

CUSTOMIZED CONVEYING SYSTEMS FOR EVERY REQUIREMENT

MATERIAL FLOW EASILY AND INTELLIGENTLY SOLVED

CONVEYING



zeppelin-systems.com

ZEPPELIN®
WE CREATE SOLUTIONS

ENGINEERING YOUR SUCCESS

ABOUT ZEPPELIN SYSTEMS

Zeppelin Systems specializes in the design, construction and technological upgrading of industrial plants for storing, conveying, mixing, dosing, and weighing high-quality bulk materials and raw materials. From plant planning and project implementation to aftersales service including process optimization. As an integrated solution provider, Zeppelin Systems delivers complete solutions from a single source.



WE ARE EXPERTS IN PLANT ENGINEERING

Our experience guarantees your success!

Zeppelin Systems individually develops and manufactures every plant. It goes without saying that, in doing so, we address the needs and challenges of our customers. We develop tailored solutions using innovative processes, smart technologies, high-performance components and efficient services, depending on the industry and sector.

Zeppelin Systems draws on many years of cross-industry experience and is a professional in the handling of high-quality bulk materials. The wide-ranging portfolio is rounded off by the unique worldwide network of technology centers, which performs trials and tests on an industrial scale. This ensures one thing: Your success! **We Create Solutions!**

Zeppelin Systems' business segments

PLASTICS INDUSTRY
FOOD INDUSTRY
RUBBER AND TIRE INDUSTRY
BATTERY INDUSTRY
CHEMICAL INDUSTRY

STORAGE AND DISCHARGING
CONVEYING
WEIGHING AND DOSING
MIXING AND KNEADING
FILTERING AND SEPARATING
PREPARATION
SERVICE



CONVEYING TECHNOLOGY IS A MATTER OF EXPERIENCE

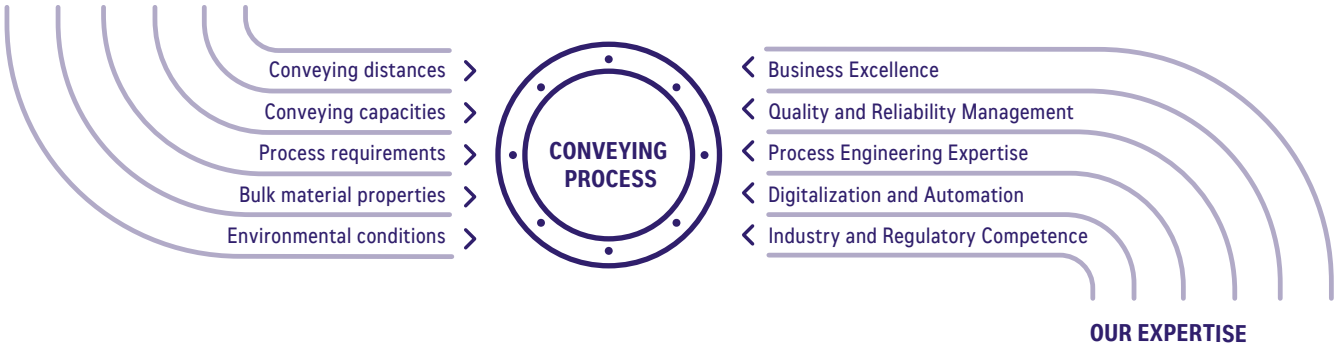
Always the right conveying system
for your requirements

Pneumatic conveying systems for powdery or granular bulk materials over long distances in pipelines offer a number of advantages over mechanical conveying systems.

Self-contained, low-maintenance pneumatic conveying allows for highly flexible piping geometry within a plant. The systems used in suction or pressure mode vary depending on the bulk material and the conveying method (dense phase or dilute phase conveying, or plug, strand, or particle clouds conveying). Zeppelin Systems supplies the right conveying line system for every application, whether smooth or roughened conveying lines or bypass conveying lines. Even plastic granulates such as PP or PE can be conveyed safely and carefully over very long distances in smooth pipes. Bypass conveying systems enable slow, careful, and reliable conveying of powdered bulk materials such as pearlized technical carbon blacks or silica.

We develop a conveying system that is optimally customized to your individual requirements based on the characteristics of your bulk material, specific plant configuration, overall concept, as well as investment and operating costs.

CUSTOMER REQUIREMENTS



FOUR CONVEYING METHODS – MANY POSSIBLE APPLICATIONS

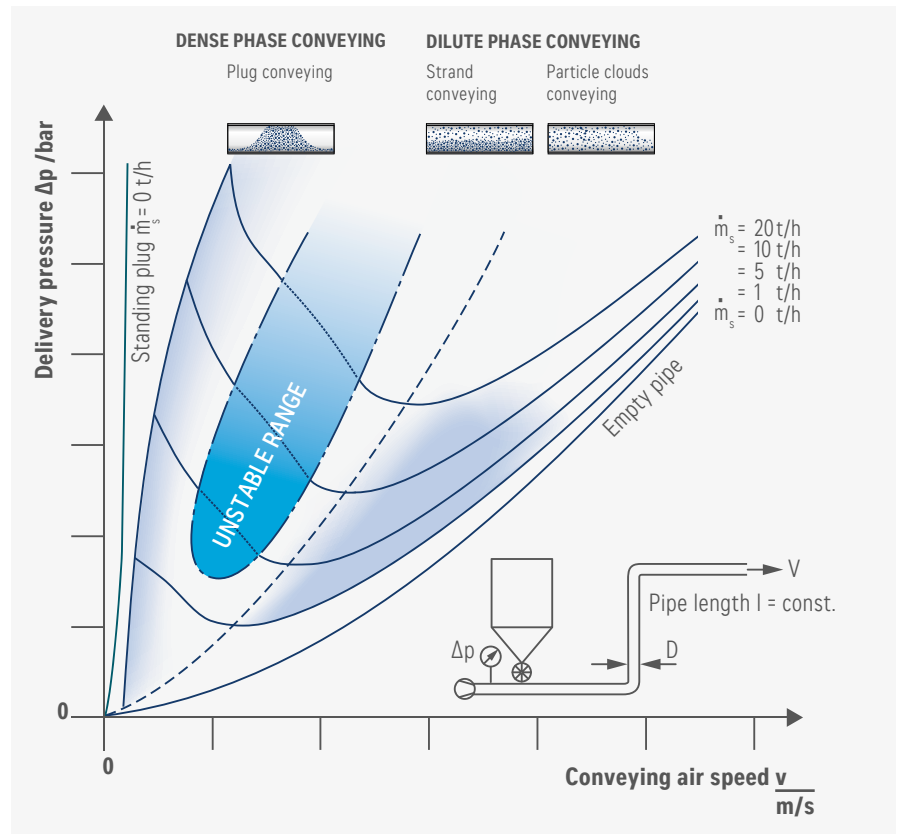
You can choose from four different conveying methods to optimally adapt the conveying process to the bulk material according to your requirements.

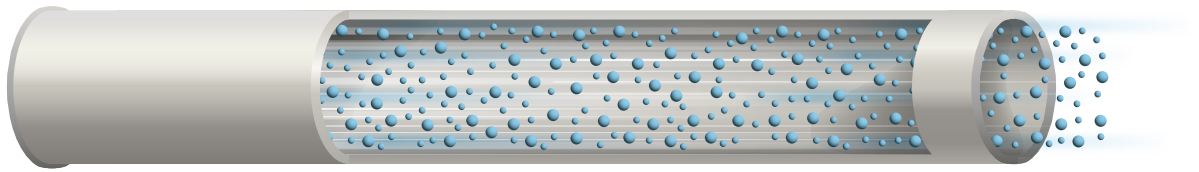
- Lean-TEC pneumatic dilute phase conveying
- Dense-TEC pneumatic dense phase conveying
- Twin-TEC pneumatic dense phase conveying with bypass systems
- Hydro-TEC hydraulic conveying

CUSTOMIZED CONVEYING METHOD COMBINATIONS

Clever combinations are also possible, for example, dilute phase conveying over long distances, followed by screening and then the use of gentle dense phase conveying. This means that Zeppelin Systems' conveying systems are designed in a logical, modular way, and the most cost-effective solution is customized to your bulk material and specific requirements.

The individual status diagrams are used to design the respective pneumatic conveying systems.





LEAN-TEC: COST-EFFECTIVE AND HIGHLY FLEXIBLE

Lean-TEC dilute phase conveying is the all-rounder among conveying methods

The pneumatic dilute phase conveying or the conveying in particle clouds is characterized above all by the high flexibility of the system, e.g., for different conveying quantities. Compared to other conveying methods, the Lean-TEC system has a straightforward design, requires little maintenance, and is suitable for both short and long conveying distances. Another advantage of dilute phase conveying is the low pipe forces and thus the reduction of the total investment due to less elaborate pipe brackets.

KEY FIGURES

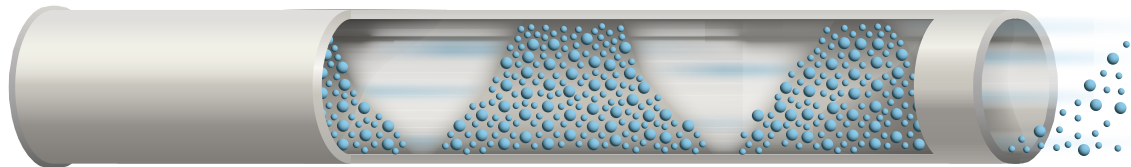
Typical speed: 15 – 35 m/s

Typical load: < 20 kg/kg





DENSE-TEC DENSE PHASE CONVEYING



DENSE-TEC: EXTREMELY GENTLE CONVEYING

Dense-TEC dense phase conveying is ideal for sensitive bulk materials

When high demands are placed on the quality of the granulate, gentle pneumatic dense-phase conveying is generally used; for plastic granulate, plug conveying is particularly suitable. Dense-TEC is ideal for abrasion-sensitive bulk materials. Compared to dilute phase conveying, dense phase conveying is more technically complex, requires higher conveying pressures (standard up to max. 3.5 bar) as well as specially designed components in terms of design and execution.

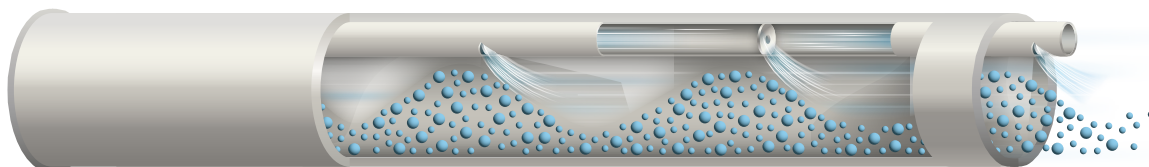
KEY FIGURES

Typical speed: < 3 – 10 m/s

Typical load: < 80 kg/kg



DENSE PHASE CONVEYING WITH SUPPORT OF BYPASS SYSTEMS



TWIN-TEC INTRAFLOW: CONTINUOUS AND GENTLE CONVEYING

Twin-TEC Intraflow is designed for fluidizable bulk materials

The innovative Intraflow system reduces bulk material deposits in the pipeline, which can lead to pressure peaks. A gas flow (air or nitrogen) from the smaller inner pipe generates turbulence in the bulk material along the conveying line, thus enabling continuous and gentle transport of the bulk material at reduced conveying air speeds. Therefore, it ensures both operational safety and careful pneumatic transport. This bypass system is mainly used for highly fluidizable bulk materials, particularly PTA/CTA.

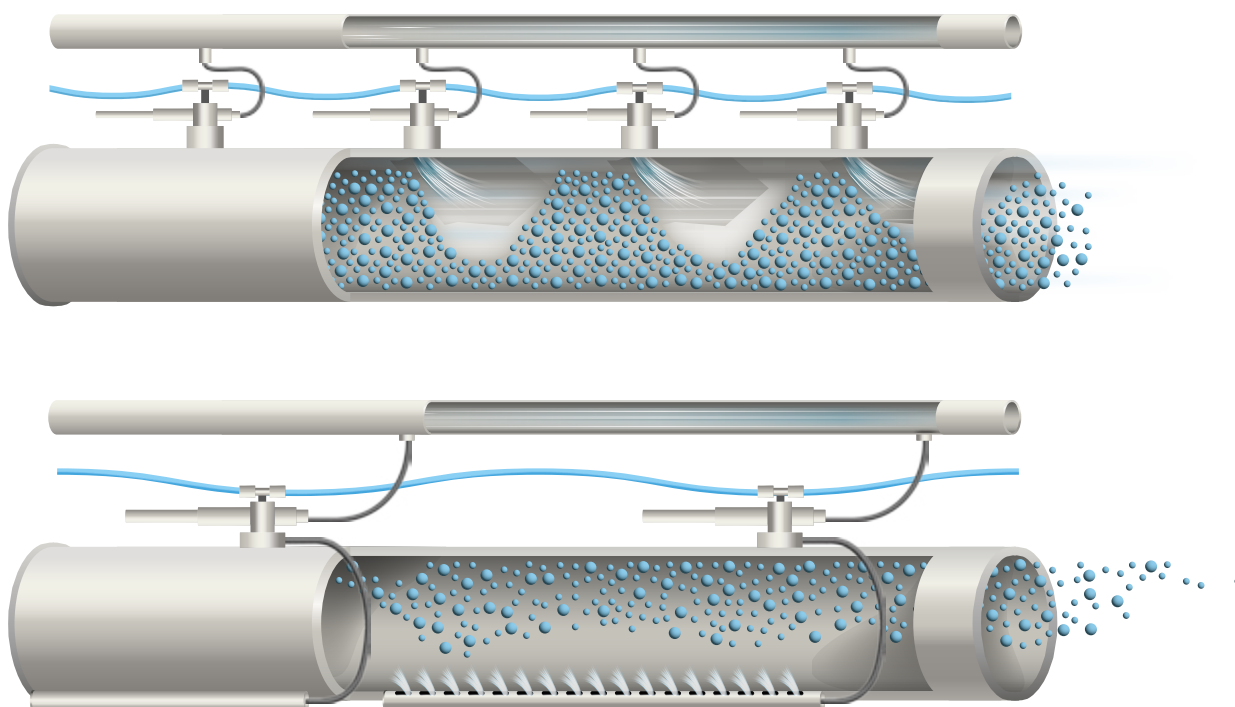
KEY FIGURES

Typical speed: < 12 m/s

Typical load: < 50 kg/kg

TWIN-TEC: OVERFLOW SMART OR AIRFLOAT SMART

The unique solution for powders

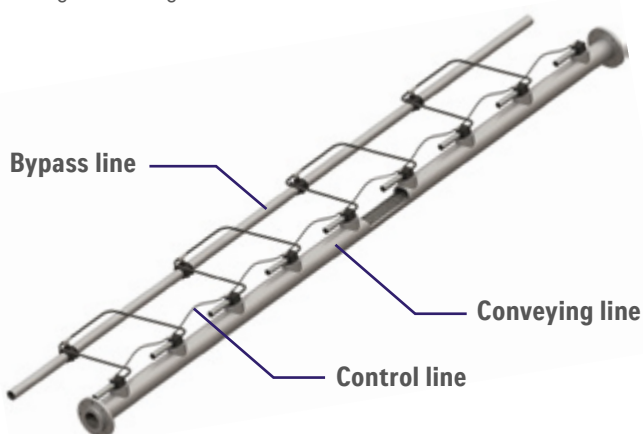


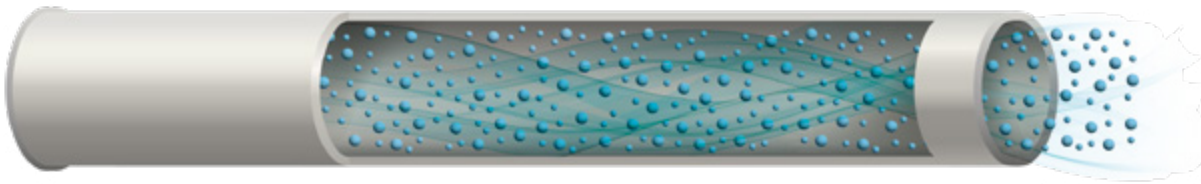
Two special bypass systems – Overflow-SMART and Airfloat-SMART – enable bulk material-friendly dense phase conveying even with powdery bulk materials. In this process, precision-controlled valves introduce secondary air into the delivery line at defined intervals. This controlled air supply ensures trouble-free conveying using the dense phase method, which is particularly suitable for sensitive materials such as pearl carbon black or silica, as it guarantees minimal grain damage.

KEY FIGURES

Typical speed: 3 – 10 m/s

Typical load: < 80 kg/kg





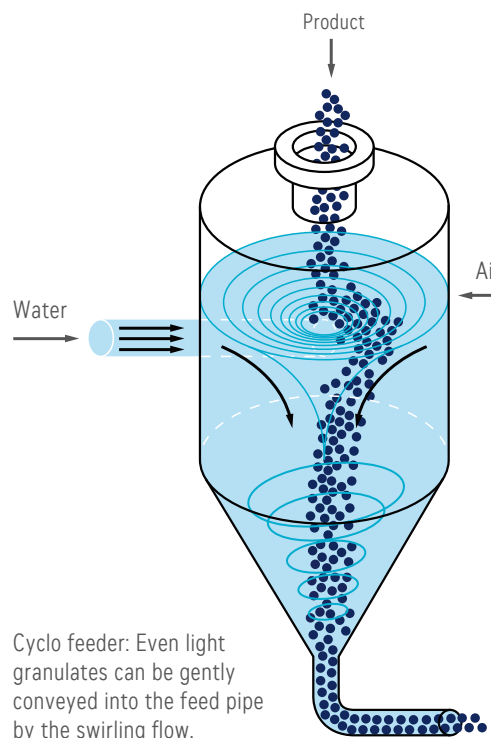
HYDRO-TEC: MAXIMUM RANGE AT MINIMUM LOAD

Gentle water conveying for sensitive bulk materials

In hydraulic conveying, water is used as the conveying medium instead of gas. This method is particularly suitable for very long conveying distances, since water, as an incompressible liquid, enables uniform and particularly gentle conveying. The slow conveying speeds significantly reduce wear and tear on the bulk material. At the same time, the system features impressive low energy consumption. Thanks to high solids concentrations, compact pipelines can be created while maintaining high conveying performance. In addition, noise levels remain very low and there is very little pipe vibration.

KEY FIGURES

Typical speed: 1.5 – 3 m/s
Solids concentration: < 40%



Overview of uses for different conveying methods

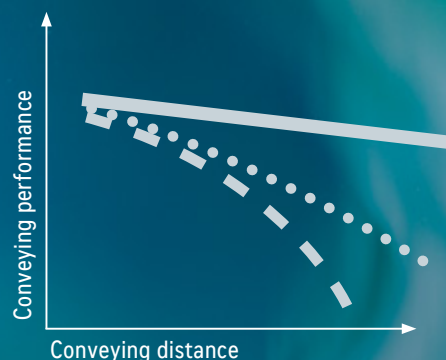
CONVEYING METHOD	BULK MATERIAL (rough specification, laboratory/ technical center tests, if necessary)			CONVEYING DATA				
	Fine powder	Coarse-grained powder (grit)	Granules	Conveying length ⁽¹⁾ [m]	Flow rate ⁽¹⁾ [t/h]	Conveying speed [m/s]	Loading (bulk material/fluid)	Typical delivery pressures (rec.) [bar]
Dilute phase conveying (Lean-TEC)								
Particle clouds conveying	✓✓	✓✓	✓✓	< 1000	< 200	20 - 35	< 15 kg/kg	< 1.0
Strand conveying	-	✓	✓✓	< 150 ⁽²⁾	< 200 ⁽²⁾	15 - 20	< 20 kg/kg	< 1.0
Dense phase conveying (Dense-TEC)								
Supercharged particle clouds conveying	✓✓	✓✓	✓✓	< 1000	< 150	20 - 35	< 50 kg/kg	< 2.5
Plug conveying	-	✓ ⁽⁴⁾	✓✓	< 400	< 150	3 - 10	< 80 kg/kg	< 3.5 ⁽⁵⁾
Bypass systems (Twin-TEC)								
Overflow-SMART	✓ ⁽³⁾	✓✓ Example Tech. carbon black		< 250	< 30	3 - 10	< 80 kg/kg	< 3.5
Airfloat-SMART	✓ ⁽³⁾	✓✓ Example Silica		< 250	< 30	3 - 10	< 80 kg/kg	< 3.5
Intraflow	✓✓ ⁽³⁾	✓✓ Example TPA		< 500	< 100	6 - 15	< 50 kg/kg	< 3.5
Hydraulic conveying (Hydro-TEC)								
	-	✓	✓✓	< 5000	< 100	1,5 - 3,0	< 40 % ⁽⁶⁾	< 8.0

- ✓✓ Preferred procedure
 ✓ Suitable procedure
 - Unsuitable procedure

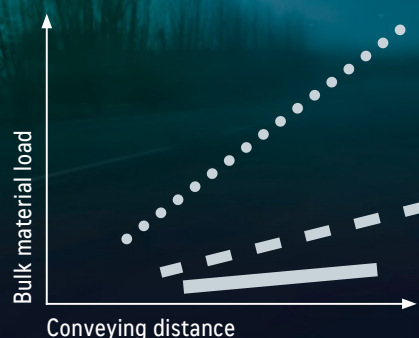
- (1) depending on delivery rate or delivery length and pipe diameter
 (2) depending on the pipe shape, close to the unstable area
 (3) not suitable for adhesive bulk materials (e.g., chalk, zinc oxide, titanium oxide)

- (4) Suitability depends on grain size distribution
 (5) When feeding bulk material through a high-pressure rotary feeder, higher pressures are possible with double rotary feeder stations or pressure vessels
 (6) Information on solids concentration

CONVEYING CAPACITY PERFORMANCE RATE DEPENDS ON CONVEYING LENGTH



BULK MATERIAL LOAD RATE DEPENDS ON CONVEYING LENGTH



- ● ● Particle clouds conveying*
 — — — Plug conveying*
 — — — Hydraulic conveying

*Pneumatic conveying

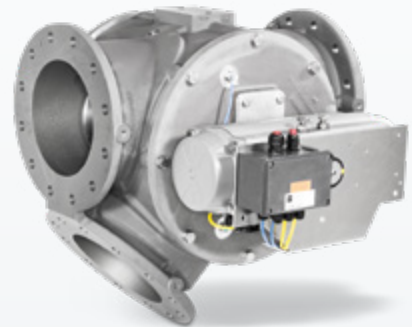
EVERY SYSTEM IS AS GOOD AS ITS COMPONENTS

Tailored conveying solutions through precise bulk material analysis



ROTARY FEEDER

Our rotary feeders ensure a smooth material flow—whether discharging, feeding or dosing bulk materials. They reliably isolate different pressure zones from each other, serve as explosion decoupling devices, and can even break up agglomerates. Whether powder or granulate, our rotary feeders stand out thanks to their high filling levels, compact designs, careful product handling, and innovative sealing systems. The result: minimal leakage, maximum process reliability. Thanks to their versatility, they can be optimally integrated into current systems and customized.



DIVERTER VALVE

Our diverter valves precisely control the path of bulk material. This includes straight paths or deflections of 30°, 45°, or 90°, as well as collection or distribution diverter valves. They are versatile, suitable for low to high pressure ranges and can handle high operating temperatures. Innovative sealing systems reduce maintenance effort, while hardened inserts increase service life. Smooth transitions and minimal dead zones prevent product carryover and ensure clean separation between batches. The compact design allows easy integration into a wide variety of conveying processes.

We develop and produce all components that are crucial for the cost-effectiveness and efficiency of your overall system in-house. This is where decades of process experience and the construction of hundreds of plants come into play. And it is how we create tried-and-tested, state-of-the-art components that can be seamlessly integrated into your overall design.



SAMPLER

Our samplers enable the safe extraction of powdered or granular bulk materials – whether directly from silos, containers, downpipes or pneumatic conveying. Sampling is carried out continuously or in batches, as required and is always repeatable and reliable. Two different operating principles are available to choose from, offering the right solution for every application. Whether for quality control, process monitoring or documentation, our samplers deliver reliable results and can be flexibly integrated into current systems.



DOSING AND CONVEYING SCREWS

Our conveying screws are ideal for mechanical conveying over short distances and for the precise discharge and dosing of powdered and granular bulk materials. They impress with their robust design, high dosing accuracy, and easy cleanability. Whether as pipe or trough conveying screws, the systems can be flexibly adapted to your products and processes and ensure a consistent, reliable material flow. Their compact design and easy maintenance make them particularly economical and versatile.



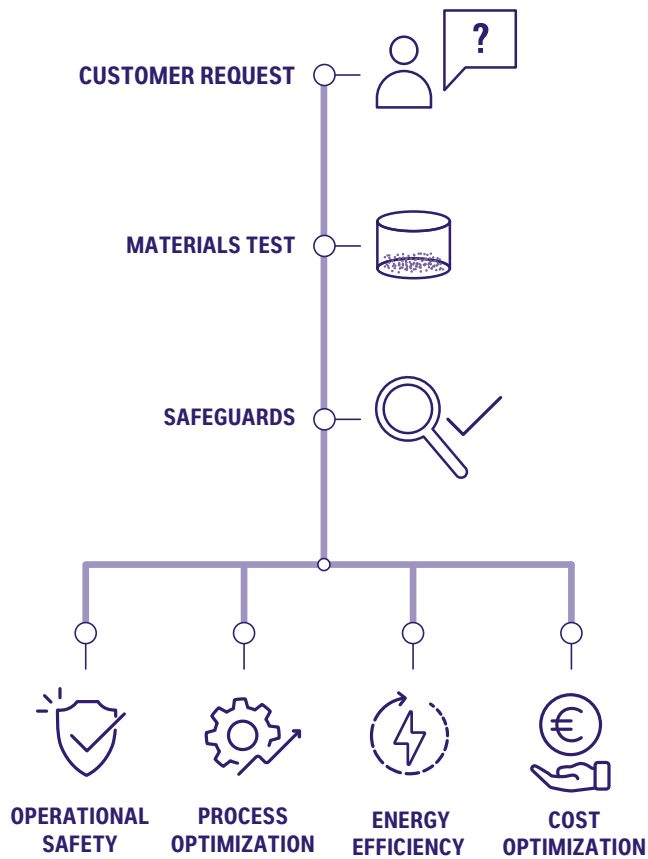
PRODUCT KNOWLEDGE IS KEY

The Zeppelin Systems Technology Center – reliable decision-making support.

In-depth work with the customer's products is mandatory for efficient processes. Only with in-depth knowledge of bulk materials can plants be realized that are reliable, process-optimized, energy-efficient, and cost-optimized. The Zeppelin Systems Bulk Materials Technical Center in Friedrichshafen is therefore equipped with all compo-

nents and systems relevant to process engineering. This is where we carry out full-scale industrial trials, thereby minimizing uncertainties in the scale-up. Special structures are also possible without any problems. To ensure you have a sound basis for your investment decision, our experts will carry out a detailed design analysis.





CUTTING-EDGE MEASUREMENT TECHNOLOGY

Numerous test facilities guarantee optimal results. Data is recorded seamlessly using state-of-the-art measurement technology. We calculate the relevant design parameters and create detailed test reports, forming a basis for your plant design. In addition, we will provide you with comprehensive advice on the other options. New and ongoing developments are thoroughly reviewed.

No matter where you build your plant: As a customer of Zeppelin Systems, you always have direct access to our Technical Center, thus securing a decisive advantage for your operational success. Take advantage of this opportunity!

OUR SERVICES AT A GLANCE

CONVEYING TECHNOLOGY

- Dilute phase and dense phase conveying of a wide variety of bulk materials
 - Dimensions: DN 65 – 225
 - Conveyance: 10 – 460 m
 - Throughput: up to 200 tons per hour
- Hydraulic conveying of granulates
- Dense phase conveying with support of bypass systems
- Suction-pressure conveying of granules and powders
- Airlocks in different sizes and designs (high-pressure, medium-pressure and blow-through airlocks)
- Pressure vessels

STORAGE, DISCHARGE, MIXING AND DOSING TECHNOLOGY

- Storage silos and containers with different discharge systems
- Different mixing silos for powders, granules and flakes
- Small component additive dosing
- Bulk material heating and cooling
- Bulk material deodorization with the Fresh-TEC process

SCREENING, SEPARATING, CLEANING

- Granule cleaning with different screening systems
- Drum sieve or wire separator
- Various filter systems and cyclones



WE ARE AT HOME IN ALL MARKETS

... and produce there as well.

Our global network of subsidiaries worldwide includes project management capacities and suppliers as well as manufacturing facilities in the major economic regions of Europe, America and Asia. This means that if you want to establish or expand a new site, we are usually already there.

CLOSE TO CUSTOMERS WORLDWIDE.

Take advantage of the benefits of a global plant manufacturer: We are familiar with the local conditions, national regulations and standards as well as legal provisions and adapt these to our plant concept. We offer you personal support on site in the respective national

language and always in the right time zone. And thanks to a dense supplier network at every site in the world, you benefit from a high degree of localization, shorter delivery times and good pricing. Billing takes place in the local currency – another advantage for you.

Compared to small, local providers, you will benefit from Zeppelin Systems' global know-how and the experience of interdisciplinary engineers who know your business. We always develop the plant concept, design and calculations in close collaboration with the customer, therefore providing a one-stop service. This makes us your competent solution provider with a full service guarantee.





TECHNOLOGY IS NOT EVERYTHING

The people at Zeppelin Systems.

Whether as a partner, supplier or employer – the deciding factor is the person. At Zeppelin Systems, we value teamwork. This applies equally within the worldwide network and to our collaboration with our customers or in the many project groups that contribute to our shared success on a daily basis. To be internationally successful in plant engineering, you need to offer more than just outstanding technology – you need outstanding employees who are able to understand customer needs, implement local requirements and put together the best plant package based on these factors. This is another reason why Zeppelin Systems can be found wherever the highest value is placed on functionality and process reliability: all over the world.





WE'RE ALWAYS THERE FOR YOU

With our 360° services, you benefit from a powerful service package.

You can always rely on Zeppelin Systems to provide first-class service. For us, the work is far from over once your plant has been designed. We carry out installation and commissioning – worldwide. We train your employees – in everything from the competent instruction in process engineering workflows and how to properly maintain the plant to how to operate it safely. We can also help you develop safety stan-

dards. Maintenance work, carrying out inspections and repairs, and a spare parts delivery service are a matter of course for us.

To keep your plant running smoothly, we offer preventive maintenance that detects and eliminates any malfunctions at an early stage. If an unexpected error still occurs, use our remote maintenance.

ZEPPELIN SYSTEMS 360° SERVICES

Professional support at every stage
of your project

Zeppelin Systems offers you service with real added value. We supply both turnkey plants and complete systems, mixers, silos and components – and are at your side every step of your project implementation. This applies not only to new plant construction, but also to modernization projects. This is how we ensure professional support and a smooth project process. Customized to your needs.

Choose from field-proven modules for all phases of your project. You can book the modules flexibly on a daily basis or as a package. We are happy to create tailor-made service solutions for you, which are optimally tailored to your system.

FASTER TO YOUR GOAL: YOUR ADVANTAGES AT A GLANCE

- No hassle with incomplete deliveries:
We inspect every packaging unit
- Optimal project coordination:
We know how your system needs to be built
- Safety through professional competence:
No one knows our plants better than we do
- Accelerated workflow: We work as a team
- Assured start of production: We ensure reliable deadlines through clear planning
- Optimum production performance:
We provide continuous support

**PERFECTLY
SUPPORTED!**

SERVICE

THE PACKAGE FOR YOUR PROJECT SUCCESS

1 GOODS RECEIVING INSPECTION

2 ASSEMBLY/INSTALLATION

3 COMMISSIONING

4 PERFORMANCE TEST

5 TRAINING

6 SPARE PARTS

7 SERVICE CONTRACTS



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