Human Factors in Offshore Drilling and Production

Research Area

Drilling Safety – Human Factors Overview

Research Statement

To conduct focused, applied research that informs an integration of Human Factors and Ergonomics into Offshore Drilling and Production operations.

- Addresses possible Human Factors (HF) issues associated with:
  - *Workplace and interface design*: fatigue, situation awareness, human-machine interface design (for both rig & control room operators), decision support, effective procedure design for comprehension/adherence, etc.
  - *Organizational and culture*: leadership, safety culture, training, hiring practices, etc.

Research Plan

- R&D work will be coordinated between TAMU (S. C. Peres & M.S. Mannan, PIs, 0.5 FTE each) and UT Austin (R. Bias, co-PI, 0.5 FTE), $80K total budget.
- Plan being developed for independent, applied research into possible Human Factors (HF) issues that are associated with increased risks for incidents. Research will be done in collaboration with industry partners to allow for directly applicable findings.

Desired Value to Stakeholders

- Estimates indicate that US on & offshore facilities have had a major catastrophic event every ~1.77 years for the last 40 years and that 95%+ of these had direct human involvement in the cause.
- TAMU and UT Austin intend to conduct applied research in conjunction with industry partners to identify what HF findings need to be incorporated into design and leadership practices to mitigate the likelihood of these incidents.

GOAL: Decrease incidents through incorporation of Human Factors and Ergonomics; Human Systems Integration

- This involves
  - Information gathering regarding existing gaps
  - Identification of existing obstacles
  - Information dissemination efforts

Not new topic

- After Piper Alpha, HF elements clearly outlined in that disaster
  (Gordon, 1998)
- Papers continuously at OTC regarding risks of bad HF since then
  (e.g., Thomas, 2002; Miller, 1999)
- Two conferences on HF and offshore drilling and production
  - International workshop on human factors in offshore operations (2000, 2002)

Major Risks: From the Literature

- **Fatigue**: Conditions offshore make assessment of fatigue and recovery from fatiguing conditions difficult. This has been identified but the research is insufficient.
- **Situation awareness** (SA): Low SA associated with most major accidents but no empirical studies done on contributors to this.
- **Quantitative Risk Analysis**: There are several Human Reliability Analysis (HRA) models used to quantify human error and employed for subsequent error reduction but most of them are not based on actual performance data from humans. Further, they do not address organizational factors.
- **Interface design:** Typically, current interfaces for daily and emergency tasks and monitoring are not designed to facilitate and support human performance. This can lead to incorrect data interpretation and performance.

Major Risks: From the Literature

- **Alarm management**: Currently panel operators are flooded with low level alarms that are not informative. Can degrade performance.
- **Procedures:** Use and mis-use of procedures has been cited as related to many incidents but there is little research on effective procedure use for the offshore industry.
- **Automation:** Effective human machine interaction for differing levels automation to insure Situation Awareness and facilitate effective emergency response of is a major risk for the offshore industry and there is little to no research regarding this topic for offshore.
- **Safety Culture:** Safety culture continues to be a predictor of safe work practices and the methods for addressing this offshore need further development.

Gaps

- Much of research correlational and so hard to identify cause and effects
  - More empirical studies needed on the topics
- We can apply research from other domains to many (if not most) of these topic
  - Although some applications may not be direct
  - Aviation, Military, Medicine, Nuclear
- None of this matters if it continues to not be consistently examined and addressed.

Topics missing

- *Perceptual vs. cognitive-based decision making*
- *Instantiating super operators' wisdom*
- *Vigilance*
- *Stressed performance testing*

Examples of Interventions (to help now)

- **Crew Resource Management** (CRM): Evidence suggests that CRM training offshore should help to address non-technical skills which contribute to safe and efficient performance

- **Human Factors Engineering Integration**: Practical approach for Human Factors Engineering Implementation Program (HFEIP) has been developed and integrated in past designs of offshore installations

Major Concerns: From the Forum

- Business case for Human-Systems Integration and Human Factors
  - Cost effective methods for retrofitting
- Effective and safe designs for differing levels of automation
- Reengineering the design lifecycle to include HFE
- HFE standards – making information accessible & interpretable

Moving Forward

Matching needs communicated at forums with risks identified in the literature

- **ROI of HF**: Academic/Industry research partnerships are needed to gather information from offshore operators regarding impacts of the risks identified, i.e., *collaborative empirical research*.
  - This will inform methods for and ROI of reducing these risks
- **Reengineering the design lifecycle to include HF**: This will require an systematic adoption of HF content and methodology into the education and training of engineers. Typically, if industry requires it, academia will provide it.
  - Risks identified can focus the training efforts
- **HFE Standards more accessible**: A multidisciplinary effort with industry, regulatory, academia, and professional associations members could establish and maintain an accessible source of HFE standards.