A strong development partner for Jungheinrich How are innovative solutions developed? It is not so much an inventive process, but rather one that is driven by analytical methods, virtual design and engineering. And Angst+Pfister has plenty of this expertise. Jungheinrich, which specializes in material-handling equipment, such as forklift trucks, and in intralogistics systems, makes the most of this expertise, having joined forces with Angst+Pfister as a development partner. The latest example is an elastomer bearing for operator cabs.

To develop new industrial trucks and further develop their technology, the engineers from Jungheinrich engage the expertise from Angst+Pfister early on to save time and money.

The "Ameise" (Ant) was the first forklift truck to be launched on the market by the German company in 1953, the year it was founded. The forklifts from Jungheinrich, with their unmistakable yellow color, are at work today in production facilities and warehouses all around the world in practically every industry. All material-handling machines have the potential to evolve together with the latest technology. Next in line are the DFG/TFG 660-S90 forklifts.

The trucks' operator cabs sit on tilt bearings that absorb any unevenness in the floor as well as vibrations in the various units. The bearings have to absorb a static force of 1,500 newtons. A key technical challenge is to design the ideal geometry of the cab bearings to ensure a high-quality damping effect. In the original design, an inner pipe was attached to the outer pipe using an elastomer across its entire surface.

Virtual design methods Josef Färber, an application engineer at Angst+Pfister, discusses the feasibility of the pipe connector with Erich Schmid, Angst+Pfister's Chief Technology Officer. Erich Schmid has profound expertise in antivibration technology from his specific experience with optimization of Formula 1 racing cars. He introduces numerical simulations based on a finite-element analysis of the original design, revealing that the static deflection is around 1.1 mm. This means that the damping effect for the cab remains low. At the same time, the tensile stress is relatively high, which has an impact on durability. Together with engineers from Jungheinrich, the objective is set to ensure static deflection of 2.5 mm together with a long lifespan while maintaining identical external dimensions.

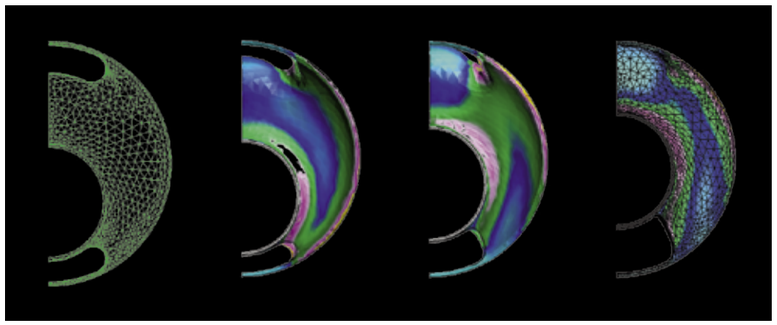
→

Recesses and fixed bias Using numerical analysis, several design versions are simulated under the corresponding loading conditions. The finite-element method leads to an innovative new design. The optimal elastomeric antivibration component now has a recess at both the top and the bottom, with the upper recess being larger than the lower one. Furthermore, the sleeve is calibrated by 1.5 mm during production. This means that the connector is vulcanized with an external diameter that is 1.5 mm larger and then compressed to the final dimension using a hydraulic press. Thanks to the increased fixed bias in unloaded condition, the tensile stress during operation is reduced, thereby significantly extending the lifespan of the connector.

A fast and efficient development process It takes only six months to go from the initial request to the creation of prototypes and on to series production. Leveraging Angst+Pfister's global production platform, the innovative new elastomer bearings went into series production in autumn 2013. Given this speed to market, the engineers from Jungheinrich frequently contact Angst+Pfister with any new development challenges. They have learned that the earlier in the development stage they get Angst+Pfister's application engineers involved, the more time and money they can save. For Jungheinrich, Angst+Pfister has become a key development partner for antivibration, fluid handling and sealing components. New market requirements and product updates provide opportunities to further optimize both the cost and the performance of the many Angst+Pfister-relevant components.

"It took just six months from the initial request, to creating the first prototypes then on to series production."
Erich Schmid, Chief Technology Officer, Angst+Pfister Group

Optimizing supply chain costs as well The broad selection of vibration absorbers, static and dynamic seals, V-belts and metal hoses from Angst+Pfister is perfectly suited for applications at Jungheinrich. At least every four weeks, Josef Färber contacts technicians at Jungheinrich, taking time to find opportunities for further savings. He is currently in the process of aligning Angst+Pfister's highly flexible global procurement platform with the state-of-the-art kanban system that Jungheinrich is about to introduce. Angst+Pfister will then supply the finished components in containers specified by Jungheinrich – no longer to the warehouse, but directly to the corresponding production lines. This will enable Jungheinrich to further cut logistics costs and gain a competitive advantage – and will allow Angst+Pfister to again demonstrate the precision of its just-in-time logistics service.



In order to make the development processes quicker and more efficient, Angst+Pfister relies on numerical simulation. Multiple design-iterations with the corresponding calculated simulation of the loading cases led to the innovative new bearing design for the forklift truck.

"We want to offer our customers the most comfortable workplace possible. When it comes to vibration isolation, we turned to the engineers of Angst+Pfister. After an extensive and comprehensive analysis, they developed the ideal solution for us and our customers."
Martin Wimmer, Development Engineer
Jungheinrich, Germany

Your contacts:
Erich Schmid
Chief Technology Officer
Angst+Pfister Group
+41 44 306 62 36
erich.schmid@angst-pfister.com

Josef Färber
Sales Application Engineer
Angst+Pfister Germany
+49 711 489 99 225 18
josef.faerber@angst-pfister.com

What the experts say

We thrive on challenges

Erich Schmid
Chief Technology Officer
Angst+Pfister Group
+41 44 306 62 36
erich.schmid@angst-pfister.com

Formula 1 and Angst+Pfister – both thrive on technical challenges, innovation and top technical performance. Erich Schmid used to develop Formula 1 chassis. He has been the Chief Technology Officer at Angst+Pfister for around a year now.

Erich Schmid, what parallels do you personally draw between the top echelon of motorsports and Angst+Pfister?
There are more characteristics in common than would seem at first glance. Not only do both expect first-class performance, they are also renowned for their innovation and are at home throughout the world. At Angst+Pfister, we thrive on being challenged by our customers to quickly develop state-of-the-art technical solutions for them, and to develop ongoing solutions together with them.

"The partnership with Jungheinrich even goes so far as to enable us to patent solutions that we have jointly developed."
Erich Schmid, Chief Technology Officer, Angst+Pfister Group

Does this mean that you and your development team strive to find the optimal solution at all times?
Yes, absolutely. For us, however, the optimal solution takes into account not only the technical aspects, also the economic and logistical perspectives: the engineering solutions we develop must fit perfectly under all circumstances and meet all of the individual demands of our customers. Most importantly an appropriate relationship between the price and the performance of any given product must also be achieved. And finally, we also focus closely on an economically and ecologically sensible supply chain. This results in sensible engineering solutions in every respect, and here I would like to place particular emphasis on the word "sensible", which is where we find our satisfaction.

Sensible solutions – is that also what helps you to earn the trust of your customers?
Jungheinrich is an excellent example. A relationship of trust has developed over the years, we are able to take full advantage of our know-how and experience based on this trust. The partnership even goes so far as to enable us to patent solutions that we have jointly developed. Jungheinrich has become an important and highly interesting partner for us.

Technical challenges seem to act like adrenaline at the start of a Formula 1 race.
My engineering colleagues and I thrive on these challenges! Since I joined Angst+Pfister as a specialist in anti-vibration technology in spring 2011 and was also appointed Chief Technology Officer around a year ago, we have mastered many challenges and have won the enthusiasm of our customers. After more than ten years of chassis development with Formula 1, I am now enjoying the technical diversity of applications and the fascinating contact with Angst+Pfister's customer base that spans a broad spectrum of industry disciplines and areas.