

JVTC Railway seminar
Date: 2021-12-01 Time: 08.30-09.50
Plats: via Skype

Program

08.30-09.10 RAMS parameters for track and switches

Presenters: Matti Rantatalo, Associate Professor & Stephen Famurewa, Trafikverket/Senior Lecturer, Operation and Maintenance, Luleå University of Technology.

09.10-09.50 Bridge testing – A solution to the sustainability challenge?

Presenter: Gabriel Sas, Professor and Head of Subject, Structural Engineering, Luleå University of Technology.

10.00 Dissertation

Integrating Ergonomics in Maintainability Design Process

Kiumars Teymourian, Operation and Maintenance, Luleå University of Technology

Zoom: <https://ltu-se.zoom.us/j/66463896980>

Abstract

Engineered designed systems or products influence the intended humans through their interactions and interface with the systems. A system or product is an object whereas a human is a living complex system, and most of human characteristics, such as capabilities and limitations, are known. During the design process, from the conceptual phase to phasing out, maintainability engineers are involved in making the designed system/product easier for its maintaining. Maintainability is a process and it is one of the design parameters, which will affect maintenance that is required as a result of the design. Maintainability and maintenance are two innate factors in a system/product that influence the health of human users. Much literature and many reports focus on human maintenance operators who, due to their working conditions, confront with many; risks, incidents, and accidents and the consequences of these situations result in many serious injuries, illnesses, and even fatalities. These unanticipated events result from a lack of synchronization between the design of the tasks required for maintenance performance, human capabilities, and limitations. The argument of this thesis is that an active integration of cognizant ergonomics expertise, in the maintainability design process, will result in viable system/product functionality, cost savings, the well-being of involved humans, and organizational efficiencies. In study I, the simulation approach was used to identify the critical posture of the maintenance personnel, and to implement the defined postures with minimal loads on the personnel who used the equipment in a practical scenario. The simulation results were given to the designers to use to improve the workplace/equipment, in order to reduce

maintenance time, which is a key parameter in maintainability. The study also described product design workflow, and the role of ergonomist participation in the design. In study II, two relevant tools, Hierarchical Task Analysis (HTA) and William Fine method, were applied in order to prevent serious accidents and make task performances safer for maintainers. The results presented a clearer understanding of the differences between “work-as-done” and “work-as-imagined”, for both manager and operators. Study III used an injuries survey, completed by maintenance operators, in a study of compression on their lower backs. This study reveals an absence of effective maintainability design during the product design stage. The general conclusion of these studies is that maintenance operators, due to the nature of their work, are exposed to more risks, and that ergonomics considerations, during the maintainability design, will lead to healthier working conditions. Different ergonomics tools were used and the results have shown how working conditions improved. These improvements were suboptimal concerning micro and macro-ergonomics aspects, due to the pre-existing working situations.