Complex filtration module

<u>An injection-molded oil-conditioning module, paired with the latest 8-speed transverse</u> transmission, can enable greater efficiency, weight reduction and improved NVH

For the new Daimler 8G-DCT transmission, Tier 1 supplier Filtran has developed a complex plastic oil-conditioning module. To increase the overall efficiency and performance of a car, transmission systems are given more gears, more sensitive shift control valves, and optional components for a hybrid version. Through continuously improving R&D capabilities and close customer contact, Filtran is able to deliver a product that ensures transmission performance in any condition over the system's lifetime, while reducing the overall weight of the components.

In comparison with the predecessor, the 7G-DCT, which had a dedicated cooler module, a separate suction filter and a metal side cover, Filtran managed to reduce the weight of the transmission by 1.1kg (>30%). This was thanks to the development of an integrated plastic component made using an injection molding process. Filtran was able to achieve this weight reduction despite the increased filtration performance, which required multiple filters and the ability to control the oil flow in specific conditions.

For smooth but direct shifting and minimized wear throughout the transmission, a clean oil is essential. The purification of the oil in the 8G-DCT transmission is achieved through sequence filtration of a sump suction filter, two pleated SmartMedia suction filters and a pressure filter.

This system is designed for improved filtration efficiency, dirt hold capacity and differential pressure over its entire lifetime. The SmartMedia suction filter represents the company's most advanced filtration technology, with several million applications globally.





ernal view of the 8G-DCT conditioning module with pleated SmartMedia suction ers at the sides. Under laser transparent plastic ment on the inside of the

While the pleated design increases the effective area and particle capacity in relation to pressure drop, it is also a selfregulating system. The pleated fine filter media incorporates partial flow openings (bypass orifices) and is surrounded by a layer of medium-efficiency filter media. In cold conditions, when the

trol valve is visible

In cold conditions, when the transmission oil is highly viscous, a specific amount of the oil flow will bypass the fine media layer, but is filtered by the outer layer. This improves the pressure differential in cold conditions. In warm operating conditions, where the viscosity of the oil is significantly lower, a certain amount of oil flows through the fine filter media, resulting in a high cleanliness level over time.

This passive controlled filtration system is accompanied by a temperature-sensitive valve. This valve controls the oil flow over the heat exchanger, which is directly mounted on the module, ensuring a short warm-up time for increased system efficiency.

High-performance cars are often driven in extreme conditions; this results in highly dynamic changes in directional force and therefore sloshing of the oil. At the same time, the oil level in modern transmissions is kept low to reduce power loss due to shearing oil. To ensure continuous oil circulation without air intake, Filtran simulated driving's dynamic effect on fluid in the module. The results of this research were used to aid the design of the stilling elements inside the oil reservoir, ensuring oil supply even under extreme conditions.

Drivetrain electrification highlights the importance of preventing NVH. Most hybrid systems are able to propel the vehicle without the ICE, using just the integrated electric motor. Without NVH generated by the ICE, the NVH of the rest of the powertrain becomes highly important.

The two major reasons behind NVH produced during oil supply to the transmission are air inside the oil pump and vibrating structural elements. During development of the complex plastic oil-conditioning module together with Daimler, Filtran took both aspects into account, looking to supply not only a functional system, but also to fulfill the comprehensive customer requirements of the whole transmission package.



Streamlines of the oil flow hrough the temperaturecontrolled valve, which egulates the flow over the neat exchanger on the outside of the oil-conditioning module



Streamtines of the old flow through the pleated SmartMedia suction filter. It can be seen that in cold conditions, the oil flows through the bypass openings in the pleated fine filter media and the surrounding medium-efficiency filter media, leading to an improved pressure differential

Velocity (mm/s) Magnitude

	1320.87
	1174.1
	1027.3
	880.58
	733.82
	587.05
	440.29
	293.53
	146.76
	0.000631196
nbar)	Filter Media -22.078
	-63.517
	-104.96
-	-146.4
-	-187.83
-	-187.83 -229.27
-	-187.83 -229.27 -270.71
	-187.83 -229.27 -270.71 -312.15
	-187.83 -229.27 -270.71 -312.15 -353.59

Pressure (r

Another benefit to the holistic development approach taken by Filtran is the ability to flangemount the module directly to the gear housing. This significantly reduces the number of interfaces and ensures a lean manufacturing process at the OEM's transmission plant. Once mounted, the integrated devices for filling, leveling and draining the oil ensure an optimal initial oil fill, as well as when replaced during field service.

Filtran's new oil-conditioning module for the Daimler 8G-DCT transmission showcases the company's 19 years of experience in developing and manufacturing high-performance plastic oil pan modules for customers globally.

Since 2000, when Filtran introduced to the market its first plastic oil pan for light vehicle transmissions, the company has focused on continuous improvement. This approach led to the technology behind the 8G-DCT module. In this system, the base body consists of the specially developed polyamide PA6.6/6. This plastic type combines the technical properties and financial advantages of PA6.6 and PA6.

Thanks to an interdisciplinary development team, Filtran is capable of meeting customerspecific design, high-performance state-based oil-conditioning and NVH reduction in modern automatic transmissions.

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