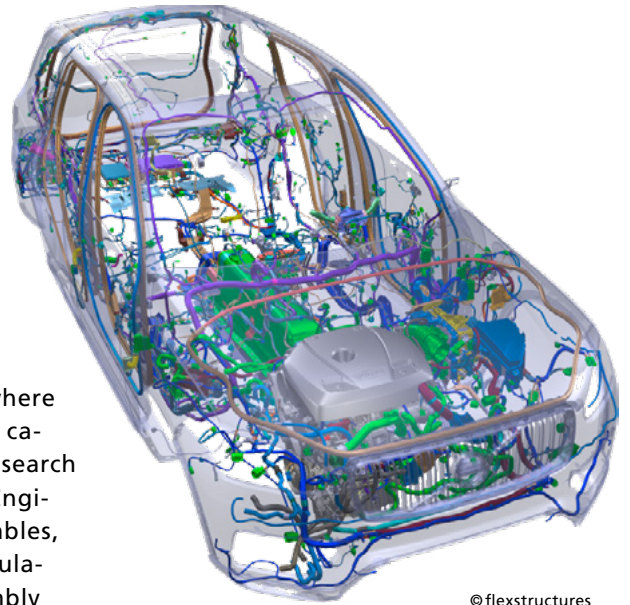


How Long Does a Cable Last?



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A look inside a vehicle: cables and hoses are everywhere.

They can be found almost everywhere in vehicles – we are talking about cables. This is why a core topic of research in our “Mathematics for Vehicle Engineering” division is the field of cables, hoses and flexible structures. Simulations help to optimize their assembly position long before hardware comes into play. But the ultimate question is: how long will the cable last?

Our “IPS Cable Simulation” software package allows the simulation of cables and hoses in real time. This means that users can interactively carry out, modify and validate the 3D mechanical design of cables and hoses in the vehicle. This allows them to find the optimum design even before the first hardware assemblies are created. This saves time and costs and reduces prototypes and further iterations.

We Continuously Enhance the Software

Although “IPS Cable Simulation” is already successful and is distributed by our spin-off “flexstructures”, our researchers are striving for continuous improvements and new functions. In current projects, for example, they are looking at the question: How long will the cable last?

The simulation already provides information about the locally occurring loads. But what do these loads mean for the cable lifetime? “A suitable cable SN Curve, which represents the relationship between local load amplitudes and the number of load cycles until failure, is crucial to the answer,” explains expert Dr. Fabio Schneider-Jung.

Comparative and Absolute Lifetime Predictions

Comparative statements are already possible with a generic SN curve. This means that although users do not know the absolute lifetime, they can compare different variants of an installation in terms of their lifetime. To additionally predict the actual lifetime, a specific cable SN curve is required.

However, determining this is no easy task. The researchers require a number of test specimens in various tests – whereby the test effort must always remain proportionate. Another hurdle is the almost impossible measurement of local loads along the cable. Here, they enrich the experimental data with simulations. Using the maximum likelihood method, they then search for the SN Curve that best matches the collected lifetime data.

“We have already determined cable SN Curves for some cables – with promising results, as the predicted lifetime was confirmed in further experiments,” concludes the researcher.

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