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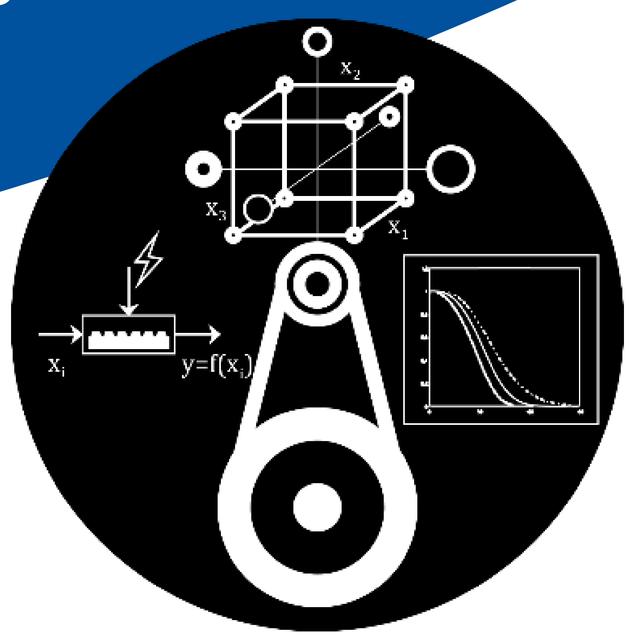
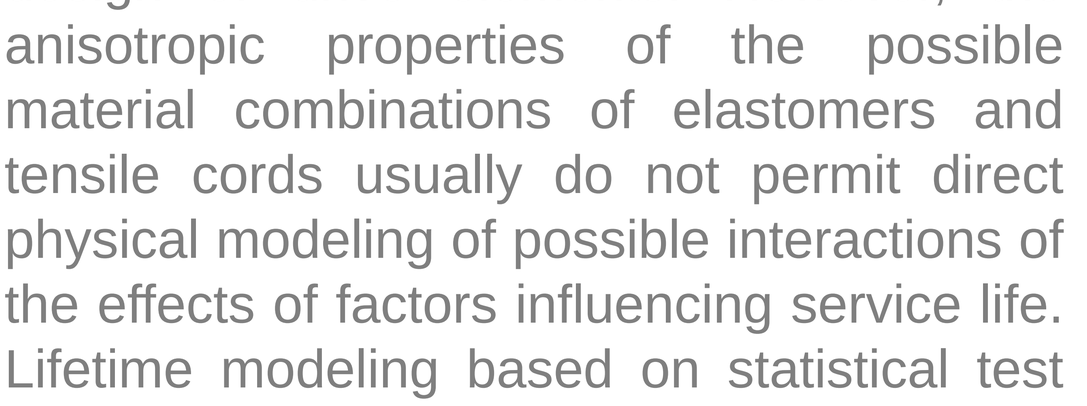
Reliability
Department

Lifetime model for a timing belt drive in steering gears based on design of experiments (L-DoE)



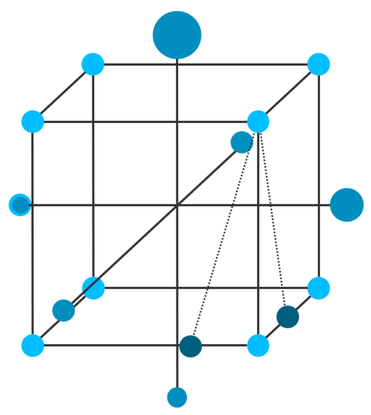
Lifetime model for a timing belt drive

The design of synchronous belt drives such as timing belts, whose modern applications are characterized by increasing precision and performance, is still based on standardized guidelines or catalog data. At the same time, their service life is directly influenced by numerous factors such as pretension, torque or ambient temperatures, or is disturbed by variances in the gear geometries. The prediction of the service life of synchronous belts is also elementary in the sense of a sustainable, constructive design of drive elements. However, the anisotropic properties of the possible material combinations of elastomers and tensile cords usually do not permit direct physical modeling of possible interactions of the effects of factors influencing service life. Lifetime modeling based on statistical test planning (L-DoE) offers a suitable approach for this.

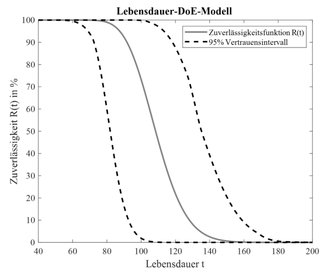


Lifetime-DoE

In addition to the efficient planning of experiments, Design of Experiments (DoE) allows the modeling and simulation of the functional relationship between independent input variables (factors) and measurable, normally distributed target parameters (effects). In the field of lifetime testing on the other hand, resulting data ordinarily follows a Weibull or logarithmic normal distribution – which in fact does not easily allow the application of DoE. Thus, the approach to model design using lifetime DoE (L-DoE) first requires a more specific test analysis and modeling.



In the context of modeling a system for predicting the lifetime of timing belts, the procedure according to the L-DoE method finds a practicable application via the definition of factors and their adjustment levels, the definition of the desired target variable and the test strategy, the test planning as well as the test execution and analysis. Finally, the derived reliability model is verified and validated.



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