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What began between Bellotti and Angst+Pfister at the InnoTrans 2012, is soon to be seen worldwide

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Air-conditioning equipment on the carriage roof, dampening vibration, but still very securely installed

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Sophisticated fluid technology reduces the weight, simplifies installation and increases the service life
Dear readers and valued customers,

When I catch the train to work early in the morning, I am always deliberately aware of the vibrations under my feet. The amount of vibration and acoustic noise that my fellow passengers and I feel and hear depends on factors such as the state of the track superstructure, the bogie suspension, the floating floor construction and, last but not least, the number of passengers.

We at Angst + Pfister can do a lot to enhance the comfort and safety of train passengers as well as to extend the service life of rail vehicles and entire track systems.

To isolate the vibrations of moving trains and to absorb shocks caused by wheel and rail surface irregularities, we manufacture floor suspension elements made of PUR, CR or EPDM, for example. Our engineers, specialized in antivibration technology, work together with clients to develop customized solutions precisely tailored to their needs.

Practically all of our solutions already comply with the new pan-European fire protection standard EN 45545, which entered into force in October 2013, replacing the respective national safety regulations of the individual EU member states. Our antivibration solutions for floating floors, and our window profiles as well, are fire- and smoke-resistant in accordance with EN 45545. We are experienced in maneuvering through oftentimes complicated certification processes and are not daunted by this task even with regard to other regions and countries.

One major European rail vehicle manufacturer has entrusted us with developing safety-relevant elastomeric components for bogies. After successful trial testing, these parts are now being installed in prototype vehicles. We expect series production to begin shortly.

However, vibration isolation starts in the track superstructure: with sub-ballast mats, under sleeper pads or mass-spring systems. We calculate, specify, test and produce track superstructure solutions with profound expertise and with the same commitment that we devote to railway vehicles.

Antivibration technology, engineering plastics technology – and just as equally sealing technology and fluid-handling technology, such as corrugated metal hoses for fuel or coolant lines. For every technology area, we staff a specialized international team of engineers that passionately and innovatively finds the right solution. And we have the global production platform that it takes to manufacture those solutions exactly in the desired quality. For another internationally operating rail vehicle manufacturer, we have just designed and produced a metal hose line system used to cool transformers that minimizes weight and maximizes production and operational efficiency as well as service life.

We are delighted to share our enthusiasm for well-engineered mobility with you. Turn the pages and read on!

Erich Schmid
Chief Technology Officer
Ensuring smooth operation on the tracks and in the carriages Since 1953, Angst + Pfister has supplied the railway industry’s leading manufacturers and operators with uncompromisingly high quality products and comprehensive engineering solutions.

Railway manufacturers, maintenance organizations and track installers all benefit from our long-standing industry experience and our engineering expertise. Industry leaders rely on Angst + Pfister for standard as well as custom-designed components that meet the highest technical specifications and railway norms. Let Angst + Pfister bundle all the components you need and ship them just-in-time to your international manufacturing facilities.

Engineering, standards and certification Angst + Pfister’s engineering team patents every year new products specifically designed for railway industry in the Antivibration, Sealing and Hosing product areas. Our solutions for railway are all compliant to the most advanced and updated standards, such as DIN EN 45 545 or other nation-specificSmoke and Fire Standards. Our representatives take part in various Standards Committees to ensure our readiness for any upcoming technical requirement.

Our customers benefit from these competitive advantages through a solid partnership with Angst + Pfister which proves time and again that co-design projects are the best solutions to reduce Time-To-Market.

SNCF laboratories, TU Munich, LAPI and LNE: We test and certify our innovations at laboratories which are recognized globally for their expertise. Furthermore, we are proud of our Quality Management process, making Angst + Pfister a market leader in product conformity within the railway industry.

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Milan World Expo 2015: a witness to an intensive partnership

A city is preparing to make history. A city is bringing the world together. Milan is building for the 2015 World Exposition. AnsaldoBreda S.p.A. is supplying state-of-the-art rolling stock for the extended Milan Metro lines M1 and M2, Bellotti S.p.A. is providing vibration-absorbing flooring for the subway trains, and Angst + Pfister is supplying the antivibration elements. The partnership between Bellotti and Angst + Pfister has its own history: a fast-paced and exciting one that spans multiple continents and is continually evolving.

Pietro Bellotti remembers it exactly. It was at the 2012 InnoTrans exhibition. The world’s leading trade fair for transportation technology is a permanent fixture in the professional agenda of the chief executive officer of Bellotti S.p.A. So it was in Berlin, in September 2012, that he personally encountered Angst + Pfister for the first time. Bellotti S.p.A., which was founded in 1927 as a company anchored in the timber industry specialized in the production of plywood, had already long since gotten involved in additional lines of business. “Our firm has been supplying the railway industry with floor panels for around 30 years now,” Mr. Bellotti explains. But mere floor panels alone are not enough. That’s why he enlisted the Rome-based AGT Engineering group several years ago as a partner to design the entire floor construction. And here’s where the contact with Angst + Pfister comes in. A new vibration-damping concept is needed. Mr. Bellotti’s initial contact person, Angst + Pfister Italy’s managing director Jean-Pierre Baroni, shows him examples of work done for railway technology suppliers like Siemens and Bombardier. The chemistry between Bellotti and Angst + Pfister resonates, and the companies start to collaborate shortly after the 2012 InnoTrans show.

The Copenhagen Metro: new solution for new trains. The timing is ideal because Mr. Baroni is already in contact anyway with AnsaldoBreda S.p.A. precisely in a matter concerning vibration isolation, one of Angst + Pfister’s many specialties. The rolling-stock engineer specializing with production facilities in Naples, Reggio Calabria, Pistoia and Palermo is a subsidiary of Fimecmeccanica, one of the largest industrial groups in Italy, with 75,000 employees. AnsaldoBreda is gearing up to build 28 subway trains for the Metro in Denmark’s capital city of Copenhagen. The trains consist of three articulated cars each and, like all of the trains employed in Copenhagen’s Metro system, will operate fully automatically without any drivers. AnsaldoBreda was awarded the order for the carriage flooring along with the antivibration system to Bellotti.

Within the span of just one year, a partnership grows between Bellotti and Angst + Pfister based on mutual profound expertise and trust. This lays the foundation for their collaborative work for the Copenhagen Metro: the antivibration system from Angst + Pfister is integrated into the flooring supplied by Bellotti. The plywood floor panels with an integrated elastic vibration-absorbing core layer rest on an aluminium/vulcanized chloroprene rubber conical mounts that isolate the vibrations of the moving train and absorb shocks caused by wheel and rail surface irregularities. The conical mounts are screwed to the plywood floor panels and are adhesively bonded to an underlying metal frame. The floor panels effectively insulated this way are covered with a rugged rubber mat.

EN 45545 fire and smoke resistance guaranteed. The solution proposed by Bellotti, AGT Engineering and Angst + Pfister meets all of AnsaldoBreda’s specifications. It is also fire- and smoke-resistant in compliance with the new European standard EN 45545, that has replaced the respective national safety regulations of the individual EU member states. Milano Metro: Vibration insulation for 30 trains. In parallel with the order for the Copenhagen Metro, the modernization of Milan’s Metro lines M1 and M2 has moved ahead as mobility further expands. While some railway technology companies favor vibration isolators spaced at points, others prefer planar isolation elements. Be it conical mounts or pads, chloroprene or polyurethane – our engineering department devises the right technically sound solution for isolating vibrations.

“Be it conical mounts or pads, chloroprene or polyurethane – we find the right technically sound solution for isolating vibrations.” Jean-Pierre Baroni, Managing Director, Angst + Pfister Italy

So, together with Angst + Pfister, we are embarking on a new chapter in our partnership and creating possibilities that benefit both companies. Angst + Pfister’s engineering solutions help us not only to penetrate the manufacturing sector of the railway technology industry more deeply, but also to develop new markets. That ultimately benefits both companies.”

Milano Metro: Vibration insulation for 30 trains. In parallel with the order for the Copenhagen Metro, the modernization of Milan’s Metro lines M1 and M2 has moved onto the radar screen. The city in northern Italy is starting to get ready for Expo 2015. AnsaldoBreda is building 30 six-car subway trains and holds an option for 30 more. And Bellotti once again is manufacturing the floor construction. So, whoever will be traveling on the Metro though Milan to the Expo grounds between 1 May and 31 October 2015, will assuredly be setting foot on a floor that provides smooth ride comfort with the help of antivibration elements from Angst + Pfister.

Work on Milan’s M4 Metro line is already underway, with 47 four-car subway trains envisaged for the line. AnsaldoBreda will once again leverage its expertise in building fully automated, driverless trains. And Bellotti, together with Angst + Pfister, will once again contribute its state-of-the-art solution. Meanwhile, Pietro Bellotti is already putting out feelers to South America. In the beginning, floor constructions accounted for only a few percentage points of Bellotti S.p.A.’s turnover, but today they generate one-fifth to a quarter of the company’s consolidated revenue.

Supply chain: delivery to the deep south within 48 hours. Jean-Pierre Baroni and his team frequently double-check the supply chain because that’s also a part of Angst + Pfister’s product and service offerings. As a precaution, Angst + Pfister’s international logistics center in Embrach, Switzerland, always maintains a reserve stock of conical antivibration mounts. These are manufactured at the Angst + Pfister Group’s own factory in Bursa, Turkey. Pietro Bellotti can thus always rest assured that Angst + Pfister controls the quality along the entire production process and is capable of delivering within 48 hours. Even to Reggio Calabria in the deep south of Italy where, at the AnsaldoBreda plant facility there, a Bellottl team installs the flooring systems in the trains.

“Angst + Pfister’s engineering solutions help us to penetrate the railway technology market more deeply and to develop new markets. It’s a win-win situation.”

Pietro Bellotti, Managing Director, Director of Transportation sector, Bellotti S.p.A., Cermenate, Italy

Embracing on the next chapter

“The vibration-absorbing floor construction concept used in the trains also lends itself to yachts and cruise liners, and is suitable in general for boats, barges and ships. By isolating vibrations and noise, we enhance passenger comfort, on land and soon also on water.

So, together with Angst + Pfister, we are embarking on a new chapter in our partnership and creating possibilities that benefit both companies. Angst + Pfister’s engineering solutions help us not only to penetrate the manufacturing sector of the railway technology industry more deeply, but also to develop new markets. That ultimately benefits both companies.”

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Railway Industry Magazine
Carriage construction: Elastic mountings absorb vibrations and noise

The field of railway carriage construction is discovering the benefits of rigid but elastic and malleable polyurethane: As a floor mounting, the elastomer isolates vibrations and absorbs noise. Siemens is currently at work in Vienna fitting 190 carriages with elastomer strips. Angst + Pfister has built up specific know-how in affixing these safety-relevant parts, and also places this expertise at the disposal of other customers.

The Angst + Pfister production facility in Zoetermeer, Netherlands. One of the European Adhesive Specialists at work.

Anyone who makes his way through a modern train is most likely moving along a double floor. Elastic mountings between the underfloor, on the one hand, and covered plywood floor, on the other, make it possible to forget any uneveness in the wheels and in the tracks. The mountings not only dampen vibrations, but also reduce noise and sound.

The elastomers in Angst + Pfister’s product range are increasingly being used as the material for these flooring structures. They significantly increase passenger comfort, and above all also extend the useful life of the carriages and their components, thereby facilitating an overall reduction in life-cycle costs.

Siemens is using a high-performance elastomer for the large-scale order which has received from Russia: This material is required to withstand the harsh climate and large temperature differences that prevail there. In addition, the polyurethane must meet the DIN 5510-2 fire protection standard.

Safety-relevant adhesive bond

An aluminum plate is mounted on the polyurethane blocks. What makes this adhesive bond between the polyurethane and the metal so special is that it is just as safety-relevant as the elastomer itself. It is for this reason that Chief Technology Officer Erich Schmid, who is personally taking care of Siemens out of our headquarters in Zurich, has trained as a European Adhesive Specialist (EAS).

The adhesive work is carried out in the Netherlands, at Angst + Pfister’s production facility in Zoetermeer, where an additional four colleagues have completed EAS training.

The elastomer blocks and the aluminum plates must be completely clean before being affixed.

Absolute precision and reliability

“Our flame-retardant two-component epoxy adhesive to be applied, both the elastomer blocks and the aluminum plates must be completely clean,” explains Erich Schmid. The staff must wear silicone-free gloves during production. There is not even the slightest breeze to be felt in the production hall, because the wind could blow up dust. Additionally, temperature fluctuations are kept to an absolute minimum. Throughout the entire production process, members of our staff are accompanied at all times by at least one of the European Adhesive Specialists. They record the stages of the work in painstaking detail in a logbook so that every single step can be retraced. The fact that the Angst + Pfister operation in Zoetermeer meets high standards of precision and reliability is highlighted by its certificate from the Fraunhofer Institute for Manufacturing Technology and Advanced Materials. Upon completion of the corresponding training of specialist staff, it awards Angst + Pfister a certificate of suitability for adhesive work in connection with rolling stock and rolling stock parts in accordance with DIN 6701-2.

Know-how that benefits the customer

“This process has enabled us to acquire new know-how and additional skills,” explains Erich Schmid. “This in turn also enables other customers to benefit.” And here, he is thinking not only in terms of professional diligence – the focus in the development of the adhesive process is also on efficiency. “If a customer involves us at an early stage of a project, this has a positive impact on production,” says Erich Schmid. “We feel responsible – not only for the final result, but also for the manufacturing processes. In engineering, we often succeed in taking a customer’s wishes and translating them into solutions that simply no one had previously thought of.”

A brief question to conclude: How are the polyurethane blocks installed together with the aluminum plates? Siemens attaches the floor mounts, which vary in length and height, to the underfloor at clearly defined intervals and at right angles to the longitudinal axis of the carriage. The aluminum plate is screwed to the plywood floor, enabling the elastomers to exert their full effect in absorbing vibrations and noise.
Soft suspension – that always stays connected

In order to adapt climatic conditions to the passenger’s comfort, trains carry state-of-the-art air-conditioning systems. In this dynamic application, soft suspension is called for. Angst+Pfister has developed tear-proof suspension elements for Liebherr-Transportation Systems GmbH & Co KG. Soft and at the same time completely secure – it doesn’t have to be a contradiction.

For the comfort of passengers, the air-conditioning units are mounted on elastomeric and metal components. Liebherr-Transportation Systems expects a lot from these components.

Anyone hearing the name Liebherr is likely to first think of cranes, construction machinery and refrigerators. But Liebherr-Transportation Systems is another important company within the Liebherr Group, internationally active with manufacturing sites in Korneuburg near Vienna, in Maritsa, Bulgaria, and in a joint venture in Zhuji, China. The company is a leader in the development, production and maintenance of air-conditioning technology and hydraulic activation systems for the railway industry.

The air-conditioning units are installed either inside the carriages, on their underside, or on the roof. In order to avoid transmitting the unavoidable vibrations emanating from the compressors to the carriage structure, the compressors must always be suspended inside the unit in complete vibration isolation. The equipment therefore is mounted on elastomeric and metal components, designed specifically for this application. These components need to be capable of withstanding environmental stresses like extreme cold and heat, rain, snow and ultraviolet radiation, as well as the cleaning agents that are in standard use. The high levels of ozone which can result from the running of large electrical engines also put the elastomer and metal components under strain.

Maximum stability essential

Liebherr has just developed an innovative new type of compact air-conditioning unit for installation on the carriage roof. This project of the rail operating company makes exceptional demands on the bearing elements. Not only do they have to be specially designed for use in rail vehicles; an important additional feature is that they cannot be torn away from the frame.

High resistance to corrosion is critical, as these components will be heavily exposed to extreme environmental influences and railroad-specific cleaning agents. With a view to meeting all these requirements, Liebherr decided to use stainless steel for the metal components. Additionally, EPDM has been selected instead of natural rubber, so that the elastomeric components can measure up to this application’s rigorous requirements. EPDM is significantly more durable in comparison with natural rubber – as shown by the table on this page.

The principle of this tear prevention safety system can be transferred with relative ease to most standard bearing systems.

Angst + Pfister engineers created a design that ensures that the air-conditioning unit can never be accidentally uncoupled from the train. The basis for their solution was the APK tool bearing from Angst + Pfister’s standard range. With its compact size and equally modest cost, it is highly efficient in isolating vibrations. The technicians developed a new kind of bearing to go with this standard component by adding a specially designed metal plate. Together with a modified bushing at the center, this constitutes the tear prevention safety system.

For the air-conditioning systems of Liebherr-Transportation Systems GmbH & Co KG has the same suspension properties as a standard bearing. In addition it is rust-proof, the rubber mixture is highly resistant to environmental influences and the suspension travel is restricted in all directions. But above all, it is not going to tear loose. The basic principle of this tear prevention safety system can be transferred with relative ease to most standard bearing systems.

Stability a top priority

<table>
<thead>
<tr>
<th>Property</th>
<th>EPDM</th>
<th>NR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rebound elasticity</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Acid resistance</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Alkali resistance</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Oil resistance</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Fuel resistance</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Temperature of use min./max. [°C]</td>
<td>40/130</td>
<td>-30/70</td>
</tr>
<tr>
<td>Steam resistance</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Resistance to weather conditions</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Heat water</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

On a scale of 1 (poor) to 6 (excellent), EPDM generally scores very much better than natural rubber in all respects.

Anyone hearing the name Liebherr is likely to first think of cranes, construction machinery and refrigerators. But Liebherr-Transportation Systems is another important company within the Liebherr Group, internationally active with manufacturing sites in Korneuburg near Vienna, in Maritsa, Bulgaria, and in a joint venture in Zhuji, China. The company is a leader in the development, production and maintenance of air-conditioning technology and hydraulic activation systems for the railway industry.

The new APK bearing is the same – and yet different. The bearing for the air-conditioning systems of Liebherr-Transportation Systems GmbH & Co KG has the same suspension properties as a standard bearing. In addition it is rust-proof, the rubber mixture is highly resistant to environmental influences and the suspension travel is restricted in all directions. But above all, it is not going to tear loose. The basic principle of this tear prevention safety system can be transferred with relative ease to most standard bearing systems.

www.angst-pfister.com
"And the Oscar goes to..." First-class product quality, speedy delivery and personalized customer service with quick response times – these attributes are self-evident principles in the eyes of Angst + Pfister. For the Knorr-Bremse group, a tradition-rich international manufacturer of braking systems, long-standing satisfaction with its supplier of a wide array of sealing, fluid handling and plastic components is worthy of a special accolade: Angst + Pfister has been awarded the “Knorr-Bremse supplier Oscar”.

The ÖBB railjet is equipped with braking systems from Knorr-Bremse.

Stars and glamour are usually associated with Hollywood. Oscars as a rule are awarded to actors, directors and other artists in recognition of outstanding cinematic achievements. But why not also pay tribute to exceptional performances in the industrial sector as well? The Knorr-Bremse group posed this question and came up with a “supplier Oscar” that it awards each year to a dependable supply partner. The awarding of this trophy to Angst + Pfister acknowledges the good teamwork between the two companies. The world’s leading manufacturer of braking systems for rail and commercial vehicles more than doubled its volume of orders for components from Angst + Pfister compared to the previous year.

Angst + Pfister supplies standardized as well as specialized O-rings and seals for products produced by Knorr-Bremse.

O-rings with a special feature Angst + Pfister supplies Knorr-Bremse with flat gaskets and O-rings from its standard product assortment, but also with a variety of custom-fabricated ones. The components must meet extreme demands in some cases. Knorr-Bremse braking systems are installed in commercial and rail vehicles that are not just underway in central European latitudes. A train that wends its way through the Siberian tundra has to withstand lower temperatures than trains here at home. The same goes for its countless individual components. The seals from Angst + Pfister possess a special property: They are resistant to frigid temperatures down to –40 °C, surpassing conventional seals on the market by 10 °C. They additionally meet the strict quality specifications set by Knorr-Bremse and the Deutsche Bahn (German Rail) corporation. For example, the time elapsed between the fabrication of a seal and its moment of delivery may not exceed one year.

Innovative brakes thanks to sophisticated seals The Knorr-Bremse group employs more than 15,000 personnel in more than 60 locations in 25 countries. Extensive investments in research and development have made the Knorr-Bremse name synonymous with innovative brakes and modern onboard systems. But a product always is only as good as its individual components. Sophisticated seals contribute to the functionality and reliability of Knorr-Bremse products. And Knorr-Bremse itself has been relying on Angst + Pfister already for more than a decade. High product standards and fast delivery make Angst + Pfister a compelling supply partner.

Highly efficient supply system Whether in Europe, America or the Asia-Pacific region, Knorr-Bremse always has an adequate supply of O-rings and flat gaskets on hand thanks mainly to an efficient Kanban system that keeps supply replenishments from grinding to a halt. Near-empty bins are replaced by full ones before they run out. The fully automatic supply system not only safeguards the brake manufacturer from O-ring shortages, but also saves the company money because it substantially reduces inventory carrying costs and eliminates time-consuming inspection of incoming goods at Knorr-Bremse.

Wishes fulfilled promptly Isabel Schwacha, an internal sales assistant at Angst + Pfister Austria, makes sure that the contents of the bins are correct. She is the brake manufacturer’s direct liaison for all matters. She takes note of the customer’s wishes and immediately sets about fulfilling them. Angst + Pfister’s worldwide span of operations has enabled the group over the years to attain an increasingly important position in Knorr-Bremse’s supplier network. In the area of sealing technology, multiple component orders have been bundled and transferred to the Oscar-award-winning partner. The “Knorr-Bremse supplier Oscar” fills Angst + Pfister with ambition and confidence: Bit by bit, we aim to capture new untapped ground.

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A simplified lighter metal hose that reduces total life-cycle costs

The new double-decker trains from Bombardier traveling on Switzerland’s rail network have cutting-edge technology from Angst + Pfister installed in their railcars. Charged with the task of cooling the transformers, the all-metal ASSIWELL® hose lines transport the heat-transfer oil between the transformer and the cooler. This solution minimizes weight while maximizing both efficiency in production and operations while maintaining durability.

Wednesday, 12 May 2010, was a historic day for the Swiss Federal Railways (SBB). It will be remembered as the date on which Bombardier, one of the world’s largest manufacturers of innovative transportation solutions and a global leader in rail transportation equipment, achieved a milestone. The order was worth around 1.9 billion Swiss francs. The bid submitted by Bombardier made the new double-decker trains from Bombardier traveling on Switzerland’s rail network have cutting-edge technology from Angst + Pfister installed in their railcars. Charged with the task of cooling the transformers, the all-metal ASSIWELL® hose lines transport the heat-transfer oil between the transformer and the cooler. This solution minimizes weight while maximizing both efficiency in production and operations while maintaining durability.

Complementary expertise Economic efficiency goes hand in hand with technical efficiency – which in turn depends not least on weight, and this is where Angst + Pfister come in. Bombardier, one of the world’s largest manufacturers of innovative transportation solutions and a global leader in rail transportation equipment, did not have far to go in its search for the necessary competence in fluid technology – the Zurich offices of Angst + Pfister and Bombardier are at walking distance of each other. Angst + Pfister and Bombardier are at walking distance of each other. Angst + Pfister with its DIN EN 15085-2 CL1 certification offers the highest-level welding quality approval for rolling-stock applications. The know-how brought by both sides of this relationship is highly complementary – giving rise to the needed innovation necessary for the railcars of these new double-decker trains.

Highly flexible hose lines The excess heat from the transformers that convert electricity into movement must be channeled away. The engineers from Bombardier defined rigid pipes with compensators for the necessary connection between the transformer and the cooler, for both the flow and the return. The fluid handling technology specialists at Angst + Pfister then suggested ASSIWELL® pipelines with integrated all-metal hose, which performs the role of the compensators – thereby making them superfluous. The flexibility of the corrugated hose, which is covered with braided stainless steel, compensates for both the thermal expansion and the relative movements as well as installation tolerances between the cooler and the transformer.

Flawless durability over 40-year lifespan Another critical point is that SBB demands a lifespan of 40 years for these train compositions, in order to minimize repair and maintenance costs and maximize operational efficiency. The requirements placed on these materials are extremely high. And ASSIWELL® meets all necessary temperature, pressure and vibration requirements, as the hose lines must perform their services flawlessly for a period of 40 years.

Around 50% lighter This elegant but long-lasting solution offers even more benefits: The continuous ASSIWELL® all-metal hose eliminates the need for the heavy flange connections used in the technical solution initially proposed. One single part takes the place of two separate parts per line, and the all-metal hose weighs just half as much as the original solution. Less weight means lower electricity consumption, lowering the life-cycle costs through greater operational efficiency. Simplified assembly The assembly process at Bombardier is also more efficient, with the flexibility of the integrated metal hose and the reduced number of parts significantly simplifying assembly. Each of the rigid pipes originally intended for use in this application, would have had to be adjusted manually in order to achieve the specified measurements. In terms of tolerances, the ASSIWELL® all-metal hose line is clearly more “yielding” and flexible, also speeding up this step in production to provide further savings.

“We have found a simple and long-lasting solution. Less maintenance means greater availability of the railcars.” Markus Heinberg, Bombardier Transportation (Switzerland) AG, Zurich, Switzerland

Rigid hose line and attached to the radiator.

Fully tested and certified An accredited external laboratory near Berlin carried out the rigorous shock and vibration tests on the all-metal hose lines from Angst + Pfister in accordance with DIN EN 61373. The three five-hour vibration tests also included simulation of the load placed on the line by the transformer, which is mounted on rubber buffers. Bombardier itself runs a test laboratory in Zurich with the aim of testing its newly developed drive systems and thereby ensuring the safe and reliable operation of its rolling stock. The company inspects every conceivable detail, anticipating every eventuality with the strictest quality tests. The ASSIWELL® all-metal hose lines from Angst + Pfister proved to be ideally suited thanks to their sturdiness, flexibility, extremely long lifespan, and durability.

Practical quick couplings Deep fluid handling know-how, complemented by a partner with extensive application experience gives rise to impressively simple solutions. The design team with engineers from Angst + Pfister also went on to suggest replacing the screw connections originally intended for use on the pipeline for filling, discharge, and oil sampling with quick couplings. The company Wüthrich-Präzision offers suitable, lightweight quick couplings with clean-break technology – using high-performance sealing components from Angst + Pfister. Thanks to these quick couplings, the transformer oil that serves as the heat transfer medium cannot drip out of the line during filling, bleeding, and oil sampling. The quick couplings are mounted at a low point to enable the heattransfer oil to flow in gently, making the filling process easier and safer.

Bombardier’s engineers are convinced by the integral solution with the ASSIWELL® all-metal hose line between the transformer and the cooler. “Thanks to Angst + Pfister, we have found an extremely simple, long-lasting, and cost-effective solution,” comments Markus Heinberg of Bombardier System Engineering. And the essential issue of “efficiency” is relevant both to Bombardier and to SBB: “Less maintenance means lower costs and greater availability of the railcars.”

ASSIWELL® is a registered and protected brand of Angst + Pfister.

Markus Heimberg, Bombardier Transportation (Switzerland) AG, Zurich, Switzerland

The new Bombardier double-decker long-distance train.

Rigid hose line and attached to the radiator.

Flexible flow and return hose sections attached to the transformer.

A simplified lighter metal hose that reduces total life-cycle costs The new double-decker trains from Bombardier traveling on Switzerland’s rail network have cutting-edge technology from Angst + Pfister installed in their railcars. Charged with the task of cooling the transformers, the all-metal ASSIWELL® hose lines transport the heat-transfer oil between the transformer and the cooler. This solution minimizes weight while maximizing both efficiency in production and operations while maintaining durability.
Always stay cool – thanks to perfectly welded hose lines

There’s no telling exactly what grave damage would happen if the power converter on an electric locomotive ceased to be properly cooled. Everything depends on the cooling system, and its hoses’ accurate fabrication is critical. Angst + Pfister has standardized its welding processes to the highest quality level – to the benefit also of the Bordline® converters manufactured by ABB, which are used in all types of rail vehicles.

A hose that can do it all is called for here. The solution deployed must reliably endure a service life of 30 or more years at an ambient temperature spectrum ranging from –40°C to +80°C. The heat produced by the motors must be dissipated continuously and efficiently. The connecting hoses in the cooling circuit therefore have to be durable in every respect and under all conceivable circumstances.

The ASSIWELL® all-metal hose from Angst + Pfister can leverage all of its strengths here. “It is not only resistant to aging and impermeable to diffusion, but also very flexible,” explains technical application consultant Urs Nötzli. “This corrugated hose with its stainless steel braiding tolerates even tight bending radii and is exceptionally fire-resistant to boot.”

In short, the ASSIWELL® all-metal hose’s properties and durability meet all of the rigorous technical and performance specifications stipulated by the lead product engineers at ABB. Working from that spec sheet, Angst + Pfister and ABB jointly developed the right solution.

Perfectly fabricated, flawlessly welded

The hose sections and the connector parts both require exact manufacturing precision because only the perfect union between fitting and hose line can be perfectly welded. To avoid residual stress in the material, its structure must be altered as little as possible. The less heat that is applied to the steel during welding, the better the steel’s quality and corrosion resistance. The welded joints, after all, have to be as durable as the metal hoses themselves.

Angst + Pfister operates its own welding shop staffed by highly qualified employees. Angst + Pfister’s experience and expertise – specifically also in the area of welding metal hose lines – accelerated the evolution of the project and quickly brought about a successful solution despite the complexity involved. Angst + Pfister’s contribution to the project also included innovative suggestions for configuring the hose lines. The cooperation with Angst + Pfister has won over Daniel Sturzenegger, a local business unit supply manager at ABB Switzerland: “Angst + Pfister’s reliability and innovativeness, and the joint further development of ideas, products and processes, help us to keep time-to-market short and to reach our ambitious goals.”

The high degree of automation yields uniform high quality. That lets everyone rest assured – not just the operator of the electric locomotive equipped with the ABB power converter, but all the train passengers as well.

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Angst + Pfister operates its own welding shop staffed by highly qualified employees.

The ASSIWELL® all-metal hose sections. Additionally, Angst + Pfister has two mechanized welding workstations in operation specifically for ABB and other customers with large batch volumes.

Highest certification level rating

Automated welding of connector parts onto metal hoses with stainless steel braiding is not exactly a routine task. Angst + Pfister’s welding shop and its team of certified welding experts meet the demanding requirements of DIN EN 15085-2 Cl1. This highest certification level rating for mechanized welding of railway vehicle components also requires systematic machine-data logging.
Technical application challenge

The coolant fluid needed to cool the power converter circulates through a hose assembly system. Tight bending radii, countless connection points and an enormous temperature spectrum that ranges from –40 °C to +80 °C put the hose lines to a severe test, especially since a service life of up to 30 years is required. Optimal hose lines must be lastingly impermeable to diffusion and must guarantee trouble-free performance in the face of harsh stresses and strains.

Technical solution

Custom-fabricated ASSIWELL® hose lines from Angst + Pfister meet the toughest demands. The all-metal hoses do not become porous when exposed to enormous temperature swings, unlike many conventional elastomer hoses. The corrugated hoses effortlessly cope with even the tightest bending radii. The hose fittings are professionally welded so that connection points do not pose any potential weak spots. Angst + Pfister possesses the highest certification level rating for welding of components for railway vehicles: CL1 according to DIN EN 15085-2. Whether in the frigid Finnish winter or the sweltering southern summer, ASSIWELL® metal hoses stand up to any challenge.

Angst + Pfister – product solutions in the area of fluid-handling technology

The customer has access to the entire ASSIWELL® product range, and our APSOFuid® specialists possess the requisite skills to refine the hoses into perfect cooling conduit systems. Long-standing experience in the railway industry enables Angst + Pfister to assist its customers competently, flexibly and with quick response times even during early stages of construction and to optimize hose lines for individual installation situations. The end outcome is highly dependable hose lines with enormous service lives, which results in long maintenance intervals, minimal downtimes and an excellent price-performance proposition.

“Angst + Pfister impresses not just with its extensive know-how, but above all with its exemplary customer support.”

Achim Gallinger, Stadler Rail Group

ASSIWELL® hoses and fittings – the perfect connection

Comprehensive range of high quality

ASSIWELL® standard hoses

Depending on the application/requirements, various series of ASSIWELL® standard hoses are available in different dimensions and with specific properties:

<table>
<thead>
<tr>
<th>ASSIWELL®</th>
<th>Series</th>
<th>Material of bellow</th>
<th>DN</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>066</td>
<td>Industrial series</td>
<td>1.4404</td>
<td>6–50</td>
<td>static, slightly dynamic</td>
</tr>
<tr>
<td>088</td>
<td>Preferred series</td>
<td>1.4541</td>
<td>8–200</td>
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<tr>
<td>100*</td>
<td>Performance series</td>
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<td>6–300</td>
<td>dynamic</td>
</tr>
<tr>
<td>100W2*</td>
<td>High performance series</td>
<td>1.4404</td>
<td>16–100</td>
<td>highly dynamic, high pressure</td>
</tr>
<tr>
<td>133*</td>
<td>Heavy series</td>
<td>1.4571</td>
<td>12–300</td>
<td>dynamic, maximum pressure</td>
</tr>
</tbody>
</table>

* Complies with PED with safety factor four

High-quality standard fittings

The ASSIWELL® assortment offers high-quality fittings for all individual hose line solutions:

- Tube brackets for cutting ring assembly according to DIN EN ISO 8434-1
- Fittings with external thread according to DIN EN 10226
- Flat sealing screw connections with internal thread according to DIN EN 10226
- 24° screw connections with internal or external threads with weld end
- Loose plate flanges with pressed or weld on collar according to DIN EN 1092-1
- Further connections according to customer specifications

Pre-finished lines

Optimized production and testing processes enable Angst + Pfister to supply pre-finished metal hose lines within short-term:

- Mechanised, semi-automatic TIG welding
- Manual TIG welding of nominal widths of 6 – 300 mm
- Mechanised TIG tube welding (orbital)
- Mechanised TIG welding of vacuum lines

The fluid technology engineers at Angst + Pfister have developed high-performance hose lines with long service lives.

Tight bending radii, several connection points: In the hose-line circulation system, the fluid circulates in order to cool the transformer.
The globally operating Stadler Rail Group develops and manufactures innovative mass transportation vehicles. In addition to city, regional and suburban rail transport, the group’s area of operations has recently expanded to include interregional and intercity rail vehicles. Stadler Rail’s modular vehicle families built using aluminum lightweight construction components optimally satisfy the demands of passengers and the requirements of railway operators.

Jointly drawing from experience As a long-standing development, supply and logistics partner, Angst + Pfister maintains close contact with the development departments at Stadler Rail AG. Over this period of extensive cooperation, Angst + Pfister has accumulated a deep knowledge about the demands placed on modern railway vehicles within the industry. Angst + Pfister successfully incorporates its multifaceted rail industry experience in the development of the KISS double-decker train, the newest generation of Stadler Rail vehicles.

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 FURT 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 glass-fiber-reinforced profiles with a matrix of unsaturated polyester resins thus fulfill special material requirements: In addition to having high mechanical strength 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.

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 offer the desired mechanical strength but not the necessary corrosion resistance or electrical and/or thermal insulation properties. Angst + Pfister will be glad to advise customers on the versatile application possibilities for UP-GFK profiles. Our plastics experts are always open to new tasks and challenges. With constructive collaboration, even innovative new projects can be successfully completed with optimum results using customized plastics solutions.
Specialist for plastics – French national railway relies on Angst + Pfister

Plastic components are used in the construction of all modern railway vehicles, but severe stress and wear make it necessary to replace them sooner or later. The French National Railway Corporation (SNCF) therefore enlists the services of an excellently diversified parts supplier: St Angst + Pfister, our everyday business also encompasses special custom-fabricated components.

Technical application challenge

Whether for brakes, chassis or carriage interiors, SNCF requires a lot of plastic parts for its flagship TGV VI 50 train. Since the rail cars are subjected to extreme stresses day in and day out, the quality of the selected materials used in constructing them has to meet especially high standards. Strict stability criteria have to be met in order to ensure durability and safety. The spectrum of requirements is wide and diverse. SNCF’s parts needs range from a variety of special components for brake cylinders and pneumatic door cylinders to plastic glazing in trains and fastening elements for handholds and WC installations.

Technical solution

Angst + Pfister supplies the French national railway with a wide array of top-quality finished plastic parts. SNCF has demand for components made of materials with good sliding properties such as fluoro-plastics, but also for engineering plastics like POM, PA and PE. Components including PTFE tubes, PUR flat gaskets and O-rings are installed in the pneumatic cylinders used to open doors automatically. UV-blocking PC viewing panes made of a special PC blend are built into switching relay housings. Angst + Pfister supplies the ideal solution for every need, such as PA-6 bearing bushes for WC sinks and APSOplast® POM for the handhold joint parts.

Angst + Pfister product solutions in the area of engineering plastics technology

Angst + Pfister customers like SNCF profit from the perfect combination of product diversity and service provided in high overall quality. As a cross-seller, we are capable of supplying all kinds of parts for complex component assemblies, all the way to complete sets of O-rings for your every need. We stock plastics from a wide array of different manufacturers, which enables corporate customers to bundle their parts procurement needs and to focus on a single supplier. Our strong research and development expertise additionally makes us capable of supplying customized and highly innovative products. Everything from a single source – that’s the unbeatable proposition that Angst + Pfister offers to rev up the railway industry.

Application challenge

Passageways and accesses to toilets in modern trains are frequently equipped with an automatic sliding mechanism. There is a requirement for robust and reliable toothed belts so that doors can open and close securely. These are also the requirement for simple raising and lowering of window blinds which are often to be found in passenger compartments. To guarantee that the automatic mechanism always operates smoothly, the rail industry depends on high-quality components and, in this regard, reliable suppliers.

Technical solution

Opening, closing, raising and lowering mechanisms can be implemented in a technically perfect manner with drive belts from Angst + Pfister. Rubber belts in HTDS and HTDB pitches provide fast and at the same time quiet door movements. Steel-cord-reinforced T5 or AT 5 PUR toothed belts are used in window blinds. They exhibit higher stability and are suitable, even with reduced belt widths, for low-speed applications with low tensile loading.

www.angst-pfister.com

A strong pull into the future - robust drive belts for automated convenience

Passengers value technical comforts – as long as they work. Automatic mechanisms on doors and other equipment are taken for granted on the railway, but are also subjected to a lot of stress. Durable PUR and rubber belts from Angst + Pfister support the sustainability of automated processes.

Not only opening and closing, but also lifting and lowering mechanisms can be constructed with drive belts by Angst + Pfister with technical excellence and precision.

Angst + Pfister – product solutions in drive technology

Angst + Pfister customers have access to a comprehensive range of rubber and PUR belts: Numerous pitches, tooth profiles, belt sizes and widths, various machining processes, laminate planes and performance levels underline the outstanding variety that provides the optimum product for every belt drive. The best possible quality is also guaranteed in service: Applications and design engineers develop customer-specific solutions hand in hand, thus making Angst + Pfister a competent partner for the rail industry.

In order that passengers traveling with the TGV feel safe and secure at all times during their journey, the plastic components used need to be robust and able to withstand heavy loads and stresses.

In order to ensure that the doors open and close safely, reliable toothed belts are required. Rubber belts in the divisions HTDS and HTDB ensure fast, but also smooth and quiet door operation.
APSOvib® range of buffers – vibration isolation elements in rail transport technology

Antivibration technology plays a very important role in modern rail transport. In order to effectively isolate all sorts of vibrations and shocks, furnishings and equipment in trains are outfitted with vibration-isolating mountings. With its comprehensive range of buffers geared to the needs of the rail industry, Angst + Pfister guarantees vibrationless riding comfort.

Technical application challenge

Whether it's doors, folding tables, seats, electrical power trains, pumps or transformers in motive power vehicles, train components are subjected to exceptional strains. Vehicular motion gives rise to shocks and vibrations that, if left undamped, not only impair smooth riding comfort, but can also cause damage. In the building of railway vehicles, it is therefore important to minimize potential vibrations to the greatest possible extent through vibration isolation technology measures in order to treat passengers, furnishings and equipment with care.

Technical solution

Angst + Pfister supplies solutions in the form of a widely diversified array of mounting elements. Our high-grade buffers absorb vibrations, cushion them and dampen their impact to a minimum. They are installed on air-conditioning units, control and securing elements, and noise protection products just as appropriately as they are on furniture and doors. APSOvib buffers are optimally attuned to the static and dynamic load forces acting on a given object or structure. In carriages and locomotives, round buffers serve as vibration-isolating fixing elements. Stop buffers made of natural rubber optimally soften function-related shocks caused by boarding doors, sliding doors and hinged hatches.

Angst + Pfister – product solutions in the area of antivibration technology

As a supply and solutions partner, Angst + Pfister understands the needs of the rail transport industry. Our APSOvib® range of buffers offers a selection of approximately 1,000 different items: round buffers and stop buffers in 13 shapes, countless sizes and three grades of hardness distinguish the balanced and clearly arranged product portfolio. APSOvib® buffers meet DIN standards 93363 and 93364, are RoHS-compliant, and are available for immediate delivery thanks to our extensive warehouse inventory. Finding the right product – with the help of Angst + Pfister’s skilled specialists on request – is also especially easy thanks to the inclusion of spring characteristics in the product specs.

Design and process approvals

For customized products, additional fire protection approvals are possible on customer request, also for APSORow® Fluid Handling Technology and APSOdive® Drive Technology.
Under Sleeper Pads provide an elastic layer between the concrete sleeper and the ballast, protecting the sleeper from damage and reducing ballast wear. They are available in various thicknesses and can be customized to fit a wide range of track conditions.

Under Ballast Mats are used to improve the track's isolation performance, reducing rail corrugation, false flanges, wear on the ballast, and possible stiffening due to infiltrations of subgrade sand. These mats are available in 10 to 50 mm thickness for 13 to 26 tons axle loads and up to 320 km/h – TC1 to TC5 (UCI) trains. They are made from mixed cellular polyurethane and high-quality recycled rubber granulates.

Mass Spring System is a long-lasting solution to dampen track vibrations. It is designed for tramway, underground, and other low-frequency vibration damping applications. The system can be installed in three main forms:

- Full surface mats solutions can reduce mechanical noise by 25 dB for systems with a natural frequency between 14 to 25 Hz.
- Strip solutions are ideal for pre-manufactured tracks and on-site concrete track pouring. Efficiency starts for natural frequencies from 8 to 15 Hz.
- Pads solutions are preferred for natural frequencies between 5 to 12 Hz, and can also improve the noise reduction by 30 dB.

These solutions are designed to be integrated into the railway infrastructure, ensuring safety, performance, and cost efficiency over the life cycle of the track.
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.

The story starts a few years ago. SNCF invited Angst + Pfister to join a development team that was to create a new standard European USP. Since 1980, SNCF had been using a pad composed of several centimeters of polyurethane covered by a layer of gravel. Those pads were heavy, manually produced, and their production quality was inconsistent. The expansion of the TGV high-speed rail network made it obvious that this technology had become obsolete and that SNCF must quickly develop a new solution.

At the same time, Austria, Germany and the European Union created a working group within the European Committee for Standardization. Angst + Pfister, as an international engineering-driven company, discovered an opportunity to apply its decades of antivibration know-how within this working group and focused on developing a new USP.

Based on polyurethane technology, this material is placed under the sleeper and ensures ballast stability during both load and no load cycles. Two years after the project kickoff, we presented our solution for certification in February 2011.

Angst + Pfister under sleeper pads (USP)

Direct advantages:
- protects the sleeper against ballast abrasion
- prevents fast internal ballast abrasive wear
- preserves ballast geometry
- preserves track design
- prevents rail corrugation
- ensures a better load distribution inside the ballast under the train axle

Indirect advantages:
- reduces ballast thickness
- reduces life-cycle cost
- reduces infrastructure cost
- extends maintenance interval

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

Angst + Pfister is also developing products for other railway elements: trains, stations, subways and tramways. Each case poses its own set of specific challenges, and 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.

A fully certified USP made with 100% recyclable HVA materials is also available.

Angst + Pfister is unique in offering a comprehensive range of railway solutions. From underneath the track all the way up to the catenary, we supply the railway industry with the best components from our five different core product groups.

Angst + Pfister is also developing new sealing profiles for train doors and windows in accordance with the latest fire protection certificates and is an important partner for train brake manufacturers.

APSOfix® Fluid Handling Technology designs and produces metal hoses for transformer cooling system to DIN EN 15085-2 plus WC and drinking water.

APSOfix® Engineering Plastics Technology supplies the railway industry with a wide range of plastic solutions such as hinges, pulleys and transparent screens, and even sliding parts for bogies compliant to many critical norms like DIN 5510-2:2009.

APSOnodrive® Drive Technology designs and supplies the right belts, pulleys and other parts needed for sliding doors, conveyors and other positioning devices.

APSOnofix® Sealing Technology is developing new sealing profiles for train doors and windows in accordance with the latest Fire Protection Certificates and is an important partner for train brake manufacturers.

APSOnofix® Fluid Handling Technology designs and produces metal hoses for transformer cooling system to DIN EN 15085-2 plus WC and drinking water.
New: APSOPUR® and ECOVIB® absorb vibrations and sound

Insulating machines so they don’t cause vibrations in their surrounding environment? Insulating light or heavy rail tracks? Or even protecting entire buildings from external vibrations? Angst+Pfister has the right people for the job:

Entire engineering teams are specialized in antivibration technology and currently expanding our already wide product range with our new APSOPUR® high-performance polyurethane foams and ECOVIB®, a complete range of elastomeric spring mats made from environmentally friendly recycled rubber granulates.

Every train track, every tram track and the bottom of almost every carriage are insulated for passenger comfort and safety. Professional antivibration technology both dampens the sound and increases the smoothness of the ride as well as the life span of the equipment and vehicles. It is proven that the correct insulation saves money by decreasing maintenance costs and downtime. The noise and vibrations felt by end users are serious cost implications. In the industrial world, pumps, motors, generators are well insulated just like all the machine and motor industries are. This product comes in a variety of six different hardnesses: five flat mats for static applications and one mat with an undulating 3-D profile for surface loads between 0.011 and 2.50 N/mm².

The correct solution thanks to our know-how.

The application engineers who specialize in antivibration technology at Angst+Pfister are the experts to these trends, by leveraging its many years of proven technical experience in this field – and a state-of-the-art product assortment. APSOPUR®: The products, made from polyurethane foam, come in twelve different grades from soft to hard. Depending on the chemical formulations, they absorb static loads between 0.011 and 2.50 N/mm². Standard thicknesses of 12.5 and 25.0 mm are immediately available from stock. To simplify installation, each performance grade of APSOPUR® has its own color.

The complete range of antivibration mats

New ECOVIB®: assortment of elastomer spring mats, produced from high-quality environmentally friendly recycled rubber granulates. This product comes in a variety of six different hardnesses: five flat mats for static loads between 0.1 and 1.50 N/mm² and one mat with an undulating 3-D profile for surface loads up to 0.05 N/mm². The thickness ranges from 5.0 to 20.0 mm or amounts to 17.0/9.0 mm for 3D mats. The commercial advantages of ECOVIB® make this product the preferred solution for many building construction and heavy machine insulation applications. For sustainable and profitable antivibration solutions ECOVIB® is the right choice for both ecological and economical reasons.

For industry, rail construction and building construction "With these two new comprehensive product lines, we can cover the entire spectrum in industry, track and building construction,” says Philippe Kirsch, International Profit Center Leader for Antivibration technology at Angst+Pfister. “We provide our customers with innovative customized solutions. The projects we deliver are meeting our customers’ technical demands and are economically advantageous at the same time."
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 100,000 standard items and integrated supply chain solutions.

Our core product divisions

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.

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