Offshore experience in assessing Human Factors in the design of CCR`S

Adam Balfour
Human Factors Solutions - Norway
Human Factors Solutions - Norway

- Idea
  - ABB – NPD – BP - Safetec

- Concept
  - Super Eva – Kristin- IOE

- Detailed
  - Grane – Balder – West Future II

- Operation
  - Jotun A - Heimal

- Modification
  - Eldfisk – Petrojarl – Oseberg

- V & V
  - Kristin – Kvitebjørn – Oseberg C
ABBREVIATIONS

CRIOP
Crisis Intervention In Offshore Production

HFAM
"Human Factors Assessment Method for Control Centres", NPD June 2003

NPD
Norwegian Petroleum Directorate
GOALS FOR THIS WORKSHOP

• Share experience- HF - Offshore - CCR´s
• Gain YOUR experience - reviewing HF in CCR design
• Inform you of NPD´s HFAM
AGENDA

Background experience

CRIOP

NORSOK

NPD Audits

HFAM - NPD
Goals

What/Why

Example

ISSUES

1. ___________

2. ___________

3. ___________
CRIOP Method, 1988

Part One: 6 Checklists
- General Checklist - layout
- Environmental factors
- Controls & Displays
- Job Organisation
- Procedures
- Training

Part Two: Scenario Analysis
- Crisis Scenario
- STEP diagrams
- Identification of weak points
- Scenario checklists - 2 levels
- Remedial actions
Experience with CRIOP Method

- Detailed requirements out of date
- No relation to HMS Regulations, 2002.
- Study performed once in entire design process
- All / each checklists not suitable for all phases of design process
- “Yes” / “No” - questions not always considered
- Competence/ role of CRIOP leader unclear
- Unrealistic time for study given in CRIOP manual
- Only process considered - not drilling, marine, utilities, ++
- Client not always aware of what result is, how to use it, ++++++
NORSOK Standards

S002 Working Environment 1997

CRIOP confused with Task and Function Analysis.

This analysis shall include a job/task analysis and shall be performed for control room and control cabin tasks, where human error may cause accidents with severe consequences to personnel, environment or property.

The evaluations shall cover normal operation including start-up and shutdown, emergency operations.

The CRIOP method, See Annex I is referred to for complex and critical control rooms § 4.9.5.
NORSOK Standards

Control Centre 1996.
- Few high level requirements
- MMI presentation to be sought to be consistent.
- Large screen displays/ mimics may be located in CR
- Mimics to be logically structured and readable
- CCTV´s to be readable. Operation CCTV - seated.
- Personnel traffic in CCR shall be limited.
- Desks to be adjustable
Experience with NORSOK Standards

- Confusion between Scenario & Task/ function analysis
- No one common HF /CCR standard
- No verification activity described
- No reference to ISO /CEN standards
- No indication that HF is a process - MMI study is “one off”
- No link to Alarm systems (Instrument standard)
- No indication of what key issues are, interrelationships between issues.
BACKGROUND - NPD - AUDITS

- Too many alarms
- New functions in CCR
- Increased complexity and demand on staff
- New technology challenge to safety philosophy
- Reduced manning in CCR
- Remote control - onshore

Illustration: Courtesy of Maritime Hydraulics, Norway
Consoles

- Space for paper, pens
- Location - contrast
- Large fixed keyboards
- Not adjustable
Complex information
Controls

- Panel based
- Hybrid
- Screen based
- (De) centralised
- Offshore/onshore
**Alarm systems**

- No philosophy
- Alarm list
- Too many
- Inconsistent
- No priority
- No grouping
- Incomprehensible

<table>
<thead>
<tr>
<th>Alarm</th>
<th>937848</th>
<th>0000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm 1</td>
<td>938848</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 2</td>
<td>924848</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 3</td>
<td>937658</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 4</td>
<td>937148</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 5</td>
<td>937148</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 6</td>
<td>937148</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 7</td>
<td>937148</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 8</td>
<td>937148</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 9</td>
<td>937148</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 10</td>
<td>937148</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 11</td>
<td>937148</td>
<td>0000</td>
</tr>
<tr>
<td>Alarm 12</td>
<td>937148</td>
<td>0000</td>
</tr>
</tbody>
</table>

© Human Factors Solutions 2003
Task based screens
Navigation

• Inconsistent

• Difficult - hierarchical

• Remember screen nr.

• Limited search functions
Colour /graphics
Stereotypes
What is Human Factors?

Why do we need HF-Assessment Method?

What is the HF-Assessment Method?

Why use the HF-Assessment Method?

Where to find the HF-Assessment Method?
Definition

Human Factors is a scientific discipline that applies systematic methods and knowledge about people to evaluate and improve the interaction between individuals, technology and organisations.

The aim is to create a working environment (that to the largest extent possible) contributes to achieving healthy, effective and safe operations.
Challenges today and in the future - (1) Key Trends

- Requirements for profitability in (re) design and operation
- Reduced manning - Increased task complexity
  (single control centre - several platforms/processes)
- Multi-skilled teams
- Increased automation (number, type of sensors/signals)
- Introduction of new technology - new ways of working
- Regulatory - Continual improvement of HSE
- Reduce risks/ (barrier philosophy) Human Error in focus
**Challenges today and in the future - (2) Consequences**

- Achieve consistent user interface (old / new / various)
- Develop user friendly control systems - (efficient navigation, task based, give overview, ++)
- Ensure different systems support operator (common alarm presentation, prioritisation, grouping, comprehensible,++)
- Ensure acceptable workload (amount, complexity, etc).
- Develop relevant procedures (access, realistic, useable)
- Ensure systematic and effective end user involvement
Goals for the method

A systematic Validation and Verification (v&v) method for reviewing:

- Process integration of HF in design & operation
- Evaluating the results of the process

In Offshore Control Centres (drillers cabin, cranes, offloader cabin, local and central control room, etc).
The Overall objective is to:

- Improve HSE level in Control Centres
- Reduce possibility of human error
- Optimize workload
- Increase safety in all situations

Increase business performance and regularity in production, optimize production rates and lower training costs

Developed for NPD by HFS in co-operation with industry
Basis for requirements in HF-Assessment Method

HSE Regulations, 2002
A Method for reviewing HF in Control Centre Design rev. 01
ISO 11064 1-3
YA 711
NORSOK
+ other Standards
Assessment Method consists of 2 main parts

1. Introduction - to HF-assessment method

2. Checklists - covers min. of requirements for HF in CR
   - Documentation checklist
   - General checklist covers all design phases
   - Specific checklists for each phase in design process
Introduction to HF-assessment method

Goals

Objectives

Basis for checklists

Flowchart of HF-assessment method
- **Documentation Checklist**
  requirements for documentation of design process /result

- **General Checklist**
  that covers requirements for all phases

- **Specific Checklist**
  with requirements for each phase
# Checklist

- **Introduction and description of each checklist:**
  
  - Purpose
  - Intended results
  - Input data and outputs
  - Revision tools
  - Activities to be performed
### Example from General Checklist

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>GUIDANCE</th>
<th>ANSWERS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. What is the goal and strategy to reduce the probability of human error in the CCR?</td>
<td>Principles include the design of screen based systems, error tolerant systems, - the location and grouping of input and output devices, information presentation, correct and easily understandable information, alarm system design. Methods include Risk Analysis, Human Error Analysis and Task Analysis.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HF-assessment method is a revision tool not a design guide
No new requirements
Specifies and emphasizes existing requirements
Provides guidance (references) to HF tools/ methods/ literature
○ Presumptions

Necessary HF competence

Experience in use of:

• HSE regulations
• Relevant HF standards
• NORSOK Standards
Why use HF-Assessment Method?

Possible benefits:

- Reduced training costs
- Reduced probability of human error
- Reduced probability of redesign/modifications
- Reduced absenteeism/staff turnover
Possible benefits

- Increased efficiency in design and operation
- Improved communication between NPD and industry
- Improved work environment
- Improved safety
Download from - www.npd.no