



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.

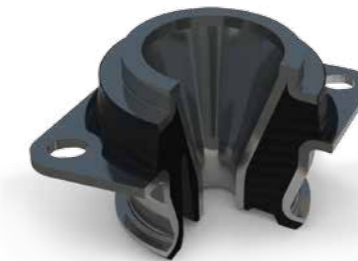
The trucks with capacity of 8-52T are assembled in the Dutch town of Nijmegen, including its trucks for container handling. Hyster-Yale Group ships its trucks from there to the whole world. In addition to robustness and reliability, the driver's comfort is also vital. Hyster-Yale Group's Hyster® brand's 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.

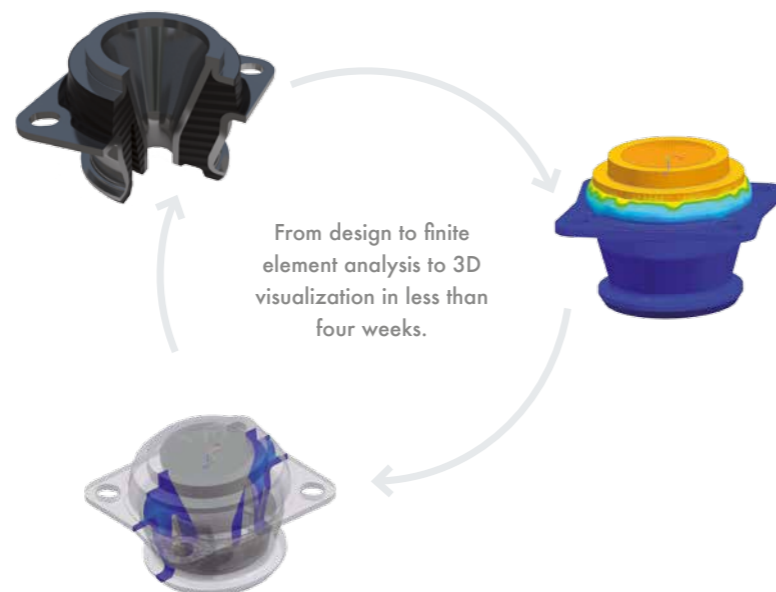
Customised series production

"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