Managing Engineering Systemic Risks - DTU Orbit (06/05/2019)

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The present level of occupational safety and safety within high tech systems such as aviation appears to have reaches a plateau in spite of comprehensive systems for incident and accident analysis. The question appears to be whether our models of accident causation focused on human error on the part of front line operators are reliable in a dynamic society. The socio-technical system involved in risk management includes several levels ranging from legislators, over managers and work planners, to system operators. This system is presently stressed by a fast pace of technological change, by an increasingly aggressive, competitive environment, and by changing regulatory practices and public pressure. In this situation a shift is necessary from reactive safety control based on analysis of past accidents to a proactive safety control based on a predictive analysis of the normal work environment and its hazard sources. Each level of the socio-technical system is traditionally studied separately by a particular academic discipline, and modeling is done by generalizing across systems and their particular hazard sources. It is argued that risk management must be modeled by cross-disciplinary studies, considering risk management to be a control problem and serving to represent the control structure involving all levels of society for each particular hazard category. The shift from a reactive to proactive safety control strategy adequate for an adaptive, dynamic system implies a very basic shift in the approach to modeling and design. Causal models of performance in terms of events, decisions, acts, and errors must be supplemented with models in terms of behavior shaping features of the work environment and of competency and performance criteria of personnel. The preconditions are outlined for an effective proactive, adaptive safety control strategy outlined and a preliminary taxonomy for description of hazard sources, work systems, and control strategies is discussed. Examples from process industries, transport systems, and health care illustrates the approach.

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