

MANSCU – Managing Safety Culture throughout the lifecycle of nuclear organisations

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Background of MANSCU-project

- Human and organisational factors have received increasing attention in the nuclear industry during the past two decades. The power companies (routinely) utilise practices to cope with various issues which are not directly technical but rather organisational challenges.
 - + Training of personnel
 - + Work instructions
 - + Leadership training
 - + Safety culture assessments
 - + Error management techniques
 - + Collecting data concerning quality and safety deviations, corrective action programmes
 - +

Some practical challenges in safety management

- The safety management practices generally speaking suffer from certain limitations:
 - They are originally drafted from managing **a single (licensee) organisation perspective**, thus applying them in supply chains or networked activities requires modifications
 - They have been mostly applied **for operating stage**, thus the organisational challenges other lifecycle phases such as design, construction or decommissioning may not be well covered
 - They have been mostly focused on enhancing safety through preplanning, supervision, following of procedures and detection of non-conformancies. The role of tacit knowledge, the need to be flexible and to carry out quick situational judgement in the execution of work is **not emphasised in safety management practices**.

MANSCU focus



MANSCU main tasks in 2011-2012

- MOREMO project 2011-2012:
 - The aim is to get new insights on ***how to deal with the complexity and variability of maintenance activities, especially during outages, in a safe manner***
 - We collected data from four Nordic power plants: Observations in field, on-the-spot interviews, office interviews and document reviews
 - We focused on identifying situations where there was a need to carry out ad hoc decisions and considers deviation from original plans
 - ⇒ How are these discussed and executed? Was the execution good from overall safety perspective, or we risks taken? Can organisations support these with safety management practices?
- DESIGN project 2011-2013:
 - The aim is to identify the organizational challenges associated with design activities in order to provide guidelines to support and guide the design process, consider HFE issues to a sufficient degree in the process, and to anticipate emerging risks.
 - We collected data through interviews in Finland and Sweden, power company representatives and regulators



MOREMO results

- The observed maintenance works confirmed our expectations: they involved many episodes where the working groups faced unexpected situations and challenges and they had to do adjustments

“Oh, this injection pump is not working and there is no free pump available in the warehouse...”

“Where is chapter six in the instructions? It seems to be missing...”

“These jacking oil pipes do not match with the drawings...”

“This service needs to be rescheduled since there seems to be an leak in the seal that needs to be inspected first...”

“What is this noise? Ah, that component is installed upside-down!”

“That new elevator complicates the hoisting of the component...”

“We cannot carry out this intensive overhauls during this outage without working in two shifts...”

“I don't remember how this PC programme works...”



MOREMO results

- The study shows that maintenance workers did not usually pay attention to the fact that something unexpected happened. In discussions they usually said that work proceeded smoothly as usually – small surprises were considered typical and mundane
- They seldom documented the challenges or the solutions they did. Consequently, limited opportunities for others to learn from the successful handling of the situations and anticipate similar things in the future. Further, typically only those small adjustments that result in unwanted outcomes become widely known in the organisation.
- Thus, it has been difficult for organisations to develop more shared and systematic means to support safety in unexpected situations – or to make sure that current safety management practices do not hamper smooth and flexible handling of these situations.
- Some practical suggestions for supporting this is presented in the NKS report: Gotcheva et al. (2013). *Modelling Resilience for Maintenance and Outage*

DESIGN project results

- The study shows that design activities are always inter-organisational processes where information flow, communication and shared understanding are important success factors for the design process
- The interview results suggest that there are recurrent challenges in design processes:
 - Designer's understanding of the context where the final design will be used is sometimes insufficient and this leads to non-functional designs
 - Safety requirements and safety philosophies vary between different organisations, there are national differences as well
 - Commercial pressures and contract arrangements may affect how safety requirements are communicated and enforced in design processes
 - Coordination of activities between organisations that work with varying degrees of nuclear industry competence and understanding of the requirements may require lots of effort
 - Distribution of roles and responsibilities in design process should be done carefully

Continuation

- DESIGN project seeks for practical design projects as case studies to carry out in-depth analysis on the actualized challenges, their outcomes and organizational solutions to guarantee safety.
- MOREMO project was finalized. However, we will continue with safety management in maintenance topic by studying a specific safety management approach: Human Performance Tools.
- Further, theoretical work continues: a mode of safety culture in networks is in progress. The maintenance and design projects provide good data for this purpose.

Additional reading

- Gotcheva, N., Macchi L., Oedewald, P., Eitrheim, M., Axelsson, C., Pietikäinen, E., Reiman, T., (in press) Modelling Resilience for Maintenance and Outage. NKS report
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- Oedewald, P., Pietikäinen, E. & Reiman, T. (2011). 3. A guidebook for evaluating organizations in the nuclear industry – an example of safety culture evaluation. Swedish Radiation Safety Authority, Research Report 2011:20.
- Oedewald, P., Gotcheva, N., Reiman, T., Pietikäinen, E. & Macchi, L. (2011). Managing safety in subcontractor networks: the case of Olkiluoto 3 nuclear power plant construction project. In Proceedings of the 4th Symposium on Resilience Engineering. Sophia-Antipolis, France, June 8-10, 2011.
- Reiman, T. & Rollenhagen, C. (2011). Human and organizational biases affecting the management of safety. ***Reliability Engineering & System Safety***, 96.
- Reiman, T. & Pietikäinen, E. (2012). Leading indicators of system safety – monitoring and driving the organizational safety potential. ***Safety Science***.