

TECH TALK

» Integrated Oil Management as a key technology for e-Axles

How can integrated oil management combine multiple cooling functions into one compact, smart system?

And what does that mean for installation space, weight, costs, and complexity?

SHW - Tech Talk

Integrated Oil Management as a key technology for e-Axles

MAIN CHALLENGES

With the increasing integration of the e-motor, transmission, power electronics and axle components, the requirements for cooling, lubrication and filtration of the entire e-Axle are rising. At the same time, OEMs and Tier 1 suppliers are under significant pressure to reduce installation space, weight, costs, and complexity.

The oil fulfills several tasks simultaneously: cooling and lubricating of the e-motor and transmission, dissipating heat, and protecting the components.

In distributed oil management, oil filters, pumps, heat exchangers, and valves are largely considered as separate components. However, each additional component requires installation space, connections, lines, seals, assembly effort, validations, and much more. With every additional interface, system complexity increases for OEMs and Tier 1 suppliers.



© Copyright BMW AG

For OEMs and Tier 1 suppliers, a central development question arises:

» How can the functions of the cooling circuits be combined so that many individual components become a compact, smart system?

» **The consequence:**
Oil management becomes a system-level issue. The oil management of an e-Axle influences thermal performance, efficiency, noise behavior, installation space, and weight.

This is exactly where the concept of fully integrated oil cooling system takes effect.

THE APPROACH

» An oil cooling module combines **four core functions** in a compact system, thereby addressing the key challenges of e-Axle integration.

OIL DELIVERY ON DEMAND

An integrated electric oil pump ensures demand-driven oil supply to the components.

THERMAL MANAGEMENT

The oil serves not only as a lubricant but also as a heat transfer medium.

SENSOR TECHNOLOGY

The integration of sensors enables the monitoring of key operating parameters such as pressure or temperature.

FILTRATION

The filter protects the oil circuit from particles or contaminants.

COOLING CIRCUITS IN DETAIL

PRIMARY COOLING CIRCUIT

» Ensuring precise, demand-driven cooling and lubrication of the e-drive unit:

The primary cooling circuit uses oil as the cooling medium and is responsible for cooling of the e-machine, as well as for lubrication and cooling the transmission components, and the bearings of the e-machine. For this purpose, oil must be drawn from the oil reservoir using an electrically controlled oil pump and delivered through a pressurized interface.

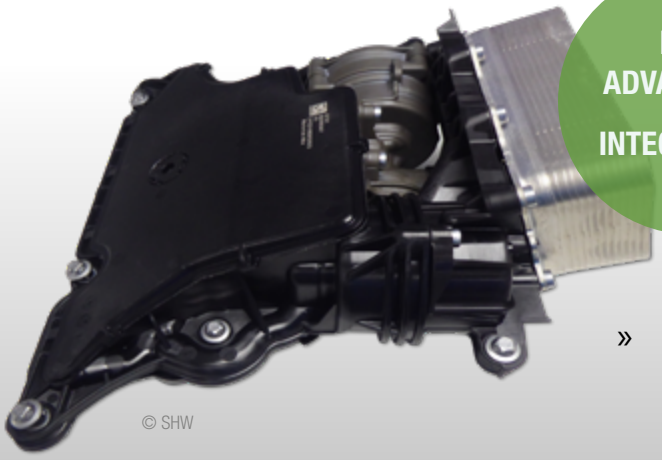
SECONDARY COOLING CIRCUIT

» Dissipating heat generated by the e-motor via the oil into the vehicle system:

The secondary cooling circuit is an integral part of the vehicle‘s overall thermal management architecture and is responsible for dissipating heat losses from the inverter, heat losses from the stator, and heat introduced into the oil in the primary circuit. The thermal energy absorbed by the oil is efficiently dissipated into the vehicle‘s cooling system through the integrated oil-to-water heat exchanger.

THE SOLUTION

» **One system** instead of many individual components



KEY ADVANTAGE: INTEGRATION

- » intelligent electric oil pump
- » oil sump
- » oil filter
- » heat exchanger
- » oil temperature sensor

» The system is robust and reliable, even under extreme cold conditions and harsh environments ranging from -40°C to 120°C.

REDUCED INTERFACES
LOWER COMPLEXITY

MINIMIZED INSTALLATION SPACE

HIGHER DEGREE OF INTEGRATION
REDUCED ASSEMBLY EFFORT

KG REDUCED WEIGHT

COST EFFICIENCY



ABOUT SHW

SHW is a leading manufacturer of components and systems for mobility and industrial applications. With over 660 years history and more than 1,700 employees, the company today combines a traditionally strong engineering expertise with technological innovation. Thanks to the mindset of our employees, characterized by diligence, ingenuity, a keen sense for pushing technological boundaries, and strong business acumen, we have consistently succeeded in actively shaping political and technological transformations, leveraging them as opportunities for growth and advancement.

» Product innovation and a willingness to embrace change have always defined SHW, enabling us to evolve from a single component manufacturer into a trusted system supplier.