Mass Transportation
Glass fibre-reinforced plastic profiles in the latest generation of double-deck trains

Renewable Energies
Development of proprietary industrial components for wind turbines

Food and Beverage Industry
Accurate timing belts perfectly positioned for the production of coffee capsules
Dear Customers,

As a leading supplier of technical components and comprehensive engineering solution provider for a wide range of industries, Angst + Pfister has been ensuring business continuity and serving the world’s leading manufacturers for over 90 years. Learn from our experts about the latest developments and solutions within your industry and how we can support you with our customized engineering solutions.

Angst + Pfister’s international team of highly specialized application engineers focuses on providing effective solutions regardless of where our customers are in the production process. Getting us involved at the beginning accelerates the time-to-money of your new design projects. Our engineers have amassed expertise across a broad range of industries and can develop innovative tailor-made solutions and recommend standard components for practically any application within our five core product areas.

Virtual design and detailed product specifications with clearly defined industry norms are created, and our state-of-the-art production facilities can quickly deliver fully functional prototypes and samples. Our excellent knowledge of materials and deep understanding of production processes helps our customers systematically reduce total cost of ownership. From the initial engineering assessment to the final series production phase, our team of highly qualified application engineers can work with you onsite across Europe and China.

Would you like to know more about our engineering solutions or how you can increase procurement efficiency and improve your working capital? Our experts will be happy to advise you!

Dr. Robert Eberlein
Chief Technology Officer, Angst + Pfister Group
Custom-fabricated glass fibre-reinforced plastic profiles for window structure applications in the latest generation of double-deck trains produced by Stadler Rail AG

High mechanical strength is one of the key characteristics frequently cited for construction elements. Additionally, advantages of the Angst + Pfister solution include low weight, thermal insulation, fire protection plus high corrosion and chemical resistance.

Demanding material requirements The windows of rail vehicles are subjected to extreme strains particularly at tunnel entrances and railway crossings approached at high speeds. The enormous forces generated by high velocity pressure must be absorbed and safely transmitted to the aluminum coach body. To this end it is necessary to interrupt the thermal bridges from outside to inside. The load-bearing profile must thus fulfill special material requirements: in addition to having high mechanical strength and good thermal insulation properties, it must keep expansion caused by temperature fluctuations to a minimum. The profile material must be designed in accordance with the geometric requirements [for double-deck coaches] and must also meet extensive fire safety requirements.

Pultrusion UP-GFK plastic profiles can offer many versatile solutions. The complex requirement specifications were discussed in close cooperation between Stadler Rail’s designers and Angst + Pfister’s plastics specialists. Experience in developing the FLIRT and GTW vehicle generations and profound plastics technology expertise with regard to materials and process technology contributed to finding the optimum solution and implementing it successfully. The jointly developed product is based on pultruded UP-GFK profiles from Angst + Pfister. These are glass fibre-reinforced profiles with a matrix of unsaturated polyester resins.

Special challenge – groundbreaking achievement The innovative profile solution meets all of the mechanical and thermal requirements that were defined in advance. Moreover, this UP-GFK modification meets the strict fire safety requirements pursuant to CEN TS 45545-2 (2009) and DIN 5510-2 (2009). A special challenge was posed by the complex installation situation in the upper passenger deck, whose curved window geometry necessitated several profile forms. Angst + Pfister succeeded in pultruding a UP-GFK profile for the vertical fastening element in the defined radius of the ceiling and window curvature – a groundbreaking achievement for this fabrication process.

Versatile deployment possibilities UP-GFK profiles are not just ideal for use in the KISS trains. The construction elements with their exceptional properties have virtually unlimited application possibilities. The high-quality Angst + Pfister profiles lend themselves as a solution, especially in cases where metals often fail the desired mechanical strength but not the necessary corrosion resistance or electrical and/or thermal insulation properties. Their low weight makes them suitable for lightweight construction, and they are exceptionally UV- and weather-resistant and are excellent for bonding. In addition to various standard profiles, customized geometries can be produced as well. Angst + Pfister will be glad to advise customers on the versatile application possibilities for UP-GFK profiles. Our plastics experts can be produced as well. Angst + Pfister will be glad to advise customers on the versatile application possibilities for UP-GFK profiles. Our plastics experts

Advantages of glass fiber-reinforced plastics

- Self-extinguishing & halogen-free
- Low weight
- Resistant to corrosion and chemicals
- High cost-effectiveness
- Linear stress-strain behavior
- Fast and easy installation
- Deployment temperature range of -100°C to +180°C
- Electrically insulating
- High strength
- UV- and weather-resistant
How is it possible to develop hose assemblies for deionized water that ensure optimum cooling of the converters while providing perfect electrical insulation? Angst + Pfister was contracted by the Swiss Federal Railways (SBB) company to tackle this question.

Angst + Pfister has developed a cost-effective solution for an efficient cooling system. A two-stage process takes place in the converter. First, the alternating-current component of the single-phase operating voltage is rectified and impeded by capacitors and an L/C absorption circuit in order to obtain a continuous as possible reference voltage. Then, a variable-frequency, variable-amplitude three-phase voltage is generated to power the asynchronous traction engines. In order to maintain the ideal temperature in the converter at all times, the GTO thyristor and the restrictor of the absorption circuit must be connected to a powerful cooling system equipped with fluid-handling and sealing technology components.

The EPDM Kevlar® insulating tube How is it possible to develop hose assemblies for deionized water that ensure optimum cooling of the converters while providing perfect electrical insulation? Angst + Pfister was contracted by the Swiss Federal Railways (SBB) company to tackle this question.

EPDM insulating sleeve with Kevlar® insert The solution devised by Angst + Pfister consists of an EPDM tube with a Kevlar® inner lining. This tube has been specifically designed for transporting deionized water because the end pieces in particular are exposed to high electric voltage. EPDM has excellent resistance to ozone and oxygen and can also withstand severe weather conditions without any problems. It therefore possesses the paramount properties for this specific application since the electrical installation itself may produce a certain ozone concentration. The long-term durability of the EPDM tube has proved to be outstanding and ensures the desired longevity of the hose lines. The valuable experience that Angst + Pfister has gained in similar applications proved to be an invaluable competitive advantage and proof of quality in devising this solution (see also the article in Angst + Pfister Magazine no. 5/2008, p. 16 and 17).

Limitless application spectrum The EPDM tube with Kevlar® insert is used to great success in a large number of specific installations. Thanks to its excellent suitability for transporting demineralized water, it is above all used in all types of cooling circuits that require excellent electrical insulation. The array of deployment possibilities is virtually unlimited and ranges from electromagnetic devices and automotive and railway applications to transformers and electrically operated industrial furnaces.

Comprehensive product assortment combined with a wealth of experience The high-grade special tubing is part of Angst + Pfister’s extensive fluid-handling and sealing technology product assortment and is available from stock in numerous standard variations. Special variations can be supplied on request. In addition, a full range of connectors and fittings for all types of needs is available to customers. The tubes of course can also be supplied as ready-to-install hose assemblies. Inventiveness and extensive engineering know-how make Angst + Pfister an expert collaboration partner that always has ideal solutions at the ready even for ambitious fluid-handling and sealing technology tasks.

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Turning down the noise from Geneva’s tramway tracks

Due to the continuously increasing demands for public mass transportation, it was necessary to expand the TPG Geneva Public Transport Service. The newest tramway network is installed in densely populated neighborhoods. In order to reduce the vibrations and loud clatter caused by passing trams, all of the rail sections are equipped with antivibration mechanisms supplied by Angst + Pfister.

A Geneva tramway at the Bel-Air stop

Geneva trams – right at your doorstep

The TPG has both a tramway network, trolleybus and regular bus lines. With the commissioning of the new TCMC track section [tramway from Geneva’s Cornavin main railway station to Meyrin and to CERN] in 2010 along with the TCOB line (from Cornavin station to Onex and Bernex) at the end of 2011, the tramway network was dramatically modernized and now covers more than 35 kilometers. When both of these new track sections were connected to the existing public transportation network, critical application zones appeared due to the high residential density in certain neighborhoods. In these areas, the tramway tracks are required to run right beside existing buildings and threatened to cause loud structural-borne sound emissions. The canton of Geneva contracted the architectural and engineering office of Résonance Ingénieurs-Conseils SA to identify the critical zones and carry out a compatibility study of the structural-borne sound emissions caused by the passing tramways. Additionally, they defined the extent and degree of effectiveness of the required vibration-damping mechanisms. Based on the measures set forth in this report, Angst + Pfister made available the best possible vibration-damping solutions, which can be specifically tailored to any situation from both a technical and cost-effective perspective.

Flawless functionality of mass spring system

The antivibration system with vibration-damping plates designed by Angst + Pfister is what is known as a “mass spring system.” Depending on the damping requirements, the system consists of a cement pad that is supported by a spring made of Sylomer® or Sylodyn® polyurethane elastomer. With this system, the track infrastructure is dynamically separated from its environment, thus reducing the transmission of strong vibrations and structural-borne noise. The insulation of the vibration emissions takes place at the precise spot where it is the most efficient – directly underneath the track foundation. After an extensive evaluation campaign, during which the various insulating materials available on the market were compared with one another, the canton of Geneva chose the antivibration solutions from Angst + Pfister.

Today, Geneva has many kilometers of track that are equipped with the mass spring system made from polyurethane elastomers.

Efficiency and construction techniques using trusted materials

When designing mass spring insulating systems, the construction technique chosen for the functionality and cost-effectiveness of the application is decisive. With flexible antivibration insulation covering the entire surface, the lowest resonance frequency of the suspended system oscillates between 14 and 25 Hz. This is sufficiently low to achieve a very good insulating effect and translates into a reduction of up to 30 dBA for structural-borne noise in many cases in the field. Strip insulation is particularly well-suited for mass spring systems that combine pre-built and onsite manufactured protective cement elements. Compared to surface insulation systems, strip supports enable better damping values with resonance frequencies of between 8 and 15 Hz for the system. Whether it is an entire surface layer or a partial strip damping system, Angst + Pfister always offers cost-effective, efficient and sustainable technical solutions.

A wide product selection of highly flexible polyurethane elastomers makes it possible to reduce the toughest structural-borne noise.

Top technology on the rise

A result of our increasingly mobile society is an increase in noise and vibrations, and is a phenomenon that is omnipresent in urban settings where public transport is located in close proximity to residential buildings. This development is detrimental to the quality of life for local residents and poses a new construction challenge in the area of public mass transportation in our cities. With mass spring systems, Angst + Pfister makes solutions for tramway networks available that represent the cutting-edge technology in this sector.

You can take advantage of the experience and know-how of Angst + Pfister as well. We are happy to send you detailed information about polyurethane elastomers solutions and look forward to solving your most demanding applications.

Sylomer® and Sylodyn® are registered trademarks of Gatterer Werkstoffe GmbH.

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Polyurethane elastomer Sylomer® surface insulation (Rue de la Servette)

Polyurethane elastomer Sylodyn® in strip form (Rue des Deux Ponts)

Polyurethane elastomer Sylomer® mass spring system under construction (Onex)
**PRAG v3®: Certified for improving high-speed rail LCC**

Total life-cycle cost (LCC) improvement is one key topic that drives R&D teams, especially in the capital intensive Railway Industry. Here it has been proven that under sleeper pads (USPs) can greatly improve LCC. For this reason, Angst + Pfister co-patented a state-of-the-art USP called the PRAG v3® that will be installed in the new high-speed TGV line connecting Nancy to Strasbourg.

Angst + Pfister had to create the PRAG v3® with a thickness of 5 mm in order to fulfill all of the technical requirements. In addition, we implemented a new solution to ensure adhesion between the PRAG v3® USP and the concrete. The project team chose a specific mesh that is casted inside the polyurethane and is then laid on the fresh concrete during the sleeper manufacturing process. This solution provides a real benefit by optimally binding both components and saves time in the manufacturing process.

Most of the European national railway organizations are currently in the process of testing PRAG v3® USPs with the goal of equipping their tracks with them soon. Angst + Pfister is accustomed to always providing the best realistically economical technical solutions.

If you are involved in the railway industry, Angst + Pfister is ready to partner with you to explore mutually beneficial opportunities.

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**Antivibration Technology** has expertise in track filtration, air conditioner vibration reduction and floor insulation with critical Approvals like DIN 6701-2, DIN 4102 B2 and UL 94 HFI.
Engineering Services – Renewable Energies

Perfluorelastomer: an innovative sealing solution for photovoltaic manufacturing equipment

A number of highly corrosive chemical reactions are involved in the production of solar cells. Angst + Pfister developed a perfectly dimensioned seal that meets the demanding requirements of Roth & Rau AG and ensures the maximum operating uptime.

For more than a decade Roth & Rau AG has been one of the world’s leading suppliers of modern production technologies and equipment for the photovoltaic decade. The company’s main focus is on developing innovative processes for cost-efficient mass production of photovoltaic products.

Its new generation of HELIA® manufacturing equipment, a further advancement on its SiNA® and MAiA® systems, stands on the cutting edge of photovoltaic production technology.

Optimally designed Kalrez® PV9100 seals from Angst + Pfister ensure maximum security in the equipment. The compound properties of Kalrez® PV9100 have a translucent amber color and were specially developed for use in thin-film etching and deposition processes. This material has excellent sealing qualities in such plasma-enhanced chemical vapor deposition (PECVD) and physical vapor deposition (PVD) applications.

Kalrez® PV9100 is created for use in applications that require high purity and ultralow particle generation in the harshest plasma environments. The compound possesses excellent mechanical sealing properties with a compression set of 21% at 250°C (ASTM D395B using AS568 K214 O-ring test specimens). The manufacturer’s recommended maximum continuous service temperature is 300°C, which lies at the upper end of the elastomer spectrum. O-rings, plates and custom-made molded parts can all be obtained in this unique material grade.

Kalrez® is a registered trademark of DuPont Performance Elastomers; VITON® is a registered trademark of DuPont Performance Elastomers; HITEC® is a registered trademark of Angst + Pfister AG.

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Kalrez® PV9100: The application oriented range covers all the dimensions required for Europe and the USA and is fully certified. Angst + Pfister also offers solutions for chemically and thermally challenging applications.

The material compound isn’t everything – seal geometry matters.

High performance Kalrez® O-rings

The first Roth & Rau AG prototype HELIA® coating equipment units were outfitted with O-rings seals that had a large inner diameter (≥1,500 mm). The seals were manufactured by DuPont Performance Elastomers by means of a special fabrication process. Test runs revealed that inherent design-related low pressure forces made it impossible to achieve a reliable seal across the entire circumference. In order to better bridge the sealing gap, the design of the seal needed to be geometrically optimized; the seal needed to be configured to exactly fit the surroundings of its future point of deployment. Leveraging Angst + Pfister many years of sealing technology experience, our engineers succeeded in designing a seal geometry that meets all of the challenging application requirements.

Kalrez® PV9100: The application oriented range covers all the dimensions required for Europe and the USA and is fully certified. Angst + Pfister also offers solutions for chemically and thermally challenging applications.

Are but a few of the applications that benefit from the anti-explosion decompression performance, high H2S chemical resistance and low temperature performance properties Kalrez® 9100. Alongside additional Kalrez® compounds and specialty sealing materials, Angst + Pfister customers can also choose from a wide range of standard elastomers in the HITEC® product family, such as FKM, silicone, EPDM and others.

Angst + Pfister’s sealing technology experts will be happy to help you with advice and customized engineering solutions.

Angst + Pfister Magazine No. 10 2012

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Engineering Services – Renewable Energies

Sustainable solutions for a sustainable industry: industrial components for the solar industry

A lot of attention is being given to the challenges and achievements in making solar power more economical and attainable for all of us. Angst + Pfister is a leading solution provider who helps make it happen.

In order to drive the trend to sustainable energy, Angst + Pfister actively supports its customers by:

• defining, designing and supplying the most suitable components for the special- ized manufacturing equipment required in this industry;
• providing co-design engineering services to develop the best solutions for over- coming technical challenges;
• creating new aesthetic design alternatives;
• improving ease-of-use and flexibility of installation processes, and
• reducing costs savings by bundling logistic services and optimizing supply chains.

Achievements in efficiently developing and manufacturing solar collectors

When developing new solar collectors, a key role is played by details such as specially designed non-outgassing sealing gaskets, weatherproof seals for grommets, new types of plug connectors for solar thermal collectors and gaskets meeting the UL photovoltaic norms of electrical plugs to the converter. Another area of Angst + Pfister’s expertise lies in developing solutions for special equipment manufacturers. Solar thermal and photovoltaic panel manufacturing requires extensive product and process know-how on the part of all partners involved when it comes to designing and building the requisite high-quality equipment. Angst + Pfister provides expert support and the right product range to enable its customers to manufacture such produc- tion machinery efficiently and economically. Numerous components supplied by Angst + Pfister are used in a vast array of different applications:

• finished and semifinished parts made of high-grade engineering plastics;
• extra-large silicone sheets for laminator presses;
• seals of all kinds to withstand the most aggressive chemical environments such as those found in the production and processing of silicon ingots;
• hoses made of metal and other materials, as well as all kind of connectors;
• toothed belt and V-belt solutions for mechanical drive and conveyance technology;
• gas springs as well as optimized vibration dampers, leveling elements and machine mounts.

Collaborating with Angst + Pfister also enables you to largely consolidate your C-parts supplier network, thus creating additional cost-cutting potential.

Enabling safe and durable rooftop installation

Optimal utilization of available roof or wall space is a prerequisite for fully harnessing solar energy. Angst + Pfister can help to optimize the installation with cost- and energy-saving solutions and components such as:

• special corrugated hoses made to measure;
• tool-free collector connectors;
• insulated flexible metal solar piping;
• roof ducts;
• innovative mounting and covering profiles;
• special hanger bolt seals for covering larger bore holes.

Employing intelligent HVAC technology

Solar collectors are the core of solar installations, but their efficiency would be in vain without the high-performance peripheral equipment connected to it. Pumps, storage tanks, heat exchangers, controllers and fittings contrib- ute to efficient, dependable, hygienic and economical operation. Moreover, they should also be flexibly adaptable to space con- straints and should be space-saving and easy to install while not having a negative vibra- tion or noise effect on the adjacent living quarters.

With their many years of experience in supporting customers in countless projects, the engineers at Angst + Pfister are there to support engineers in the field of solar energy in situations where additional core compe- tence is required. Solar technology engineers benefit from Angst + Pfister’s vast technical expertise and comprehensive portfolio of services, which features for example: design- ing and optimization support using CAD and CAE tools, specification and procurement of optimal materials and requisite regulatory compliance certifications, provision of indus- try-specific technical seminars and training courses.

We are pleased to consult you!

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APSOvib®: Customized elastomeric mounts for wind turbines

Alternative energy from wind has grown tremendously in recent years, with global installed capacity growth of around 30% per annum. In 2008, the Angst + Pfister Group decided to develop proprietary industrial components designed to specifically meet the needs of this rapidly evolving market.

This article illustrates how product development works at Angst + Pfister and shows how components are effectively adapted to meet customers’ specific needs. At the end of 2008, there was already more than 120,000 megawatts (MW) of installed wind power capacity worldwide. Almost 30,000 MW of new capacity was installed in 2008 alone, and similar growth momentum was already being registered in the years before that. During this time, it also became apparent that China was emerging as a new core market in the wind power industry. China has since developed into the world’s most dynamic wind energy market, and today it boasts a bigger installed capacity base and faster growth rate than any other country. So when Angst + Pfister first got involved in wind energy technology in 2008, we logically concentrated on the Chinese market and achieved our first joint development and sales successes there. Today, wind energy technology is a core industrial segment for the Angst + Pfister Group, and we derive a substantial portion of our earnings from this business area, particularly in the highly competitive Chinese market.

Customized components for wind turbines

Since entering the wind energy market in 2008, we have achieved success in directly marketing numerous components from our very extensive array of standard parts. However, particularly in the area of antivibration technology, there was also a need for new product developments to supplement the existing range of elastomeric mounts on the market for giant wind turbines. In order to ensure full structural integrity, Angst + Pfister utilizes state-of-the-art virtual product development technologies when devising new components.

February 2011: 2-MW wind turbine prototype in Inner Mongolia, China. This prototype is equipped with a manifold of Angst + Pfister components among which the generator mounts play an essential role. The turbine has been in operation without interruptions since September 2010.

It goes without saying that before an initial prototype is built, technically-demanding products like elastomeric mounts for wind turbines are first exhaustively simulated on a computer to verify their suitability for day-to-day use. We do this with the help of our longstanding, broadly proven expertise in polymeric materials, which pose especially tough challenges for realistic computer simulations due to their pronounced nonlinear material behavior. A realistic analysis of elastomeric mounts thus combines all three possible causes of non-linear component behavior: the material itself, operating conditions and component geometry. We also kept a steady eye on modularizing the product to a large extent, which optimizes the total cost of ownership lowering production costs.

Virtual product development and state-of-the-art simulation of real working conditions of the APSOvib® generator mount prior to prototype manufacturing.

The 2-megawatt wind turbine. This mount not only meets all of the requirements for day-to-day operation, but is also designed to withstand critical stress forces such as those that occur, for example, if the wind turbine drive train accidentally jams. Furthermore, the mount’s rugged temperature resistance even in cold environments makes it deployable in nearly all of the world’s climate regions. The elastomeric mount was developed and tested over a period of twelve months under strict compliance with all of the relevant industry specifications. It was particularly also tested and certified for conformity with the Germanischer Lloyd “Guideline for the Certification of Wind Turbines.”

In China, more than 100 wind turbines in the 2-MW class have already been successfully equipped with Angst + Pfister generator mounts since mid-2010. A variety of other components from our Antivibration Technology, Sealing Technology, Fluid Handling Technology and Engineering Plastics Technology product groups round out Wind Power Industry product basket.

If you are looking for a strong internationally present technology partner that is capable of supplying a wide range of high-grade products, profound engineering expertise and customized logistics concepts for the wind energy sector, then Angst + Pfister is the right address. We are eager to work with you to develop wind turbine solutions.

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www.angst-pfister.com
Accurate timing belts perfectly positioned for the packaging industry

Rychiger AG develops and manufactures machines for the production of coffee and tea capsules. The prefabricated capsules must be moved into exact position at individual processing stations such as filling and sealing stations. The use of custom-made timing belts designed by Angst + Pfister makes it possible to meet these precise positioning requirements.

State-of-the-art machines for the filling and sealing of prefabricated capsules and customized solutions for complete packaging processes are the core competency of Rychiger AG. The company based in Stäffisburg, Switzerland, is one of the world’s leading suppliers in this field. Rychiger AG has been fully meeting customers’ high demands for many years now, with a product range that is always at the cutting edge of new technology. Intelligent selection of materials and profound technological know-how form the foundation of the company’s success. The use of innovative barrier materials such as multilayer plastics or aluminum combined with precision filling and sealing technology guarantees safe, durable and customer-friendly packaging for Rychiger AG’s clients.

Timing belts – from station to station with millimetric precision

Coffee capsule systems (Illustration 1) have quickly become bestsellers. The Rychiger FS 910 (Illustration 3) assembles, fills and seals prefabricated capsules of all types. The machine, designed for dry cleaning, built around five modules that can be combined and supplemented with other modules or functions as needed. Custom-made timing belts from Angst + Pfister measuring up to 20 meters in length transport the capsules from station to station through the machine and ensure ultra-precise positioning.

Thanks to light and air-tight barrier materials and nitrogen flushing of the capsule contents, the fabricated capsules without environmental packaging materials have a shelf life of up to 12 months. The capsules are put through a series of production steps as they are moved through the machine on carrier plates (Illustration 2). Up to 1,440 capsules with a diameter of 37 millimeters can be filled per minute.

Expectations fully met

The conveyance system for the unusually long machine had to meet high expectations with regard to positioning and linear precision. The wish to position capsules at different manufacturing step stations simultaneously with a single conveyor element presented the engineers with a great challenge. Initially, an attempt was made to achieve the required rigidity with welded standard timing belts. In order to circumvent weak points in the welding and splicing inaccuracies, Angst + Pfister divided a BRECO® 50 AT20 timing belt into two 25-millimeter-wide belts and then welded these to the required length of 18,720 millimeters. Afterwards, the belts were also welded laterally so that the belt connection was staggered by 180 degrees. The positive result was a significant increase in strength and stiffness in the critical area.

Focused expertise

At the same time, the accuracy of the partition in the AT20 profile could be doubled by staggering of the belts. To achieve optimum coherence of the two belts, the back of the belt was ground down to the steel reinforcement and reextruded with a polyurethane surface. Two BRECO® 50 AT20/18720V timing belts of this type that are manufactured in pairs are employed in the Rychiger FS 910 (Illustration 3). They move the capsule carrier plates that are perpendicularly attached to them safely and reliably through the entire machine (Illustration 4). The close collaboration between Rychiger AG’s skilled engineers and Angst + Pfister’s drive technology experts resulted in a highly efficient, reliable and economically feasible solution. The deciding factor for this excellent outcome was the early combination of technological and solution expertise into a productive joint-development team.

Diversity with guaranteed longevity

Angst + Pfister’s timing belts meet our customers’ highest demands and can be adapted to any application in accordance with the construction specifications and deployment conditions. A wide variety of materials, special steel cord designs and diverse coating options are available, and there is also the possibility of mechanical finishing. For conveyance and transport tasks, the high-quality drive elements are also available with weld-on or bolt-on flights, while internal steel cable reinforcements provide high load capacity. Moreover, the use of polyurethane as a substrate also makes the timing belts extremely abrasion-resistant and thus especially durable.

Engineering and Experience – a strong team

Application-specific solutions in the field of drive technology are one of Angst + Pfister’s great strengths. Our drive technology experts will be glad to consult with you onsite. Or simply tell us the parameters of your individual application and our engineering team will pull out all the stops to develop an ideal solution for you.

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Maximum measuring accuracy thanks to highly efficient vibration dampers

The ultra-innovative x-ray “free-electron laser” (FEL) that is currently being developed at the Paul Scherrer Institute will reveal information previously inaccessible to humans. To keep the FEL accurately functioning, Angst + Pfister devised a customized solution that reduces vibration to an absolute minimum.

The Paul Scherrer Institute (PSI) conducts globally recognized large-system research and provides, among other things, world-class research workplaces and infrastructure. The new SwissFEL testing facility is being built to provide instructive insights into the internal structures of materials. The novel cutting-edge technology places high demands on all components. The x-rays generated by this system enable interdisciplinary teams from the fields of biology, chemistry, physics, and material sciences to gain deep new insights into the internal structures of materials and into the physical processes taking place in them. The goal of SwissFEL is to enable scientists to obtain new detailed information about various processes that previous research methods could not unveil. The peak intensity of the planned SwissFEL facility will be approximately ten billion times higher than that of PSI’s existing synchrotron Swiss Light Source (SLS).

A specialist in antivibration technology, Angst + Pfister explained in detail to its customer the advantages and disadvantages of each vibration insulating technology. The highest insulation efficiency was achieved with the air springs. But in contrast to the other proposed products, this option is not maintenance-free. The solution proposal employing helical spring elements achieved an intermediate degree of insulation. Finally, the polyurethane strip bearing was the least expensive solution on the one hand, but on the other hand it offered the lowest insulation efficiency.

Harnessing engineering know-how to devise the ideal solution. After carefully weighing all of the criteria, the project managers at the PSI opted for the mounting solution with the highest insulation efficiency. In terms of functionality, the air spring elements supplied by Angst + Pfister are the best possible solution for effectively eliminating vibrations at the SwissFEL facility. The natural frequency of this setup is in the 4 Hz range at a load of approximately 260 kg per bearing. An extensive product range coupled with the know-how of a distinguished expert in the field of antivibration technology resulted in an optimum solution for this application.

Two institutions with decades of technical expertise, Angst + Pfister and the Paul Scherrer Institute designed and implemented an optimal solution for this challenging engineering assignment.

We will be happy to work out a customized solution for you using our wide range of standard or custom designed product.

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Details make the difference

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Two institutions with decades of technical expertise, Angst + Pfister and the Paul Scherrer Institute designed and implemented an optimal solution for this challenging engineering assignment.

We will be happy to work out a customized solution for you using our wide range of standard or custom designed product.

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### Quality Certification Documents and Engineering Services

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<thead>
<tr>
<th>Documents</th>
<th>Norm</th>
<th>Description</th>
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<tr>
<td>Manufacturer certificate of compliance 2.1</td>
<td>EC 10204-2.1</td>
<td>Certification of delivery in compliance with the order specifications</td>
</tr>
<tr>
<td>Manufacturer certificate of compliance 2.2</td>
<td>EC 10204-2.2</td>
<td>Certification of delivery through manufacturer’s quality-control department</td>
</tr>
<tr>
<td>Manufacturer certificate of compliance 3.1</td>
<td>EC 10204-3.1</td>
<td>Certification of compliance with the order specifications including results of specific testing</td>
</tr>
<tr>
<td>Manufacturer certificate of compliance 3.2</td>
<td>EC 10204-3.2</td>
<td>More rigorous certification of compliance with the order specifications including results of specific testing</td>
</tr>
<tr>
<td>Declaration of conformity</td>
<td>ISO/IEC 17025</td>
<td>Certification that the specific properties of a certain good or version meet recognized standards</td>
</tr>
<tr>
<td>IMDS entry</td>
<td>VDA 231-106</td>
<td>Entry in International Material Data System and Global Automotive Declarable Substance List</td>
</tr>
</tbody>
</table>

### Engineering Services

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulting</td>
<td>Engineering consulting charged per hour</td>
</tr>
<tr>
<td>Designers</td>
<td>Services comprise product and material design and testing, failure analysis, computer aided engineering, etc.</td>
</tr>
</tbody>
</table>

* price based on requirement

### Value Adding Manufacturing Services

#### Sealing Technology
- Stamping of flat gaskets
- Mechanical workshop: turning, milling and drilling of hydraulic and pneumatic seals, flat gaskets and rotary seals
- Rubber cutting: cutting of rubber boards and rolls
- Finishing (WABE): cutting profiles and O-ring sets

#### Fluid Handling Technology
- Mechanical workshop: turning, milling, drilling and broaching of fittings
- Assembling hoses: pre-cutting of long hoses and assembling of hoses
- Finishing (WABE): pre-cutting of short hoses
- Welding of metal hoses: pre-cutting of metal hoses and welding of metal hoses

#### Plastic Engineering Technology
- Mechanical workshop: turning, milling, drilling and broaching of parts
- Plastic cutting of sheets, tubes, rods, foils, pre-cut parts and profiles

#### Drive Technology
- Belt cutting to length, punching and welding
- Mechanical workshop: turning, milling, drilling and broaching of pulleys, couplings, gears
- Finishing (WABE): cutting, punching, welding, labelling belts/reparing safety lamps, changing safety lamp battery, labelling electrical drives, mounting metal belts

#### Antivibration Technology
- Cutting and stamping of sheets
- Broaching and drilling of rubber-metal rails
- Turning and crosscutting of unrest springs
- Calibrating gas springs from 50 N to 2,000 N

### Engineering assessment

Over the years, Angst + Pfister has amassed expertise across a broad range of industries. Getting us involved at the beginning accelerates the time-to-money of a new design project. Under the APSO (Angst + Pfister Solutions) brand, our engineering specialists develop tailor-made solutions for practically any application within our five core product areas.

### Design-in and cost-out

Our application engineers’ excellent knowledge of materials and deep understanding of the manufacturing process make Angst + Pfister the ideal partner for customer-specific product solutions. Our experts consider the entire production process and help our customers systematically save money by reducing total cost of ownership.

### Prototyping and samples

During the development process, Angst + Pfister saves time for customers not only by quickly creating prototypes, but also by manufacturing pilot series. We also provide declarations of conformity with a wide variety of industry regulatory norms and leading industry-specific certifications.

### Series production

Drawing on a wide international network of manufacturers, Angst + Pfister supplies the technical component that exactly complies with the detailed product specifications and all pre-agreed quality certifications and industry standards.

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**Virtual design and detailed product specifications are created, and our state-of-the-art production facilities can quickly deliver fully functional prototypes and samples.**

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We create your custom-cut components using our high performance computerized cutting equipment

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### Customer benefits

- Clearly defined norms
- Detailed product specifications
- Quality certification documents and testing
- Supply chain solutions
Save time and money in procurement with Electronic Order Processing

At Angst + Pfister we offer a wide range of Electronic Order Processing (EOP) solutions to manage order-related information in an integrated way. So what is your benefit? It is simple: less manual work, fewer mistakes and reduce the process costs per order by as much as 60%.

APSOparts® The Angst + Pfister Group’s on-line shop is your source for more than 100,000 catalog items and is a platform for creating customized items. APSOparts® is a state-of-the-art e-commerce platform where you can find low market prices, real-time product availability and delivery information. If you would like further information about APSOparts®, visit us online or contact support@apsoparts.com.

APSOparts® upload module What about the possibility of composing your orders offline and then uploading the final list directly into your shopping cart with a few easy clicks?! Our easy upload module enables you to import order files into APSOparts® in the most common formats: Microsoft Excel (.xls), plain text format (.txt), comma-separated values format (.csv), xml, and SAP IDocs.

APSOParts® NetScan Quickly reordering inventory is easy with the integrated APSOparts® scanner and barcode labels. Customers can implement this practical solution in a few easy steps, creating ready-to-print barcode labels and then simply scanning the desired item’s barcode and entering the desired quantity (Figure 1). Pushing one button, you will automatically be logged in and the data will be transferred to APSOparts®. With two additional clicks the order is already in our system, ready to be processed (Figure 2).

EDI “light” and “full” Electronic Data Interchange (EDI) is the next step up in our EOP portfolio of procurement efficiency solutions. EDI is ideal for sustainable supply chain management improvements and for ordering both standard catalog parts and custom-made special items. Angst + Pfister handles and accommodates all of the current EDI standards on the market to exactly meet our customer’s needs.

Angst + Pfister’s EDI solution is so flexible that it can be easily expanded to include electronic invoicing (Swiss VAT compliant). The EDI “light” (Figure 3) and EDI “full” (Figure 4) solutions give Angst + Pfister customers a further choice of Electronic Order Processing options. EDI “light” is especially designed to reduce the time and cost of implementation: we can go live with EDI in the span of just a few days!

We also have more specific and tailored-made EDI solutions to meet the requirements of the most demanding customers.

We are specialists in situations where administrative costs for ordering C-parts are higher than their actual order value.

APSOparts® Punch-out catalog Many of our customers order standard parts at irregular intervals due to small production runs, variable product ranges, or maintenance, repair and overhaul (MRO) work.

In order to keep procurement costs and warehouse inventories low, customers use ERP software to coordinate C-parts orders. Angst + Pfister’s punch-out catalog uses Google functions to select products in the APSOparts® online shop and then to import them, with all of the agreed-upon conditions, into the customer’s ERP system. The order then automatically goes via EDI to Angst + Pfister. Our solution is available for SAP, ARIBA or any ERP system that supports the standard OCI interface (Figure 5).

E-platforms E-platform connections are part of our daily business. We have developed standardized connections between Angst + Pfister and the most common e-purchasing platforms: Swisscom IT Services, Ariba, io-market and cc-hubwoo, to name just a few. So for customers affiliated with these platforms, ordering Angst + Pfister products becomes even easier because they can benefit from one-stop shopping through a unique purchasing process interface with all of their suppliers.

C-parts logistics suppliers Angst + Pfister works in close collaboration with industry-leading C-parts logistics suppliers of fastening technology such as Bossard SmartBin, Debrunner Acifer, SFS unimarket and Würth Industrie Service. Adding Angst + Pfister products to an existing logistics supplier’s basket offers our customers additional procurement efficiency (Figure 6).

We would be glad to discuss all of our electronic ordering processing solutions in greater detail with you. Together we will find the one that will enable you to improve supply chain management to thus make you even more successful on the market. We’re looking forward to providing you with more details – just contact us!

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Figure 1: Barcode scanning

Figure 2: Availability and order overview

Figure 3: EDI “light”

Figure 4: EDI “full”

Figure 5: Punchout catalog

Figure 6: C-parts logistics suppliers
Huge assortment of more than 150,000 standard articles

Outsource your global sourcing to Angst + Pfister and leverage the economies of scale from our huge procurement volumes. Our global network of approved manufacturers ensures consistent quality and best price across our massive range of standard and customer-specific items.

Balanced and varied: the new APSOvib® range of buffers

Angst + Pfister’s APSOvib® range of buffers provides a comprehensive and balanced array of round buffers and stop buffers. Our clearly structured product offering with its distinct buffer type designations ensures clarity and makes it easy to quickly find the ideal buffer from an assortment of more than 1,000 different items, whether for use as equipment mountings or as vibration-isolating fixing elements. Each type of deployment places specific demands on buffers: load capacity, spring deflection and spring stiffness must be precisely coordinated. Thirteen different buffer shapes are available in three different grades of hardness and produced according to the international standards DIN 95 363 and DIN 95 364 to cover every conceivable application.

The ideal buffer effortlessly shoulders the weight force that acts upon it while also providing the right amount of spring deflection for the given circumstances. To help you select the right APSOvib® antivibration elements, the product descriptions for each individual buffer provide information on their spring characteristics, dimensions, hardness and fastening method. It goes without saying that custom-fabricated buffers tailored to your specific needs and expert advice are also part of Angst + Pfister’s APSOvib® service offering!

Order directly via our online shop APSOparts® and benefit from our high product availability: www.apsoparts.com

APSOvib® Semifinished Plastics

for any application: innovative solutions involving plastics

Our European logistics center stocks an extensive assortment of semifinished products in more than 120 different types of plastic; ranging from simple standard plastics to ultra-high-performance plastics. Specially modified plastics are also available to meet application-specific requirements such as ATEX-compliant explosion protection. For uses in the food industry and medical technology, we provide the requisite product conformities and certifications such as ISO 10993, USP and FDA.

Ready-to-use finished parts are manufactured on a customer-specific basis, i.e. from drawings, sketches or samples on powerful CNC or conventional machine tools using methods such as turning, milling or drilling – whether as prototypes, in small batches or all the way up to mass production series. Angst + Pfister also supplies outline-cut finished parts processed by means of stamping, water jet cutting and laser cutting. Hot forming of transparent plastics, casting of polyurethanes, and extrusion and injection molding of thermoplastics round out our offering.

APSOplas® Semifinished Plastics

for any application:

innovative solutions involving plastics

High-performance computerized cutting equipment guarantees precision cutting to size and angle in accordance with customer specifications. With our cut-to-size configurator, you can also easily calculate and order custom-cut plastic plates from our APSOparts® online shop at www.apsoparts.com

APSOvib® range of buffers

APSOplas® Semifinished Plastics

APSOseal® O-rings and Rotary Seals

from one single supplier:

Benefit from our extensive product assortment

With its specific know-how and more than 90 years of experience in sealing technology, the Angst + Pfister Group has made it its mission to provide customers with skilled and solution-minded advisory support. Our experienced application engineers assist you in:

• defining the right material
• optimally designing the groove and
• optimizing assembly

Our wide assortment of O-rings covers the full spectrum of standard and high end applications while presenting an excellent price-performance proposition. In addition, we also supply optimum sealing solutions even for highly specialized applications.

More than 150,000 standard articles available for your individual needs

“We appreciate the broad range of customized products and the absolute supply punctuality.”

Florian Wenger, LNS Europe SA

“Angst + Pfister’s know-how and delivery reliability help keep our production running like clockwork.”

Dominik Huber, Digmesa AG

www.angst-pfister.com
Angst + Pfister is continuously expanding its technical competence for your benefit. We are further investing to serve you even better by expanding our already enormous assortment and by developing sustainable technology solutions. We are pleased to inform you about our latest innovative news!

### News

**Stromwerk**: Sustainable solar power for the industry

Angst + Pfister is firmly committed to developing technologies for renewable energy and driving solar power for industries across Switzerland. In line with this vision, Angst + Pfister has found a dynamic, innovative partner in the Swiss solar power industry: Stromwerk AG, headquartered in Zurich. As of September 1, 2011, Angst + Pfister holds a 50% equity stake in Stromwerk AG that builds and operates its own photovoltaic power plants in Switzerland since 2008. The renewable solar electricity that it generates is sold to environmentally conscious enterprises who want to benefit from this locally and sustainably produced energy.

Solar power from your own industrial rooftop

The economic and ecological added value is clear, additionally utilizing solar power produced on your companies own roof generates enormous boost to your company’s public image, lower investment costs and is useful for complying with environmental regulations and certifications. A roof-mounted solar power plant is often a compelling environmental management systems fully comply with international norms and standards. We look forward to continuing to serve you in the future with the highest and sustainable quality standards.

### Articles

**Angst + Pfister Nano Tension Meter**: tiny measuring device with big benefits

The newest Angst + Pfister Drive Technology product is small, practical and highly efficient. Whether during the installation, final check or startup of machinery equipped with belts, the handy Nano Tension Meter, which is hardly bigger than a matchbox, today forms part of the standard toolkit for all drive belt technicians.

**COLLECTOR® and COLLECTOR® FLEX**: flexible user-friendly hoses for the food-and-beverage industry

The high-grade COLLECTOR® suction and pressure hose is ideally designed for applications on milk collection trucks. The hose’s white inner lining made of natural rubber is absolutely odorless and has no effect on taste. Additionally, this lining is unaffected by raw milk and many commonly used detergents. Cleaning is easy because this hose is also resistant to hot water at temperatures of up to +70°C; the temperature can even be raised to +90°C for periods of up to 20 minutes. Steam sterilization is even possible at temperatures of up to +130°C for a maximum of 20 minutes.

One special feature of this hose is its ultra-flexibility, which makes it very easy for the operator to handle. Its natural-rubber outer layer is extremely abrasion-resistant and is also resistant to UV radiation and ozone. It goes without saying that COLLECTOR® and COLLECTOR® FLEX hoses meet all of the respective national food hygiene regulations. The COLLECTOR® with its integrated steel-wire helix is a high-quality product that has proven itself over years of use. It is available from stock in the following nominal widths.

New: The COLLECTOR® FLEX with an integrated plastic helix is an advancement on the tried and trusted COLLECTOR® hose and is available on request.

**COLLECTOR® and COLLECTOR® FLEX hoses**

**Angst + Pfister Magazine No. 10 2012**

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**Angst + Pfister News**

Stromwerk AG, your partner – for a strong and sustainable future from both an ecological and financial perspective.

Would you like to upgrade your building into a solar power plant or to enter a new business segment with photovoltaics? We will be happy to work with you to devise a solution tailored to your interests.

**Stromwerk AG, CEO of Stromwerk AG**

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Contact: kontakt@stromwerk.ch

**stromwerk.ch**
Individual PEWATRON solutions for industry

PEWATRON is an independent company within the Angst + Pfister Group specialising in sensors, power supplies and electronic components.

Pressure monitoring as a core competence
PEWATRON stocks suitable sensors or sensors for almost all applications. The pressure sensor range includes sensors for pressures of 20 Pa to 3000 bar; with or without boost or conditioning, for assembly on printed circuit boards or in pipes and for price-sensitive or high-end devices.

The range has been continuously adapted to meet current customer and market requirements by introducing additional products and upgrades. New applications make ever higher demands on the sensors: for example, digital interfaces are often requested instead of analogue.

Main fields of application: medical technology, pneumatics, mechanical engineering, vehicle construction, hydraulic systems.

Pressure sensor PEWALog data logger – robust multi-talent with LC-indicator
The PEWALog allows four external sensors with analogue output signals to be connected. The measuring and storage rates can be adjusted independently between 1 second and 12 hours. Over two million measurements can also be stored in the logger. A catch is included in the scope of supply to enable the logger to be mounted easily on a profile rail (TS 35).

The recorded data can be read out on any laptop or PC with the aid of the supplied software (set-up, reader and viewer software) and a USB cable.

The main fields of application are: research and development, medical technology, laboratory technology, food industry, agriculture and farming.

The compact PEWALog measures and stores up to four different measurements simultaneously.

Power supply units for industry, IT and medical electronics
PEWATRON is continuing to expand the range of high-quality and reasonably priced power supply units manufactured by Mean Well, FSP Protek and Power Mate (P-Duke). The universal input for all models is 85-264 or 180-550 VAC, and one to five output voltages from 3.3 to 56 V are available. Some versions also have an auxiliary output for activating control electronics or potential free contacts and functions such as PFC, Remote, Remote Sense.

Standard designs available include Open Frame, U-Profile, print solderable modules, desktop units as well as various housings and industrial formats. DC/DC converters are also available as print or chassis modules. The entire range of power supply units is available from the online shop. We will also be pleased to develop solutions tailor-made to your particular requirements.

Complete range: power supply units 5 W to 3000 W with one to five outputs in the following designs: open frame, chassis, print module and desktop version.
Angst + Pfister Group: The Leading Supply and Solutions Partner for Industrial Components

We help our manufacturing clients to save hundreds of thousands of euros every year by providing custom-engineered components, a vast product range comprising more than 150,000 standard items and integrated supply chain solutions.

Our core product divisions

APSOpast®
Engineering Plastics Technology

APSoseal®
Sealing Technology

APSOfuid®
Fluid Handling Technology

APSODrive®
Drive Technology

APSObib®
Antivibration Technology

The Angst + Pfister Group serves its customers internationally with uncompromisingly high-quality products and comprehensive solutions. Our global supplier and distribution platform enables us to guarantee the same product quality and price regardless of whether you are manufacturing across Europe or Asia. The breadth of our standard product assortment makes us a one-stop shop that not only simplifies your search, but also enables you to consolidate suppliers. Our engineering solutions are designed to seamlessly interface with your R&D in ways that save you research time and money in the product development stage.