



NEWS RELEASE

Plastic leaf springs for series application

IKV research project with Ford focuses on reliable failure prediction

Aachen, November 2017 – In a joint project entitled "Composite materials for chassis components", a research team from the Ford research centre in Aachen and the Institute of Plastics Processing (IKV) in Industry and the Skilled Crafts at RWTH Aachen University is examining the fatigue and failure behaviour of glass fibre-reinforced plastic springs. The aim of the Ford-RWTH alliance is to develop a reliable prediction model that allows the series application of these leaf springs in the automotive industry.

The stricter specifications with regard to emissions, safety and comfort in the automotive segment necessitate the targeted application of lightweight construction materials. Fibre-reinforced plastics (FRP) are particularly suitable for structural lightweight construction as they not only have outstanding weight-specific properties such as high stiffness and strength, but also a number of other advantages compared with the currently used metal components. They are corrosion-resistant and also have superior fatigue behaviour. At the same time, they offer good damping characteristics and are thus predestined for use as spring elements. Because of the possibility of orienting the fibres in a spring in the load direction, enormous weight savings of up to 80 percent can be achieved compared with classic steel springs.

Nevertheless, a considerable amount of uncertainty in predicting the life expectancy of glass fibre-reinforced plastic springs has until now been hindering their use in series application. A wide variety of fracture modes and the broad scattering of the test results under cyclical load that is typical of this material make it virtually impossible to obtain a quick and reliable estimate of the life expectancy.

For this reason, the research team in the joint project is occupied with carrying out a detailed examination of the properties of such springs. In a variety of tests, the material was subjected to a 3-point flexural load and tested under all sorts of different boundary conditions. With the help of the results, the team is implementing advanced analytical and numerical methods for calculating the life expectancy. The focus is always on the economic efficiency of the calculation, which is nowadays reflected in the calculation time needed for numerical models.

Through the implementation and further development of phenomenological models for use in FE methods, it is possible to transfer the data from the material to the part without the need to calculate every load cycle individually. From the analytical and numerical descriptions of the damage and failure profile, new possibilities are derived for shortening the time needed for real tests. At Ford, a load spectrum is to be specified that produces the same damage development as a real load pattern but requires only a minimum of the testing time.

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About IKV

IKV, the Institute of Plastics Processing at RWTH Aachen University, is Europe-wide the leading research and education institute engaged in the field of plastics processing enjoying outstanding reputation. More than 300 staff are employed in finding solutions to problems connected with processing, materials technology and part design in the plastics and rubber industries. IKV's close contacts with industry and science, together with its outstanding facilities, enable cutting-edge research in plastics technology and ensure that students benefit from a comprehensive, practically oriented course of study. Plastics engineering graduates from IKV are thus sought-after experts in industry. In organisational terms, IKV is divided up into the four specialist departments of Injection Moulding, Extrusion and Rubber Technology, Part Design and Materials Technology, and Composites and Polyurethane Technology. The institute also takes in the Centre for Analysis and Testing of Plastics, and the Training and Further Education department. IKV is run by an Association of Sponsors, which currently has a membership of about 290 plastics companies from all over the world. Univ.-Prof. Dr.-Ing. Christian Hopmann is Head of the Institute and Managing Director of the Association of Sponsors. He also holds the Chair of Plastics Processing at the Faculty of Mechanical Engineering at RWTH Aachen University.

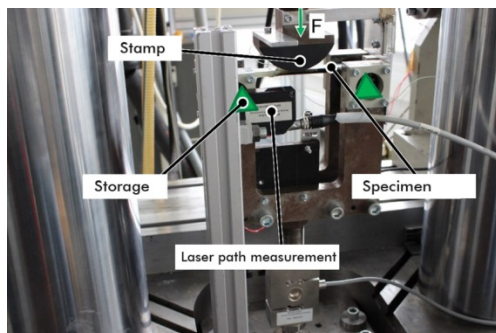
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Cyclical 3-point flexural test on a representative specimen to determine the fatigue properties of GRP (photo: IKV)