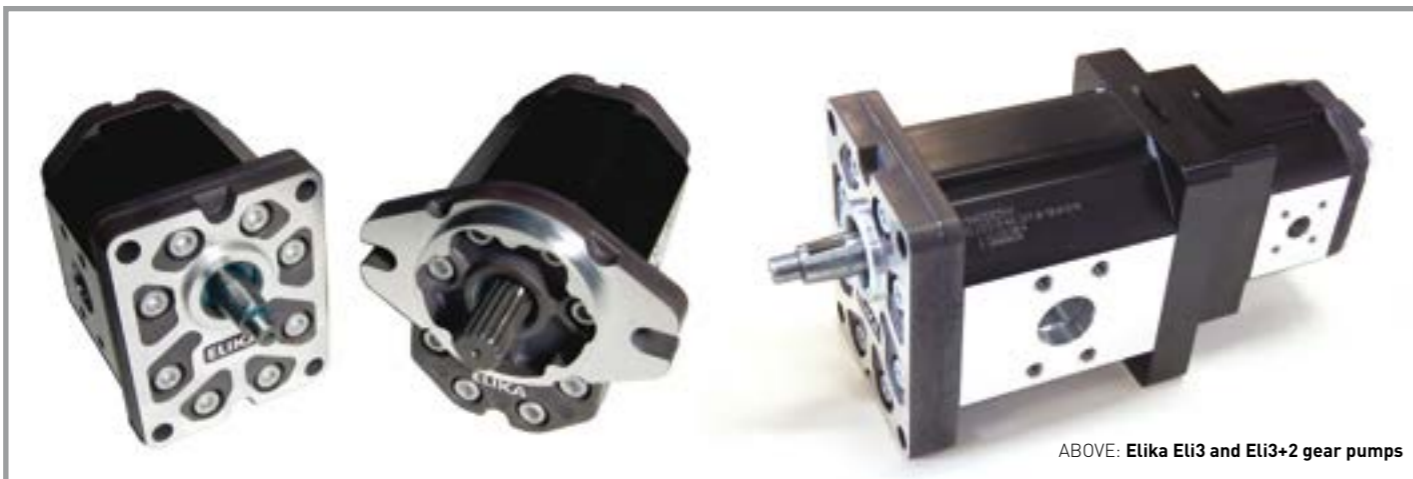


Sound advice

ELECTRIC FORKLIFTS HAVE MANY ENVIRONMENTAL BENEFITS, BUT THE ABSENCE OF AN ENGINE MEANS THE NOISE FROM THE HYDRAULICS CAN SUDDENLY BECOME PROBLEMATIC – UNLESS YOU’VE INCORPORATED ELIKA PUMPS, THAT IS



ABOVE: Erika Eli3 and Eli3+2 gear pumps

▶ Noise pollution has recently become a major concern for both mobile and stationary industrial vehicle manufacturers. Noise emanating from off-highway machinery was once seen as a much less pressing concern than that of limiting harmful exhaust emissions, but the EU now has extensive legislation in place designed to reduce NVH (noise, vibration and harshness) and provide a much more comfortable environment for vehicle operators, not to mention anyone within hearing distance.

Low noise emissions from industrial vehicles is therefore becoming an essential requirement for most operators and customers. There are two main approaches to noise reduction: the first is to take measures to attenuate NVH propagation by applying isolators and dampers to major noise and vibration sources. In addition to adding cost, weight and bulk to the final product, these palliative modifications are rarely 100% efficient as they are only effective under certain conditions and only for certain frequencies.

The second, more efficient, approach is to tackle the problem at the source, designing the machine to be as quiet as possible using low-noise technologies. The application of an alternative technology to lower the level of noise is normally the cheapest solution, giving the greatest acoustic results. This forward-looking approach may also offer a substantial saving compared with the cost of fixing a problem after the

event. Gear pump noise has two distinct origins – mechanical and hydraulic. The mechanical noise is what can be expected from any pair of gears, and depends mainly on the level of precision and the surface finish of the gear wheels. The hydraulic noise is primarily generated by the trapping of fluid between the top and the bottom of the tooth. The pressure peaks that arise from entrapment of the fluid between the top and the bottom of the pump are a crucial problem for involute gear pumps. During the delivery phase, the fluid, being compressible, reaches very high pressure spikes causing, high noise, vibration, pressure ripple and mechanical stress.

Managing the noise level is also a pressing issue for most manufacturers of mobile machinery. Finding a solution to tackle noise pollution can, however, create considerable cost owing to the implementation of hydraulic dampers and noise insulation. With almost 40 years of experience in designing, developing and manufacturing large-capacity electric forklift trucks, Carer can offer products that, thanks to their excellent performance, high uptime and savings in terms of running and energy costs, represent a valid alternative to internal combustion forklift trucks. In the niche market of equipment used to handle extremely heavy loads – where most of the big manufacturers can only offer internal combustion machines – Carer is one of the very few companies in the world that is able to

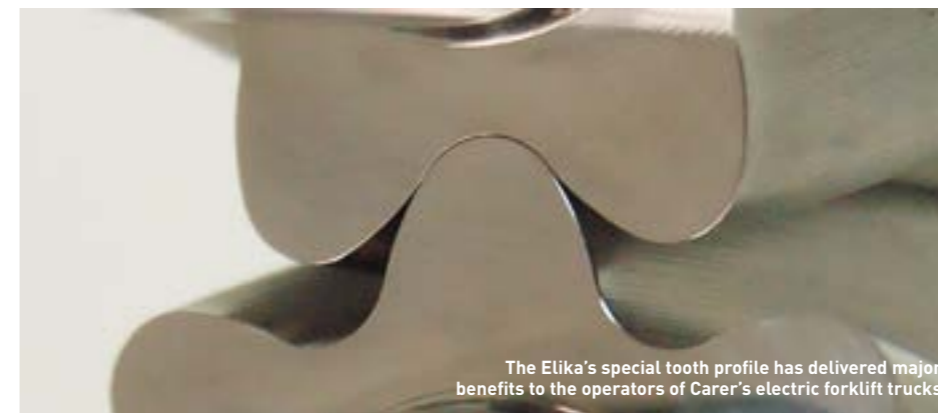
provide optimal solutions via forklift trucks operated exclusively with electricity for this specific kind of handling application.

Its range of counterbalanced electric forklift trucks with capacities up to 16,000kg on standard products and up to 18,000kg on special machines can all provide top performance levels with considerable savings in terms of running costs. The absence of an endothermic engine inevitably makes these machines very quiet; this feature however, makes the noise level produced by their hydraulic circuit much more noticeable. Carer, however, solved this problem by using Marzocchi’s Erika gear pump.

Ideal solution

Erika pumps can operate efficiently and quietly at very low speeds – below 500rpm – making these pumps the ideal solution for designers of many electric vehicles, as well as lifting and material handling equipment and electric aerial work platforms. The use of the Erika gear pump eliminates adverse noise effects on humans and the surrounding environment, reducing the noise level by an average of 15dB(A) compared with a conventional external gear pump.

The study of the Marzocchi tooth profile was conducted in collaboration with the Faculty of Engineering of Bologna University, through the generation of a dedicated design software. The



The Erika’s special tooth profile has delivered major benefits to the operators of Carer’s electric forklift trucks

experiments carried out led to the definition of a specific tooth profile capable of obtaining excellent acoustic performances even at high pressures.

To be able to engage a pair of toothed wheels without encapsulation requires an enormous concerted effort as any errors in profile would immediately lead to a great deal of noise, interference and poor reliability – but fortunately, the development of tooth-grinding technology makes the economical production of high-precision toothed wheels possible.

The helical toothing ensures the continuity of motion despite the low number of teeth – a feature that greatly reduces the fundamental frequencies of the pump noise, making the sound much more pleasant. In this way it was possible to minimize both

the pressure oscillations and their frequency. Without encapsulation, the particular shape of the profile considerably reduces pressure-oscillations and vibrations produced by the pump and transmitted to the other components, reducing the noise of the hydraulic system.

The pump structure minimizes the internal leakage, maximizing volumetric efficiency under all conditions. This feature makes the Marzocchi Erika pump suitable for work operations with low speed and high pressure. Internal leakage in hydraulic circuits is a major cause of pump components overheating, but this is virtually eliminated in the Erika pumps. The very low noise level being generated by these pumps makes this product particularly suitable for those applications

where screw pumps, vane pumps or internal gear pumps are traditionally used.

Elika is a registered trademark that will aid Marzocchi Pompe in the identification of these new products. Eli2 includes pumps with displacements from 7-35cc/rev, which are also available in multiple stage configurations. Eli3 series pumps are available in 20-87cc/rev displacements. Multiple versions are also available, while the biggest family, Eli4, boasting displacements of up to 200cc/rev, will be coming soon. The maximum operating pressures are similar to those of Marzocchi’s GHP series and extend up to 300 bar. The simple construction, small size and high performance of the Erika pumps, make this new product very competitive.

It’s all good

Carer’s electric forklift trucks offer all the benefits associated with using electric technology without affecting the desired high performance levels and lengthy operating times. In addition, there are no harmful emissions for the environment and worker health, reduced vibrations and noise, greater energy efficiency in comparison with internal combustion engines, and lower running costs.

The Carer company’s extreme flexibility and potential is fully expressed in its SPED department, which was created to make special machines designed to meet customers’ specific handling needs. Starting from 18,000kg forklift trucks that can sustain a speed of 15km/h, to specialist machines for the handling of radioactive waste, the SPED department can offer endless opportunities.

The paper industry is one of the main sectors in which Carer’s machines are used. In fact, handling increasingly bigger and heavier reels allows these electric vehicles to reach their full potential. The variety of model options available in the Carer range of trucks means there is almost always a suitable machine for any kind of job.

Steel plants, forging plants, foundries, and iron and steel manufacturers in general are undoubtedly the most challenging areas for forklift trucks of any kind. But this is also where Carer’s electric trucks show their mettle by offering customers endless environmental and economic benefits, as well as advantages in terms of space and reliability. Operators can now effortlessly handle coils, raw materials and finished products with electric vehicles, while ensuring long-term protection for the environment, considerable savings and, in most cases, the chance to move in the same spaces with very compact machines. **ALT**

Daniilo Persici works in the R&D department at Marzocchi Pompe SpA, where he leads test, FEA and CFD analysis

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