

Future-orientated
technology for
wet grinding
and dispersing
processes.

Your global partner for economic solutions.



Better solutions for your production. Better products for all.

Buhler's technology and know-how can be found in many things we use every day: turning on the LCD display, printing out vacation photos on an inkjet printer or polishing the high-gloss finish of our cars. Most banknotes in the world are printed with security inks produced on Buhler machines. All these products have to satisfy the most stringent requirements.

Buhler – for sophisticated products

In all industries where wet grinding and dispersion are key processes – printing inks, coatings, electronic materials or fine chemicals – Buhler demonstrates a comprehensive know-how and the ability to deliver its customers tailor-made systems for complex processes. As a global technology partner for process engineering, Buhler offers you not only state-of-the-art machines, but also complete solutions for the manufacture of highly advanced materials.

Outstanding process engineering

Buhler sets standards in the area of “grinding and dispersion” – outstanding technology combined with the advantages of a worldwide in-house production and marketing network. Revolutionary inventions such as the three-roll milling technique or Perl Mills® allow you to achieve increasingly finer formulations. These techniques help improve the overall product. In some process technologies such as nanotechnology, our solutions are the actual reason which enable smooth production at high flow rates in the first place.

Solutions for higher productivity

Buhler always focuses on your needs. From individual machines to complete manufacturing systems, we design, plan and build in close collaboration with our

customers. We put our entire know-how in both process and mechanical engineering at your disposal to find the optimal manufacturing process for your product. Our objective is always to produce the desired product in flexible batches at the highest possible energy efficiency and lowest overall costs. The result: economic solutions that increase your productivity and competitiveness.

Added value through cooperation

We are a worldwide supplier of machines, systems and process technologies tailored to customer requirements. Even after installation, you are never alone: We offer comprehensive services during the entire lifecycle of our machines and plants, naturally in the form of a tailor-made service package. On request, we offer assistance in working out financing concepts.

Buhler operates worldwide

Buhler designs complete solutions for its customers not only in the area of “grinding and dispersion”, but also for the food industry, die casting technology and bulk material handling. Another plus: Buhler is active worldwide. We are present in over 140 countries with more than 7'700 employees.

Buhler is your partner in making visions a reality. Together we can develop tomorrow's products today.

View of the Säntis (eastern Switzerland)
2'504 m above sea level



Buhler solutions: **1** – Components for display technologies. **2** – Printing inks. **3** – Inkjet inks for digital printing.
4 – Automotive coatings. **5** – Weather- and UV-resistant coatings. **6** – Metal pastes for solar systems.
7 – Materials for electronic components. **8** – Coatings for highly-stressed surfaces.

Product visions become reality.

Grinding and Dispersion – overview of services.

Mixing and wet grinding equipment

From the full-volume mill for mass produced products to high-performance mills for nano-dispersions; from the small laboratory three-roll mill, to the electronically controlled ceramic three-roll mill and the high-capacity three-roll mill; continuous and batch-oriented mixing systems; as single machine or complete production plant

Financing

Process development, concept formulation

Development of tailor-made concept and feasibility studies, including support in investment appraisals, process development for small production islands, all the way to turnkey, fully automated production facilities

Plant engineering and process automation

Project management; generation of safety analyses, cost planning and time scheduling; interface management and coordination of participating partners

Analytical laboratory

Performance of chemical, physical and special microscopic analysis; use of internationally recognised analysis methods; laboratory locations in Europe, the U.S. and Asia

We support our customers over the entire lifecycle of plants and machines, from planning, process development and manufacture through to startup, servicing and maintenance.

Analysis guarantees success

Buhler is an experienced partner where innovative economic solutions are required. We bundle process know-how and creativity in interdisciplinary teams providing you with competent assistance in each phase of a project. Each project is unique, and must be planned individually, regardless of whether it involves the development of tailor-made processes and plants for manufacturing new products or a modernisation project. At Buhler, we follow a comprehensive approach with the

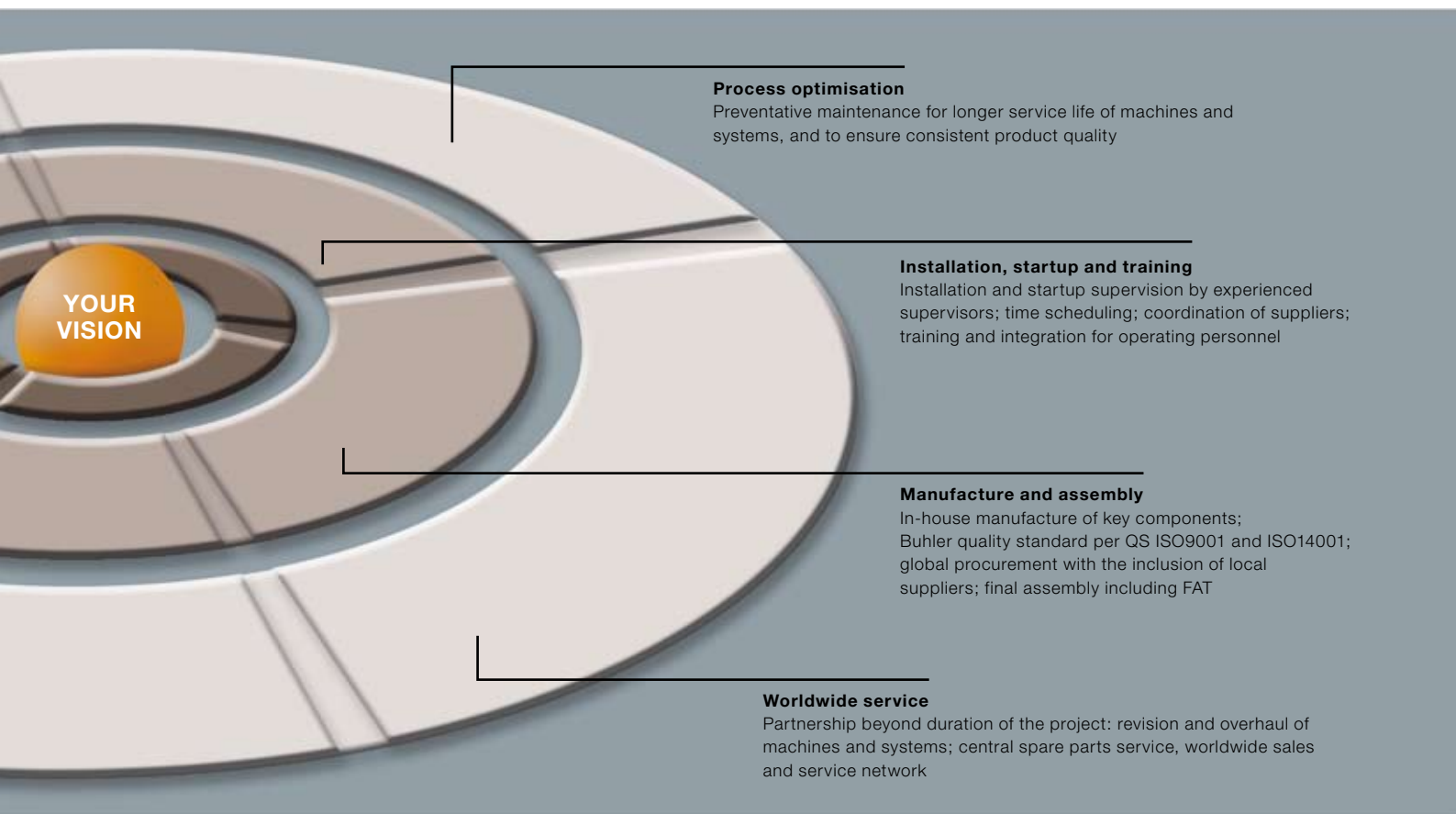
aim of developing sustainable solutions at an optimal cost-benefit ratio.

Customer Involvement

Success is based on a systematic approach. We work closely with you through each and every step. The requirements of the production plant are determined at joint workshops. In this way, we develop an overall concept optimally geared toward your special requirements and expectations.

An eye for the essential

Each project begins with a comprehensive analysis performed by our specially trained engineers. An exact record of all analysis details is important for the subsequent dimensioning of the system and selection of the



technology. The desired flow rates and quality features of the final product are the starting point. Raw materials, recipes and formulations have considerable influence on the selection of the process technology. The local conditions and technical infrastructure on site also represent important influencing factors. In addition, legislative requirements and provisions, such as environmental guidelines and occupational safety regulations must also be observed. Just as crucial is whether a new facility is being built, or a single application to be integrated into an already existing plant.

The optimal basis for decision

Based on the analysis, we generate a feasibility study with proposals for suitable procedures. Our experts provide you with comprehensive advice, and point out

alternatives. In the process, you benefit from our technological know-how along with the continuous research that Buhler pursues in relation to all aspects of the process engineering applications. Should it be necessary to develop a process from scratch, Buhler will provide the corresponding research equipment and process engineering services.

Once the details have been ironed out, we assist in appraising the cost effectiveness which aids in providing our customers with confirmation regarding the project feasibility. 3-D studies and detailed layout plans provide an optimal basis for your technical, organisational and commercial decisions. We also submit proposals to procure individual components locally if these are less expensive.

Coatings.

Brilliant solutions for a variety of applications.



“Buhler agitated media mills offer extremely high flow rates, allow quick batch changes and are very user-friendly.”

Whether it is environmental influences such as rain, dust, UV radiation or sea salt, paints and coatings must provide protection even in extreme conditions, while still being attractive in appearance. Each area of application requires tailor-made formulations – from high-gloss, shock-proof automotive coatings to weather-proof paints and coatings for containers or ships that have to withstand saltwater and abrasion.

The process engineering and energy concept of Buhler Perl Mills® are optimised solutions, which realise high power densities and flow rates in a small grinding area. All products are extremely user- and service-friendly, permitting rapid batch changes while keeping cleaning requirements to a minimum. The machine controls are logically configured, simple and safe.

We use wear-resistant materials, so that you can reliably manufacture a variety of high quality paints and coatings. The Buhler programme is modular in design and offers scale-up capabilities. Buhler provides the mill size to suit your needs: from laboratory mills to pilot plants, ending with high-capacity production mills. These can be horizontal and vertical mills for large-scale continuous operation, or small, user-friendly mills for customers requiring frequent product changes. Special cooling concepts enable the manufacture of temperature-sensitive products.

Buhler agitated media mills set the standard

The Buhler Perl Mill® is distinguished by an intelligent concept and successful detailed solutions, all of which are geared toward improving customer productivity. The Perl Mill® Centex® sets standards in the produc-



Paints and coatings increase the functionality of buildings, ships, offshore platforms, containers, motor vehicles and industrial equipment, and lend them their characteristic appearance.

tion of heavy-duty paints and coatings. The Perl Mill® SuperFlow® offers grinding and dispersion down to the nanometre range. Any time brilliant colours and durability are required, e.g., for high-quality automotive or special coatings, this powerful agitated media mill is the answer.

Possible applications of Buhler technology:

- OEM and refinish coatings
- Primers and fillers, electrocataphoresis coatings
- Marine paints, in particular anti-fouling formulations
- Coil coating products
- Paints and coatings for special applications, e.g., for buildings, metals, industrial plants or oil platforms

■ **Nano-grinding of light-fast pigments**

More brilliance through nano-grinding: Many modern coatings owe their outstanding quality and resistance to the unique dispersion properties of the Buhler SuperFlow®, the multi-talent with linear scale-up possibilities.



Inks.

State-of-the-art technology.



Automated production facility for printing inks consisting of a dosing, mixing and dispersing section, along with three-roll mills and agitated media mills.

■ Centrifugal Perl Mill® ZR120

For ultra-fine dispersion and high-grade grinding in sub-micron range of low to medium viscosity, water or solvent-based products. The machine is logically designed for very high recirculation rates.



Modern technology and economic efficiency are reflected in the plants and machines developed by Buhler for the manufacture of pasty, liquid and digital printing inks. Buhler's first three-roll mill was built in 1919. Today, Buhler is the recognised market leader in the field of high-viscosity products such as offset or sheet-fed printing inks.

Cost reducing solutions

Buhler has suitable technology for all tasks in each phase of the production process. For pre-dispersion, we offer both high-performance dissolvers in batch systems as well as re-circulating mixing systems, for instance inline dispersers. Our ContiMixer technology allows a continuous mixing process. Reliable and safe to operate agitated media mills and three-roll mills are available for the dispersion of pasty printing inks for roller offset, sheet-fed or screen printing processes. The two technologies can

A wide variety of possible applications for printing inks: screen inks for textile prints, flexographic inks for packaging, gravure and offset inks for disposable products, e.g., periodicals and advertising materials, inkjet inks for digital printers for personal use and large-format plotters in the advertisement industry.



also be combined when the product has to satisfy more stringent quality requirements. Our fully automated systems attain the desired colour effect with a minimal use of pigments. This reduces raw materials expenses, and creates a lean cost structure for our customers.

Process technology that increases quality

We combine the suitable technologies into a sophisticated and innovative comprehensive solution—tailored to your needs. Particle fineness in the nanometre range is required for the dispersion of digital printing inks for inkjet applications. Buhler offers flexible and cost-effective machines and plants for this purpose. The range of applications extends from inks for home office printers to special inks for large-format plotters and other professional equipment.

Liquid printing inks such as flexographic or gravure inks are finely dispersed in re-circulating processes on agitated media mills ensuring especially tight particle size distributions. Our latest innovation is a method to manufacture varnish for oil-based printing inks using extrusion technology.

Possible applications of Buhler technology:

- Roller offset inks (coldset, heatset) for high print runs
- Sheet-fed inks for high quality publications
- Screen inks for textiles and printed electronics
- Flexographic inks for weather and impact-resistant prints and packaging
- Gravure inks for periodicals and advertising material
- Inkjet inks for digital printers or electronic prints

Electronics. Powerful stimulus for the industry.



High-quality computers, cell phones or displays require increasingly effective features. Buhler's solution: high-value pigment dispersion for display technologies.

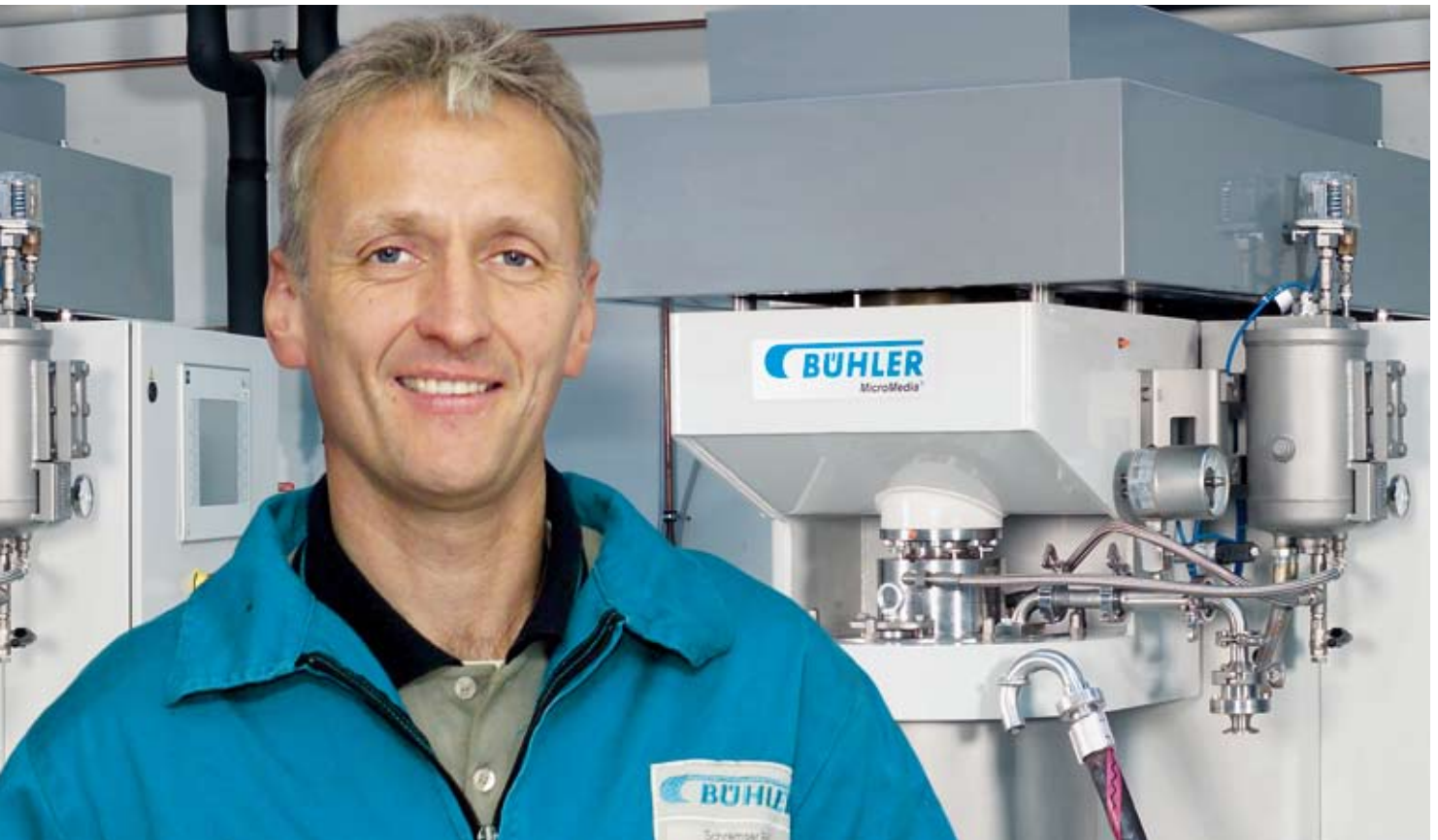
The electronics industry is shaped by rapidly changing technologies and markets like no other industry. Increasingly shorter innovation cycles and enormous cost pressures pose great challenges to producers. Solutions for products meeting the highest quality requirements are demanded. Buhler's expansive product range encompasses agitated media mills and roller mills as well as continuous and discontinuous mixing systems.



■ **Trias® three-roll mill**
A novelty allowing full product quality control is the optional thickness monitoring on the third roller facilitated by precise electronically controlled roller gap and pressure.

All machines can be configured for a specific application. Buhler offers a wide range of materials for equipping the processing units, including wear-resistant metals, plastics and ceramics for especially demanding applications. The high level of automation for plant and data login systems ensures constant product quality.

“Buhler’s continual development of engineering and process technology enables customers to manufacture better products and be at the forefront with market innovations.”



Solutions for high-tech applications

Buhler operates an on-going development programme for mechanical and process technologies. The prime objective being, to quickly recognise and promptly satisfy new demands. Continued improvement of products for the electronics industry requires increasingly finer formulations and enhanced product qualities.

Our innovations in three-roll mill technology as well as nano-grinding with micro beads have laid the foundation for new up-market products. The new Trias® three-roll mill enables complete product quality regulation. Ceramic rolls and oil-free operation are optimally suited for the clean room. Buhler solutions satisfy the most stringent hygiene and quality requirements. VIVA® roll technology enables products processing in a wide roll pressure range.

Nano-grinding free of contamination

MicroMedia®, Buhler’s agitating mill platform, is ideal for the gentle nano-dispersion of hard or shear sensitive materials. High-strength metal materials and extremely small grinding media ranging from 300 µm down to 20 µm, ensure metal contamination-free grinding down to the nano range. Operating parameters can be varied in a range from “soft dispersing” to “high energy grinding”.

Possible applications for Buhler technology:

- Highly transparent colour filters for LCD panels
- Phosphor and glass pastes for plasmapanels
- Ceramic pastes and slurries for micro-insulators
- Metal pastes for the solar industry
- Polishing slurries and pastes
- Solder-stop paste and adhesive components

Process development. Innovations for sustainable cost reduction.



“Laboratory trials and pilot projects are used to lay the foundations for the optimal manufacturing process for your products – economical, reliable and environmentally sustainable.”

■ PML 2 – flexible solution for the laboratory

The universal Perl Mill® platform for process development in the laboratory is modularly designed and offers a high degree of flexibility. The drive unit can be equipped with different process units for a variety of applications.



Trials are run on small-scale industrial machines so as to simulate the production processes under realistic conditions.

Innovative processes and solutions increase the added value of your production. Buhler develops or optimises procedures and manufacturing processes, always keeping you one step ahead of the competition.

Our laboratories and pilot facilities in Switzerland, Germany, the U.S., China and Japan offer customers the world over state-of-the-art technologies and the highest of standards. Experienced planning and research teams develop and test processes and products under real conditions, not only on laboratory equipment, but also on small scale industrial machines.

We conduct performance tests, to establish the optimal operating parameters and provide you with the expertise of our specialists. Viscosity, particle size distribution and other specific product properties are determined in the



Successful process and project development: Production facility at Schuite & Schuite Druckfarben GmbH – continuous varnish production off 6'000 kilograms per hour, comprised of raw material storage, dosing systems and twin-screw reactor.

laboratory in order to establish the optimal manufacturing process. Efficient process configuration and improved raw material processing result in lower costs.

Trials for optimised processes

In order to achieve representative results, we run trials with your own raw materials intended for production. Our long-standing process know-how guarantees the development of an optimised process. The high level of automation enables flexible production and constant product qualities resulting in an economical, reliable and safe production process.

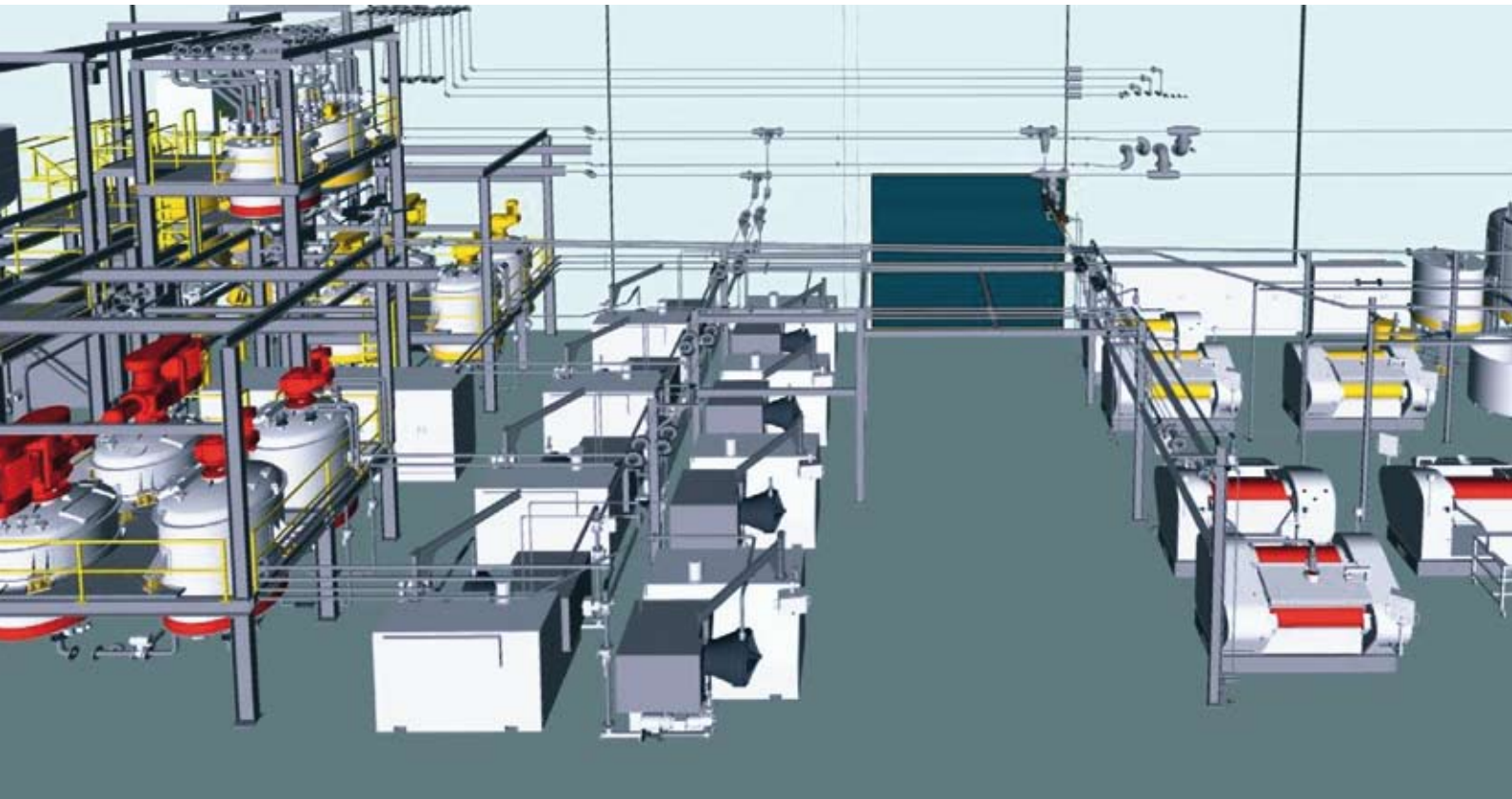
We are convinced that solid basic research is the guarantee for progress and long-term success and this is the reason for Buhler's ongoing investment in research and development. We collaborate with prominent institutes

and universities worldwide. Joint projects continuously expand our expertise, to the benefit of our customers.

A practical example

The introduction of Buhler extrusion technology is revolutionising the process of manufacturing varnishes for printing inks. The previously employed batch technology can today be replaced by the cost-saving and reliable continuous production in a twin-screw reactor. The advantage for the customer: uniform quality after only a few minutes of operation. A precise metering and control technology guarantees seamless production with flexible throughput rates. The high level of automation, with centrally monitored and controlled operation, ensures ease of use. One of many examples of how Buhler optimises manufacturing processes.

Plant engineering. Cost-effective production facilities.



Raw material flexibility

Powders, pellets or liquids – storage containers are optimally designed. Tank, silo or bag storage capacities depend on the required throughput. Standard delivery and packaging forms are taken into account and varying qualities can be handled with ease.



Precise dosing ensures quality

Fully automatic dosing and weighing systems provide the processing unit with the required materials at the right moment. The optimal batch size represents the starting point for the number and layout of dosing devices.



The correct mixture

Certain substances are frequently mixed or dispersed in advance. A high mixing quality or optimal level of pre-dispersion is critical for subsequent processing. Bühler mixing systems achieve this objective with short mixing times.

“We deliver tailor-made total solutions to suit your requirements, taking into account production parameters and operational requirements.”



Grinding and Dispersion

Buhler offers a wide range of machines: from agitated media mills to three-roll mills. The entire process, from the standpoint of process technology and energy consumption, is optimised in order to achieve the required end product quality.



Finishing, the final step

Mixing devices that ensure a high level of homogeneity are a necessity. The flow characteristics of the respective liquids are the decisive parameters. Reliable quality control provides the possibility to implement timely corrections.



Comprehensive engineering

Buhler makes optimal use of the existing floor space. Installation, day-to-day operations, maintenance, future expansion and optimised process flow are all considered during the planning stage. Modern control technology allows precise control of process variables thereby achieving constant quality levels.

Service ensuring smooth production. 24 hours, 7 days a week, available worldwide.



Buhler tests its customer's processes and products according to international standards in analytical laboratories.

Service is part and parcel of our relationship with the customer. You can count on a competent contact person always being in the area. Buhler operates service centres all over the world. Our engineers and service specialists are ready to advise and assist you with any questions and problems. If you wish, during the entire lifecycle of your machine or plant: from setup and startup to maintenance and reconditioning.

Your production runs smoothly with Buhler

You are always safeguarded with our tailor-made service and maintenance contracts. Together, after comprehensive consultation and analysis, the exact range of services required is specified – maintenance entirely in line with your needs. We are also able to give advice on

potential plant modernisation options, as well as information on a variety of different retrofit packages. The result, your equipment is fit for the future. And to top it all, quick spare parts availability ensures that your production will always run smoothly.

Analyses based on international standards

It is important to Buhler that our customers achieve the best results. We conduct extensive trials in order to tailor our machines to your products. Our specialised analytical laboratories offer a wide variety of analysis methods and techniques which conform to international standards. We also work with you in developing or improving your processes, and put our know-how to work to increase your profitability. And we do so at a location near you, at one

“We offer support during the entire lifecycle of our equipment – from installation and startup all the way through to production process optimisation.”



Workshops held at Buhler education centres impart the basics of maintenance operations to improve system performance.



of our worldwide sites and laboratories. We place high value on customer cooperation and provide you with the best service for your applications.

We are always there for you

We provide customers with detailed information on the operation of our machines and plants in order to make optimal use of them. Buhler experts can also provide information on the latest technical innovations. We offer specialised, practical training for your personnel at our technology and education centres in Uzwil, Switzerland, or for larger groups, on-site training. Trained personnel know how to use Buhler equipment to its full potential thus ensuring higher productivity and better product quality.

- **Fast spare parts service worldwide**
We have original spare parts in stock at our logistics centres around the world, so that your equipment can be repaired quickly.



Buhler Group.

Global technology partner for the industry.



“Buhler is active worldwide. Our trademark is fast response, knowledge of local conditions and we speak your language.”



Corporate headquarters in Uzwil with production facilities and training centres.

Buhler is one of the leading suppliers worldwide in the area of mixing, grinding and dispersing technologies. When it comes to processing raw materials to high-quality functional products, we provide the right technology and necessary know-how for economically and ecologically sensitive manufacturing, regardless of whether it is for a single machine or a complete, turnkey production plant.

High standards worldwide

Customers across the world trust Buhler's competence and experience. They know that our trademark is consistent quality in consultancy, product management, technology and service the world over. We have defined high quality standards throughout the company according to QS ISO9001 and ISO14001, and place great value on being present with our worldwide production facilities, laboratories and service centres.

■ Buhler is active in over 140 countries, and has more than 7'700 employees worldwide. In fiscal year 2008, the company achieved sales of 1.89 billion CHF.



Good partnership starts on site

Buhler aims to be there whenever and wherever the customer needs us. We are represented on all five continents, always somewhere in your area, speaking your language, and we are familiar with the local legal regulations and customs.

The right technology for each industry

Buhler is a solid family business with a modern management structure and is distinguished by a broad spectrum of core competencies. We have the suitable technology required for each branch-specific requirement. Plants for handling, processing and refinement of grains and rice are one of our special fields. We also offer outstanding production solutions for paints, coatings, chemicals and plastics, as well as for foodstuffs such as chocolate and pasta. Our business unit 'Die Casting' is looked upon as one of the prominent ground-breaking suppliers for this complex manufacturing process.

Our goal is your success

In times of breakneck technological transformation, our aim is to provide customers with innovative solutions that give them added economic value and market success. We achieve this through our comprehensive approach. In addition, Buhler technology enables the most economic use of valuable raw materials and resources. In this way, our customers create greater value while profiting from lower energy costs. Investments in Buhler solutions pay off: They represent high productivity and availability while, at the same time, minimising operating, service and maintenance costs. With Buhler, you have a reliable partner at your side – all over the world.

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