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Physics of Failure - "How stuff fails"

Reliability Foundation 9

holland innovative

Identifying critical components in systems and taking the necessary measures to avoid failures is an essential skill in order to achieve a reliable design. A component can fail in many ways and as a result of various causes. Understanding the underlying causes of failure and failure mechanisms saves time and money during product development and prevents dissatisfied customers and users.

**Failures do not occur...
they are designed into the system!**

Register: www.holland-innovative.nl

Integration into the Product Creation Process

Thinking in functions and failure mechanisms is essential during the Product Creation Process (PCP). Loss of functionality implies the failure of a construction or design, which can occur in numerous ways. Insight into the physics of failure contributes to the PCP during all phases of developing high-quality and reliable systems.

A selection of the skills that will be acquired

The training focuses on the identification, understanding and modeling of failure mechanisms. Based on appropriate design measures, the probability of occurrence of failure mechanisms is minimalized. After this, the reliability can be predicted, accounting for variation due to design, manufacturing and user. Thinking in terms of failure mechanisms during development and insight into failure mechanisms in mechanical, mechatronic, and electronic systems. Topics covered include: fatigue, wear-out, degradation, connections, electrical failures and modeling and preventing failure mechanisms.

The aim and result of the training

The participants of 'Physics of Failure' acquire practical and detailed knowledge on failure mechanisms in products and their impact on reliability. The knowledge gained can be applied immediately during design for reliability (DfR) and product improvement projects to prevent failures.

Target group

The course is intended for development and reliability professionals actively involved in design, testing, warranty analysis, reliability and risk analysis (FMEA) within DfR, DfSS, and improvement projects. It is an extension of the DfSS Black Belt training with respect to reliability.

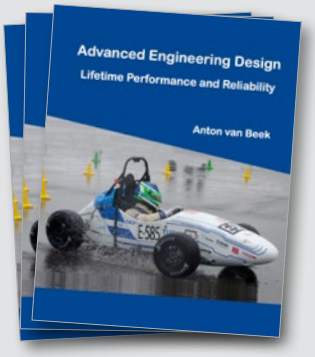
Course duration and number of participants 4 Blocks of 1 day, from 9.00 to 17.00. Maximum group size: 16 participants.

Instructors Dr. Anton van Beek (Technische Universiteit Delft) and Dr. Ir. Coen Smits (Holland Innovative).

Location and investment Holland Innovative, High Tech Campus 29, Eindhoven. The investment is €2.990,- (ex. VAT) per participant. This includes 4 training days, a syllabus of the course material, the book 'Advanced Engineering Design; Lifetime performance and Reliability', lunch and refreshments. In addition, four times free participation in the Reliability User Group. Not included in the price are the costs for the theoretical exam.

Dates, registration and more info See www.holland-innovative.nl under Academy.

Contact Team HI Academy, tel. +31 40 85 14 610, academy@holland-innovative.nl



Extensive reference accompanying training

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Focus on complex business processes


The weakest link determines the strength of the chain

Product leadership: Factor 10

What does it mean for your business to develop a reliable product - first time right? Or to be able to identify, define, and mitigate risks at an early stage? In-depth-insight of failure mechanisms threatening your design is crucial in achieving superior product quality and reliability. In this training, the Factor 10 approach will be integrated in all subjects.

Level

University or college education, or equivalent level of knowledge gained through experience. Participants are recommended to first follow the Reliability Foundation 1 & 2 training or to ensure that their body of knowledge includes life data analysis and reliability testing.

Materials

You are invited to bring your own cases and data to analyse during the training in class. A calculator with scientific functions is recommended for various calculations.

Program in 4 blocks of 1 day

- Failure cause, failure mechanism, failure effect. Thinking in terms of failure mechanisms.
- Risk analysis (FMEA) of a test setup and component; defining failure mechanisms.
- Fatigue, Material behavior, types of fracture, Hertzian stresses, static and dynamic strength
- Wear-out mechanisms - tribology. Pitting, fretting, cavitation, erosion, lubrication, contamination, sealing.
- Degradation - chemical reactions. Temperature, humidity, contamination, oxidation, crystallization, ozone, UV radiation. Degradation models such as Arrhenius, Peck, Coffin-Manson, Power law.
- Failure of connections, bolts, inserts, glues, welds.
- Electrical failures, such as short circuit, burn-in, contact resistance, SN-whiskers, EMC, ESD.
- Design guidelines, safety factors and derating.

Cooperation and certification

The Reliability Foundation Program is a post-graduate education, focusing on the practical aspects of reliability engineering. The program has been developed in accordance with VDI 4002 reliability guidelines in collaboration with the University of Stuttgart and consists of several modules that will result into a VDI reliability engineer certification.

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The **Holland Innovative** House: *core* *results* *enablers*

Holland Innovative BV:

- For solutions in project management, product & process development and improvement, and reliability
- 40 professionals with an experience level of more than 20 years
- Market areas: HighTech, Automotive, Solar & Energy, MedTech, Agro & Food

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