

magazine

INTERNATIONAL ENGINEERING SOLUTIONS

WHEN SECURITY COMES FIRST

For its motocross machines, KTM relies on sealing technology from Angst+Pfister.

MORE COMFORT DURING LONG SERVICE LIFE

How our cabin mounts enhance Hyster-Yale forklifts.

OUTSTANDING FEATURES

PERTEC® - The new high-performance elastomers of Angst+Pfister





into building Angst+Pfister's reputation become effective. We generate competitive advantages for our customers by improving the performance and quality of their products, which in turn reduces costs, or simply gives them an extra competitive boost. Also, Angst+Pfister's solutions are always single source solutions.

One of these solutions is the PERTEC® range – a new generation of high-performance elastomers, meeting a spectrum of high-level standards. The compounds offer abrasion resistance and resistance to chemicals, withstand high temperatures and are minimally permeable for sealing technology products. We will be introducing some of the PERTEC® products in this magazine. In addition, there are further examples of applications involving innovative sealing technology – for example, the valve cover screws for the top-performance KTM motocross motorbikes, the triple-certified valve O-rings for Bardiani Valvole or the replacement part kits for the machine manufacturer CFT Group. The last two simultaneously demonstrate our competency and capabilities for logistics solutions and in the food industry.

This issue also brings you an insight into five exciting anti-vibration technology projects: Our engine mounting system for Hyster Yale forklifts has improved driver comfort. The product facelift provided by our protective bumpers for electricity generators made by the company SDMO ensures lasting good looks for the generators in operation at customer sites. For industrial vehicles retrofitted with three-cylinder engines, we have designed solutions that optimally isolate oscillations. And, in addition to supplying the mounting system for Alstom's rail transformers, we have also supplied fluid technology systems.

If any of these articles piques your interest in our projects, please feel free to contact our people for a chat! As mentioned at the start: They will be interested in what you have to say.

I wish you inspiration and a pleasant read.

Erich Schmid
Chief Technology Officer

Dear Readers and Valued Customers,

Empathy is the ability to understand the concerns of others: Where are you heading? Where does the problem lie? What can be done about it?

Our employees with excellent technical skills who are working using the latest processes to develop innovative high-performance products form only part of the success stories shared by the Angst+Pfister magazine. It is just as important that our employees understand our customers - through and through. And they clearly do. In this issue there are umpteen examples of engineers who “believe in building good customer relationships”. About salesmen who can “put themselves in their customers' shoes”. About employees who “can communicate on an equal footing” or “speak the same language”.

In these times of rapid change, when we face more complex challenges, when regulatory requirements and expectations are becoming more stringent – our employees like to focus on the factors that achieve clarity and move projects forwards in the right direction. First and foremost it is important to listen. Only then can the skills that went

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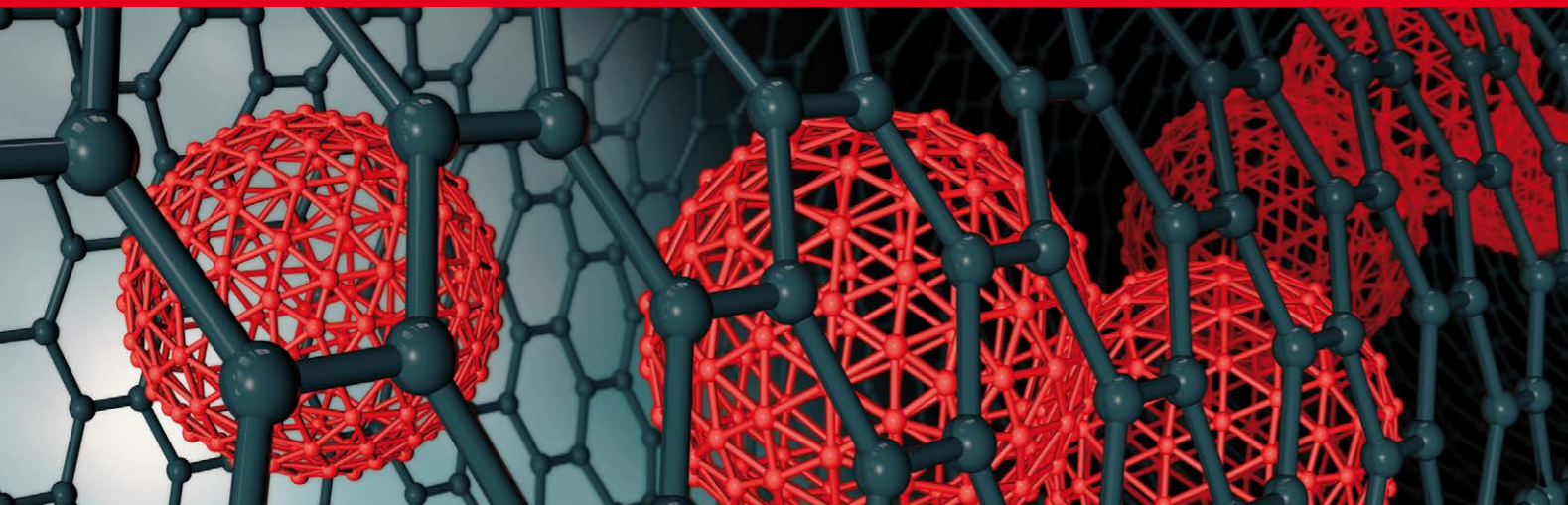
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Do you have any further questions about one of the magazine topics?

engineering@angst-pfister.com
or call
+41 44 306 62 57
We will contact you immediately.

PERTEC® – The new generation of Angst+Pfister high-performance materials



The demands on materials for use in a variety of industries are becoming increasingly more challenging. The focus is not only on the longevity of the materials with respect to reliable performance when exposed to occasionally extreme conditions such as very high or low temperatures, aggressive fluids, gases or extreme physical loads, but the operational safety of machines and systems also has to be guaranteed. In addition, many of the materials must be legally approved. These materials are rightly referred to as high-performance compounds.

Anyone involved in international operations and markets continually faces new challenges and must be able to rely on the performance of their operational facilities. This necessitates longevity of the machines to avoid production stoppages through service down time and the resulting sales losses or costs. It goes without saying that a machine's durability depends substantially on the quality of its components, whereby the materials used to manufacture these components are always being improved in order to fine tune their performance to changing requirements and deliver incremental improvements.

In this regard, compounding has become one of the key fields in engineering when it comes to high-performance elastomers, to the extent that it is very important for parts manufacturers to work together with specialist partners who can supply specially formulated compound and who are highly-skilled developers.

For many years now Angst+Pfister has understood the importance of compounding to its customers, particularly its increasing significance in the future, and can lay claim to significant experience in this area. Incorporating these competencies in the high performance portfolio was only the first step. It is first and foremost about growing this field of expertise and continually improving it, in order to be certain of providing customers with good customised solutions that keep pace with the latest technologies and meet the new challenging requirements. This means continual learning, research, investing, and testing.

A significant and important step for Angst+Pfister was the strategic alliance with TSF S.p.A from Italy, one of the global market

leaders for the development and production of high-performance elastomers, because through the alliance the compounding capabilities of the Angst+Pfister Group are expanded and access is assured to the know-how of a company that is considered to be one of the global leaders in this area.

Compounding elastomers for sealing or anti-vibration parts is an artful and precise science. The skilful combination of polymers with additives and the correct kneading time not only result in the vulcanised elastomeric compound having the physical characteristics and performance values required by the final application, but also ensuring a raw material that can be efficiently used in injection or compression molds in such a manner as to minimise waste and ensure good flow properties. Angst+Pfister knows that access to material engineering know-how and competence in chemistry, combined with experience reflected in a stock of existing recipes, know-how in development are the basis for delivering the most effective and efficient solutions to our customers.

With PERTEC® Angst+Pfister has developed a new generation of high-performance elastomers with excellent material qualities for a range of industrial uses. The growing PERTEC® family has a whole range of high-performance elastomers that are specially designed for specific industries and internationally certified with all necessary approvals.

The first very successful ongoing projects, and satisfied customers, show that with PERTEC® Angst+Pfister has created a new high-performance material that fulfils individual needs for solutions in the area of sealing technology at the highest technological level. And that is not the end of it. Angst+Pfister is continually determining the needs of the market and identifying the segments in which the new high-performance mixtures can offer significant improvements for industrial applications and also benefit the TCO of customers.

Please contact us for support in finding the specific solution for your requirements under engineering@angst-pfister.com



Current approvals

- 3-A Sanitary Standard Number 18-03 Class I
- BfR XV (Silicone)
- BfR XXI (Natural and synthetic rubber) Category 4
- DVGW EN 549 D2/H3
- EC 1935/2004 article 3
- FDA - CFR 21 - 177.2600 food a) - f)
- French Arrete 25.11.92 No 293
- GB 4806.11-2016
- KIWA NSF/ANSI 51 formulation

- LFGB § 30/31
- SR 817.023.21
- USP Class VI Ch. <87> (in vitro) and Ch. <88> (in vivo) 121°C
- PAH Category 1 (AfPS GS 2014:01)
- PAHs requirements according Regulation (EU) No 1272/2013

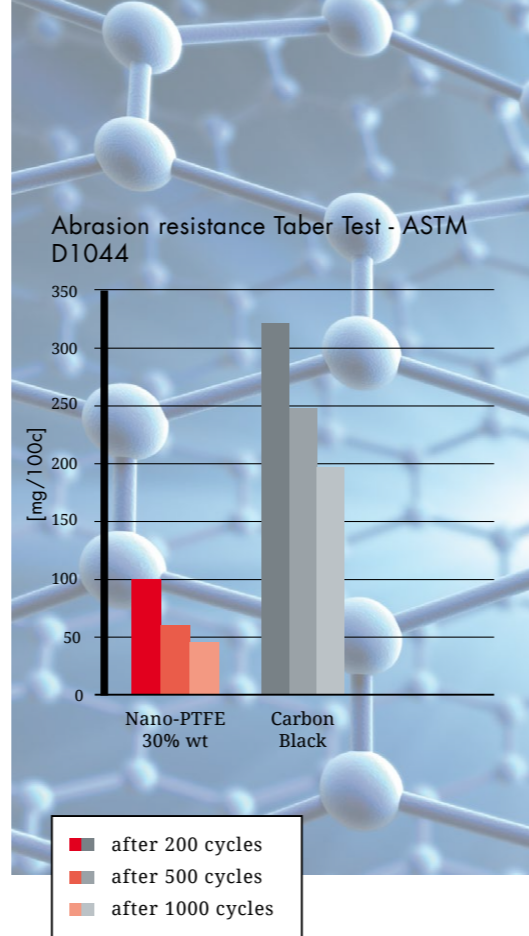


PERTEC® NP FKM

In contrast to the conventional coating of materials to improve their performance, a new class of peroxide-cured PERTEC® NP FKM compounds has now been developed based on nano-PTFE, the qualities of which are extraordinary. It has very high abrasion resistance, is highly resistant to chemicals, and has a very low permeability. In spite of its high degree of hardness, it has very good tensile strength and contains no metal ions.

The advantage, in contrast to the standard methods using PTFE powder is that material accumulation can be avoided, dispersion is very homogeneous, and a degree of filling up to 40% (using PTFE powder max. 6%), is possible, as well as simultaneously achieving good mechanical qualities.

The Angst+Pfister products that are typically made of PERTEC® NP FKM, are O-rings, molded parts, and membranes, which are particularly suited for valves, pumps, and couplings for the pharmaceutical, food, and chemical industries.



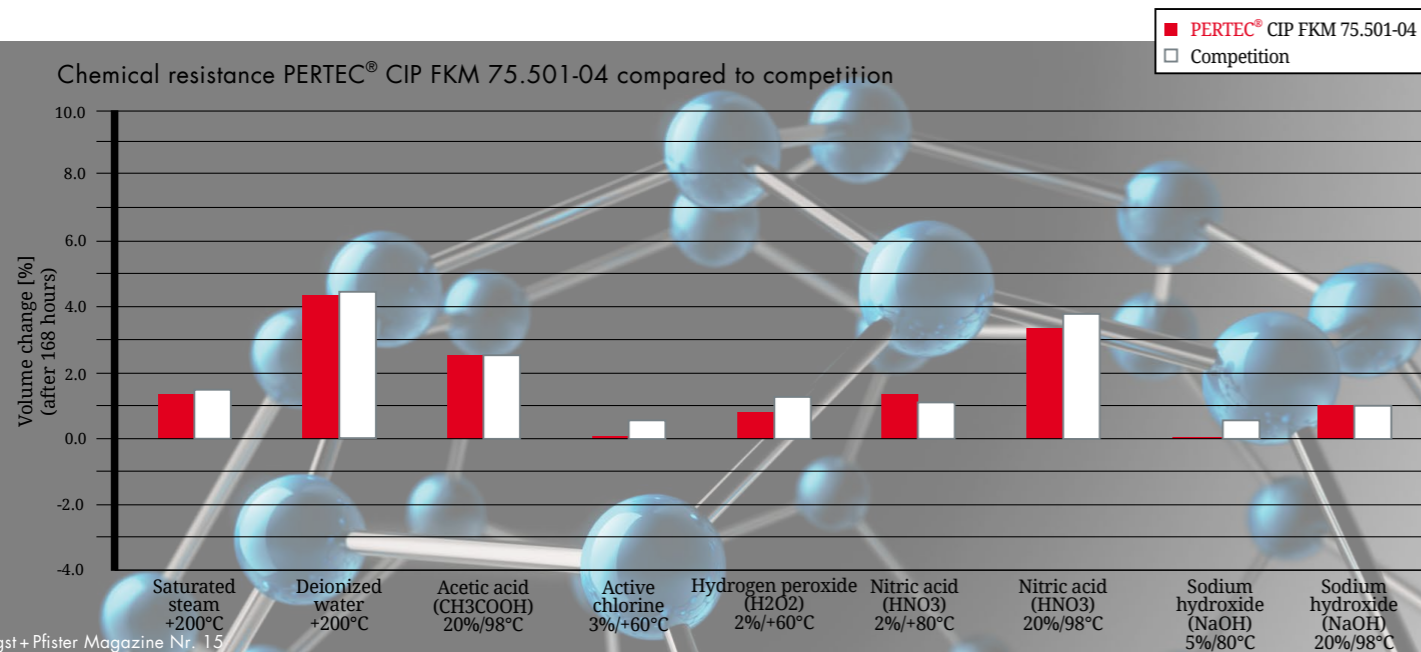
PERTEC® CIP/SIP FKM

With PERTEC® CIP/SIP FKM a new special high-performance elastomer has been developed for use in CIP (Cleaning In Place) and SIP (Sterilisation In Place), systems that are in use where a very high level of hygiene is mandatory, such as in the food, pharmaceutical, medical, and chemical industries. In these systems, the application components and materials are exposed to aggressive chemicals (e.g. nitric acid or hypochlorite) in cleaning materials, as well as high concentrations of grease and extreme temperatures.

Thanks to the very high fluorine content, PERTEC® CIP/SIP FKM has very good chemical resistance and is resistant to very high temperatures up to +200°C. It shows very good abrasion resistance and very low permeability.

Angst+Pfister produces mainly O-rings, molded parts, membranes, and dynamic sealings from PERTEC® CIP/SIP FKM for use in the pharmaceutical, food, medical, and chemical industries.

PERTEC® CIP/SIP FKM complies with all the regulations relevant for these industries, see page 5.



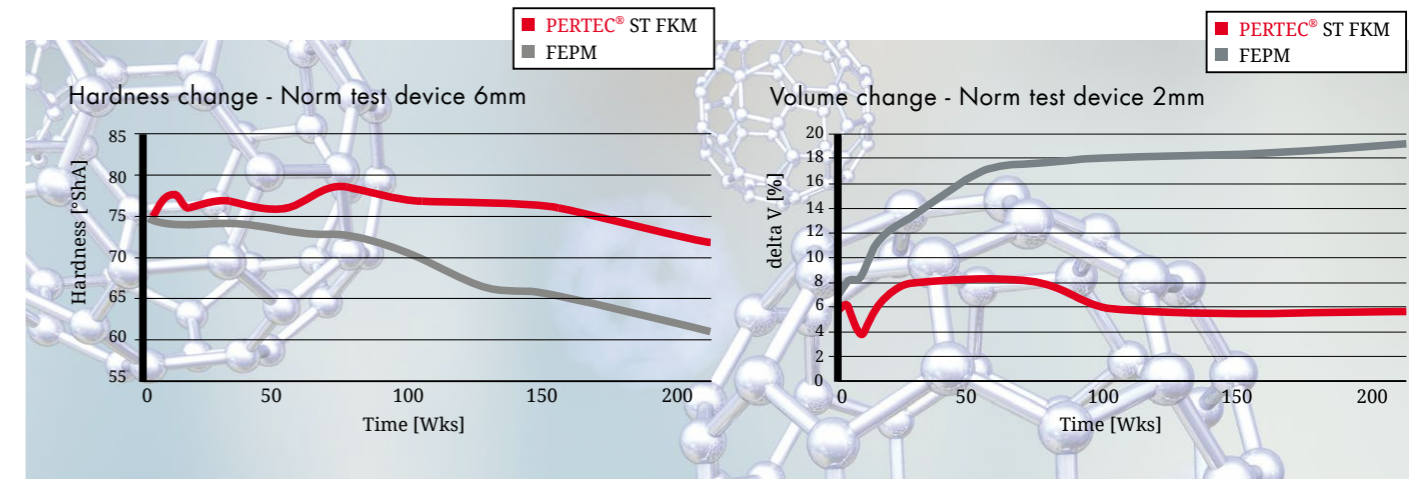
PERTEC® ST FKM

PERTEC® ST FKM is a high-performance elastomer which is particularly suited for use in contact with steam and hot water, not least because of its high resistance at temperatures from -15°C to +200°C. It has been developed by Angst+Pfister to be resistant to a multitude of aggressive chemicals, mineral oils, and grease as well as ozone, weather, aging, and is oxygen compatible with very low permeability.

The high fluorine concentration ensures exceptionally high resistance to very high temperatures, making it particularly suitable for steam applications such as steam heating units, steam turbines, steam jet pumps, gas atomisers (gas flares) or steam cleaning.

The special mix makes very economical processing possible for both compression (CM) and injection methods (IM), which in turn offers very high flexibility with regard to the optimal, tailor-made production. This results not just in very high quality, but also has a beneficial effect on the price.

The main application of PERTEC® ST FKM is for O-rings, molded parts and membranes for couplings, turbines, pumps, and valves for the chemical industry.

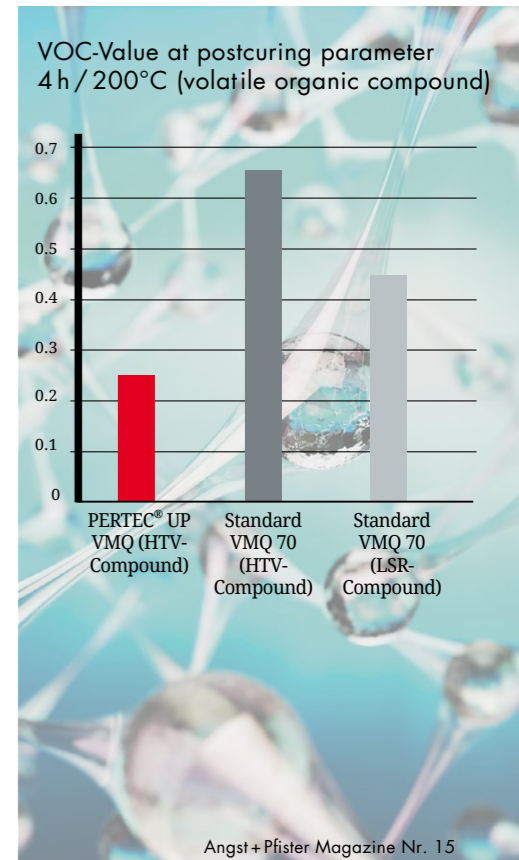


PERTEC® UP VMQ

PERTEC® UP VMQ is a new high-performance elastomer specially developed for uses in which absolute material cleanliness is mandatory. The name itself says this - UP stands for ultra-pure. The focus lies on uses for the food, pharmaceutical, and medical industries, where complete material sterility is the most important requirement. In these sectors there can be no contamination of the environment by the materials in use. The specific requirements are prescribed in various international regulations. PERTEC® UP VMQ complies with all global food contact regulations, see page 5. Furthermore, all substances used in the compound are listed in the EU as well as the US food industry regulations.

PERTEC® UP VMQ is also characterised by very good mechanical qualities in a temperature spectrum from -60°C to +200°C. It has very good resistance to a multitude of aggressive chemicals, has very good tensile strength, and low VOC (Volatile Organic Compounds) content.

Typical Angst+Pfister products made of PERTEC® UP VMQ are O-rings, molded parts, and membranes for drinking water applications and for uses in the pharmaceutical, medical, and chemical industries.



* This information is based on our available data. These values are measured on standard test specimens and are within the normal tolerance range of material properties and do not represent guaranteed property values. Therefore they shall not be used for specification purposes.

Perfectly sized for limitless power

When performance is vital, there is no room for compromise. KTM, the leading manufacturer of motocross motorcycles, knows this and so do its business partners. Since mid 2017, Angst+Pfister has been supplying a series of bolt seals for the valve covers of the new KTM model 450 SX-F. The development process also caught the attention of the motor biking employees of Angst+Pfister.



Despite extreme conditions: Motocross riders must be able to rely on their machines.

High speed, narrow curves and spectacular leaps – this is the world of motocross. And here – there is no doubt about this – KTM's off roaders are setting the pace.

For the bikers, KTM equates to pure enjoyment along with total concentration. And these machines have to withstand a lot when racing through rough terrain on punishingly muddy or dusty trails with the engine roaring at full throttle.

A basic priority is the safety of the biker, which depends on the safety of the bike and can only be guaranteed with quality components built for a long service life and engineered to withstand extreme conditions. Durable components also reduce costs.

As a long-established partner of KTM, Angst+Pfister is now providing the sealing technology for the bolts on the valve covers of the new KTM model 450 SX-F.

Long-term partnership on an equal footing

The employees of Angst+Pfister care a lot about the manufacture of components like these. "Emotion is part of the game," notes Andreas Gogl, General Manager of Angst+Pfister Austria and CEE, with glint in his eye.

Angst+Pfister has been in partnership with KTM for several years. "We are very proud to have an internationally-established, highly-regarded company with such a strong brand as our partner," says Andreas Gogl. He emphasises that the collaboration has always

been very professional, which is not always a given. "This is due, for instance, to the early planning and coordination between Engineering, Purchasing, Quality and us as suppliers".

Minimum tolerance for the shape and size

Finding the right rubber is fundamental when it comes to bolt seals. "On the one hand, the part must have a high degree of chemical resistance to petrol and cleaning materials," explains Andreas Gogl. "On the other hand, it has to withstand temperatures up to 200 degrees Celsius." The most difficult thing, however, is to maintain the tolerances with regards to the available space and size of the components. The part measures 19 millimetres in diameter and may only deviate from this by 0.2 millimetres. "That is not easy when it comes to rubber, because we are dealing with an organic material." A standard seal from Angst+Pfister provided the basic form that was then modified to suit the specific needs of KTM. The Angst+Pfister specialists worked meticulously to produce the solution; the wealth of engineering and production experience Angst+Pfister is able to call upon an essential part of the process.

Optimisation of production technology

"The dimensions of this product were novel," continues Andreas Gogl. The design and the materials were chosen in close coordination with the customer with Angst+Pfister primarily responsible for optimisation of production and the questions: How can the seal be manufactured? How can the tolerances be maintained? What is the right material?

First, Angst+Pfister adapted a drawing KTM had provided for the engineers. The optimum dimensions for keeping production costs as low as possible were then calculated by the partners together – the seal was going to be manufactured in large numbers. "The volume of the component needed to be as low as possible to save on materials – while at the same time, we had to guarantee as long a life span as possible," remembers Andreas Gogl.

Prototype tests

First Angst+Pfister delivered a sample part to KTM. To the customer's satisfaction, their prototype test results were the same as those produced by the engineers of Angst+Pfister. "The sample testing went very well, no additional finishing was required. It was very important to err on the side of caution before we started series production," explains Andreas Gogl.



«The sample testing went very well, no additional finishing was required. It was very important to err on the side of caution before we started series production.»

Andreas Gogl, General Manager Austria + CEE, Angst+Pfister



The driver also demands maximum comfort from a "powerhouse".

Strong partners, tough trucks - when reliability and efficient cooperation clinch the deal

Hyster-Yale Group contracted Angst+Pfister to make further improvements to the driving comfort of its 8-18t forklifts by designing a cab mounting solution that would limit cab movement and ensure as little transfer of engine vibration as possible. The engineers and the international Research & Development Centre of Angst+Pfister were able to make full use of their specialist expertise and very quickly produced the required customised engineering components.

Hyster-Yale Group, a USA based company manufacturing industrial trucks, produces some of the toughest forklifts in the world - a combination of innovative design, industrial quality components and advanced production and testing. The product portfolio ranges from container handlers and reach stackers to forklifts for nearly all industrial applications, through to warehouse trucks.

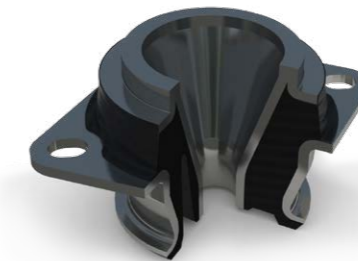
The trucks with capacity of 8-52T are assembled in the Dutch town of Nijmegen, including its trucks for container handling. Hyster-Yale Group ships its trucks from there to the whole world. In addition to robustness and reliability, the driver's comfort is also vital. Hyster-Yale Group's Hyster® brand's credo is: "When nothing but the grittiest makes the grade the answer is Hyster", which is why the company continually strives to maximize vehicle comfort.

Positive experience

Jeffrey Veldhuis, Product Engineer, and Reinier Schuurman, Product Leader, both responsible for vehicles with a lifting capacity of 8 to 18 tons at Hyster-Yale Group, had already had a uniformly positive experience of working on a past successful Angst+Pfister project now completed. The main issue was a vibration damping system for the new EURO IV engines. "Our bearing elements the APSOvib® type 26 from Angst+Pfister's standard range provided the solution," relates Kamel Ahmed, Product Application Engineer at Angst+Pfister Netherlands.

Data exchange across the Atlantic

Jeffery Veldhuis and Reinier Schuurman now faced a new challenge: A customer with very tough underground application in the USA wanted the cab movement on around thirty vehicles reduced - and as fast as possible. They contacted Angst+Pfister and supplied the data necessary to run a rigid body analysis. Based on the analysis results, Angst+Pfister initially put forward various APSOvib® bearings from the standard range that could undergo testing. These components were measured in the USA using an accelerometer. The resulting large volume of captured accelerometer data was then analysed by Angst+Pfister Netherlands applying Fast Fourier Transformation (FFT).



APSOvib® mounts were first used as standard products, then as customer-specific development.





Angst+Pfister's new bearings increase the service life of forklift trucks.



Fast problem solving

Thanks to FFT, Angst+Pfister's engineers were very quickly able to identify the vibration frequency that had to be curbed. This was the basis with which Angst+Pfister Netherlands was able to recommend a superior bearing solution - with the optimum stiffness required to ensure the driver's cabin is as comfortable as possible. The bearings needed to be both extremely robust and durable. "We are not aware of many companies that are in a position to produce such high quality anti-vibration bearings in such a specific design over such a short period of time," says Product Leader Reinier Schuurman of Hyster-Yale. The bearings were initially retrofitted in the thirty forklifts in the USA.

Customised series production

"For the series production we then needed a customised version of the metal and rubber components," continues Reinier Schuurman. However, they had to be significantly smaller than the standard product. "So we began by designing half-size components that also had to exhibit the same isolation properties," relates Kamel Ahmed. A com-

pany like Hyster-Yale Group has stringent quality requirements meaning that the quality standards demanded of production partners are equally high: only the best is good enough.

Kamel Ahmed was exactly the right coordinator for this challenging collaborative project. He got the Angst+Pfister Group

Senior Engineering and the international Angst+Pfister Research & Development centre involved to ensure the customer would again be guaranteed the best solution. After all, a strong relationship with your customer is the key to success. If the chemistry is right and you can both progress at the same speed then motivation and a good outcome are preprogrammed.



Dedicated technical expertise to engineering design solution

The engineers used CAD software to calculate and design a pilot component, the behaviour of which was then simulated at the international Angst+Pfister Research & Development centre using finite element analysis to determine the optimum stiffness. The design had to be adjusted precisely several times to do this, each time adding in more accuracy in a process that took less than four weeks to reach the final technical design of the anti-vibration component. For Angst+Pfister this was a real opportunity to apply all its know-how. The product was fully designed and produced from A to Z by Angst+Pfister in house - including the rubber compound made especially for the anti-vibration bearings. "We designed a component with special properties that was not yet available on the market." adds Kamel Ahmed with pride.

Greater durability

After eight weeks in total, forty components were delivered for field trials. "That is very fast," says a pleased Raphael Friedli, Senior Engineer at Angst+Pfister, who worked on the project at the headquarters in Zurich. "They are exactly as we calculated they would be. We have dramatically lengthened the service life of the parts - and consequently the durability of the vehicles." The customer is more than satisfied. Angst+Pfister rapidly found a solution by applying advanced technical methods to optimise the "total cost of ownership" - that is, all the direct and indirect costs of the forklift.



«We designed a component with very special properties that did not yet exist on the market.»

Kamel Ahmed, Product Application Engineer, Angst+Pfister Netherlands

Alstom is counting on Angst+Pfister for its M7 rail engineering project in Belgium

A fast paced development timeline, solutions for complex technical requirements with combinations of strict fire protection regulations, needs for outstanding mechanical performances and suitability for complete systems integration – that was the key with which the engineers from Angst+Pfister won several contracts with the transport company Alstom. Alstom's customer, Belgian Railways, will be running with our anti-vibration and fluid technology as of 2018.



The M7 rail engineering project – a flagship for modern mobility solution for the people of Belgium: Nearly 1'400 new double-decker rail cars are due to be rolled out on the Belgian railway network beginning in 2018. Angst+Pfister's customer Alstom Transport is building a first batch of 90 motorized traction units for this major contract. Alstom requires anti-vibration and fluid technology components for the installed HVAC units as well as for the main traction transformer.

It began with a special ventilator and auxiliary transformer bearings

"In March 2016, our management was given the opportunity to present our technologies and our competences to Alstom Transport in Belgium," explains Emanuele Varini, Project Engineer at Angst+Pfister. Shortly after this, the Alstom engineers contacted Angst+Pfister. "Initially our task was to design a special vibration isolation support for an auxiliary transformer and for a ventilator necessary for the cooling system of the coaches. We provided Alstom with the preliminary sketches and information on the design, which convinced them," says Emanuele Varini. "But the real challenge was in harmonizing the mechanical qualities of the bearing ensuring long lifetime whilst meeting the requirements of the European railway fire protection regulation EN 45545-2. In addition, Alstom needed us to meet a fast paced development timeline".

Angst+Pfister invests in a new product

All this culminated in Alstom issuing a highly detailed catalog of requirements and specifications for this special HVAC bearing. This included vibration isolation properties, mechanical resistance to shock loads, temperature resistance, chemical compatibilities, corrosion protection and electrical resistance properties. On top of this, the fire resistance level of EN 45545-2 R22 HL2 was necessary. "Rubber burns and the chemicals added to enhance the fire resistance may influence its mechanical quality," says Emanuele Varini. "Finding the optimum mix requires intensive research and tests. For this level, the rubber must pass three tests: it has to be very flame-retardant (oxygen index acc. EN ISO 4589-2), it should produce as little smoke as possible (smoke density acc. EN ISO 5659-2) and the smoke should pass a toxicity analysis (smoke toxicity acc. NF X 70-100-1/-2)," explains Emanuele Varini. In order to properly tackle the problem, an intensive tests plan was organized. "Even before the contract was awarded, Angst+Pfister decided that we would invest our resources in this project," says Emanuele Varini. This gesture of anticipatory confidence in the customer eventually paid off. The Angst+Pfister engineers set out to explore the limits of the fire retardancy and mechanical performance of the product managing to meet the customer specifications and deadlines, eventually being awarded the contract.

Four projects at the same time

An open attitude is very much appreciated by the customer: As a result Alstom showed interest in a further fluid technology solution for the HVAC cooling unit – ASSIWELL® metal hoses – after the Angst+Pfister engineers demonstrated their core capabilities in the field during a proactive engagement. “This is a complex system with hoses, pipes, and covers welded together,” explained the lead engineer Steve Spirlet, and continues: “Our strength does not lie only in delivering isolated components, but rather in developing an entire system. In this way we can reduce interfaces, for instance, and simultaneously the cost.” Alstom appeared to be more than happy with Angst+Pfister’s recommendations: “When we delivered both the anti-vibration and fluid system prototypes, we received a further project for a special traction transformer bearing from an Alstom plant in France,” reports Emanuele Varini. This time the issue was vibration damping for the main transformer of the vehicle which converts the power from the transmission

lines to run the vehicle's motors. Again, speed was of essence. “The delivery deadline for the prototypes was very tight,” Emanuele Varini remembers. Having met this challenge, Alstom France was then also interested in Angst+Pfister’s fluid technology to cool hot oil with an air feed for this transformer. Here, too, ASSIWELL® hoses have been designed to good use.

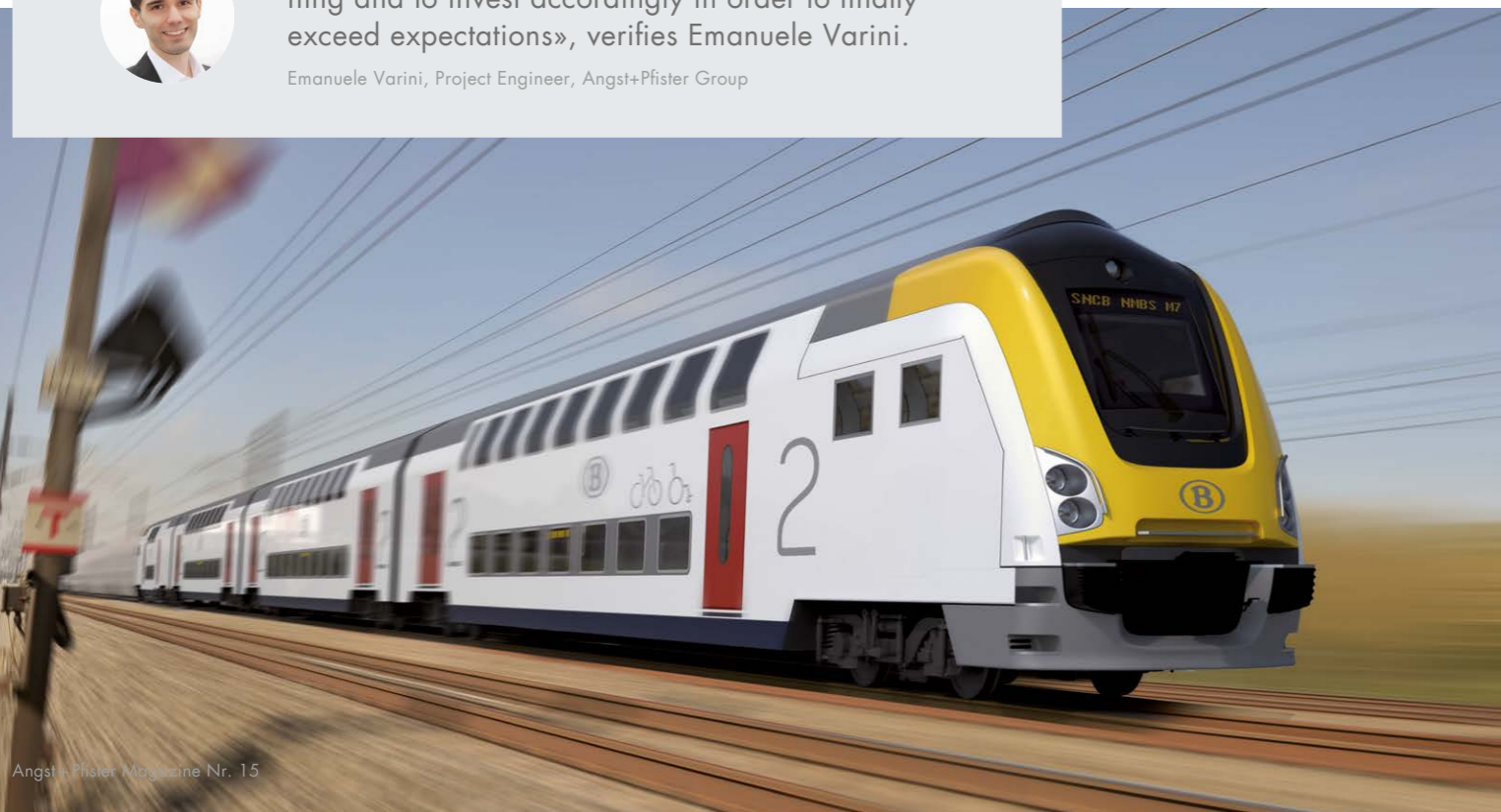
Good customer relationships motivate

All the projects finally went into serial production but the Alstom story and the M7 rail engineering project have not finished yet. Angst+Pfister is currently engaged in designing and producing a further special anti-vibration tube clamp for the hoses of the cooling unit. “It paid off to make that extra effort from the beginning and to invest accordingly in order to finally exceed expectations” verifies Emanuele Varini. In addition, he lays great value in a good and personal relationship with the engineers of the customer. “We speak the same language and we can understand each other very well. Joint projects are also a lot of fun.”



«It paid off to make that extra effort from the beginning and to invest accordingly in order to finally exceed expectations», verifies Emanuele Varini.

Emanuele Varini, Project Engineer, Angst+Pfister Group



EN 45 545 Fire Protection Certificates on Angst + Pfister products



APSOvib® Anti-vibration Technology

| Part type | Material | Hardness ShA +/-5 | DIN EN 45 545 |
|---|------------------------|-------------------|-------------------|
| Anti-vibration elements for bogies (layer springs, primary buffers, round and stop buffers) | NR | 50 ShA | R24: HL2 |
| | NR(BR) | 70 ShA | R24: HL3 |
| Floor supports | CR | 45 ShA | R10: HL2 |
| | CR | 49 ShA | R9: HL3, R10: HL3 |
| | CR | 70 ShA | R9: HL3, R10: HL3 |
| | EPDM | 46 ShA | R10: HL3 |
| Floor supports – Metal Cushion | Metal Cushion | | > HL3 |
| Floor supports – PUR – metal | APSOPUR® L55 (12.5 mm) | | R10: HL3 |

APSOseal® Sealing Technology

| Part type | Production technology | Material | Type | Hardness ShA +/-5 (Density g/cm³) | DIN EN 45 545 |
|--|-----------------------|--------------|------------------------------------|-----------------------------------|------------------------------|
| Molded parts, molded flat gaskets, O-rings | Compression | EPDM | Compact | 60 ShA | R1: HL2 |
| | | EPDM | Compact | 70 ShA | R22: HL3, R23: HL3 |
| | | VMQ | Compact | 40 ShA | R22: HL3, R23: HL3 |
| | | VMQ | Compact | 70 ShA | R22: HL2, R23: HL3 |
| Flat gaskets | Punching | EPDM | Compact | 70 ShA | R22: HL3, R23: HL3 |
| | | VMQ | Foam | (0.16 g/cm³) | R22: HL3, R23: HL3 |
| | | VMQ | Foam | (0.208 g/cm³) | R22: HL2, R23: HL2 |
| | | VMQ | Foam | (0.35 g/cm³) | R22: HL3, R23: HL3 |
| | | VMQ | Foam | (0.43 g/cm³) | R22: HL3, R23: HL3 |
| | | CR | Foam – closed cells | (0.195 g/cm³) | R24: HL3 |
| Elastomeric profiles | Extrusion | EPDM | Compact | 50 ShA | R22: HL2, R23: HL2, R24: HL2 |
| | | EPDM | Compact | 60 ShA | R22: HL3, R23: HL3, R24: HL3 |
| | | EPDM | Compact | 65 ShA | R22: HL3, R23: HL3 |
| | | EPDM | Compact | 70 ShA | R22: HL3, R23: HL3 |
| | | EPDM | Compact | 75 ShA | R22: HL3, R23: HL3 |
| | | EPDM | Compact | 77 ShA | R22: HL3, R23: HL3 |
| | | EPDM | Foam | (0.8 g/cm³) | R22: HL2, R23: HL2 |
| | | EPDM | Foam – mixed closed and open cells | (0.8 g/cm³) | R22: HL2, R23: HL2 |
| | | VMQ | Compact | 40 ShA | R22: HL3, R23: HL3 |
| | | VMQ | Compact | 50 ShA | R22: HL3, R23: HL3 |
| | | VMQ | Compact | 60 ShA | R22: HL3, R23: HL3 |
| | | VMQ | Compact | 70 ShA | R22: HL3, R23: HL3 |
| VMQ | Foam – closed cells | (0.35 g/cm³) | R22: HL3, R23: HL3 | | |
| VMQ | Foam – closed cells | (0.55 g/cm³) | R22: HL3, R23: HL3 | | |

APSOfluid® Fluid Handling Technology

| Part type | Product | Material | DIN EN 45 545 |
|------------------|---------------------------|-----------------------|----------------------|
| Industrial hoses | Conveyance hose for water | EPDM | R22: HL3 R23: HL3 |
| | Cable protection hose | EPDM and NBR | R22: HL3 R23: HL3 |
| | Cable protection hose | Silicon | R22: HL3 R23: HL3 |
| | Air brake hose | CR | R22: HL3 R23: HL3 |
| Hydraulic hoses | Hydraulic hose Type 2TE | NBR/EPDM | R22: HL3 R23: HL3 |
| | Hydraulic hose Type 15C | NBR/EPDM | R22: HL3 R23: HL3 |
| | Hydraulic hose Type 25C | NBR/EPDM | R22: HL3 R23: HL3 |
| | Hydraulic hose Type 15N | NBR/EPDM | R22: HL3 R23: HL3 |
| | Hydraulic hose Type 25N | NBR/EPDM | R22: HL3 R23: HL3 |
| | Metal hoses | ASSIWELL® metal hoses | Stainless Steel |

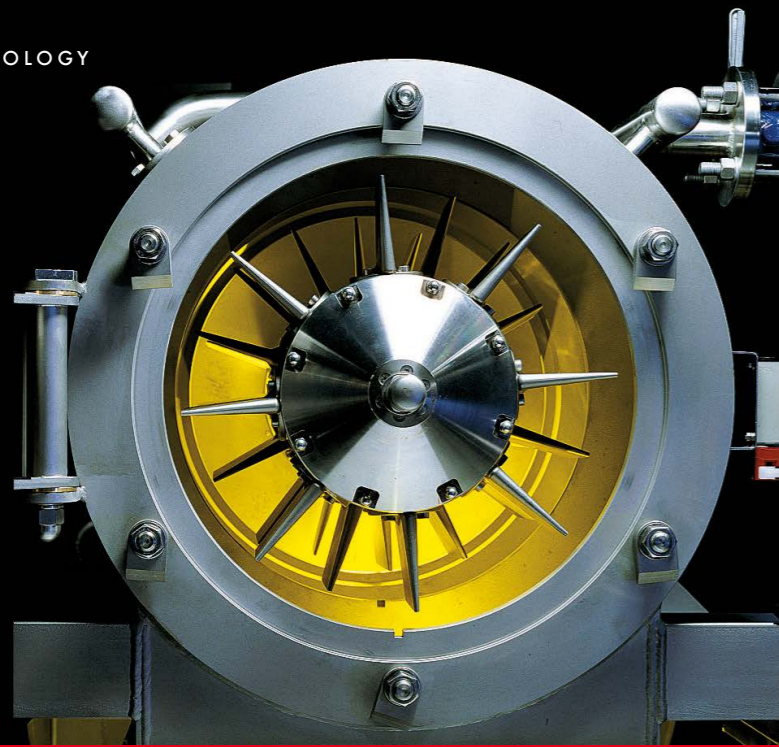
APSOplast® Engineering Plastics Technology

| Material | Type | DIN EN 45 545 |
|--------------|------------------------------|--|
| UP-HLM FR | Hand layup GRP Laminate | R1, R2, R3: HL2 |
| UP-GRP | Pultrusion profile | R1, R2, R3: HL3 R22, R23, R24: HL3 |
| UP-GM 203 | Red/white | R1, R2, R3: HL2 R22, R23, R24: HL3 |
| EP-GC 202 | Natural, (Yellow/brown) | R7, R17: HL2 R1, R2, R3, R11, R12, R22, R23, R24: HL3 |
| PE-UHMW FR | Black | R7: HL2 R10, R24, R26: HL3 |
| PA 66 FR | Black | R17, R23: HL1 R24, R26: HL3 |
| PA 6 FR | White | R22, R23, R24, R26: HL3 |
| PA 6 FR | Extrusion profile, coloured | R22, R23, R24, R26: HL3 |
| PC FR transp | Transparent, flame-retardant | R4: HL3 |

In addition to this range of products, we can supply you with special and/or customised products upon request at any time: consult us!



engineering@angst-pfister.com



More service at less cost

As a rule, it is the engineers of Angst+Pfister who fine tune the customer solutions. The CFT Group in Parma wanted to improve their replacement part service for its customers. The solution was devised by Angst+Pfister's experts in Italy in cooperation with the Angst+Pfister Global Logistics Centre – with tangible cost benefits for the contractor.

Several major Italian gastronomy products originate from the Parma region of Italy. But that is not all. The CFT Group is the leading global manufacturer of food processing and packaging machines, and as such lends the traditional agriculture image of this region an industrial dynamic. "Our customer manufactures individual machines and entire factory systems – and it all began with processing equipment for tomato sauce," recounts Alessandro Rugiero. He works as a sales & marketing manager for Angst+Pfister in Italy.

Sealing technology for the food industry

Angst+Pfister has long been a supplier of O-rings for the machines of the CFT Group. These products are made of FDA certified compound and produced with certified production processes in order to ensure compliance with the particularly high standards of the food industry. The aggressive acids used in food processing mean machinery has to be overhauled regularly and overstressed parts replaced – as soon as the time of year allows. The CFT Group customers do this themselves on-site. They receive the replacement parts by delivery, including among other parts the Angst+Pfister O-rings.

Outsourcing to the Angst+Pfister Global Logistics Centre

The replacement parts are delivered in a bag as a kit set. "The CFT Group wanted to improve its service," says Mauro Delù. As a Sales Application Engineer at Angst+Pfister, he was responsible along with Alessandro Rugiero for tackling the project. "It was really important that we tuned in to the customer to hear what they needed." At the end of the day, this was going to be a logistics solution, not a technical one. And of course the price had to be right. Alessandro Rugiero and Mauro Delù essentially proposed to the customer that the kits should be packed at Angst+Pfister's Global Logistics Centre. This

would mean that the supply chain of the replacement parts could be optimised to the extent that the kits could be at the customers' premises between seven to ten days after ordering. "Speed is very important to us and Angst+Pfister is organised around that requirement," says Enrico D'Asaro, Spare Parts Manager, CFT Group

Working together towards quality

"Our Global Logistics Centre has a modern, automated packing machine," says Alessandro Rugiero. It fills the bag with the smaller replacement parts whereas the larger parts are still packed by hand. "We began this project with 18 different kits - each kit containing between ten and fifty individual products. After little more than a year, in the second stage of the project, our aim is to be even more efficient," says Mauro Delù. The objective is to reduce

the complexity even further with a limited number of higher-level kits which can then contain various sub-kits. The result of these changes will be a further improvement for CFT to the total cost of ownership – that is all the direct and indirect costs of the process. The Angst+Pfister Global Logistics Centre provides modern logistics and warehousing services such as customized "safety stocks" or supply chain management – equipping customers with the best, fastest and most efficient solutions.

"The whole thing is regulated by a framework agreement with CFT," adds Alessandro Rugiero. The kits are tagged with a code and sport the logos of the CFT Group and Angst+Pfister. It's proving very popular with CFT's customers: "The kits are put together by two global market leaders whose names both stand for quality," says Enrico D'Asaro of the CFT Group



«Thanks to our automated Global Logistics Centre and service capabilities, we are also in a position to optimise the supply chains of our customers.»

Alessandro Rugiero, Head of Sales & Marketing, Angst+Pfister Italy



A buffer with style

In the future, KOHLER SDMO's rental power generators are going to include an elastomer component with a textured surface. From KOHLER SDMO's design patent, the developers at Angst+Pfister struck out in a creative direction so that during loading and unloading, the generators impress – and their visual appeal is not lost.



Abrasion-resistant, weatherproof and visually appealing: Angst+Pfister developed the leather-like surface texture in no time at all.

So what exactly does the customer want? This is the question driving the employees of Angst+Pfister whenever a new project begins. “Even with smaller projects, we generally visit the customer to have a look at their current situation and to get a thorough grasp of their challenge,” says Raphael Friedli. He works as a senior engineer in Anti-vibration Technology for Angst+Pfister in Zurich. This approach allows him and his colleagues to come up with the best possible solution – mostly in one sweep. “It was just the same for SDMO Industries”.

The eye decides

SDMO Industries S.A. is located in the heart of France. The company is No. 3 worldwide in the power generation business, capable of generating electricity even under extreme conditions – such as on oil

rigs or in the desert. A segment of their business is the design and sale of specific generators to rental companies, which can be used – for example, at events. Performance and reliability are what count for KOHLER SDMO. Their products are high-quality products and robust in the long term. “The generators need protective bumpers so that no damage is done when these mobile units are loaded on forklifts and carted around,” explains Raphael Friedli. And the protective bumpers have a visual impact. It was important to KOHLER SDMO that the function of the bumpers was more than to support the reliability of the generators. Their appearance also mattered and the generators had to look good and retain their appeal and high-quality for a long time. The previous usually smooth rubber surface can, however, show scratch marks after a short time without a lot of force being applied.



«It is essential to be close to the customer and to understand exactly what you are working out solutions for.»

Raphael Friedli, Senior Engineer Anti-vibration Technology, Angst+Pfister Group

Maintaining close ties with the customers

“KOHLER SDMO then asked what we could do with the surface texture of the protective bumpers so that the generators stayed looking good for as long as possible.” Ultimately, the metal-rubber components should make the KOHLER SDMO products stand out on the market – as a brand with high quality standards. “To make this possible, it is crucial to be customer focused and exactly understand the purpose of the solutions under development,” maintains Raphael Friedli. He and the engineers at Angst+Pfister's International Research & Development Centre drew their inspiration from plastics technology. The idea was to give the protective bumper a kind of leather look, as is already known, for example, from the plastic parts of car interiors. “I had never seen anything similar for buffers,” says Raphael Friedli.

Documenting quality

Producing rubber with a surface like this was no great cost factor. “We are in a position to do this efficiently,” explains Raphael Friedli. The surface patterns are first tool etched with acid. To perfect the look, Angst+Pfister also painted parts of the metal plates, to which the bumper rubber is attached, black. The bumpers, however, not only had to be and remain immaculate, they also had to protect the generators – additional qualities are required: They must be abrasion-resistant and weather-resistant. That means that they should withstand UV and ozone exposure and be resistant to humidity-damage. “We have achieved all these qualities with a special mixture based on EPDM polymers,” reveals Raphael Friedli. Wherever KOHLER SDMO's mobile generators are placed – thanks to Angst+Pfister's good-looking protective bumpers, they will perform well for years to come and project the quality image of the manufacturer.



The generators are equipped with protective buffers so that the forklift trucks do not leave any damage when loading and unloading.

An all-rounder serving the global food industry

Three industry standards in one product: O-rings and plastic components for the manufacturer of valves Bardiani Valvole have to comply with European and US standards and be 3A hygiene certified. That is where Angst+Pfister steps in as a recommended supplier for customers in the food industry. The business partnership has led to improved efficiency for Bardiani and better customer service.



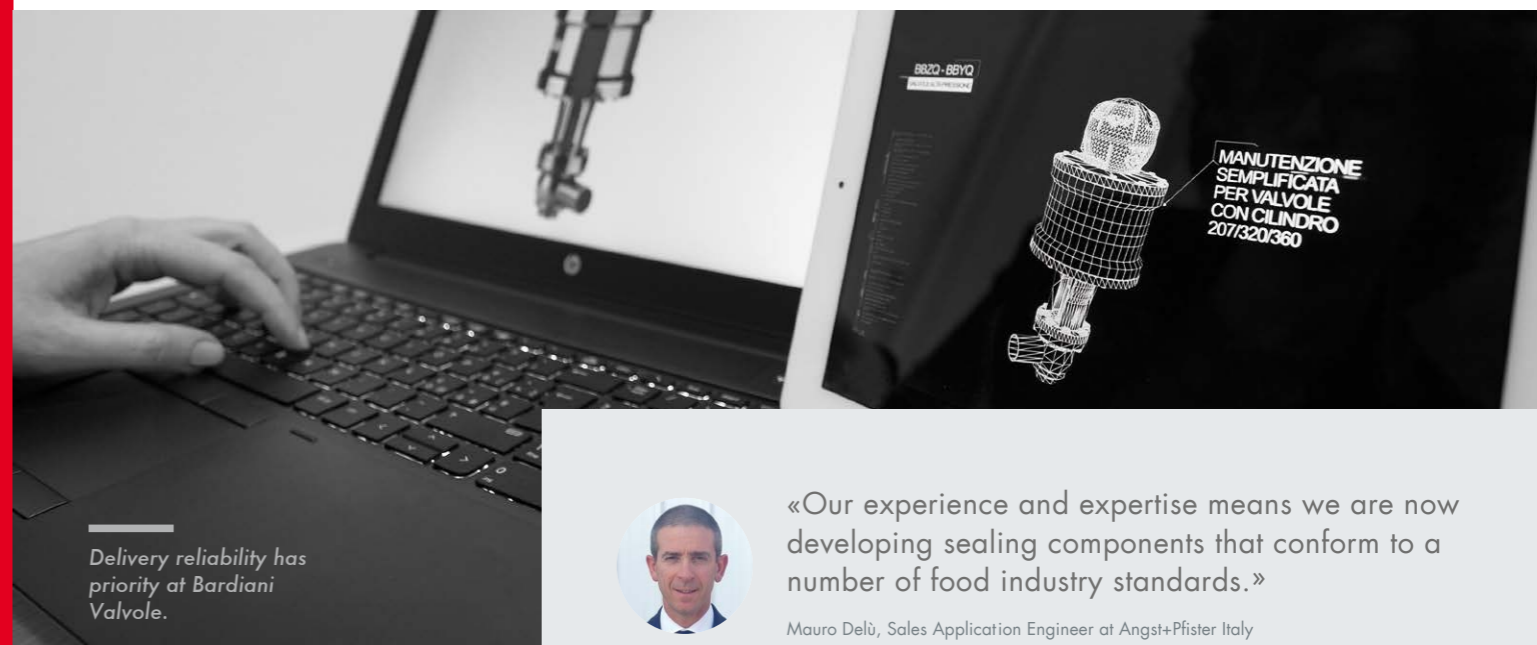
Bardiani Valvole uses the O-rings of Angst+Pfister.

"Business in Italy is very people orientated," says Mauro Delù of Angst+Pfister Italy. As a Sales & Application Engineer, he and Head of Sales & Marketing, Alessandro Rugiero, put a lot of effort into building solid, trusting relationships with the customers. For some years now this has included the family firm of Bardiani Valvole in Fornovo di Taro – not far from Parma – a company that is in a good position of growing and evolving.

Keeping pace with global ambitions

Bardiani and its almost one hundred employees have been supplying customers with valves since 1981 – primarily customers in the food industry, as well as beverage, pharma and others. The focus is on the service: timely delivery and ongoing product improvement in close collaboration with the customer. And this is what has made Bardiani Valvole successful, but also means they need suppliers who can keep pace: "If you are enjoying global growth, you are well advised to work with business "partners who are also globally active," declares Alessandro Rugiero. "Thanks to our technical expertise we are in a position to meet very challenging market requirements." And this is what Bardiani Valvole faces.

Angst+Pfister has supplied the Italian manufacturer of valves with O-rings for a long time. Over five years ago Bardiani contacted Mauro Delù and Alessandro Rugiero. A few of their customers had been asking about products that complied with various standards. Bardiani



Delivery reliability has priority at Bardiani Valvole.



«Our experience and expertise means we are now developing sealing components that conform to a number of food industry standards.»

Mauro Delù, Sales Application Engineer at Angst+Pfister Italy

recognised a market trend and commissioned Angst+Pfister's engineers to develop a new rubber compound. The challenge: The compound had to fulfil three standards simultaneously. These included the American Food and Drug Administration (FDA) certification and the European Union EN-1935/2004 standard. And on top of that the requirements of the hygiene label 3A for the milk processing and food industry.

Fewer products

Ensuring one component meets three standards is no easy task. In the past different materials had been necessary to implement this. Working together with the engineers at the Zurich headquarters of Angst+Pfister, they arrived at the optimum compound in little under a year. The outcome was fluororubber (FKM) O-rings. "At the same time we managed to reduce the number of current products for Bardiani, as we now had one part that fulfilled all requirements," continues Alessandro Rugiero. His partner R&D Director at Bardiani Valvole, Stefano Pesci, agrees: "That impressed us and made us more efficient than before. That's why we use O-rings sourced from Angst+Pfister."

Fast delivery from stock

The successful collaboration with the O-rings won Angst+Pfister a further contract shortly after. This time the requirement was for polytetrafluorethylene (PTFE) components that also comply with the same

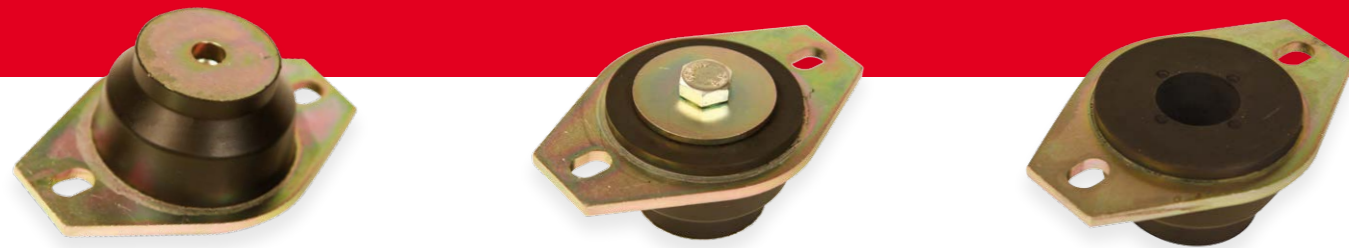
food standards. They will mainly be used as guiding elements in the valves and because they are in contact with food need to produce as little abrasion as possible.

"Key to this project was being able to reduce the delivery time from several weeks to ten days," says Mauro Delù. That's why the components are now held in stock at Angst+Pfister's warehouse. Bardiani produces a lot of customised products for its customers which is not easy for a supplier. The quantities are almost unpredictable - and fast delivery a serious challenge. Gianfranco Lommi, Purchase Manager of Bardiani Valvole is appreciative of the importance of this: "We are delighted that Angst+Pfister's solution has also improved our customer service."



New bearing systems for three-cylinder internal combustion engines

Manufacturers face considerable challenges when converting industrial vehicles to three-cylinder engines. Angst+Pfister has everything needed to provide intelligent solutions for engine bearings, starting right from scratch. The engineers have access to decades of company experience and advanced technologies.



Downsizing" is the future for combustion engines – even for industrial vehicles. In order to keep CO2 output within the legal requirements, there has to be a reduction in both displacement as well as the number of cylinders. It is now commonplace to find three-cylinder engines in the small vehicle market segment. The manufacturers of the industrial vehicles are having to come up with new ideas. In comparison to four-cylinder engines, three-cylinder engines have a massively increased vibration. Customer requirements for driver comfort means there is little room for trade off – comfort is an equally important requirement for the vehicles with three-cylinder engines.

The special case of industrial vehicles

When considering vibration for four-cylinder engines, only the position of the second cylinder is significant. The one and a half configuration is the dominant arrangement for three-cylinder engines with an ignition angle of 240 degrees. In addition, there is strong vibration due to the momentum of the crank drive off the first cylinder. This creates a stagger effect. "Theoretically, this can be compensated with a balancer shaft parallel to the crankshaft," suggests Raphael Friedli, Senior Engineer in Anti-vibration Technology at Angst+Pfister. However, cost considerations mean this is often disregarded for industrial vehicles.

Technical expertise is needed

What does this mean in terms of the bearing systems for the three-cylinder engines? The overall stiffness of the bearing system has to be significantly reduced in order to isolate strong, particularly low frequency vibration. This is firstly a challenge because of the fatigue limit of the static bearings - and secondly due to the dynamic high-stress processes of ignition, load change and acceleration. "Additionally, manufacturers of internal combustion engines set limits on the permissible acceleration and vibration. The softer the bearing system, the longer the vibration distance," says Raphael Friedli. This is the point at which the technical skills of the Angst+Pfister engineers come into play.

An approach led by experience and advanced methodology

"A group of experts discuss the requirements for any new components," explains Raphael Friedli. Modern analysis and the development processes - such as multiple body simulation, the finite element method and CAD construction software - are applied to produce a basic design. Even more important than these procedures are the decades of experience Angst+Pfister has collated in designing both rubber and metal parts and in tool construction. "It is this that allows us to carry out several design iterations within a matter of weeks," says Raphael Friedli. This gives the engineers of Angst+Pfister an edge in their ability to produce component designs in very little time. And: The designs not only fulfil the technical specifications; they are also produced highly efficiently.

Engine bearings cannot be analysed in isolation

Current vehicle designs with four-cylinder engines have been optimised over years for comfort and material savings. "When other engines are installed in the same vehicle, the fine tuning begins again from square one," says Raphael Friedli. The same applies to the stiffness of the mounting structure and even details such as the mirror and steering rod vibration. "Even when the



«We are an effective engineering partner for our customers as we supply new and efficient bearing systems backed up by technical production expertise.»

Raphael Friedli, Senior Engineer Anti-vibration Technology, Angst+Pfister Group

problem is limited to the engine bearing system, you cannot avoid multiple body simulation." The low excitation frequencies of the three-cylinder engines interact strongly with the various vibrations produced by the vehicle itself. This is one of the reasons why Angst+Pfister works closely with all its customers: After all, the large number of system parameters mean a comprehensive analysis can only be performed by the developers of the vehicle. Experience has shown that cooperative projects produce a faster market launch.

Support from A to Z

The design process can follow a variety of routes: Either the customer specifies the mechanical characteristics of a component or Angst+Pfister works with the customer to define those characteristics. "As soon as a component has a design with a production drawing, a formulation for the rubber mix and the process flows are in place, then we can make a start on the prototype or

series tools," explains Raphael Friedli. These are then quality tested in-house and delivered to the customers with the necessary documentation and certification. Angst+Pfister engineers are often on site for commissioning or field tests. This allows any quick adjustments to be made – should they be necessary.



Economical three-cylinder engines are on the rise. Most different high-tech solutions ensure smooth running and temperament.

100,000 Times Exactly the Right Product

It doesn't always have to be a customised request. Quite often, a look at Angst + Pfister's complete product range on www.angst-pfister.com or a visit to our online shop on www.apsoparts.com can be more than worthwhile for developers and especially for purchasers.

Whether O-rings or hoses, cone mounts for vibration isolations, plastic profiles or toothed belts: Angst + Pfister's range includes more than 100,000 standardised products. They can be ordered online and most can be shipped immediately. Standardised products and individual consultations are not mutually exclusive. Our international team of engineers, which often conceptualises highly complex solutions for our customers, will be happy to assist if required. Countless of standardised products have emerged from Angst + Pfister's

Engineering Department, so that new customers do not have to pay for the design but only for the actual product itself. Furthermore, Angst + Pfister's specialists continue to use standardised products by customising them in accordance with the buyer's specific design requirements. The uncomplicated ordering process is followed by our lean logistics. It is capable of fully adapting to the customer's supply chain which can lower costs even further.

APSOvib® Bushings (vulcanized or pressed)



APSOvib® Bushings are ideal as torsion springs, wheel supports and in suspension – and require no maintenance. They improve the safe handling and ride comfort of agricultural machines and other specialist vehicles when used in the suspension, axles, torsion bars and shock absorbers. They are available in vulcanized or pressed finishes. For vulcanized bushings the elastomer is vulcanized on the external and internal sleeves. The bushing is subjected to considerable compression on the main load surface in a radial direction, and resists with extreme rigidity in this direction.

APPLICATION:



APSOvib® Marine mounts



APSOvib® Marine anti-vibration mounts are specifically designed with ocean comfort in mind through the efficient isolation of vibrations generated by marine engines or propellers but also other static engines such as generators, compressors and pumps. They are manufactured in galvanized and passivated steel compliant with 2002/95/EC (RoHS) to prevent corrosion over time. Three different sizes and different grades of stiffness of mount allow for a high application versatility, covering load capacities from 35 kg to 960 kg and spring travel from 4 mm to 6 mm.

APPLICATION:



HITEC® O-rings



The Angst+Pfister HITEC® O-ring range includes O-rings made from NBR, EPDM, VMQ and FKM compounds with approval and conformity specifications for the drinking water, food, pharmaceutical and medical industries. Our EPDM 70.10-02 is of special interest due to its excellent mechanical properties such as a very low compression set, and it holds the full range of certification required for all the above industries – and this in one single material.

APPLICATION:



FEP-O-SEAL® O-ring



FEP-O-SEAL® O-rings feature an ideal combination of two materials: the core is elastic silicone, or FKM, providing natural resilience while the FEP sheath guarantees chemical resistance. FEP-O-SEAL® O-rings are suitable for a range of applications at temperatures ranging from -60 °C to +200 °C. They are pressure-resistant, guarantee a low compression set and have a much lower tendency for cold flow in comparison to PTFE. FEP-O-Seal® O-rings are suitable for all food processing applications as they fully conform with FDA, 1935/2004 EC, 3A Sanitary Standard and USP Class VI.

APPLICATION:

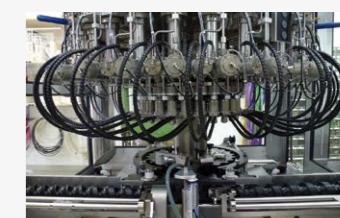


TETRAFLEX® S PTFE Hose lines



PTFE (known as Teflon) is one of the most versatile plastics on the market. PTFE has an almost universal chemical resistance and a service temperature range from -60 to +260 °C. Our PTFE high pressure hoses TETRAFLEX® S PTFE have an inner layer of this unique material rendering them suitable for an incredible number of applications. External braids made of stainless steel give the hose high pressure capability and good kink resistance. The hose connections are available as standard components or custom-made in stainless steel or galvanized steel in a range of diameters DN 5 - DN 25 (for larger than DN 25 - the TETRAWELL® PTFE hose can be used). We also supply antistatic designs and/or multi-layered braids for particularly high-pressure resistance.

APPLICATION:



APSOplast® PTFE N100

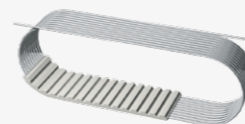


Our customer has traditional know-how in designing and manufacturing the elements that make up an espresso machine (boilers, coffee groups, etc.). As they sell their machines on the US market they asked us for help with the components requiring NSF/ANSI 61 homologation. Angst+Pfister immediately adopted the new regulations and switched to making all parts that come in contact with drinking water to the material APSOplast® PTFE N100, which is homologated according to NSF/ANSI 61.

APPLICATION:



SYNCHROFLEX® Polyurethane Timing Belts



Manufactured from high tensile steel cord tension members and wear-resistant polyurethane, the SYNCHROFLEX® timing belt is dimensionally stable and highly durable for efficient and tolerant transmission elements to optimise machine drives.

APPLICATION:



Logistics, quality assurance and customer focus worldwide

Our state-of-the-art logistics centre is the linchpin of Angst + Pfister's logistical services. At the roughly 23,000-square-metre logistics centre, 140,000 different stock-keeping units are warehoused and more than 1,500 separate items are reliably processed and shipped daily. Excellent C-parts management coupled with a world-spanning procurement network guarantees high product availability – even for custom items – with fast delivery times. With just-in-time, Kanban, supply management and other logistics concepts, Angst + Pfister enables customers to synchronise their incoming parts shipments to precisely match their production rhythm and to thus minimise inventory carrying costs. Our ISO 9001: 2008, ISO 14001:2004 and ISO/TS 16949:2009-certified complete quality assurance system additionally enables customers to greatly simplify their incoming goods inspection procedures.

www.apsoparts.com

APSOparts® simply order fast and easy

Over 100,000 great solutions at the touch of a button



Assortment highlights

Engineering Plastics Technology

- Semi finished panels, cut to size according to customers specifications
- POM and PEEK as round bar
- Standard plastics: PE, PP, PC, PMMA, PUR, PVC with certificates for the food industry
- Technical plastics: PA, POM, PET
- High-performance plastics: PEEK, PAI, PBI
- Fluoroplastics: Pure and filled PTFE, PVDF
- Protective plugs, surface protection nettings
- EC 1935/2004

Sealing Technology

- O-rings in the qualities NBR, EPDM, FKM, FEP, VMQ, FFKM
- Round cord in NBR EPDM, , VMQ
- Quad-rings / X-rings in NBR, edge protection sections, adhesive and sealing tape
- Radial-shaft sealing, axial-shaft sealing, mechanical seals
- Piston seals, rod seals, scrapers

APSOparts® offer

- No small order surcharge
- Price & availability display in real time
- Global Logistics Centre in Switzerland
- Standard range has more than 100,000 products

Customer benefits

- Small quantity orders without surcharges
- Quick decision-making tool for your procurement
- Unified processes, short lead times, Swiss quality standards
- Supplier of five industrial product lines

and ISO 14001:2004 also simplifies customers' incoming goods inspection.

The goal is to build a sustainable, long-term and successful business relationship with our customers. APSOparts® currently ser-

ves over 15,000 satisfied customers. If you have any questions about products, prices or the shop in general please do not hesitate to contact our service team at any time under support@apsoparts.com.



APSOparts® / Status 1.12.2017

Management: Rolf Werder (CEO), Marc Frech and Rainer Senn
 Locations: Zurich/Switzerland and Fellbach/Germany
 Contact: support@apsoparts.com
 Languages: DE, EN, FR, IT
 Organisation: 100% independent subsidiary of the Angst+Pfister Group



APSOparts® customer Franz Stankalla GmbH

About us

“Franz Stankalla GmbH is located in southern Germany. We are a supplier, working in machining production, CNC milling, and CNC turning and also offer component assembly. We produce prototypes, small series through to big series in a range of plastics, steel, stainless steel, NE metals and special alloys, which are directly programmed in digital 3D models with our CAD/CAM systems.”

Change to an online shop

“Before we ordered plastics from the APSOparts® Online Shop, each order had to be requested, a written offer was then made and finally an order was placed. With the change to the online shop, the expense and processing time for the request and offer evaluation disappeared, and in addition we could see whether the required material was available or when we could expect the delivery. Because we are always receiving orders which have to be delivered within two weeks, this saves us valuable time. We are entirely happy with the shipping system from the central warehouse; it fulfils our requirements for delivery time and packaging. At the moment, ordering via APSOparts® is undertaken by two people.”

“For us, it is highly advantageous to know instantly whether materials are in stock and the price, and it means you do not have to deal with the order/request twice.” Franz Stankalla, CEO, Franz Stankalla GmbH



APSOparts® customer KVA – a partner company of Hürner AG

“Because we often require smaller cuts of different technical plastics, pricing process before the new system was particularly time-consuming and involved some uncertainty. Calculating the order meant using the thick Angst+Pfister catalogue, as well as the separate Final Terms, and making telephone inquiries to Angst+Pfister.”

“At the moment there are two of us who actively use the online shop. We are in a position to find prices for our calculations at any time. As a result, we accelerate the procedure and above all, costing is more certain. The traffic light system coupled with a delivery deadline is as good as it gets with regards to availability. Now we can give the end customer a precise delivery deadline – in addition to price, a central focus of our daily business.”

“Something we would like to highlight: the huge range of products, all of which are usually available from the warehouse. In addition, we really value the cutting service – the costs for this are already included in the respective product. As such, we can rely on the price 100%.”

“In the same vein as the preliminary costing, we put our orders together directly in the shop and can submit them without having to generate a separate form. Not only we save time, but also eliminate a possible source of errors.”

“Overall, we feel the online system to be an absolute success. We would not want to do without the convenience, the optimised procedure and cost certainty.” Rolf Tanner, CEO, KVA

KVA – expertise in plastics systems engineering

We manufacture numerous components in our manufacturing hall for tailor-made customer solutions in plastics technology, such as appliances, containers, troughs, liners, as well as special constructions. In addition to the commissioning, we also organise the legally stipulated servicing. TÜV-certified plastic welders guarantee optimum quality and the professional implementation of your requirements.

KVA – CNC processing fulfilling the highest standards

An up-to-date and well-maintained machine park makes it possible for us to meet your requirements, from the smallest to largest component. Trained expert personnel proudly implements every order and ensuring quality results.

Company portrait (see our new website)

www.kva-kunststoff.ch / www.huerner.ch

IS-LINE and Pewatron

Sensors and power electronics under one roof

In May 2017, IS-LINE and Pewatron combined their sensor and power electronics activities through the Angst+Pfister Group. Their shared objective is to fully support customers with intelligent solutions based on many years of experience and combined expertise.

As a distributor of leading international sensor manufacturers – such as acceleration, pressure, rotation speed, flow, humidity, fill level, gas, force, magnetic field, tilt, position, current, temperature, ultrasound and displacement – IS-LINE has concentrated on the target markets of industrial and medical technology, mechanical and plant engineering, and safety technology.

An example:

OEM flow sensor for cooling lubricants

The optimised use of coolants offer opportunities to reduce costs as well as opportunities to optimise systems and conserve resources. SonoQ – as a partner of IS-LINE – designed the innovative flow sensor platform SQ Flow KSM for this application. The OEM liquid flow meter uses the ultrasound time-of-flight (ToF) method, whereby sound waves are generated and received via piezoelectric converters. The sound wave accelerates in the direction of the flow and decelerates against the flow of direction. The difference in the sound propagation times in both flow directions is proportional to the flow rate. The special time-of-flight technology allows for a high dynamic range of 1:175 with an accuracy of +/- 1%, including idle connection. This instantaneous, self-monitoring measurement technology with low pressure loss can also easily be used with polluted media or pressure surges in dynamically changing flow currents. From this basis, the SQ-Flow-KSM platform is built according to the customer's needs and optimised according to application, depending on the

requirement. Thanks to its special properties, it is suitable for maintenance-free flow measurements of coolants, such as in grinding and CNC machines, laser systems, cooling systems or irrigation systems:

- ✓ Largely independent of temperature and electrical conductivity
- ✓ Almost instantaneous (minimum delay)
- ✓ Pulsating flow rates are possible (e.g. for use in diaphragm pumps)
- ✓ No moving parts
- ✓ No damage at excessively high flow rates
- ✓ Excellent long-term stability
- ✓ Low overall pressure loss
- ✓ Flexibility in the installation and positioning of the sensor
- ✓ Flow direction detection
- ✓ Empty tube and air bubble detection
- ✓ Leakage detection

Further technical information:

www.is-line.de/SQ-Flow

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The flow sensor platform SQ Flow KSM uses innovative ultrasound technology.



IS-LINE builds on strong partners

About IS-LINE

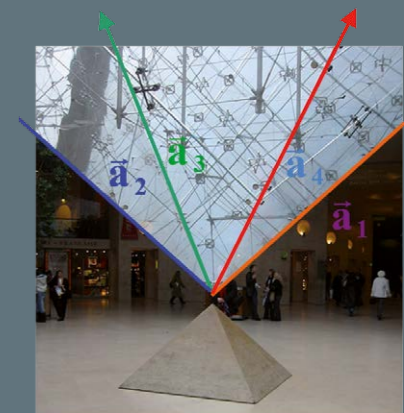
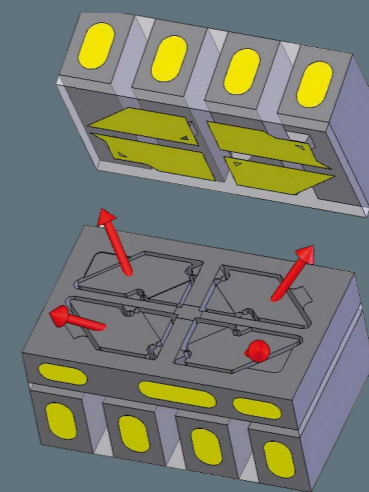
IS-LINE stands for 'Intelligent Sensors for Innovative Solutions'

IS-LINE GmbH was founded in 1998 as a subsidiary of the HY-LINE Group under the name of HY-LINE Sensor-Tec Vertriebs GmbH. In 2012, the company left HY-LINE Holding, becoming an independent market enterprise called IS-LINE. IS-LINE represents numerous international manufacturers in the area of sensor technology and power electronics, including the most renowned specialists and market leaders in their field. As a manufacturer representative, we have access to the most important internal production structures and information. This allows us to provide our customers with first-hand information and support.

Our sales engineers and application engineers are trained specialists in their respective business areas, ensuring that clients always receive expert advice. Close customer relationships are very important to us. Our well-equipped storage facilities include all common products, ensuring optimal delivery service.

Inclinometers – four axes are better than three

Inclinometers are currently installed in a number of vehicles and other types of mobile machinery. The majority of these applications are critical to safety; if the tipping warning of a construction machine fails at a crucial moment, it can have deadly consequences. By implementing an innovative sensor design, our inclinometers promise the highest possible level of intrinsic safety.



Basic structure of the 4-axis 3D MEMS accelerometer.

The basic measurement principle is always the same: the angle of inclination is determined in relation to the vertical direction of the earth's gravitational pull. MEMS sensors are responsible for this in modern cars, as well as in many other types of mobile machinery. They generally consist of three orthogonally arranged accelerometers for x, y and z. When the vehicle is at rest and absolutely horizontal, only the vertical components should have a value of 1 g (according to the earth's gravitational pull). When the vehicle is inclined, the angle of inclination can be determined vis-à-vis the vertical direction by means of trigonometric relationships from the three measured components.

4-axis acceleration measurement

But what happens when the transmitter, signal transmission or sensor electronics fail? In the worst case, a malfunctioning anti-theft device costs the car itself. But if a tilt sensor fails in a piece of construction machinery, it could have fatal consequences. This is exactly where the Japanese manufacturer Murata comes in with its novel inclinometer. It is based on its in-house capacitive 3D-MEMS automotive digital platform, which is certified pursuant to the automotive standard AEC-Q100 for the reliability of electronic components in the automotive supply industry. Unlike a conventional 3-axis sensor (x, y, z), the SCA3300 inclinometer measures acceleration in four non-orthogonal axes. The unique, patented 4-axis design makes it possible to self-monitor the 3-axis measurement values.

Inclinometer for robust applications

The SCA3300 inclinometer with digital SPI interface offers selectable measurement ranges for x, y and z of +/- 1.5 g, +/- 3 g and +/- 6 g with an extremely low noise density of 37 µg/√Hz at 1.5 g. Its operating temperature is in the range of -40°C to +125°C and it stands out for its robust design that has a high shock resistance and prevents a sticking effect. The sensor also features a very high long-term stability. It comes in a Dual Flat Lead (DFL) package, making it suitable for SMD mounting, with dimensions of only 7.0 x 8.6 x 3.3 mm³. Thanks to its special features, the SCA3300 is suitable for inclination measurements in the +/- 90 degree or 360 degree range and is ideal for applications such as mobile machinery, autonomous driving (ADAS), forklifts, robotics and more. Models and evaluation kits can now be ordered from IS-LINE.

Further technical information :

www.is-line.de/SCA3300

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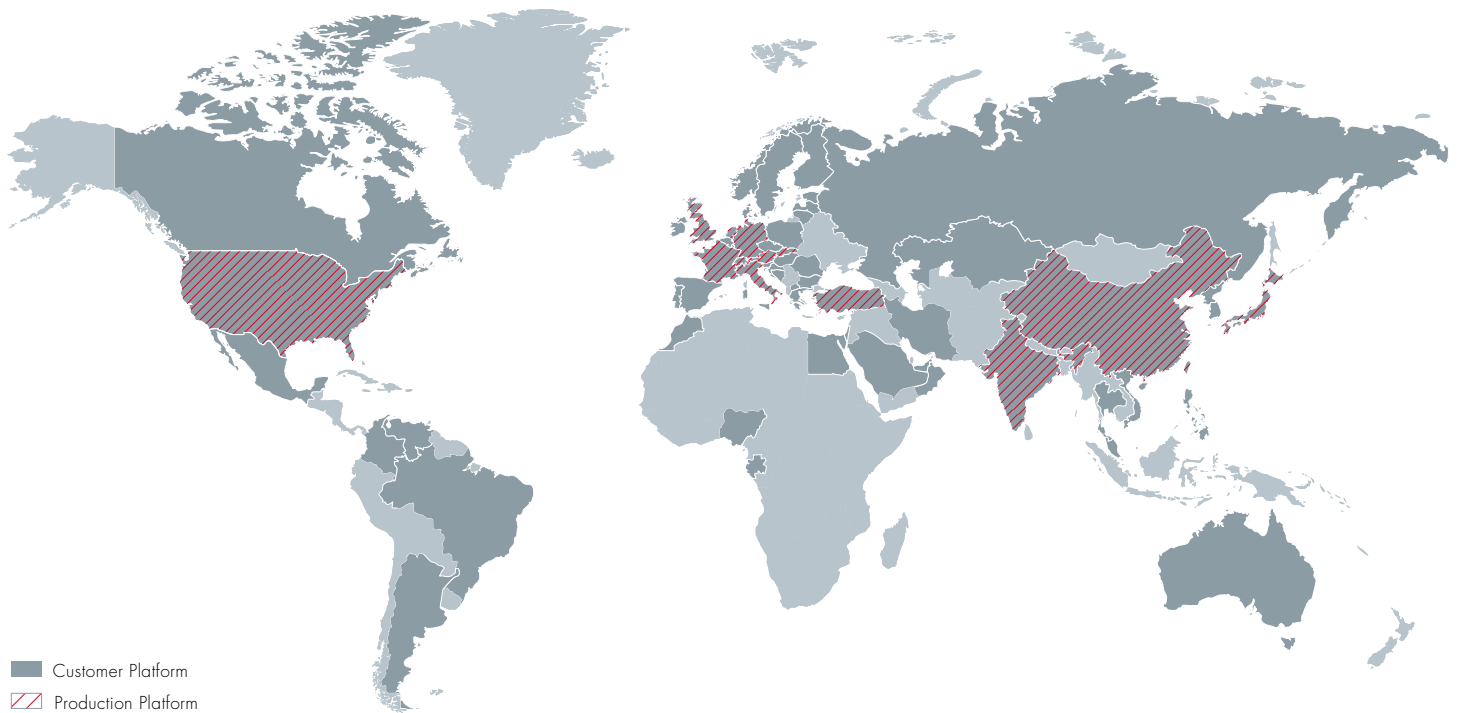
The robust SCA3300 inclinometer is suitable for use in construction machinery.

Services

The Angst+Pfister Group supplies its services to every corner of the globe. We are offering solutions tailored to the customer's specific needs with our local application specialists. We are providing engineering-lead solutions to thousands of original equipment manufacturers in over 50 countries.

Production Platform

Our global production platform spans across 15 countries. In addition to our own state-of-the-art manufacturing, we have reserved capacity with internationally renowned production partners. This allows us to always select the best production location based on our customers' quality, quantity and delivery requirements.



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