Ecological process technologies

Leading technology for biobased PLA plastics
Greener process oils for rubber production
CPE pumps – energy-efficient by design
Sustainable processing with COX™ ProFlow™ dispensers
About Sulzer
Sulzer’s core strengths are flow control and applicators. We specialize in pumping solutions and services for rotating equipment, as well as separation, mixing and application technology. Our customers benefit from a network of over 180 production and service sites around the world. Sulzer has been headquartered in Winterthur, Switzerland, since 1834. In 2017, we achieved sales of roughly CHF 3.0 billion with around 14'700 employees. Our shares are traded on the SIX Swiss Exchange (SIX: SUN).

Pumps Equipment
The Pumps Equipment division specializes in pumping solutions. Intensive research and development in fluid dynamics, process-oriented products and special materials as well as reliable service solutions help the company maintain its leading position in its focus market segments.

Rotating Equipment Services
The Rotating Equipment Services division provides cutting-edge maintenance and service solutions for rotating equipment dedicated to improving customers’ processes and business performance. When pumps, turbines, compressors, generators and motors are essential to operations, Sulzer offers technically advanced and innovative solutions.

Chemtech
The Chemtech division is represented in all important industrial countries and sets standards in the field of mass transfer and static mixing with its innovative solutions. The product offering ranges from process components to complete separation process plants. The customer support covers engineering services for separation and reaction technology and tower field services to perform tray and packing installation, tower maintenance, welding and plant turnaround projects.

Applicator Systems
Customers of the Applicator Systems division benefit from advanced solutions in the field of precise applications as well as two-component mixing and dispensing systems for adhesives, dental, healthcare and beauty applications. A global network ensures that local knowledge and competence help Sulzer to keep its leading position in its market segments.

Did you know that environment-friendly plastic can be manufactured from biobased raw materials? This plastic, called polylactic acid (PLA), is biodegradable in industrial composting plants. The production process was invented as early as 1954, but it took almost 50 years for this plastic to be used in large quantities. Sulzer has made major contributions to optimizing the PLA process for industrial use. Sulzer’s falling film crystallizer is key for the monomer purification, the SMR loop reactor is essential for the ring-opening polymerization and our devolatilization technology achieves an excellent monomer recovery.

In cooperation with our customers, Sulzer constantly develops new process technologies to reduce the harmful effects of the chemical industry. For example, Sulzer distillation plants are used to produce a non-hazardous process oil for tire production. Let us help you to develop sustainable or non-hazardous process technologies.

Dipl.-Ing Sven Cammerer, Head of Polymer Business, Winterthur, Switzerland
Biobased, biocompostable and 100% recyclable to a virgin form — these are the main advantages of plastics made from polylactic acid (PLA). With long-term of experience in lactide purification and PLA polymerization, Sulzer delivers process know-how and key equipment for the production of PLA. Join us on the journey to a sustainable future.

Everybody can make conscious choices to use sustainable products. Sustainable alternatives for plastics which do not degrade do exist. One is polylactic acid (PLA) — a thermoplastic polymer obtained by polymerization of lactic acid (LA). The process was patented as early as 1954, but it took almost 50 years for this plastic to be used in large quantities. Sulzer has made major contributions towards optimizing the PLA process for industrial use in the last 25 years. The resulting bioplastic features mechanical and thermal properties comparable or superior to its traditional oil-based counterparts, and offers a wide range of applications (Fig. 1). Thanks to its biocompatibility, it can safely be used also for medical purposes. PLA is also used as raw material for 3D printing for home use due to its low melting point and flow properties.
Main PLA application areas

Bottles  Films  Thermoforming  Fibers  Nonwovens  3D printing  Injection molding / rotomolding

Fig. 1 Main PLA application areas.

New generation of raw material

The lactic acid (LA) monomers are obtained via fermentation of glucose or sugars from crops such as corn, wheat, sugar cane, sugar beet and many others. Until now, these raw materials have been extracted mainly from sugar beet or corn or tapioca starch (Fig. 2).

The need for biobased, biocompostable, recyclable and non-hazardous plastic materials inspired researchers all over the world to find other renewable plastics. And they have been successful. They have produced a new generation of plastic that uses biorenewable material and, in the future, lignocellulosic sugars could be used. Lignocellulosic sugars are second-generation raw materials extracted from biomass such as straw, corn stover, sugar cane bagasse or wood chips (Fig. 2). KU Leuven’s Centre for Surface Chemistry and Catalysis, Belgium, even applied for a patent using the waste of cheese production to extract lactic acid.

Renewable, natural resources

The broad range of feedstock suitable for the production of PLA allows process industries worldwide to use the plant-based resources in accordance with their local availability to produce the sugars. This possibility allows users to maximize the process’s cost-effectiveness, and the reliability of the supply chain while minimizing the carbon footprint for raw material transportation. For example, sugar cane and its bagasse can be chosen as the raw material for PLA production in equatorial regions, while straw, corn or wood chips can be the most suitable options in moderate temperature zones.

Generation and recycling cycle of PLA

Fig. 2 PLA generation (e.g. from corn) and subsequent recycling process.
Process steps for PLA generation
The process of converting sugar into PLA plastic involves several steps (Fig. 3). First, sugar is fermented with robust and efficient non-genetically modified (GMO) strains to generate lactic acid (LA). Second, the LA is polymerized through a polycondensation reaction to a prepolymer with low molecular weight (Fig. 5, page 7). The polycondensation reactors, thanks to their flexible operating conditions, help to remove by-products and maximize the yield. The low molecular weight prepolymer is then converted, through a catalytic reaction, to lactide. The lactide is then purified with Sulzer distillation and crystallization equipment before being polymerized. After being fed to a series of loop and plug-flow reactors, the lactide is converted to PLA. Thanks to the proprietary devolatilization devices of Sulzer, the remaining volatile components are separated by degassing the PLA melt. Depending on the final product application, the last mixer is used to add color or additives to the melt. As the last step, PLA is converted into solid pellets in order to be transported or stored.

Integrated PLA technology
With over 25 years of experience in lactic acid and lactide purification and polymerization, Sulzer and its partners can deliver single, key equipment solutions for PLA manufacturing. In addition, Sulzer designs and implements key equipment and integrated modular solutions (Fig. 4, page 7) for individual steps of the polymerization. Sulzer Chemtech also offers several additional services to ensure that customers in the agricultural, chemical and fiber sectors can continuously benefit from their integrated PLA technology. More precisely, installation supervisors and start-up engineers provide support in the assembly, installation, commissioning and start-up of the equipment.

Additionally, the operation and maintenance training offered by Sulzer helps plant operators to thoroughly understand the system. Finally, to assist customers in maximizing the performance and service life of their equipment, the company also provides recommendations and guidelines on the best maintenance practices.

Controlled biodegradability
One of the main benefits of the Sulzer technology is that with the same installation, the properties of the polymer can be adapted easily. There is no need for different process lines. With the Sulzer technology, the monomer ratio and the molecular weight of the PLA can be set precisely according to the requirements of the market applications.
This flexibility of the process lines is important because the specific setting influences the speed of biodegradability of PLA-based products. The biodegradability is controlled by adjusting the relative amounts of D- and L-lactides. In fact, PLA polymers with high amounts of the D-configuration are easily biocompostable; PLA polymers with high amounts of L-lactides are not. As a result, PLA-based materials with higher amounts of D-lactides are suitable for disposable applications, such as food packaging with a short shelf life, whereas PLA-based materials with higher concentrations of L-lactides are required for more durable solutions, such as electronic components. Thanks to Sulzer’s smart measurement control and precise heat settings, the amount of L- and D-lactides in the PLA pellets can be easily adjusted.

**Key equipment for PLA**

Some of the key equipment developed by Sulzer as part of its PLA production offering includes falling film crystallizers, the loop and plug-flow reactor (SMX™), Sulzer Mixer Reactors (SMR™), distillation and degassing technologies (Fig. 5). In addition, these solutions are fully scalable and ideal to accommodate variable production volumes, allowing manufacturers to expand their business up to 100’000 tons per year.

**Main benefits of Sulzer’s key equipment**

The most important factor for good polymerization is that the process temperature is maintained at a controlled level and that the feed material is thoroughly mixed. This is more difficult in conventional polymerization, where the dimerization process and polymer reaction take place in a continuously stirred tank.
Scale-up proven in industrial use
With the support of Sulzer, one of the world's top two PLA manufacturers developed a large plant to produce 75'000 tons per year of PLA plastics, including heat-resistant PLA composites, for a wide range of applications. Specialized and highly qualified teams performed extensive laboratory and pilot testing and proposed a customized design that met the plant and manufacturing requirements. Thanks to the support provided by Sulzer Chemtech's experts, the PLA manufacturer has been able to create one of the largest PLA plants in the world, and deliver high-quality bioplastic solutions for a greener future.

Sulzer can offer special mixer reactors that combine these two processes: mixing and heating or cooling. These reactors have a smaller diameter than the tank and provide uniform temperature distribution. The tubes inside the mixer heat exchanger are filled with a transfer media, depending on the application, and allow a regular temperature transfer. The transfer tubes are shaped in a special form which ensures the material passing through the reactor is mixed (Fig. 6).

Because the mixer reactors are arranged in a loop, continuous material flow is possible, and uniform polymerization can be achieved. The process control can monitor the main process parameters to guarantee the polymer specifications. Sulzer's devolatilization technology is used to strip the monomers from the PLA to achieve high quality of the material. Degassing occurs quickly; the material does not stay in the vessel for a long time. This is important because a long dwell time increases the yellowness of the material or degradation of the polymers.

Supporting sustainability
PLA is a biobased, biocompostable, recyclable and non-hazardous plastic material, and can be produced from renewable sources. It can be used in many applications: thermoformed products, fibers and non-woven materials, films or molding. All these exceptional properties make PLA not only suitable for packaging, medical devices and implants, as well as electronic devices, but also for textiles, 3D printing processes and components for the automotive sector. Furthermore, the possibility to produce PLA composites, such as foamed PLA, further expands the range of applications for this bioplastic. Sulzer is ready to support you to produce sustainable plastics from biobased materials.
Replacing tires — a common routine for every vehicle holder. Did you know that rubber particles are carcinogenic when the tire is produced with the wrong rubber process oil? Treated distillate aromatic extracts (TDAE) are non-hazardous rubber process oils. However, TDAE manufacturers struggle to deliver high-purity products. Sulzer’s Kühn™ agitated column (ECR) provides a key solution that enables manufacturers to increase this yield.

Process oils are softening additives, and experts estimate the world’s demand for these substances is around 1’000’000 tons per year. They are essential for the manufacture of a wide range of rubber-based products, including tires, tubes, battery containers, belts and hoses. In fact, these oils facilitate the processing of the rubber. Additionally, they lower the cost of the final product and contribute to the rubber performance, for example by improving the adherence properties of tires.

Greener process oils for the rubber industry
Distillate aromatic extracts (DAE) have been traditionally used as process oils. Recently, these substances have come under scrutiny because of their high polycyclic aromatic hydrocarbon (PAH) content. Some PAHs are highly carcinogenic, mutagenic and reprotoxic pollutants. Therefore, the European Union and countries worldwide are replacing DAE with nontoxic process oil alternatives with low PAH content.

New standard
The new industry standard is treated distillate aromatic extracts (TDAE). These are obtained by processing a DAE feed to reduce the concentration of PAHs, and meet the current environmental regulations.
Removal of PAHs from process oils

PAHs are best removed via liquid-liquid extraction. This method is based on the different solubilities of DAE components in the presence of solvents, which remove or extract the PAHs from the process oil. The DAE, because of its high viscosity, is dispersed as droplets in the solvent (Figs. 1 and 2). The many small droplets provide the large interfacial area needed for the extraction process to take place. After sufficient contact between the solvent and the PAHs, the droplets coalesce and leave from the top of the column as purified TDAE, while the solvent carrying the PAHs leaves from the bottom (Fig. 1). As a result, only a single extraction step needs to be added to the existing DAE production line.

Despite the advantages of using TDAE, the post-treatment of DAE is particularly challenging due to the level of expertise required in the extraction step. As a result, only low volumes of PAH-free TDAE are currently available and these are insufficient to ensure a reliable supply to rubber manufacturers.

Agitated columns for optimal separation

Thanks to its expertise in separation processes, Sulzer was able to provide an innovative process for the efficient removal of PAHs from DAE. The best-suited extraction column, known as an agitated Kühni column (ECR), features a number of turbine agitators. In this way, the DAE that are mixed with the solvents not only flow axially through the column but are also rotated. The rotation reduces the droplet size of the dispersed phase while increasing the interfacial area between the DAE and the solvents.

Directives on PAHs

In recent years, legislation worldwide has become stricter to protect humans and the environment from the toxic PAHs found in DAE. According to the Commission Regulation (EU) No. 1272/2013 amending Annex XVII to Regulation (EC) No 1907/2006, articles whose rubber or plastic components can come into direct, prolonged or short-term repetitive contact with the human skin or the human oral cavity may not contain more than 1 mg/kg (0.0001% by weight of this component) of any designated PAH compound.
Sulzer’s solution offers a flexible geometry for the internals which allows optimization of the throughput and mass transfer. More precisely, the perforated plates along the column can be spaced differently, defining the optimal height of the agitated compartments (Fig. 3). The rotating internals are adapted to the compartment geometry. This enhances the extraction performance by reducing back-mixing and compensating for changing conditions over the column height. Also, by reducing the number of components and the robust design, Sulzer can deliver a smaller, easier-to-maintain agitated column that has a longer service life. These advantages further reduce the carbon footprint of TDAE production.

Pilot testing and comprehensive support

The Sulzer engineers ensure the correct design of extraction equipment at its world-class pilot test center in Allschwil, Switzerland (Fig. 4). The trials enable a safe scale-up to an industrial-size unit and to provide full process guarantees for customers. Thus, Sulzer can provide the most reliable and effective solution for PAH extraction.

Based on the customer’s individual process requirements, Sulzer engineers customize the Kühni agitated column (ECR). Customers can benefit from a complete solution out of one hand: Sulzer creates the initial design, conducts pilot testing and fine-tuning of the equipment, and commissions the finalized column at its customers’ sites.

By adopting tailored columns, oil refineries can benefit from energy-efficient solutions that minimize the volumes of solvents required while increasing extraction efficiency. In particular, the TDAE obtained with the Kühni agitated column (ECR) contains residues of PAHs that are well below the threshold set by the European environmental regulations. In this way, Sulzer is leading the global transition towards safer and greener process oils, which will result in less hazardous rubber for tires.

Fig. 4   Sulzer conducts customer-specific trials for TDAE in Allschwil, Switzerland.

Anyone can help to reduce pollution by buying tires produced with TDAE. It’s nice to know that we can actively do something to reduce carcinogenic materials in our world. Our team is always looking for new process technologies that allow us to produce safer or less hazardous end materials. Additionally, we design new products and engineer or optimize processes in close cooperation with customers. Refineries and petrochemical plants around the globe make use of our specific processes, and we are proud to offer this sustainable solution for safer process oils for rubber components.

Mark Pilling, Head Engineered Solutions Refinery Group, Tulsa, OK, United States
Energy efficiency is a hot topic in the process industry, and many authorities around the world are preparing related regulations. First, the European Union (EU) created the Energy-Related Products Regulations (ErP). Now, the U.S. Department of Energy (DOE) has introduced a regulation that specifies the Pump Energy Index (PEI) for clean-water pumps, with the target of reducing energy consumption. From 2020, only pumps, which can satisfy the PEI requirements, are allowed on the market.

In many industrial processes, pumping systems are responsible for 25–90% of energy usage. The energy consumption depends on the design of the pump and the installation, the specific application, as well as on the conditions and the operation of the system. These components and factors have to be configured optimally to achieve the lowest possible energy and lifetime costs.
Steps to energy optimization

Energy is often wasted because of inefficient or oversized equipment. To optimize the pumping system, users have to be aware where most of the energy is used and how to boost the efficiency of the installed equipment. Optimization of the equipment helps not only to save costs, it cuts down the carbon dioxide footprint as well (Fig. 1).

Correct pump selection saves energy

Energy costs are the biggest share of the total cost of ownership (TCO) of a process pump (Fig. 2). Using the right pump technology that is properly sized for a specific application is the best way to reduce energy consumption and the overall lifetime cost of the pump.

To select the most efficient pump technology for an application, the Sulzer sales engineers need to thoroughly understand the application, fluid characteristics and flow demands. Combined with a comprehensive knowledge of pumping technologies, this information helps to define the most appropriate pump for optimal performance and energy savings. The most cost-effective solution when it comes to initial capital investment and long-term operating costs will be achieved by matching the most appropriate pump construction and material.

The next highest impact on energy consumption can be accomplished through optimal sizing of the pump. Pump duties are often overestimated and safety factors added to the required head and flow of the pumps. This results in the selection of an oversized pump, which does not run at its best efficiency point (BEP) and, therefore, wastes energy.

The rotational speed of the pump has a big impact on the selected pump size and its efficiency. For clean liquids, high rotational speeds can be selected to maximize the efficiency and energy savings – with direct savings to the end users as a result.
Replacing a pump with a high-efficiency design normally increases the efficiency (Fig. 3) and reduces the energy consumption between 3% and 20%. In some cases the reduction can be as much as 50%. Correct pump selection enables considerable savings in energy and investment costs, and is a key factor for successful process runnability.

The best efficiency and further energy savings can be achieved by driving the pump with a variable-speed drive (VSD) and a maximum diameter impeller. This combination allows the rotational speed of the pump to be adjusted to achieve the desired head and flow for the process application. The efficiency improvement can be up to 10% over that of a pump driven at constant speed.

Efficiency by design
Sulzer has been adapting to market needs for centuries, and is always thinking ahead to fulfill future needs of its customers. Sulzer launched the new CPE ANSI process pump range in June 2018. The pump range is designed to exceed the strictest energy regulations for all industries as well as the requirements of the ASME B73.1 standard. The CPE pump (Fig. 4) also complies with the U.S. Department of Energy (DOE) pump efficiency index (PEI) that will come into force in 2020.

The CPE pump is the next-generation ANSI pump. The new pump range meets the process requirements in a variety of industrial applications. It is suitable for use with clean or slightly contaminated liquids, viscous liquids and fibrous slurries. When engineering the new CPE pump range, Sulzer engineers considered the factors that influence the total cost of ownership (TCO) of a process pump. The goal was to offer a pump that brings savings to the end customers in all TCO fields. With the new pump design, the engineers improved not only energy efficiency but also stability and reliability.
The new closed impeller design with low net positive suction head (NPSH) runs stably with low suction pressures. The impellers are optimized for low flow applications, therefore a special low flow impeller is not needed. The innovative impeller was designed in tandem with the volute case and sealing chamber. The result is a very efficient hydraulic system, which, together with improved conditions in the shaft sealing area, leads to higher reliability. Heavy-duty rigid bearing units ensure a long bearing life and minimize the service interventions. Semi-open and closed impellers offer versatility for a variety of liquids, maximizing standardization and minimizing the need for spare parts.

**Self-priming, high-efficiency option available**

The CPE pump can also be used in applications where it is necessary to pump liquid from below floor level. By adding a Sulzer ejector to the standard CPE pump, it turns into an efficient and fast self-priming pump (Fig. 5). Ejectors can be installed on all standard dry-installed process pumps — both as retrofits for existing installations and for new installations.

**Optimal pump for various industries**

Sulzer ANSI pumps are used in a wide range of chemical process applications as well as in general industry including clean water. Selecting the best material according to specific process requirements is important for maximizing pump life, especially for aggressive processes where resistance to corrosion and abrasion is vital. Sulzer offers a large variety of material options for the ANSI pumps, ensuring the optimal pump for each process in a wide range of industries.
Sustainable processing with COX™ ProFlow™ dispensers

You need a lot of strength in your hands to do rock climbing, but not to operate our dispensers. The latest COX™ ProFlow™ dispensers are powerful yet compact and suitable for smaller hands. The one-component manual dispenser is durable and offers superb ergonomics. ProFlow is flexible in use, and you can switch between sealants easily. These two variants are available for the Asian market only — a dispenser for cartridges or a combi version for cartridges and sachets.

The COX ProFlow dispenser is designed and built to meet the most rigorous requirements. Its strength, efficiency and, above all, versatility make the ProFlow the go-to tool for semi-professional and do-it-yourself users. The Sulzer engineers in Hungerford, UK, have developed an easy-to-operate tool with many smart functions. No matter what size your hands are, no matter how strong you are, you will be able to use the ProFlow with ease.

The COX ProFlow offers dispensing solutions for all your application needs. Under the Sulzer brand PC COX focuses on innovation and product performance, and is a global leader in the design and production of handheld sealant and adhesive dispensers. More information under www.coxdispensers.com
No drips, no lost material
Each ProFlow dispenser has a built-in switchable pressure relief device (PRD). This PRD instantly creates a limited return on the drive rod as soon as trigger pressure is released (Fig. 1). The PRD thereby releases the pressure built up in the cartridge or sachet and stops “flow-on.” Therefore, the ProFlow is essentially a non-drip system. Besides saving filling material, you benefit from clean hands and a clean floor as well.

Features for easy operation
Thanks to its compact design and its epoxy-coated cast-aluminum handle with smooth trigger operation, you benefit from maximum comfort and efficiency (Fig. 2). The lightweight, anodized aluminum barrel is corrosion-resistant and durable. Designed for longevity, the dispenser can be used for a long period of time and thus contributes to sustainability as well.

ProFlow cartridge dispenser
The strength of U-formed steel profiles is well known in the construction industry. The epoxy-coated, U-opening rotating steel frame adds substantial strength to the tool and allows for ease of cartridge insertion and removal. The one-component manual dispenser for 310 ml cartridges is designed for use with low-to-medium viscosity sealants and adhesives. Sulzer has also thought of all those who like to keep order in their workshops — the curved rod end creates convenient tool storage (Fig. 3).

ProFlow Combi dispenser
With the ProFlow Combi dispenser, you need only one dispenser for different filling systems. It gives complete flexibility to switch easily between cartridge or sachets. The one-component combi dispenser can be equipped with cartridges or sachets in different sizes (310/400/600 ml). Whether to use low-to-medium viscosity sealants or adhesives, the dispenser is suitable for both materials. The threaded endcap allows simple access to the barrel for insertion of materials but also provides a secure fixing while the dispenser is in use (Fig. 4).
COX applicator product range
Sulzer Mixpac’s COX and MK™ dispensers are the market-leading brand for handheld sealant and adhesive dispensers. In combination with Sulzer Mixpac’s strong position as a technology leader and system provider, we offer a complete product range of mixing, dosing and application systems (Fig. 5).

The ProFlow manual dispenser provides users with a versatile tool that satisfies numerous demanding dispensing applications. It is designed to be robust and durable whilst remaining a comfortable and efficient tool in use.

Matt Lyndon, Head of Engineering Sulzer Mixpac, Hungerford, United Kingdom

Applications
The ProFlow has been designed to meet the needs of the construction industry, providing solutions for interior and exterior applications. The COX ProFlow offers dispensing solutions for all application needs, including bonding, crack repair, roofing, sealing, surface repair and waterproofing (Fig. 6).

Fig. 6  Application areas of COX ProFlow.

Specifications of COX ProFlow
- Lightweight dispenser: 0.64–0.84 kg / 1.4–1.85 lbs
- Maximum thrust: 2.0 kN
- Mechanical advantage: 10:1
- Tool component approval: Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) EU regulation
- Customized version on demand
- Warranty up to one year
Bacteria, fungi and algae produce valuable substances from simple base materials. They can manufacture environmentally friendly plastics and break down metals.

Bacteria are life forms that combine characteristics of the animal and plant worlds. They were the first living cells on our planet and have been colonizing the Earth for over three billion years. Over the course of evolution, bacteria have had ample time to develop a huge range of properties.

They can be found everywhere, even in places where life can otherwise barely exist: sulfur springs, volcanic crevices, boiling water, oily rocks, in glacial ice, and in the eternal abyss of the deep sea. Microbiologists suspect there are around 500’000 types of bacteria, but so far only a few thousand have been studied in depth.

Bacteria and other microbes are not just pathogenic enemies of humans (causing diseases such as tuberculosis, listeriosis, borreliosis, cholera, leprosy and the plague), they are also helpful friends.
Environmentally friendly plastics
Forty years ago, scientists at the British chemical multinational ICI began to research how they could use Alcaligenes eutrophus to produce new types of plastics. By nature, the bacterium stores its energy reserve in its cell interior as hydroxybutyric acid. Feed supplements were given to the microbe to make it produce polyhydroxybutyric acid (a polyester) that is as robust and water-resistant as conventional plastics but which also decomposes into carbon dioxide and water within a few weeks when composted. This environmentally friendly plastic is now being used for items including shampoo bottles and disposable razors.

The ETH (Swiss Federal Institute of Technology) in Zurich cultured another bioplastic manufacturer, Pseudomonas oleovorans. This oil-eating bacterium stores excess octane in its cells. After a specific treatment the octane can be used to produce a type of soft rubber that is stable between –20 °C and +170 °C but that can be digested by compost bacteria after use.

Microbes as miners
Human ingenuity has produced ever-larger mining machines for drilling, digging and shoveling. The fact that the treasures hidden in the earth’s interior can also be uncovered by tiny, invisible helpers is one of the most fascinating discoveries of the modern age. In 1947, a bacterium that can oxidize sulfur, iron and copper was discovered in the acidic water in coal mines.

Utilization in the food industry
Some 8’000 years ago, the Babylonians brewed beer using Saccharomyces cerevisiae. Thanks to its ability to convert sugar into carbon dioxide and alcohol, brewer’s yeast became an indispensable helper for beer brewers, winemakers and bakers (who use it to create sourdough).

Molds such as Penicillium camemberti and Penicillium roqueforti also transform milk into popular specialty cheeses. Lacto- and bifidobacteria turn milk into yoghurt, thus making it more long-lasting. And propionic acid bacteria create the recognizable holes in Swiss Emmental cheese.

Fig. 1 Bacteria create the holes in Swiss Emmental cheese without any drilling tools.
This bacterium, *Thiobacillus ferrooxidans*, can convert the sulfides in ore deposits into soluble metallic sulfates, allowing the metal to be extracted from the solution with relative ease. The method has since become very important in the extraction of substandard ore deposits and in generating secondary value from overburden dumps. It is enough to spray the enormous gravel heaps at the mine with acidified water because the bacteria are already there by nature.

Microbes that do not just dissolve the metal but firmly deposit it in their cell walls – or even eat it – are also of great interest. The Sargassum natans seaweed (Fig. 2) can store gold from water containing gold in amounts of up to 40% of its own weight in its cells.

For other microbes, lead, radium and tin are on the menu. This opens up the biotechnical possibility of removing heavy metals from sewage and industrial waste cheaply.
Ethoxyquin is an antioxidant commonly used to conserve feed and raw material for animal nutrition. The current production method is known to yield traces of phenitidine that are unwanted in the final product. Sulzer was asked to develop a solution for ethoxyquin purification for the European company ITPSA in Spain.

Based on the customer requirements, a method was developed based on distillation. It was simulated and validated by Sulzer engineers in Sulzer’s test center in Allschwil, Switzerland, in February and March 2016 with pilot tests using the actual customer material.

These pilot tests confirmed a residual concentration of phenitidine as low as 29 ppm weight in the product. Based on this result, ITPSA ordered a modular plant from Sulzer. The skid was successfully started up in July 2017 (Fig. 1). The plant is now producing ethoxyquin with a content of phenitidine of only 2.5-3 ppm-weight.
Sulzer inaugurated a new manufacturing site for Applicator Systems products in Wrocław, Poland. Strong growth in the adhesives and dental segments required additional production capacities. The new site will generate more than 100 new jobs.

The new site with 6,440 m² of manufacturing space is Sulzer’s new hub in the heart of Europe for cartridges and mixers for adhesive customers around the world. The new site will significantly increase the production capacity for adhesives systems of the Sulzer Applicator Systems division. Sulzer chose Wroclaw because the city offers a strong business environment, a large talent pool and great infrastructure for logistics.

The leased, made-for-purpose manufacturing facility required an investment of about PLN 10 million (close to CHF 3 million) for state-of-the-art injection molding and assembly machines.

This new site will allow Sulzer’s production facility in Haag, Switzerland, to reallocate capacity to its focus on products for the dental and healthcare markets. Sulzer recently strengthened its position in these markets with the acquisitions of Transcodent and Medmix.

Sulzer’s CEO Greg Poux-Guillaume said: “This investment in additional manufacturing capacity confirms our belief in the strong prospects of our Applicator Systems adhesives, dental and healthcare segments.”
Sulzer has been active in France and dedicated to delivering pumps and services to the French market since 1918. During this time, Sulzer Pompes France has adapted flexibly to the market demands and has continually reinvented itself.

Sulzer started production in Saint-Denise, France, in 1918 as Compagnie de Construction Mécanique Sulzer. At that time, Sulzer specialized in producing and servicing diesel engines for the French navy.

After a strong growth of the business, Sulzer needed more space. In 1958, Sulzer moved to a larger factory in Mantes-la-Jolie. The company developed internationally and was named Sulzer Pompes France in 1991. Sulzer grew steadily in France, also sustained by several acquisitions. Ahlstrom pumps, PACA Pompes Services, ABS, Cardo Flow, Matis Interventions and Ensival Moret were integrated successfully into the Sulzer organization. Sulzer now has 15 subsidiaries all over France, located in Ambès, Beauzelle, Buchelay, Brignais, Bruges, Feyzin, Florange, Rosny sous Bois, Schweighouse, St. Quentin, Tours, Velaux, Vannes, Wambrechies and Yvetot.

In 2014, a new greenfield factory was built in Buchelay, west of Paris. In addition to the design department and production halls, the building also houses a test bed for pumps, pump packaging, and the parts and retrofit store. Sulzer pays attention to sustainability – and achieves it with solar panels, rainwater recovery and smart air-conditioning in the building.

Sulzer France successfully supports the nuclear power industry in France. The company Electricité De France SA (EDF) has ordered 28 special pumps and maintenance services to guarantee the safe operation of its pumps in nuclear installations.

For the 100th birthday of Sulzer in France, most of the 15 sites organized a celebration with a common theme to remind all employees of Sulzer’s rich tradition in the country, which is also the basis for the future.
Service agreement between ABB and Sulzer in the UK

Sulzer Electro Mechanical Services (UK) Ltd is the first Loyalty Partner of ABB. For one year, Sulzer has been providing workshop and repair services for medium- and high-voltage motors and generators for ABB customers.

Since June 2017, Sulzer has been offering inspection, remedial work, modification, repair and rewinds of ABB large machines, along with some field services. All repairs were made to ABB-approved standards using original spare parts. Among the field services that are offered through Sulzer is ABB’s life expectancy analysis program (LEAP). This program offers customers a range of inspection services that optimize maintenance and planning for electrical machines. They also predict the remaining lifetime of the stator insulation system.

ABB customers are happy that we can offer all these services as a Loyalty Partner for them. The big advantage for them is that we can implement original spare parts quite quickly, without reengineering them. More than ten customers are already using our services.

Chris Powles, Head of Electro Mechanical Services (UK), Birmingham, United Kingdom
And the winner is …

Marcin Wyszynski who works for the International Paper company in Kwidzyn, Poland. He works as a maintenance specialist for the reliability department. Being the lucky winner of our contest, he will receive an Apple Watch Nike+ soon.

International Paper's Kwidzyn mill is one of Europe's leading manufacturers of pulp and paper. The Kwidzyn mill manufactures high-quality office paper, for use in printers and copiers; offset paper for the printing of reports, books, manuals, posters, advertisements, inserts and leaflets; coated paperboard for the manufacture of, for example, pharmaceutical packaging and luxury packaging for cosmetics or confectionery products; as well as newsprint made from 100% recycled wastepaper.

Contest for new subscribers

If you sign up by December 1, 2018, you will automatically be entered in our prize draw to win an Apple Watch (Series 3, GPS). The winner will be randomly selected and informed by e-mail on December 6, 2018.

Sign up under www.sulzer.com/str-newsletter

Terms and conditions

The prize is an Apple Watch (Series 3, GPS). The winner will be chosen randomly from all participants who subscribe to the STR newsletter between October 1, 2018, and December 1, 2018. The winner agrees to have his/her name published in the next Sulzer Technical Review. There is no written information concerning the contest. Limited to one entry per person. Sulzer employees and their family members are excluded and cannot participate in the contest. Exclusive place of jurisdiction is Winterthur, Switzerland.

News ticker

+ + + GEKA presents a “green” lip gloss. The lip gloss packaging convinces with sustainable materials as recycled PET and biodegradable PLA material. + + + Sulzer has placed five million of its treasury shares with domestic and international investors, increasing the free float to 51%. + + + With Medmix Systems AG, Sulzer has acquired a provider of applicators for tissue treatment, bone repair, oral surgery and drug delivery in the healthcare market. + + + The EC 531 next-generation pump controller is launched. + + + The Sulzer Chemtec division is an industry partner of the European Training Network “TOMOCON,” which introduces smart tomographic sensors for advanced industrial process control. + + +