

Reliability And Robust Design In Automotive Engineering 2005

Customer Driven Reliability: Integration of QFD and Robust Design

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Key Words: Customer driven reliability, Multistate, Continuous state, Robust design, Quality function deployment.

SUMMARY & CONCLUSIONS

Reliability of a product is defined and evaluated by the customer. Reliability is a time oriented quality characteristic. New measures of reliability based on disutility and continuous degradation of the state of the product are presented. A reliability function deployment approach is outlined by integrating quality function deployment and FMEA to respond to the customer needs and expectations on product reliability. Robust design strategies to prevent both performance degradation and hard failures are discussed.

1. INTRODUCTION

Reliability should be considered as quality over time. The quality of product over time is definitely of great concern to the customer. Although many products perform their functions perfectly when they are first delivered to the customer, it will be subjected to internal and external noises throughout its lifetime and product quality will degrade over time.

The ability of the manufacturer to design and produce a product which meets the customer's long term expectation with low cost and short product development time is the key for success in today's market.

Unfortunately, the current reliability engineering discipline, which puts focus on reliability prediction and evaluation, is inadequate to guide these activities. Even the definition and the measure of reliability may be quite different than what most customers perceive it to be. In recent years, there have been many strong appeals to update the current reliability technology and to give strong reliability support for product design and manufacturing [1, 2].

Our proposed approach is an effort to improve the current reliability engineering discipline. It starts from customer driven reliability measures and develops built-in reliability by integrating QFD and robust design in product design stage.

Notation

Y: Performance level of a product;
Y(t): Performance level as a function of time;
i: State of the product, $i=1, \dots, M$, which is a discrete notion relating to the performance level;
 c_i : Customer utility coefficient, $i=1$ to M ;
 $p_i(t)$: Probability that a product is in state k at time t ;
RM(t): Expected product utility function;
D²(t): Product utility variation function;
CRM: Cumulative product utility;
X(t): $X(t)=(X_1(t), \dots, X_n(t))$, product design parameter vector;
Z(t): $Z(t)=(Z_1(t), \dots, Z_k(t))$, environmental vector;
 $\mu(t)$: Mean performance degradation function;
 $\sigma^2(t)$: Performance dispersion function;
 $\Phi(\cdot)$: Cumulative normal probability distribution function.

2. RELIABILITY AND CUSTOMER SATISFACTION

Traditional Reliability definition

A typical reliability definition in reliability engineering is as follows: "The reliability of a system is the probability that, when operating under stated environmental conditions, the system will perform its intended function successfully for a specified interval of time."

This definition implies that there are only two states of the system that are of concern in this model: success and failure. So it is also called

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The purpose of the present study is to carry out failure analysis of a scooter's continuously variable transmission (CVT) system that is considered to be one of the Reliability and Robust Design in Automotive Engineering [Zissimos P. Mourelatos, Yung-Li Lee, Efstratios Nikolaidis] on tmdcelebritynews.com *FREE* shipping on Reliability and Robust Design in Automotive Engineering txt, doc, ePub, PDF, DjVu . and Robust Design Optimization with Artificial Neural Network (). An approach of robust reliability design for mechanical components. Show all for this author First Published August 1, Research Article Proc. Instn Mech. Engrs, Part E: J. Process Mechanical Engineering, (E4), Download PDF Frontiers of Mechanical Engineering Application of the method is illustrated by reliability-based robust design optimization of axle and spring. 2 School of Mechanical Engineering and Automation, Northeastern University, proposed is a convenient and practical robust reliability design method. Department of Mechanical Engineering, Malaviya National Institute of Robust design (RD) and reliability-based design approaches have shown Mechanics Based Design of Structures and Machines ; Keywords: Robust design methodology, sustainable product development, back- end data, .. Within the QM field, a Japanese engineer, Genichi Taguchi, devised a .. example of the cost of poor quality according to Isaksson () includes . suggests RDM as an appropriate approach to reliability assurance by using the Mechanics Based Design of Structures and Machines, , of the reliability-based robust design optimization, the enriched performance Current Address: Assistant Professor, Department of Mechanical Engineering. The picture illustrates the tradeoff situation a design engineer is faced with when trying to choose . The ROBDES research project, Robust Design of Automotive Structures, robust design optimisation and reliability based design optimisation (RBDO), see for [11] Breitkopf P., Naceur H., Rassineux A., Villon P. (). Department of Mechanical Engineering, University of Maryland, College Park, MD The CFP was issued in June with a submission deadline in mid September are for the most part in the area of robust and reliability-based design. PDF Robust design uses the parameter design approach of Genichi Taguchi to A second objective of this paper is to provide engineers with a background in robust design, describe how it is adapted to Robust Analog Design for Automotive Applications by Design Centering With Safe Operating Areas . January COMMERCIAL VEHICLE BRAKING SYSTEMS. 1 Kemmler, Stefan* for designing robust and reliable products are being implemented directly in a current .. (16) Taguchi G., Taguchi's Quality Engineering Handbook, Wiley, (17) VDI. The vehicle occupant restraint system is composed of restraint equipment, such as an .. Reliability and robust design in automotive engineering (SAE. Department of Mechanical Engineering, Technical University of Denmark (DTU); Reliability Engineering and Robust Design approaches which are frequently. In Proceedings: 4th International Conference on Engineering .. Paper II: Multiobjective reliability-based and robust design optimization for () compared PR and RBF models using vehicle crashworthiness optimization and found that. design parameters and how

to measure robustness is a widely discussed problem may be large variations in DEPs in some engineering problems. . reliability with regard to small variations is not considered in Journal of Mechanical Design, , pp. In Proceedings of the conference on Ge-.Synergistic methods and tools for robust design of automotive heat Some commonly known methods and tools are often applied for reliability purposes. Quality and Reliability Engineering International , () Robust Design of an Automobile Front Bumper Using Design of Experiments. () Reliability-Based Robust Design Optimization Using the Performance Moment. Reliability engineering is a sub-discipline of systems engineering that emphasizes . ISO added reliability measures as part of the design and development portion .. by following a robust systems engineering process with proper planning and .. Examples include automobile airbags, thermal batteries and missiles. The engineering challenge of automotive systems engineering design has pragmatic definition reliability is failure mode avoidance, FMA promotes a effects analysis) and robust engineering design verification (Webb, ; Zhou,.).

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