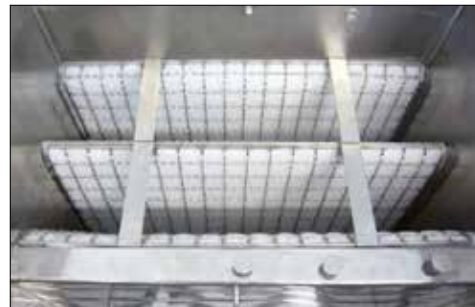
- Option of integration in a complete production line
- Modular architecture allows simultaneous production of different batches

Extreme Variability

- Designed for variable batch sizes
- Product diversity: suitable for particles from 2 to 30 mm in diameter
- Special applications: ideal for sensitive products of low hardness

Air Flow Bed Technology

- Reproducible parameters and linear scale-up
- Homogeneous coating thicknesses with a smooth surface
- Virtually no measurable spray loss



Simple filter design

Designed for Convenience

- Flexible arrangement of coating processes based on a modular principle
- Pneumatic product discharge at both ends
- Integral recirculation air fans ensure an efficient supply of conditioned process air
- Soundproofed housing



Freely movable compartment

Exploiting Technologies

*Up to Twelve VS 40
System Modules*





VULCANO for AIRCOATER®

Process air is introduced through the VULCANO, the round container bottom especially for the AIRCOATER®. The two-piece design results in two counter-rotating air flow beds, which come together in the break-up zone.

- Circular break-up zone where the inner and outer product circulation streams come together
- Two-piece container bottom consisting of overlapping circular plates
- Arrangement of the process air supply gaps ensures counter-rotating product distribution
- Precisely defined flow rates ensure accurate control of the product movement
- Spiral, orbital movement guarantees gentle distribution of the product
- Uniform movement of the particles means abrasion is reduced to a minimum



VULCANO container bottom
for the AIRCOATER®

VULCANO for VARIOSCALE®

The VULCANO is a rectangular booster especially for the VARIOSCALE® which works according to the same principle as the VULCANO for the AIRCOATER®. Its linear break-up zone divides the rectangular container bottom into two halves with counter-rotating, orbital product circulation.

- Overlapping linear booster plates conduct the product vertically upward on either side of the break-up zone
- VULCANO for the VARIOSCALE® has fixed dimensions: 600 mm long, 500 mm wide
- Modular VARIOSCALE® design



VULCANO booster for the VARIOSCALE®

LINEAJET

All pilot and production scale machines in the AIRCOATER® and VARIOSCALE® series are equipped with LINEAJET spray nozzles, which are integrated in the break-up zone.

- Linear spraying gap results in a homogeneous product coating
- Bottom spraying: liquid spray directed vertically upward is applied to the product in the break-up zone
- Spraying power determined by the length of the spraying gap
- Precise spraying gap dimensions allow precise reproduction of droplet sizes
- Controlled spraying air prevents the formation of drops from multiple droplets



LINEAJET spray nozzle

Exploiting Technologies

Functional Components





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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