

Modular filtration system

With the proliferation of drivetrain electrification resulting in increased demands in oil filtration, modular filter system offers purification, cooling and reduced friction losses

▶▶ In future the market share of electrified drives is expected to increase significantly. Because of this, dedicated hybrid transmissions (DHT) are expected to be very well represented. The reasons for this are synergy effects resulting from the geometric and functional integration of the electric motor into the gearbox housing.

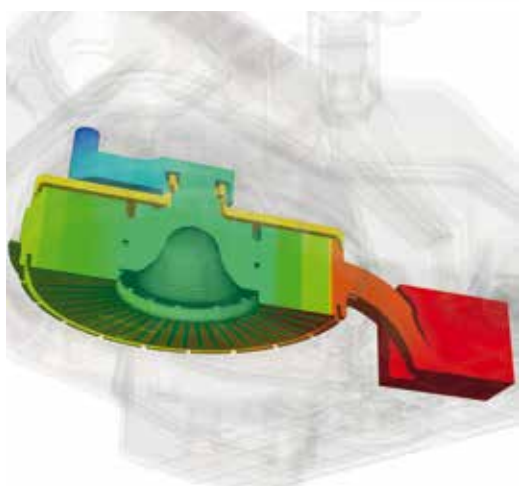
Depending on both the degree of geometric integration and the desired functional depth, there are different requirements for the transmission architecture of DHTs. In addition to the design differences, the integration also has an influence on the oil housing. Furthermore, the overall system design depends on the integrated components.

Tooth engagement and wet-running clutches for shifting gears in particular have a major influence. This is due to the high quantity of dirt released into the oil. Other elements that can be influenced by the oil purity are the bearing and the electric motor or its position sensor.

The determining factor here is not the particle's input into the oil, but the particles in the oil. They can



Module with filter, heat exchanger and oil pump for electrified drivetrains



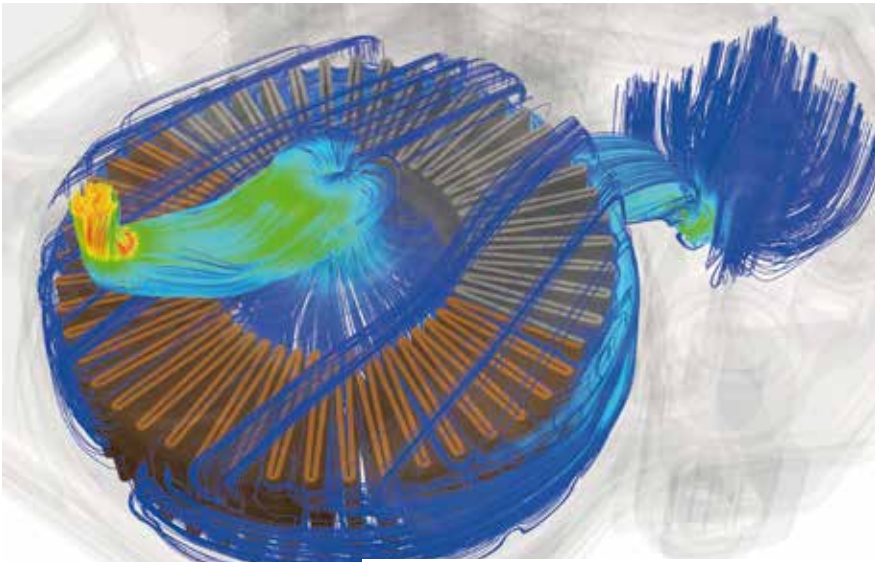
A significant pressure drop between the filter inlet and the outlet

strongly influence the wear of the stator and rotor windings and lead to position encoder malfunctions. It must also be distinguished whether the entire system uses a common oil housing or whether there are separate oil reservoirs.

All these influencing factors and the various combinations and characteristics of these factors lead to an increased number of variants. This has a corresponding effect on the requirements for oil conditioning. Simply put, the less the geometric and functional integration, the lower the demands on the oil housing. The converse is also true.

In addition to the greater market penetration of dedicated hybrid transmissions, new drive concepts in the field of pure electric mobility are being developed. However, there are two major challenges that need to be solved. Both result from the high speeds of the electric motors. On one hand, the bearing of the motor's rotor shaft and the bearing of the gearbox input shaft is subjected to very high speeds and tooth forces.

Therefore needle roller bearings, cylindrical pin bearings or cylindrical roller bearings are often used, but they are sensitive to dirt ingress



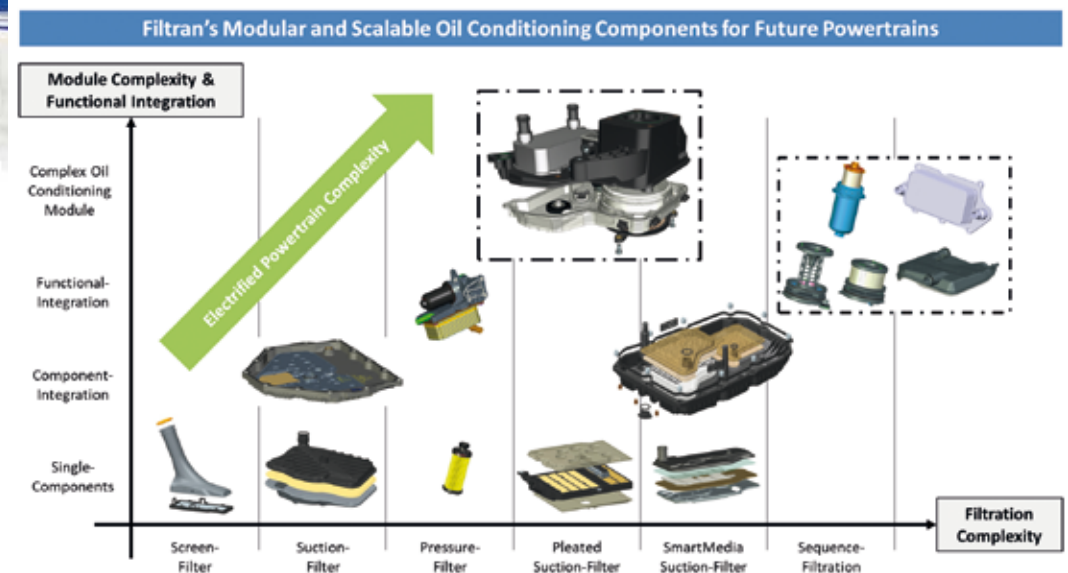
Left: The stream lines around an IBS Filtran pleated oil filter

Below: Modular and scalable oil conditioning components for future electrified powertrains

and insufficient cooling. To generate a solid system, it is necessary to reduce the number of particles as well as particle size. The other challenge is to keep the oil level low, especially with a wet-running electric motor. In this way power loss due to oil shear is reduced. However, it is difficult to ensure continuous oil circulation with a low oil level.

To meet resulting requirements, Filtran has expanded its portfolio in HEV and BEV powertrains. In the course of development, new technologies were combined with extensive experience in the field of automatic torque converters, dual-clutch transmissions and CVTs. The result is a modular and scalable oil conditioning system that can be adapted to a number of individual applications.

The simplest variant of filtration is the use of screen filters. These are usually equipped with stainless steel or plastic fabrics. Often these filters are used as pump protection when the oil is only used for cooling and lubrication. If oil purity needs to be increased, suction filters with




different filter layers that hold the particles inside can be designed. In this way, oil contamination can be avoided. This leads to a safe function fulfillment of hydraulic valves with simultaneous reduction of wear.

The next step in the process of modularization is the combination of suction and pressure filters. Different filter media are matched to each other in such a way that the highest dirt absorption and efficiency is achieved with the lowest possible pressure drop across the filters. For this purpose, Filtran has developed special filter media in its own laboratories.

If oil cooling is required, Filtran offers pressure filter modules fitted with an integrated heat exchanger. These modules require less space due to the integrated design and can also be installed locally. In many cases they also have additional valves that can control oil flow depending on the oil temperature.

If the aim in transmission and powertrain development is to combine the oil balance systems into one component, an integrated oil module based on an oil pan is the ideal solution. Equipped with suction and pressure filtration, Filtran's oil pan has been designed for this purpose and features a heat

exchanger and an oil pump. These modules enable flange-mounting to the gear housing, thus reducing the number of interfaces. In addition it is possible integrate switchable oil flow control valves.

Filtran's integrated oil module technology not only ensures the functionality of the next generation of propulsion systems, but also reduces the amount of oil needed and losses caused by sharing oil. 

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