Eaton’s redesigned coupling satisfies environmental concerns, delivers cost benefits, offers space savings, improves performance and reduces time to market.

Location:
France

Challenge:
Cost pressure for quick disconnect couplings on mobile equipment.

Solution:
Eaton’s enhanced Flat Face coupling allowed the mobile OEM to achieve savings through offering a smaller size coupling that offers same flow rate as the previous higher size coupling.

Results:
Beside cost savings the reduction in coupling size provided reduction in space claim and weight for the customer what led to additional efficiency improvements.

“Using Eaton’s Flat Face couplings allowed our end customer to generate additional cost savings through weight reductions of the hydraulic system what led to efficiency improvements and fuel reduction.”
Christian Kuenstel, Product Manager for Connectors, Hydraulics Group EMEA

Background
With over 50 years of experience within the global mobile equipment industry, Eaton’s customer is recognised as an industry leader in the field. Supplying sectors such as construction, mining, quarrying and logistics, the company develops and builds high-quality equipment such as telehandlers, forklift trucks and backhoe loaders. Hydraulics are extensively utilised throughout mobile equipment, providing the life blood of operations and the power to get the job done, which is why this customer has been using Eaton as a long-term supplier of performance-critical components.

Challenge
There is a large focus on industry to be respectful of the environments that they operate within and this was one of the primary reasons that the new Flat Face couplings from Eaton (FF coupling) was selected for this application. Flat Face couplings from Eaton offer dry-break or minimum-spill performance as required in a broad range of applications within agriculture, construction and municipal/public works. These applications have one thing in common – oil spillage that can damage the environment, during disconnection is not acceptable any more.

Although the purchasing decision for buyers within the mobile equipment market is based, to a certain extent, around innovation, it is also quite cost sensitive due to the fact that capital expenditure costs are tightly controlled. It is imperative, therefore, that manufacturers within this field keep their build costs in check to ensure they remain competitive. Essentially, this focus means that component value is examined regularly.

As a long-standing strategic partner to the customer, Eaton was challenged to alleviate certain cost pressures by closely examining the hydraulic flat face coupling utilised by the company. It is essential that hydraulic systems operate efficiently and safely. Traditional couplings that have been utilised for years come with drawbacks such as restricted flow and leakage. With this in mind, OEMs are today seeking alternatives in order to improve factors like operating costs and machine uptime. Here, a viable alternative has emerged in the market, namely flat-face, quick-disconnect couplings. Due to the significant advantages offered by these innovative couplings, uptake has been high. However, not all flat-face couplings are made equal.

The request by the customer to scrutinise its flat face couplings is a familiar scenario to Eaton, which works in partnership with many large OEMs to satisfy their unique product challenges. However, in this case, Eaton wanted to go one step further, taking on the additional challenge of improving the overall cost versus performance ratio of the coupling.
Solution

Eaton set about re-engineering its Flat Face coupling design to meet the requirements. Following extensive development efforts, the redesigned Flat Face, quick-connect/disconnect coupling now features a flow rate that is up to 25 percent greater, and a high-performing pressure rating of up to 400 bar to maximise machine performance. Furthermore, the renewed Flat Face coupling helps to reduce pressure drops and decrease energy loss. Due to the improved flow performance the customer was able to utilise a smaller 3/8” FF coupling rather than a 1/2” as it has an equivalent flow. This means that installation space can be reduced. An added advantage for the customer is that if you reduce the size of the coupling then you save weight which in turn results in lower fuel and energy consumption, thus making its machines much more efficient. Two couplings per telehandler are specified to equip any tool which requires hydraulic power, one for pressure line and one for return line.

When considering couplings for hydraulic applications, it is essential that they offer superior flow. If the coupling is not able to deliver sufficient flow, then the pump for the hydraulic oil will have to try and compensate, which means that the amount of energy it draws from the ICE (Internal combustion engine) is greater. In turn, the amount of fuel utilised for this compensation effort is increased. Flat Face couplings that have been engineered to offer greater flow in hydraulic applications can therefore deliver benefits in terms of fuel economy. At Eaton, engineers have optimised the internal architecture of couplings to ensure that the smooth transition of hydraulic oil through the system is improved. This smooth transition allows for pressure to be maintained at the necessary levels, thus negating the need to the pump to compensate and draw more energy.

For added peace of mind, the redesigned Flat Face coupling provides performance levels that exceed the requirements of ISO 16028 standards for working pressures by achieving 400 bar for static, steady or non-pulsed applications, instead of 250 bar as per the standard. What’s more, the couplings boast a burst pressure of 1,400 bar and 350 bar for ISO pressure rating in dynamic applications with moderate hydraulic shocks, which again exceeds the 250 bar defined in the standard. It is apparent that the many benefits of the re-engineered Flat Face coupling in this application have had a considerable impact on performance and cost.

Protecting the environment

On the subject of green credentials, Flat Face couplings from Eaton offer dry-break or minimum-spill performance as required in a broad range of applications within agriculture, construction and municipal/public works. These applications have one thing in common – oil spillage is not acceptable. Indeed, features such as ‘sleeve lock’ mitigate the risk of accidental disconnection. The push-to-connect sleeve-lock design incorporates double shut-off flat face valves, ensuring there is no fluid loss on either connection or disconnection. If couplings leak, people can become exposed to the chemicals in hydraulic fluids. The exposure to chemicals may be due to inhalation, ingestion or touch. There are instances of people suffering from skin irritation or weakness in hands when handling hydraulic fluids, along with episodes of intestinal bleeding, pneumonia and even death through hydraulic ingestion.Another hazard of hydraulic fluid is that when a coupling leaks, the chemicals of the fluid can either stay on top of the soil or sink into the ground. If the chemicals get into a water course, they will sink to the bottom. In such cases, the chemicals could stay there for more than a year. Aquatic life can absorb the toxic hydraulic fluid, leading to illness or death.

Another important point here is that when a traditional coupling leaks, it will need to be changed, which impacts on maintenance and downtime costs. With conventional couplings, the whole hydraulic system will have to be drained. In contrast, Flat-Face quick-connect/disconnect couplings from Eaton can be connected under residual pressure without the inclusion of air due to their dry-break feature, thus negating the need to depressurise the entire system.

Corrosion resistance

The redesign includes ‘green’ Guardian Seal plating that offers up to three times more corrosion resistance. Tests reveal 720 hours minimum salt-spray corrosion resistance, which helps provide higher protection against environmental challenges to reduce maintenance and downtime, and improve productivity and reliability in harsh operating conditions. Another drawback associated with corrosion is poor appearance; in certain markets, the role that aesthetics play cannot be underestimated. Indeed, in regions such as Germany and Scandinavia, corroded couplings are simply not acceptable. OEs spend millions ensuring that their products are cutting edge in terms of performance. However, there can be no doubt that aesthetics play a huge role in company reputation. If the couplings used are not resistant to rust, then damage to the OEM brand can be done through negative market perception.Clearly, elements such as water and salt spray (used on treated roads) can wreak havoc on system components, causing them to rust if not protected. Eventually, corroded components will break down and hydraulic fittings could well leak, causing reliability and maintenance issues. The point here is to only work with manufacturers that seek to provide the ultimate in terms of corrosion-resistant coatings. Eaton guarantees 720 hours of corrosion resistance against red rust (as tested in a salt-spray test lab environment). Engineers from Eaton are continually looking at ways they can innovate with regard to corrosion protection. What’s more, the company specialises in offering environmentally friendly coatings. The seal configuration can be connected under residual pressure, in other words there is no need to drain the system, thus reducing downtime. What’s more, the Flat Face features a specific threaded body to allow bulkhead assembly as well as color coding ring are customized features that allow the customer to enjoy a 100% integrated/ adapted solution.

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