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Pierburg

## **Electric oil pump: a strategic component for e-motors and electrified powertrains**

**The electrification of the powertrain is one of the driving forces in the automotive market, motivated by the push towards fuel efficiency improvement and emission reductions. Within this context, a prime role is played by the electrification of auxiliary assemblies since they can run independently of the I.C. engine, thus shrinking power intake and consumption. Of growing popularity within these developments are the multi-talented electrically driven oil pumps. They can be employed as auxiliary for the I.C. engine as well as for different purposes within the powertrain including with today's electric motors.**

On hybrids cars, they maintain hydraulic pressure whenever the engine is not operating such as especially during start-stop and “sailing” modes. On automatic transmissions, they function as an additional pump to allow a downsizing of the mechanical one. On wet dual-clutch vehicles, electric oil pumps have a cooling purpose. Irrespective of the type of transmission, they can also be used as a scavenge pump to reduce the splashing losses caused by the gearwheels in the oil pan.

However, one application of increasing interest for the market is the cooling of e-drives both for HEV and BEV. Indeed, the constant increase of the power density of the e-motors is pushing more and more manufacturers towards an oil-cooled electric unit rather than a water-glycol one. In the former field of application, Pierburg GmbH commands vast experience and its current product range includes a variety of dedicated technical solutions.

### **Efficient products for a variety of requirements**

An entire product family offers engineering features covering the aforementioned requirements. Basically, the family is made up of three types of product by which Pierburg, depending on customer needs, is able to supply oil pumps with small to medium outputs.

- Pump (type 1) mounted outside the oil sump and fitted with a three-phase EC motor and normally with a gerotor.
- An oil pan-installed pump (type 2), also fitted with a three-phase EC motor and submerged below oil level.
- A radial pump (type 3), driven by a single-phase EC motor, also mounted outside of the oil sump.

A relevant feature of type 1 is its installation flexibility. The model is designed as a plug-in unit and can be mounted, with no or only slight modifications, on a variety of powertrains, thus addressing widely different customer applications. Indeed type 1, scaled in different outputs, is the preferred solution for the cooling of e-motors.

Type 2 pumps, in contrast, are virtually custom-tailored due to the different oil pans used on the various kinds of vehicles.

Type 3 pump keeps the transmission oil level low and thus reduces splashing losses caused by the gearwheels. Since pump pressure is low in such instances, a centrifugal pump is most effective in terms of costs, weight, and noise emissions.

### **Longstanding experience generates synergies**

An electrically driven oil pump has three subsystems: pump, motor, and electronic controller. Whenever a new pump is developed, attention is paid to the integration of these modules with a view to arriving at a further reduction of footprint, weight, and component count. Since Pierburg has years of experience in these respects and for some time now has been a specialist in electrically driven coolant pumps, such development targets as the durability of the electronics under extreme ambient conditions and vibration profiles have been achieved. Advanced communication and diagnosis functions have been further developed and adopted from the coolant pump family for synergy effects with the result that customers nowadays benefit from bidirectional communication between pump and controller. Meriting particular mention are the improvements regarding noise emissions on this type of pump which are attained by fine-tuning commutation and lowering pressure pulsation through hydraulic design optimizations.