Metal Carrier Replacement Via Polypropylene & EPDM Reduces Costs in Automobile Sealing Profiles
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Today, motor vehicle seals that are applied to the bodywork need to satisfy many different functions. In addition to their sealing effect, it is above all the dynamic properties of the seal as well its resistance to weathering and different temperatures that need to be taken into account. Apart from the technical properties of the product, further factors such as recyclability, weight and manufacturing are becoming increasingly important. For this reason, the substitution for metal in many fields of automotive engineering is making ever greater advances.

The use of high-grade engineering plastics as a construction material in place of metal has enabled the fuel economy as well as the reliability of modern motor vehicles to be raised substantially. That’s why TROESTER GmbH & Co. KG has recently offered an extrusion process which allows the flexible metal carrier in dynamic bodywork seals to be replaced in a simple manner by an engineering plastic. In this patented manufacturing process, a flexible U-shaped reinforcement is fabricated in the extruder head by means of sequential co-extrusion and integrated with all of the other functional components of the seal in a single step.

The structure of the fabricated reinforcement with its alternating arrangement of hard and soft segments is similar to that of a spine. In common with the spine, the new process allows for maximum possible strength at minimal weight in conjunction with excellent longitudinal flexibility. The U-shaped segments of the hard components provide the required high degree of clamping force, while the soft components – similar to an intervertebral disc – endow the reinforcement with outstanding flexibility.

In addition to the costs of the metal carrier and its susceptibility to corrosion, the new process also dispenses with all of the metal strip handling processes in the form of storage and bending devices. There is a choice of various material combinations for the new reinforcement, depending on whether the customer is more focused on cost savings and cost effectiveness, or instead opts for weight reduction and a greater suitability for recycling.

The use of highly-filled polypropylene in combination with an EPDM soft profile compound will provide the maximum cost-effectiveness in the new process. Without any major changes to the normal course of EPDM processing, this will already result in material cost savings of over 20% compared to a conventional EPDM profile with metal reinforcement. The necessary thermal separation of materials in the extruder head can take place in quite different ways and is already integrated in the sequential head. Present-day vulcanisation equipment continues to be employed in its customary manner in the new process. The early introduction of microwave energy into the profile serves to ensure the dimensional stability of the profile cross-section in subsequent processing steps. Even without metal reinforcement, the vulcanised proportion of rubber gives the profile sufficient strength to be able to pass through all of the downstream processing steps without suffering deformation. At the normal production speed of around 20 m/min, spray cooling is used to cool the finished profile after it has undergone vulcanisation. During the course of this, the final cross-section shape, especially the position of the U-shaped clamping foot, is determined by mechanically-controlled cooling of the polypropylene section at the end of the line.

If, on the other hand, the focus is on recycling and a reduction of weight, then a material combination of polypropylene and thermoplastic elastomers (TPE) is preferable. Where TPE and polypropylene is used in place of EPDM and metal, a weight reduction of over...
35% in respect of the complete seal is easily possible. Because of their similar processing temperatures, thermal separation in the extruder head is not necessary for this material combination. In addition, the mechanically-controlled cooling of the profile, as is customary during calibration, takes place immediately after the extruder head and not, as is the case for EPDM, at the end of the line. There are however disadvantages here compared to EPDM with regard to productivity, as the TPE profile neither has tensile strength nor dimensional stability immediately on exiting the die. Consequently, the maximum possible line speed is restricted to approx. 12 m/min for this material combination. The material costs for a TPE-polypropylene solution are also higher than those for EPDM-polypropylene, but this can be partially offset since the line equipment will be simpler, as vulcanisation technology is no longer necessary.
Innovations for the Rubber Industry

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