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Product Reliability in German Automotive Industry for Sustainability - The Development of Methods and Processes of Field Damage Analysis

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Sustainable products and manufacturing in the automotive industry become key sales arguments out of the customer focus. Reliable products contribute to sustainability through an increased customer usage phases (lifespan expectancy) and therefore reduced resource usage.

Furthermore, increasing functionality and complexity of technical products result in complex damage symptoms and causes within the customer use phase. Especially in the automobile industry, complex damage symptoms often consists multiple damage causes. Therefore the importance of structured field product observation and field data analysis is growing steadily. For the manufacturer, the goals are the comprehensive analysis of the product quality and reliability over the whole product life cycle, in detail:

- At an early stage after product market launch: Accurate and economic identification of possible damage causes and knowledge of the product failure behaviour based on a small amount of field damage cases (samples).
- Product life cycle: Detailed mapping and analysis the long term product quality and reliability.

These enable the manufacturer to organize further actions, for example rectification of faults in the field, product optimisation, or the initiation of concentrated development-approaches/-strategies for failure prevention (e.g. "Carry-over-part" strategies) in the future.

Currently no industrial standard of the reliability analysis is capable to fulfil completely the requirements of a comprehensive reliability analysis over the whole product life cycle. Based on these requirements the ‘Field damage analysis (FDA)’ concept was developed by the Department of Quality Management and Production Metrology, Cologne University of Applied Sciences, in cooperation with manufacturers of the automotive industry.

Key aspects of the FDA concept are as follows:

- Integration several statistical and organisational methods in a comprehensive analysing process.
- Mapping product reliability over whole product life cycle.
- Nonparametric and parametric statistical analysis of failure data, for example, relating to identification of possible damage causes, production batches differences or climatic influences.
- Technical analysis of damaged components based on a reduced amount of field damage cases
- Optimisation of economic aspects of reliability analysis with a high detection rate of damage causes

The lecture outlines the process of the FDA concept and presents advanced methods (such as the DCD algorithm, WCF approach, OMSP concept and RAW concept) and industrial methods (e.g. Weibull distribution and Eckel candidate method) to ensure the key aspects. Furthermore the integration of value added networks in the FDA concept to gain more information about the damage causes is described. Finally a realistic case study demonstrates the application and benefits of the ‘Field damage analysis’ concept.

Thematic Areas:

Life Data Analysis, Warranties, Risk Analysis and Management, Reliability