

# All-round filtration

The filtration sector is expanding to include oil pan, cooler, and pump innovations

■ **Filter specialist IBS Filtran** realized a world first in 2001 when it launched a plastic oil pan with integrated sump filter onto the transmissions market. The Tier 1 supplier's development was the first plastic oil pan innovation for a passenger car application in series production, and since then, IBS Filtran has produced more than eight million plastic oil pans, with demand for the product continuing to increase.

But what prompted a leading filter development company to produce a plastic oil pan module in the first place? Historically, the core competencies at IBS Filtran relate to filtration innovations made for transmissions. The company also has extensive experience in plastics design.

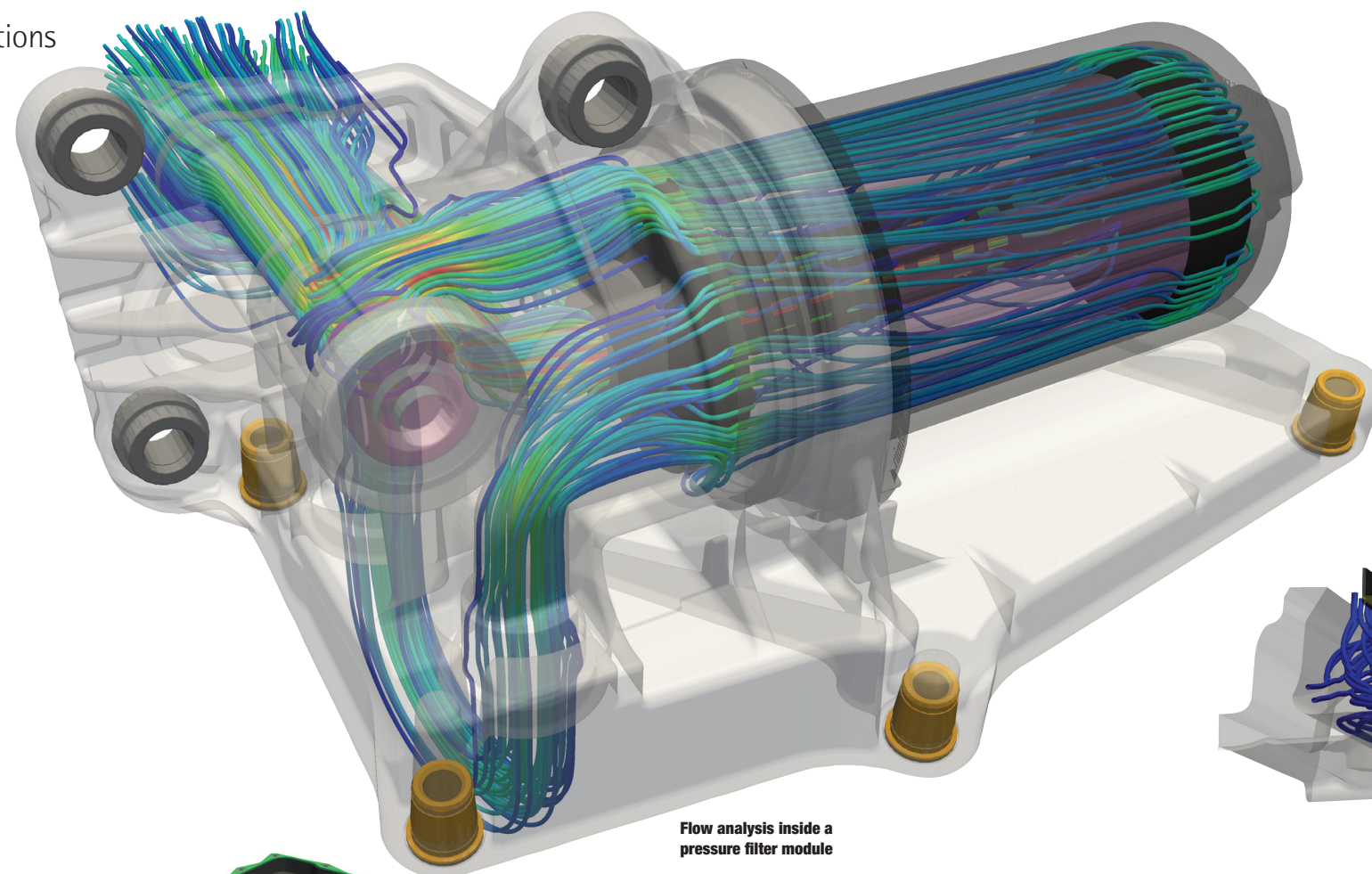
And it was these core capabilities that helped the supplier to deliver state-of-the-art filters until the sector expanded to all-round innovative filtration technology, meaning that module design was just a matter of time for IBS Filtran.

The successful story of the plastic oil pan development is mainly based on the material characteristics of the innovation and the higher level of design freedom. If the glass-fiber-filled nylon is designed in the correct way, the components will show high strength and stiffness, as well as lower weight compared with metal solutions. As a result, depending on the specific application, a weight reduction of more than 50% on the part can be achieved.

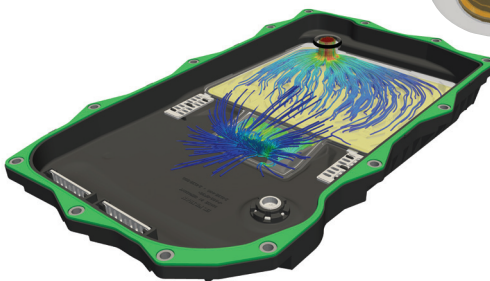
But the huge weight saving generated by the alternative material is not the only argument for using a plastic module. In addition to this, the possibility of easily adapting additional features to a plastic component or subsystem fits perfectly to the trend of cutting overall system costs by using module design and function integration.



The full plastic oil pan with integrated suction filter, gasket, plastic bonded magnets, and a drain plug



Flow analysis inside a pressure filter module



In-depth oil inflow analysis of a plastic oil pan with integrated sump filter



The full plastic pressure filter module part, an innovative design that features an integrated heat exchanger

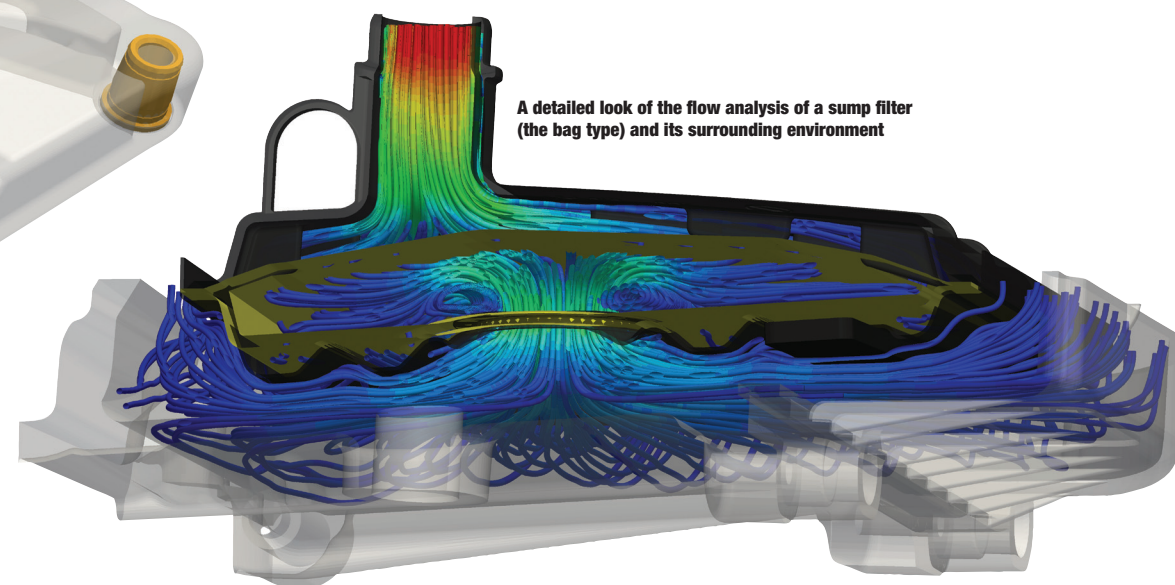
A plastic oil pan is no longer limited in its function as an oil reservoir; it has been upgraded to become a module that covers multiple functions, including filtration, oil circuits, pumps, splash guards, heat exchanger, oil displacer, and much more. The pan body is used as a type of carrier, where all of the additional functions can be adapted. This arrangement means that not only are the number of components, interfaces and suppliers reduced, it also decreases the amount of logistical effort, therefore enhancing technical improvements and assisting with budgetary requirements.

Another development where similar benefits can be achieved by using a plastic design is a pressure filter and cooler module, which was recently launched into the market for a dual clutch application. While one competitor's aluminum die-cast version failed under working conditions, IBS Filtran's plastic module fulfilled the requirements, saving both weight and costs. The filtration system is completed by a patented SmartMedia sump filter, which tunes the cleanliness level of the

transmission fluid to ensure excellent shift qualities throughout its lifecycle.

Although the effort involved in developing a complex module is very high, the automotive market is constantly demanding shorter development times. As a result, this is a big challenge that calls for extensive know-how, experience, and perhaps most importantly, strong development tools.

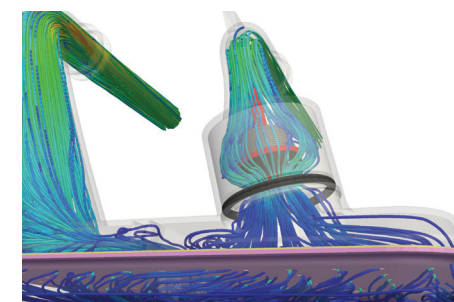
Computer-aided engineering software tools such as 3D-CAD, Mold Flow, FEA and standard CFD are widely used today. In the case of CFD, IBS Filtran has developed, in cooperation with Fraunhofer Institute ITWM, a customized CFD program called SuFiS, which is able to simulate porous media and filtration in real filters. Although this pioneering work has already been transformed into a successful application, the technology continues to validate the simulation against lab results. Today, well-calibrated CFD software is used on a daily basis for every development. Nevertheless, SuFiS is continuously enhanced and an update in its visual display offers engineers a better understanding of the



A detailed look of the flow analysis of a sump filter (the bag type) and its surrounding environment

complex flow and filtration processes inside and around a filter.

Inner and outer flow has to be carefully considered, and that's especially the case when a very compact design is requested. If flow channels are reduced to a certain limit, the pressure drop will increase to a critical level. IBS Filtran's most recent innovative filter types – CombiMedia and SmartMedia – are improving filter performance by combining different media types and layers in one filter, so that inner structures are based on a fully



Sump filter (SmartMedia type) with non-return valve

packed housing. An example of the flow analysis of the outside of the filter is the capability of a magnet to capture particles; and this is highly affected by the flow velocity around it.

Very specific items need very specific and often extremely detailed research. But just as important is an understanding of the whole transmission system, the individual components, and their functions, characteristics, and interaction. Modern transmissions are often equipped with vane pumps, which are relatively good in terms of efficiency and generating a high supply pressure, but also quite sensitive in terms of pump noises. Therefore the filter design should also take into consideration the air situation, where the information on flow velocity and pressure distribution is needed. Vortex formation and flow break-away edges should be avoided as they collect air bubbles.

IBS Filtran engineers work continuously to expand their know-how in the field of filtration and the technologies that are necessary to create modular designs. **TTI**