

## Systems for the Rubber and Tire Industry

Innovative technologies for economic raw material handling





## A century of experience gained through your tasks

**The industry sector of the Zeppelin Group is among the leading manufacturers of plants for storing, conveying, blending, and dosing of premium bulk solids. Thanks to our world-wide activities and locations in all important industrial centers we can always provide our clients with the latest, most innovative and reliable technology to ensure maximum economic success.**

As the direct successor of Count Ferdinand von Zeppelin who turned the human dream of flying into reality by building his legendary airships over a century ago, we are used to looking ahead. Constantly innovating, striving for perfection and maximum functionality in our products has turned us into the company that Zeppelin is known as today: the technology leader for handling premium bulk solids.



On site world-wide - always near our customers. Production plants in Germany, Belgium and Brazil, production partners in Saudi Arabia, Thailand and China as well as subsidiaries and representations all over the world enable Zeppelin to serve its customers with speed, flexibility and the utmost closeness to them. More than 200 engineers – including specialists in chemical engineering – guarantee innovative and economic construction of plants.





Zeppelin has been the leader in the international market of silo construction for decades. Thanks to our own modern manufacturing and the international experience of our assembly staff and service engineers we guarantee quality of the highest level.



## Competence in bulk solids handling – you can rely on Zeppelin

**The industrial Zeppelin Group and its various divisions are focused on the requirements of their customer groups. All activities have, however, one thing in common: the economic handling of premium bulk solids.**

**Silo plants** for the plastic, food, and chemical industries integrated in one logistics concept: from consultation and design to manufacture, assembly and after-sales service.

**Turn-key plants** for the plastics processing and chemical industry as well as for rubber producers and tiremakers.

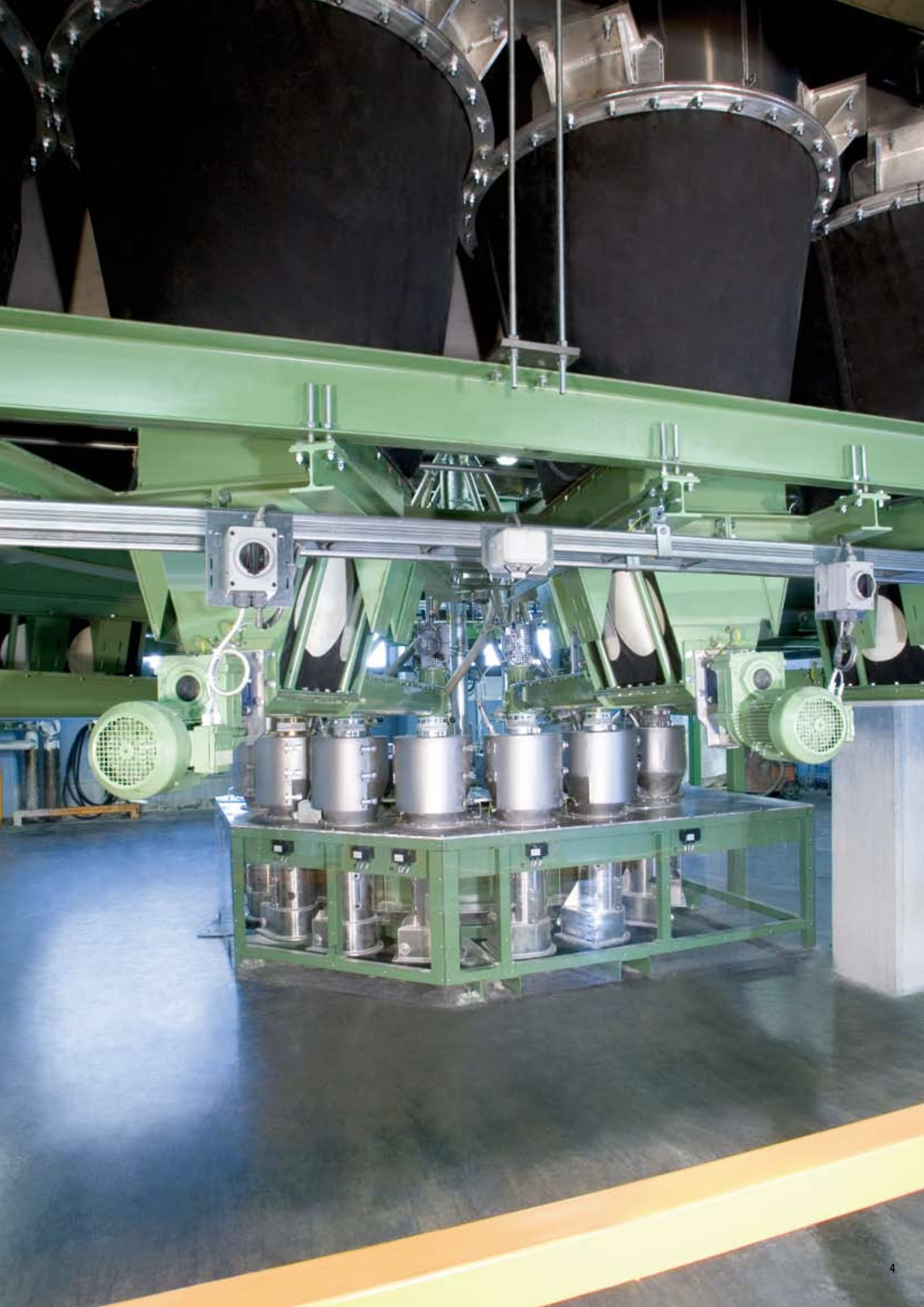
**Conveying components** for any application: for powders or pellets, for high or low pressures, for products with good or poor flowability, for standard or special applications.

**Silogistic:** turn-key plants for plastics producers, engineering companies and forwarders. Zeppelin is the world-wide leader in the planning and construction of logistic centers and manufacturing plants.



Pulling all the strings: the central office for the industry sector is located in Friedrichshafen, Germany. Here, in the world's largest Technology Center for pellets and powders, tests are carried out on an industrial scale. The test results are available to all subsidiaries, therefore allowing our clients to always be on the safe side – no matter where their plant is located.





## Innovative technologies for first-class mixing results

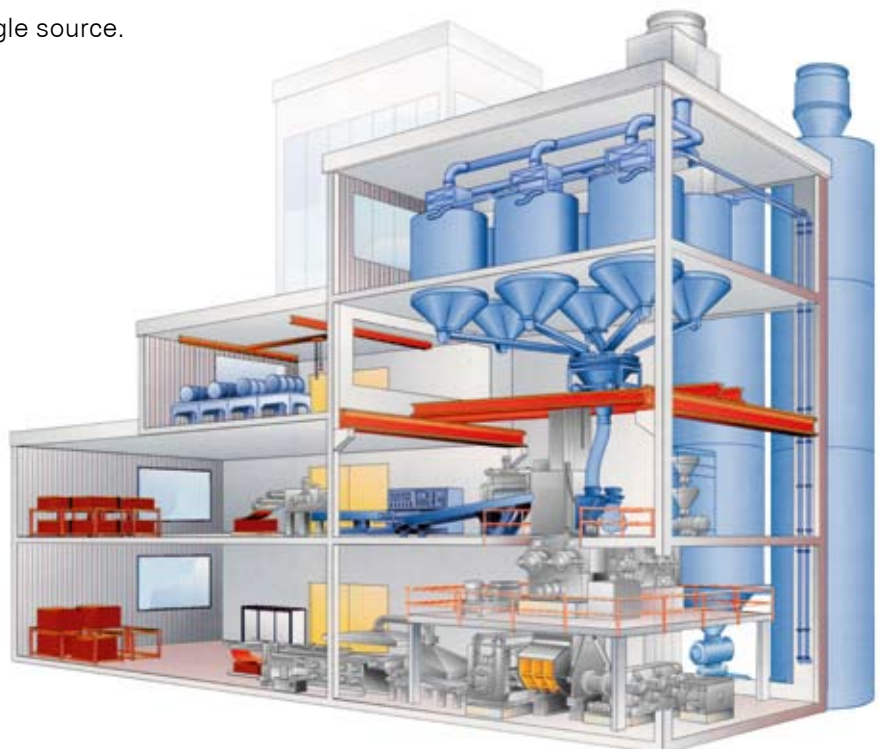
**Corporate earnings of companies in the rubber and tire industry rise and fall with the exact blending of raw materials and the reliable and highly accurate weighing and dosing. The quality of the mixture is a decisive factor – one that requires purpose-designed technologies, expertise and mostly experience.**

Zeppelin, as technology leader in this challenging market, not only provides the rubber and tire industry with more than 20 years experience but also with knowledge our experts have gained through the manufacturing of more than 500 systems.

Zeppelin delivers everything for raw material intake, storage and conveying technologies, polymer feed, weighing and dosing of carbon black and silica, oils and additives, small components and even complete mixer feed systems from a single source.

Technical innovations such as our patented dense phase conveying process for beaded carbon black and silica are trend-setters in the rubber industry and stand for Zeppelin's outstanding reputation worldwide.

Skilled staff: for such complex systems, we rely on in-house capabilities for all the key functions – development, production, quality management, installation and commissioning are performed by our own experienced Zeppelin specialists.

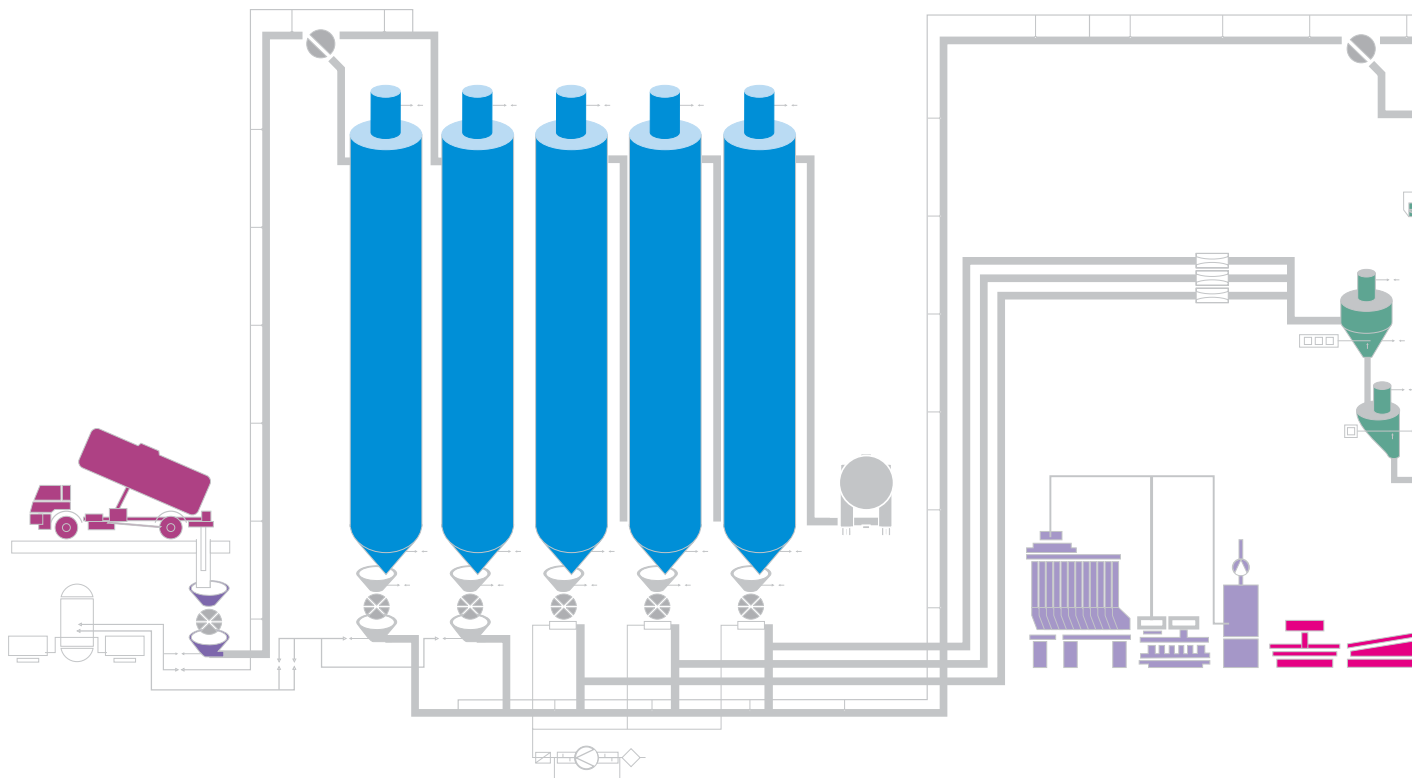


## Turn-key systems from the mixing room specialists

**As the technical leader in the field of raw material handling for rubber and carbon black plants, Zeppelin has become accustomed over the years to meeting the exact requirements of our customers.**

We can therefore take over the responsibility for complete batch preparation processes, and guarantee the batch weights and product quality by using specially developed techniques and components.

An in-depth understanding of the whole spectrum of material handling is the basis for a complete system that is cost effective and reliable. Zeppelin as a system supplier will provide sound advice, show alternatives and guide you to the optimal arrangement tailored to your individual requirements.

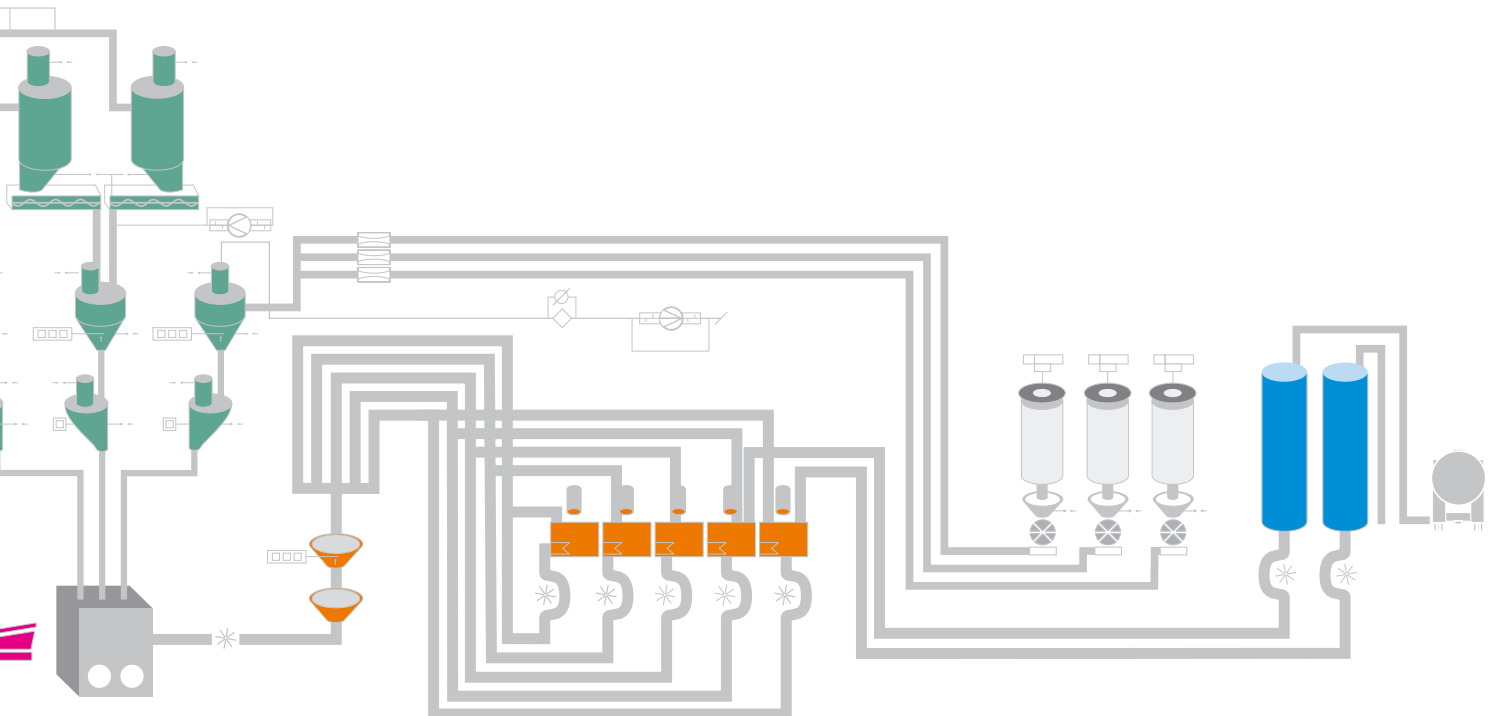


You will benefit from the experience and know-how of our project engineers and that, at a very early stage of the system conception. As the technology leader, we consider ourselves to be a counselling partner to our customers from the very beginning and in the long term.

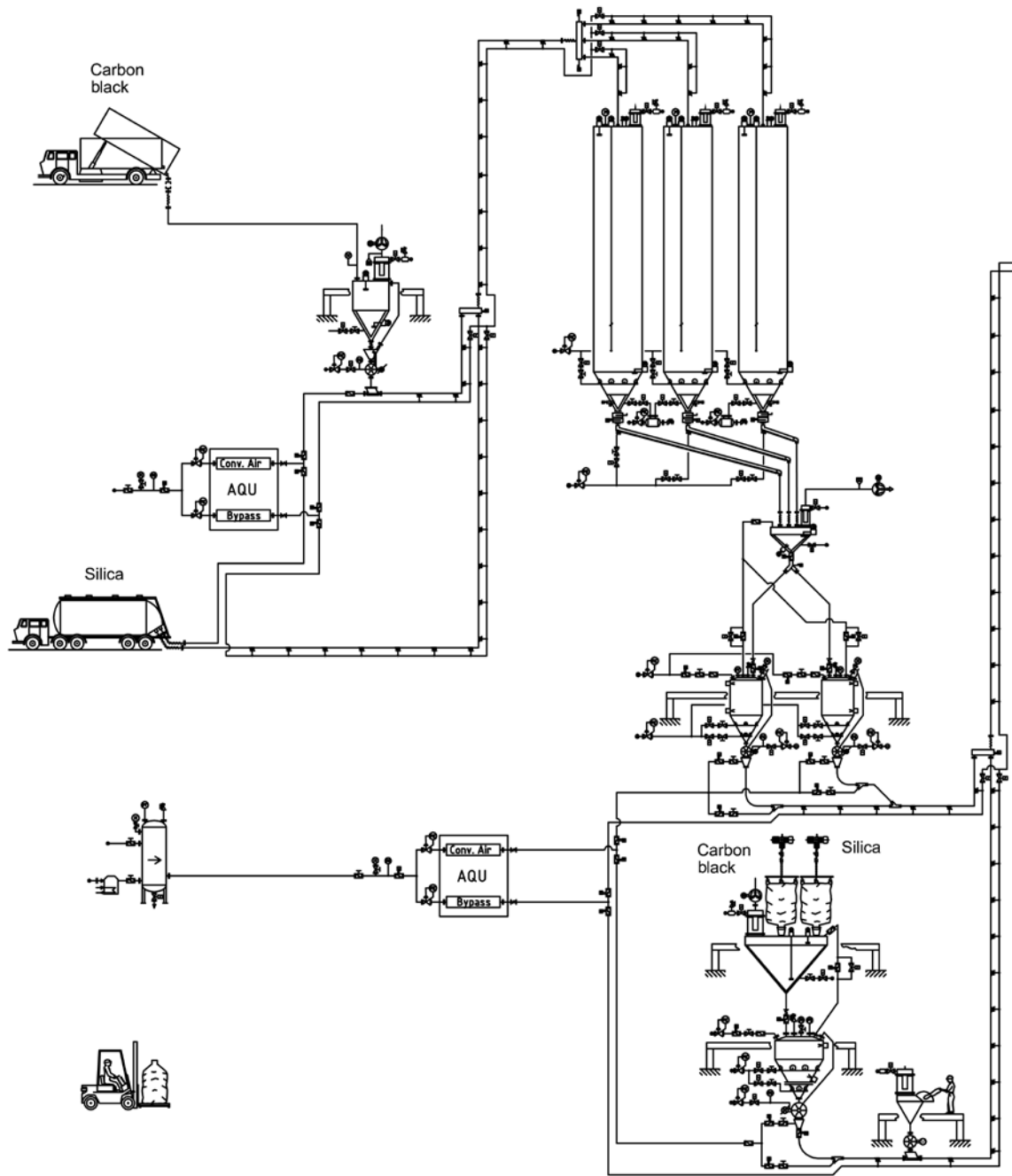
The decision whether a system concept is most suitable depends on the products you make and with which recipes, quantities and

cycle times they are produced. These basic conditions directly influence the arrangement of your system.

Zeppelin's competent specialists will assist you from the preliminary arrangement and building requirements to the final design and layout of the system, because we set great store in one particular concept: the profitability and operational security of your system.







Bag emptying station



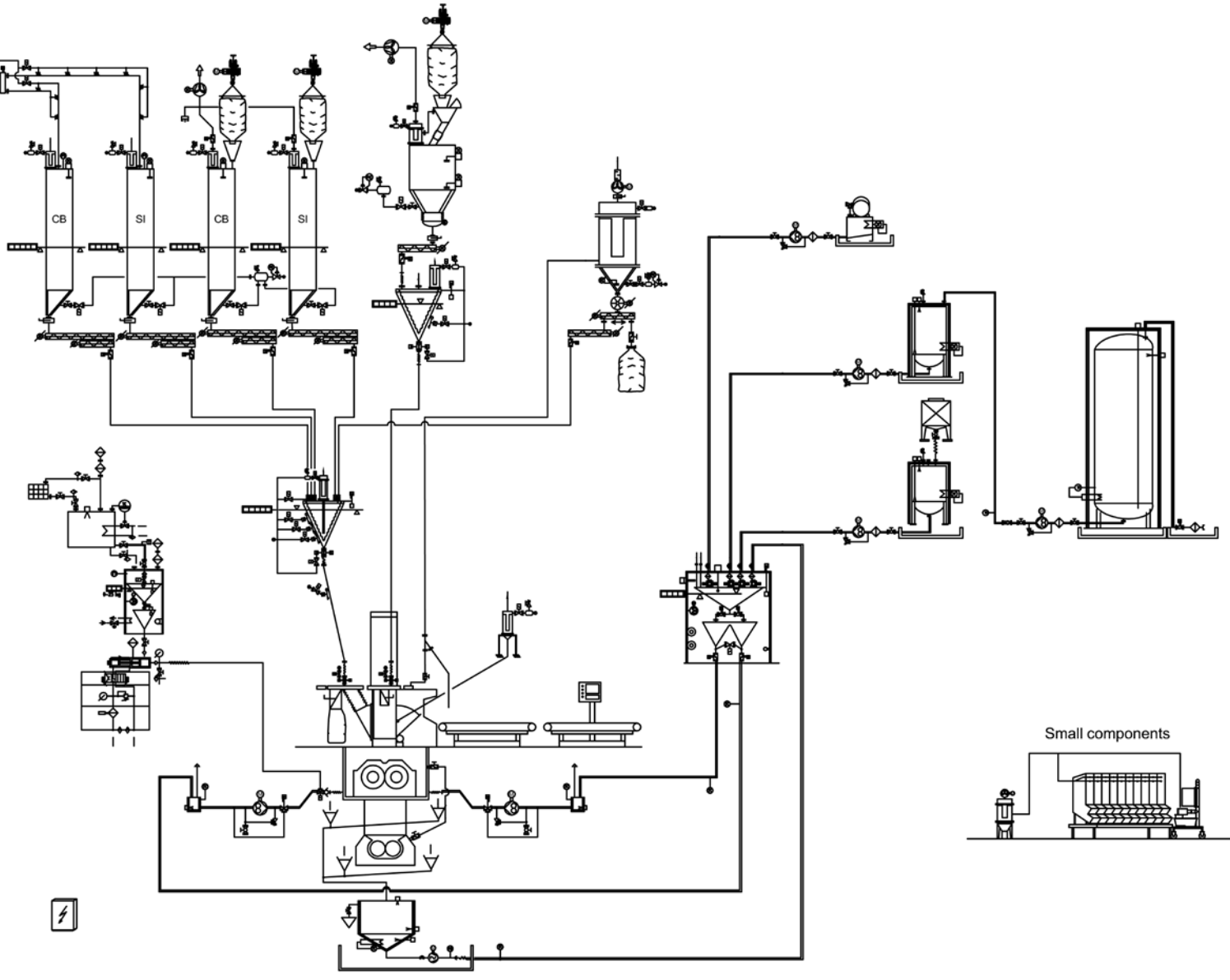
Rotary feeder



Hose diverter valve



Weighing hopper



Scale



Weighing system for small components

## First-class technology – in use all over the world

**Hundreds of installations of Zeppelin systems have proved their advantages through accuracy, profitability and reliability. For that reason, we lead the way both technically and in the market. Our customers know they profit not only from first class techniques but also from the advantages that come from working with a truly international organization.**

Therefore, Zeppelin systems for the rubber and tire industry are found in places where buyers appreciate customized advice, experience, quick and dependable execution and a reliable process – in other words: all over the world. Our customers are all highly renowned companies in the rubber and tire industry.



Always on the safe side –  
with the technology leader  
in silo manufacturing



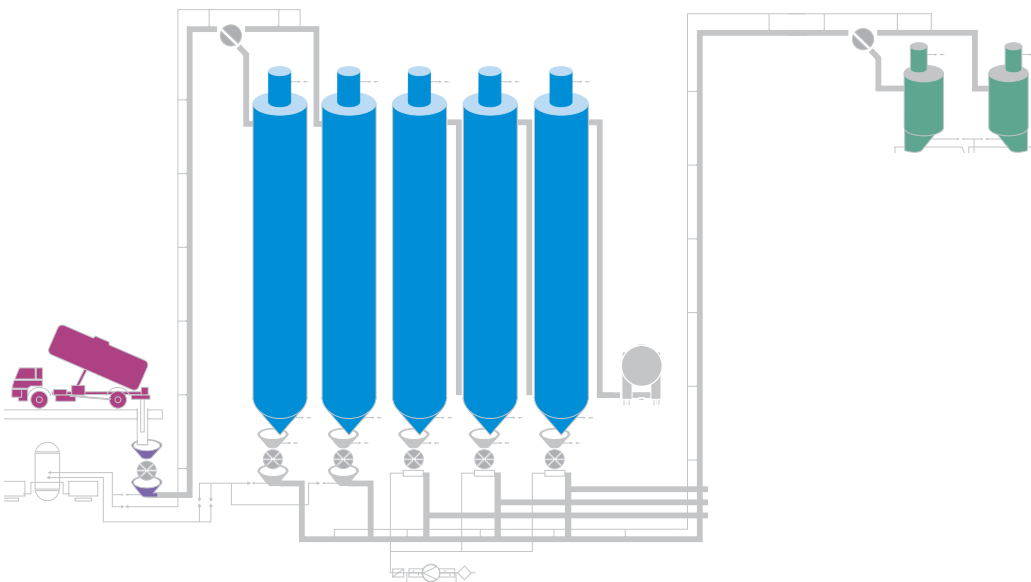
**Zeppelin has been the world-wide market leader in silo manufacturing for over 40 years. Profit from our experience in handling demanding products like carbon black, silica, kaolin, zinc oxide, sulphur and other cohesive and non free-flowing powders.**



Whether at the bulk silos or the smaller day-bins and receiving hoppers – special designs and technologies for mass flow, filtration, discharge and dosing guarantee reliable storage of the raw materials for your rubber compounds as well as a dependable discharge, accurate dosing and a working environment free from dust emissions.



Right from the product intake you will profit from Zeppelin's system competence. Deliveries of material in various forms of bulk or FIBC transport must be managed and unloaded flexibly, quickly, reliably and free of emission. It must be transported by special conveying methods optimized and adapted to accommodate the material characteristics.



## Smooth conveying of carbon black and silica – dust-free, reliable, low fines generation

**To ensure an absolutely dust-free system and environment, the powdery raw materials have to be conveyed pneumatically in closed systems. Depending on the characteristics of the product, quality requirements and equipment configuration, we can offer vacuum or pressure systems and dilute, dense or dense phase conveying processes.**

For conveying with minimum fines generation, the appropriate conveying velocity is essential. For sensitive products such as beaded carbon black or silica we target the lowest possible velocities ( $< 10$  m/s). For less sensitive products (e.g. zinc oxide) or less stringent fines ( $< 125 \mu$ ) limitations we can utilize simpler high speed technologies.

In modern rubber compounds in the tire industry, very different qualities of carbon black and silica are used. Despite the very different characteristics and flow properties of these raw materials, the conveying system must operate reliably, dust free and with the specified performance at all times.

For dense phase conveying we use our patented by-pass conveying systems (Overflow) where a controlled quantity of secondary air is put into the pipe at defined intervals, preventing material plugs from blocking the line.

For a steady air supply, our patented intelligent air management systems (e.g. AQU-R) – which regulate the airflow – automatically comes in use. This optimizes the system to suit the flow characteristics of the carbon black and silica grades for minimum fines.



Secondary air injection with Overflow Valve



The AQU (Air Quantity Unit) is a key element of the system as it regulates the airflow according to the product, conveying distance and pipe route. Stored data allows the operator to select the product and target hopper, and the velocity is automatically controlled independent of line pressure.



Carbon black with high fines content after conveying with too high a velocity



Carbon black with a minimum fines content after optimized conveying

## High precision mixer feeding

**A prerequisite for short cycle times and high productivity is the exact and quick dosing of the formula components (polymers, powders and liquids) as well as the reliable and complete discharge of the scale contents into the mixer. Of course, the system must also avoid dust emissions into the environment while minimizing product losses.**

Dosing is done by rotary feeders, dosing screws or conveying lines which are adapted to the products and work with adjustable frequency controllers. Our weighing systems, including the down-stream mixer feeding chutes, guarantee accurate batches and rapid, complete emptying into the mixer.

This process is ensured by use of suitable weighing hopper designs, discharge aids, fluidization, venting techniques and non-stick materials. It is therefore possible to empty the scales in a very short time without the risk of residual material sticking in hoppers, drop chutes and mixer feed chutes. This in turn ensures the accuracy of the batch formula right to the mixer.

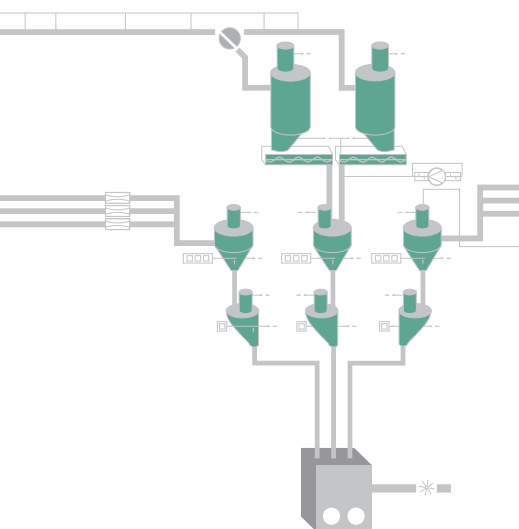
The decision of which system is used to feed the scale is the starting point for the design of your system. In principle three methods are at your disposal:

- intake by vacuum conveying
- intake by pressure conveying
- intake by gravity (from day-bins via dosing screws)



Holding hopper with integrated fluidization for quick and complete product discharge

Mixer feed chute with off-spec discharge





## Systems with maximum reliability

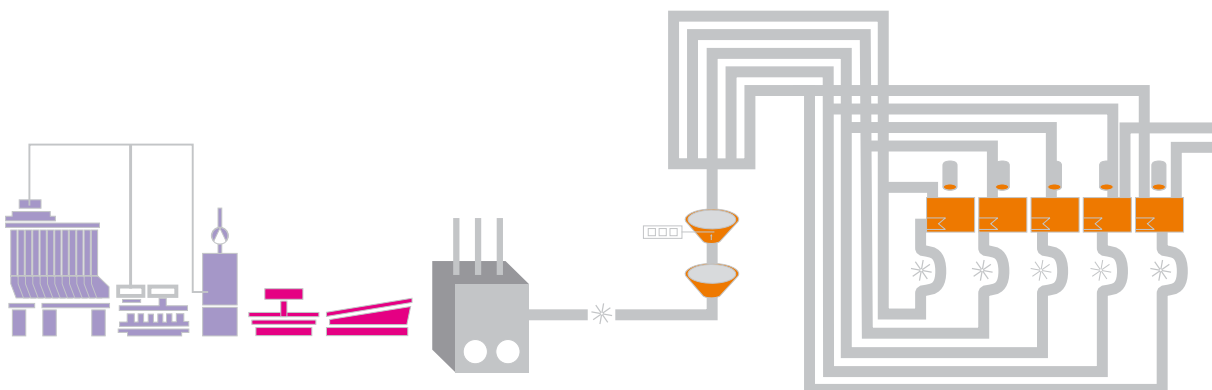
**For liquids and small components, we have our own specially designed turnkey products and solutions.**



Scope of supply: bulk storage, day-tanks, drum heating and discharge stations, small components, plasticizer scales and pumps.

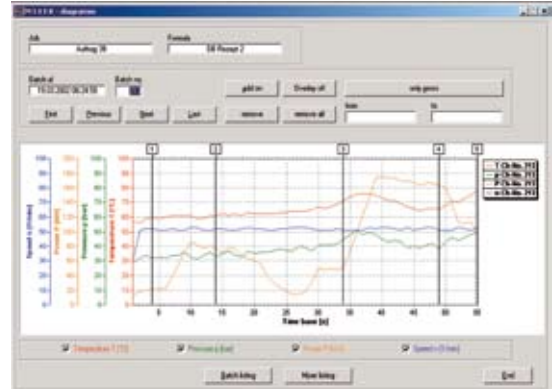
Liquid additives handling: A core component of a liquid dosing system is the liquid scale developed by Zeppelin for use with plasticizers, oils, melted waxes, stearic acid and other liquid additives. Heatable, easy to access, with coarse and fine dosing valves for exact weighing, over-charge safety device and automatic calibration options. Available as field-proven standard solutions – or individually adapted to your special requirements.

Minor ingredients: Our small component systems are designed to limit operator error and provide material traceability. Manual, semi and fully automatic arrangements customized to suit the number and type of additives, storage capacity requirements, batch weights, cycle times and your manpower needs.

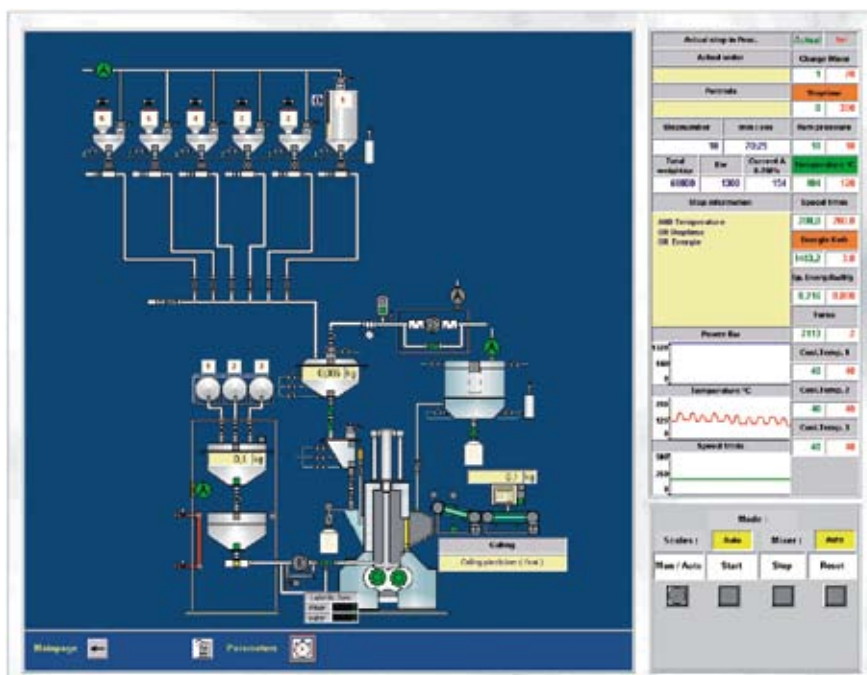


## Everything under control

The controls package is the central nervous system of a modern automated mixing room. We can provide everything you need: power distribution, weight controllers, central servers, material and formula database, archiving, local operator stations and remote visualization, programming stations and modem fault finding facilities. Whether you simply require a functional description or a complete system, we comply with your specifications and actively support you to achieve the control system you need.



We think long-term – and advise you with this in mind. In the end, the control system must be operator friendly and serviceable as this bears directly on your operating results. Our comprehensive batch reports will also allow you to easily identify how you can improve your products in future and arm yourself for the markets of tomorrow.





## Leading edge technology is no luck, it's an achievement

**Your investments in individual components and complete systems must be profit-able, using the right product for a specific job, readily available and at a fair price. Zeppelin, as the technology leader, runs a powerful Development and Technology Center researching different technologies for handling bulk solids.**

To further contribute to your success we offer the services of our Technology Center whose capabilities span the entire Zeppelin product range. Acquiring factual information on your product helps you to select the best possible component or plant design.

Our Technology Center is built on an industrial scale to meet our customers' wide range of demands. For this reason we can provide you with tailored answers to your individual tasks, with trials on an industrial scale and special configurations that can be quickly installed.



## Powders or pellets – we have all the answers

**The heart of our research and development activities are the two Technology Centers – one specially designed for pellets and the requirements of the large scale chemical industry and the other for powders and additives (for the rubber and plastics processing industry).**

Whether commercial-size installation or processing plant, we conduct full scale tests to avoid the uncertainties of scale-up calculations with the help of the Technology Center's impressive range of options. Because our customers naturally expect maximum process reliability, Zeppelin provides them with unquestionable results as a solid basis for their investment decisions.

To ensure the completeness and accuracy of the results, Zeppelin provides:

- competent result analysis by its specialists
- conclusive test reports and documentation
- determination of relevant design parameters



## The Zeppelin Group of companies: All specialists under one roof

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