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Human Factors in a Pipeline Control Centre

Title

Human Factors in a Pipeline Control Centre

Areas covered in today's presentation on control room Human Factors

- Control room Human Computer Interface (HCI) Assessment
- Control room staff fatigue assessment

In each area we'll discuss the approach taken by BPA and the findings and improvements we've implemented

Background on BPA

- BPA operates oil distribution pipelines and storage facilities within the UK, including
  - UKOP
  - WLPS
  - WGPS
  - Buncefield East Storage
  - FINA Line
- Central control centre for all BPA operated pipeline facilities is located at Kingsbury, near Tamworth (known as the KCC).
- KCC is manned 24 hours a day, 365 days a year
- KCC is the focal point for pipeline control, pipeline scheduling but also for emergency response co-ordination

Kingsbury Control Centre

Control Centre HCI Assessment - Methodology

- Stage 1 was an assessment of the Human-Computer-Interface (HCI) at the KCC.
- Assessment undertaken by an HF consultant (CCD), was conducted during 2007 as part of the management of change for the introduction of the FINALINE control system
- Focus of the study was towards
  - Are HCI's adequate to support KCC operations and reduce human risk in control centre tasks?
  - Alarm management
- Assessment consisted of task analysis, interviews and work observation

Control Centre HCI Assessment – Summary of Findings

- Alarms
  - Reporting issues only rather than events
  - Alarm tones, appearance, messages, etc to be common across different control systems at the same location
  - Company alarm management philosophy to prevent alarm flooding
- Mimics
  - Common approach across systems managed from one location
  - Only present relevant information (remove redundant functionality)

- Recommended to implement common ‘design modules’ into systems managed from one location
- Recommended to hold regular “alarm review” meetings between BPA Operations management, KCC staff and clients

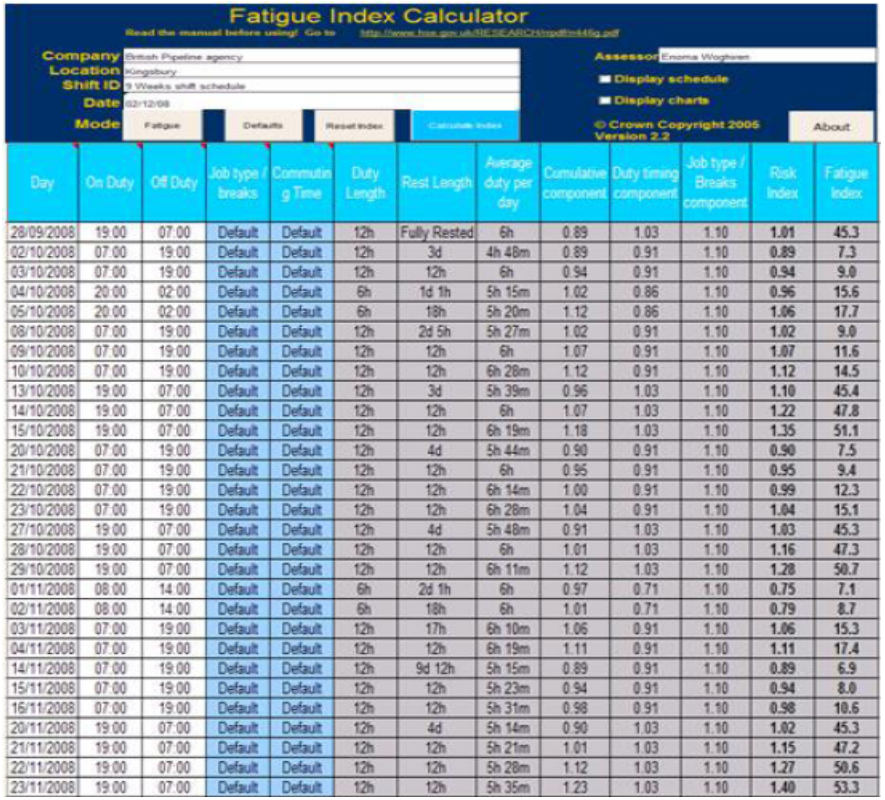
Control Room Staff Fatigue Assessments

- Stage 2 – assess fatigue of control centre shift staff
- Assessments into control room fatigue was conducted in late 2008 by BPA's HS&E Manager

- The study highlighted the following issues
  - A system of fatigue management was not specifically catered for (within BPA)
  - The robustness Fatigue education could be improved
  - Higher levels of overtimes and shift swapping could occur
  - Improvements to ensure regular breaks for shift staff

Control Centre Staff Fatigue – Risk Assessment

- Study consisted of questionnaires given to control centre staff to identify working patterns and perceptions.
- Fatigue risk assessment based on questionnaire results
- Results compared against the HSE's good practive guidelines for shift design
- This gave areas that could be targeted for improvement



Fatigue Index Calculator

Read the manual before using! Go to http://www.hse.gov.uk/RESEARCH/rpdf/rr445g.pdf

Company: British Pipeline agency
Location: Kingsbury
Shift ID: 9 Weeks shift schedule
Date: 02/12/08
Mode: Fatigue | Defaults | Reset Index | Calculate Index

Assessor: Enoma Woghiren
Display schedule
Display charts
© Crown Copyright 2006
Version 2.2
About

Day	On Duty	Off Duty	Job type / breaks	Commuting Time	Duty Length	Rest Length	Average duty per day	Cumulative component	Duty timing component	Job type / Breaks component	Risk Index	Fatigue Index
28/09/2008	19:00	07:00	Default	Default	12h	Fully Rested	6h	0.89	1.03	1.10	1.01	45.3
02/10/2008	07:00	19:00	Default	Default	12h	3d	4h 48m	0.89	0.91	1.10	0.89	7.3
03/10/2008	07:00	19:00	Default	Default	12h	12h	6h	0.94	0.91	1.10	0.94	9.0
04/10/2008	20:00	02:00	Default	Default	6h	1d 1h	5h 15m	1.02	0.86	1.10	0.96	15.6
05/10/2008	20:00	02:00	Default	Default	6h	18h	5h 20m	1.12	0.86	1.10	1.06	17.7
08/10/2008	07:00	19:00	Default	Default	12h	2d 5h	5h 27m	1.02	0.91	1.10	1.02	9.0
09/10/2008	07:00	19:00	Default	Default	12h	12h	6h	1.07	0.91	1.10	1.07	11.6
10/10/2008	07:00	19:00	Default	Default	12h	12h	6h 28m	1.12	0.91	1.10	1.12	14.5
13/10/2008	19:00	07:00	Default	Default	12h	3d	5h 39m	0.96	1.03	1.10	1.10	45.4
14/10/2008	19:00	07:00	Default	Default	12h	12h	6h	1.07	1.03	1.10	1.22	47.8
15/10/2008	19:00	07:00	Default	Default	12h	12h	6h 19m	1.18	1.03	1.10	1.35	51.1
20/10/2008	07:00	19:00	Default	Default	12h	4d	5h 44m	0.90	0.91	1.10	0.90	7.5
21/10/2008	07:00	19:00	Default	Default	12h	12h	6h	0.95	0.91	1.10	0.95	9.4
22/10/2008	07:00	19:00	Default	Default	12h	12h	6h 14m	1.00	0.91	1.10	0.99	12.3
23/10/2008	07:00	19:00	Default	Default	12h	12h	6h 28m	1.04	0.91	1.10	1.04	15.1
27/10/2008	19:00	07:00	Default	Default	12h	4d	5h 48m	0.91	1.03	1.10	1.03	45.3
28/10/2008	19:00	07:00	Default	Default	12h	12h	6h	1.01	1.03	1.10	1.16	47.3
29/10/2008	19:00	07:00	Default	Default	12h	12h	6h 11m	1.12	1.03	1.10	1.28	50.7
01/11/2008	08:00	14:00	Default	Default	6h	2d 1h	6h	0.97	0.71	1.10	0.75	7.1
02/11/2008	08:00	14:00	Default	Default	6h	18h	6h	1.01	0.71	1.10	0.79	8.7
03/11/2008	07:00	19:00	Default	Default	12h	17h	6h 10m	1.06	0.91	1.10	1.06	15.3
04/11/2008	07:00	19:00	Default	Default	12h	12h	6h 19m	1.11	0.91	1.10	1.11	17.4
14/11/2008	07:00	19:00	Default	Default	12h	9d 12h	5h 15m	0.89	0.91	1.10	0.89	6.9
15/11/2008	07:00	19:00	Default	Default	12h	12h	5h 23m	0.94	0.91	1.10	0.94	8.0
16/11/2008	07:00	19:00	Default	Default	12h	12h	5h 31m	0.98	0.91	1.10	0.98	10.6
20/11/2008	19:00	07:00	Default	Default	12h	4d	5h 14m	0.90	1.03	1.10	1.02	45.3
21/11/2008	19:00	07:00	Default	Default	12h	12h	5h 21m	1.01	1.03	1.10	1.15	47.2
22/11/2008	19:00	07:00	Default	Default	12h	12h	5h 28m	1.12	1.03	1.10	1.27	50.6
23/11/2008	19:00	07:00	Default	Default	12h	12h	5h 35m	1.23	1.03	1.10	1.40	53.3

Control Centre Staff Fatigue - Improvements

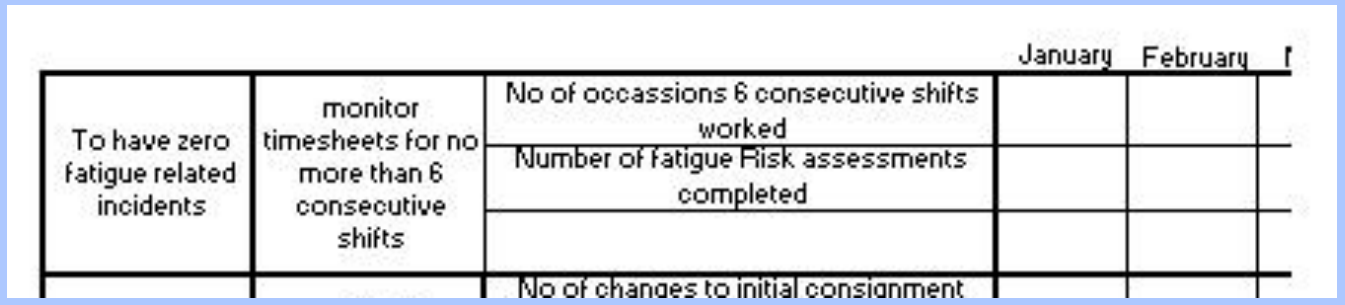
- Better regulated shift pattern has been introduced based on the findings
- Control room staff levels increased from 9 to 10 personnel
  - Allows for 24 hr coverage by two men
  - Allows operation of a DD – NN – RRR shift pattern to reduce fatigue
  - Improvements in controller shift breaks implemented

Control Centre Staff Fatigue - Improvements

- Fatigue education has been improved and training rolled out to operations staff.
- A work instruction was issued to document BPA policy and instructions on fatigue management
- The assessments also identified the benefit for distinct hierarchy/roles in the KCC to bring in more supervision between Despatcher and Controller positions

Control Centre Staff Fatigue – Operational Measurements

- Following the implementation of improvements there was a need to measure the performance of the new work systems
- KCC monthly KPI's updated to include a measurement on fatigue performance (see picture on right)
- Reviewed by management on a monthly basis so any trends can be identified



			January	February	
To have zero fatigue related incidents	monitor timesheets for no more than 6 consecutive shifts	No of occassions 6 consecutive shifts worked			
		Number of fatigue Risk assessments completed			
		No of changes to initial consignment			

Human Factors in a Control Room

- Thank you for listening, are there any questions?