

## **International Regulators' Forum**

### **Generic report on offshore lifting and mechanical handling issues**

#### Introduction

Injuries and dangerous occurrences arising from lifting operations account for a significant proportion of the total of those occurring offshore. For example, in the period 1998 to 2003, lifting and mechanical handling accounted for about 20% of all reported incidents on the UKCS. A similar pattern is thought to exist worldwide.

The IRF decided that it would be beneficial to look at the worldwide picture to review national initiatives and to share best practice in order to improve our effectiveness in regulating these risks. In particular, the project sought to:

- Identify concerns associated with lifting and mechanical handling,
- Identify initiatives to address those concerns,
- Identify benchmarks used to seek compliance with relevant national legislation, e.g. relevant codes and standards,
- Rank the issues to identify the priority concerns,
- Promulgate the findings to raise awareness, and to
- Develop common approaches to generic issues.

This report is the first outcome of the above deliberations. It is supplemented by separate reports from each IRF regulator describing their national strategy for addressing risk associated with offshore lifting. National reports can be found on each regulator's web site.

#### Identifying issues of concern

In April 2003, a questionnaire was sent out to each IRF member. The results were collated by HSE to inform subsequent discussion at IRF meetings.

The format of the questionnaire followed the sequential steps that make up the process of transferring goods from the dockside to the drill floor. The questions were divided into the following categories:

- A. Loading the supply boat at the dockside
- B. Transfer from the supply boat to installation and vice versa
- C. Deck to deck lifting operations
- D. Drill floor lifting operations
- E. Generic lifting issues
- F. Intelligence

For each category, a number of issues were identified and assigned a unique code; e.g. A1, B3, C6 etc. The questionnaire asked respondents to list the activities that they considered to pose significant risk, and to describe the regulatory initiatives used to assess whether those risks are properly

controlled. Typically, these initiatives encompass the whole range of regulatory activities including inspection, audit, advice, input to industry guidance, sponsoring research, incident investigation, and enforcement. Respondents were also asked to identify the benchmarks used to identify good practice when making decisions on appropriate enforcement action. Finally, IRF members were asked to forward any other relevant documentation such as inspection strategies etc that described the initiatives they had in place.

Responses were received from regulators in: Newfoundland, Nova Scotia, Netherlands, Norway, New Zealand, United Kingdom, United States of America, and Western Australia.

### Prioritising the issues

Respondents were asked to assign each issue with a simple high / medium / low priority to enable the issues to be ranked. The chosen ranking system is crude but simple. However, it does penalise a high priority issue that was only identified by a small number of respondents. The full list of issues identified is given in Table 1.

Issue No	Issue	Points
Loading the supply boat		
A1	Incorrect manifest	9
A2	Defective slings	13
A3	Weight of load not marked	10
A4	Load not secured	11
A5	Loads too close together	1
A6	Invalid certification	2
A7	Debris fall from FLT pockets	1
A8	Protection of placards	1
A9	Certification expired	1
A10	Loading dangerous goods	2
Boat to deck lifting operations		
B1	hook snagging on supply boat	17
B2	boat slingers struck by load / hook	16
B3	sling shedding from crane hook	14
B4	static and dynamic crane rating	18
B5	adverse environmental conditions	13
B6	access to stacked installations	14
B7	heavy lifts	3

Deck to deck lifting operations		
C1	proximity hazards	12
C2	blind lifts	16
C3	stacking of loads	13
C4	poor slinging practice	16
C5	handling tubulars to the catwalk	15
C6	pipe handling - catwalk to drill floor	15
C7	use of webbing slings	2
Drill floor lifting operations		
D1	pipe handling in the derrick	14
D2	inspection of drilling lifting equipment	14
D3	man riding using winches	20
Generic lifting operations		
E1	competence of banksmen / slingers	21
E2	competence of crane operator	22
E3	competence of maintenance staff	17
E4	competence of crane examiners	16
E5	supervision of lifting operations	17
E6	planning of lifting operations	19
E7	inadequate maintenance	16
E8	inadequate crane design	11
E9	human factors	14
E10	ergonomic issues	3
E11	training documentation / validation	3
E12	defective standards of inspection	5
Intelligence		
F1	analysis of lifting accidents	19
F2	which cranes are used where?	6

Table 1 - Lifting issues identified in the IRF survey

## The top ten issues

The top ten priority issues are displayed below in table 2.

TOP TEN ISSUES	ISSUE No	RANK
Competence of crane operator	E2	22
Competence of banksmen / slingers	E1	21
Man riding using winches	D3	20
Planning of lifting operations	E6	19
Analysis of lifting accidents	F1	19
Static and dynamic crane rating	B4	18
Hook snagging on the supply boat	B1	17
Competence of maintenance staff	E3	17
Supervision of lifting operations	E5	17
Inadequate maintenance	E7	17

Table 2 – Top ten IRF lifting issues

It is clear from the above that the competence of those engaged in planning, supervising and undertaking lifting operations is considered crucial to safe lifting. Maintenance is another key area of concern.

The initiatives and benchmarks employed by IRF members for the top ten concerns are summarised below.

## (E2) Training and competence of crane operators

### Regulatory initiatives:

- Auditing of training and competency
- Crane operator accreditation schemes
- Monitoring of training and assessment schemes provided by industry
- Participating in the development of training guidelines with industry, e.g.
  - PSA<sup>1</sup> plans to introducing the OMHEC <sup>2</sup>standards for training and competence into the revised Norsok 003 standard
  - CNS<sup>3</sup> Safe Lifting Practices – Volume 2 – Offshore Lifting Operations & Cargo Handling
- Assessment of training requirements described in the Safety Case
- Research into supplementing conventional training with computer simulation to expose the crane operator to potentially dangerous situations in a safe environment
- Inspection of lifting operations

### Regulatory benchmarks:

- Recommended Practice for the Operation and Maintenance of Offshore Cranes, API RP 2D 1999
  - Clauses 3.1.1 "Operators", 3.1.2 "Qualifications for Operators" and Appendix A1 "Commentary for Operator Training". Must be trained and have experience on the type of crane that will be operated.
  - MMS - PINC G-202
- Petroleum Occupational Health and Safety Regulations Offshore Newfoundland, DRAFT November 1989 – Part 14
- Petroleum Occupational Safety & Health Regulations – Nova Scotia, Draft, April 5, 1990
- East Coast Offshore Petroleum Training and Qualifications Guidelines, Canadian Association of Petroleum Producers, (CAPP) Feb 2002
- NL - Working Conditions Decree - Article 7.18, sub 3
- OMHEC *Training Standard for Offshore Crane Operators and Banksman*
- Step Change Lifting and mechanical handling guidelines
- NOGEP<sup>4</sup> training handbook.
  - Course 1.2a ( base) and 1.2b (refresher)
  - Part of the course is on the job training (loading and unloading of supply vessel ) specific for that crane type. Course carried out by SBW
- APPEA<sup>5</sup> Guidelines for Lifting Equipment - March 2000

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<sup>1</sup> Petroleum Safety Authority – Norwegian regulator

<sup>2</sup> Offshore Mechanical Handling Equipment Committee

<sup>3</sup> Nova Scotia regulator

<sup>4</sup> Netherlands Oil and Gas Exploration and Production Association

<sup>5</sup> Australian Petroleum Production and Exploration Association

(E1) Competence of banksmen / slingers

Regulatory initiatives:

As for (E2) Training and competence of crane operators.

Regulatory benchmarks:

As for (E2) Training and competence of crane operators but also including:

- Recommended Practice for the Operation and Maintenance of Offshore Cranes, API RP 2D 1999
  - Clause 3.1.4 "Qualification for Riggers" and Appendix A2 "Commentary for Rigger Training". Signal training is covered in Rigger training.
  - PINC G-190
- UK - Cogent training standards for banksmen and slingers
- GPITO<sup>6</sup> and riggers standards

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<sup>6</sup> Gas and petrochemical industry training organization – NZ

(D3) Man riding using winches

Regulatory initiatives:

- Avoid use unless absolutely necessary, challenge duty holders to provide safer alternatives; e.g. service equipment from drill floor or derrick racking board where possible
- Only permit use of winches specially designed for man-riding. Devices used for lifting personnel to be certified for such use by the manufacturer or acceptable third party.
- Independent brake on hoist winch drum.
- Emerging guidance
- Review existing standards that address personnel lifting equipment and procedures
- Assess the state of the art of emerging technology to provide the rider with a stop control and up / down motion controls
- Audit and inspection of lifting operations,
- Audit and inspection of maintenance and testing regime

Regulatory benchmarks:

- Petroleum Occupational Health and Safety Regulations Offshore Newfoundland, DRAFT November 1989 – Parts 4 & 14
- CNS 0- Safe Lifting Practices – Volume 4 – Offshore Personnel Hoisting ( In draft form to be issued in Dec. 2003)
- Guidelines Respecting Drilling Programs in the Newfoundland Offshore Area, 2000 Appendix E
- Nova Scotia Offshore Certificate of Fitness Regulations. April 11, 1995
- Petroleum Occupational Safety & Health Regulations – Nova Scotia, Draft, April 5, 1990
- NL- Article 7.36 b section 5 and 6 of the Working Conditions Decree
- LOLER<sup>7</sup> Regulation 5 lifting of persons
- Step Change *Best practice guide to man riding safety*
- The PSLA Schedule and APPEA Guidelines
- CNS - Safe Lifting Practices – Volume 4 – Offshore Personnel Hoisting ( In draft form to be issued in Dec. 2003)
- HSE Guidance HSG 221 Technical guidance on the safe use of lifting equipment offshore

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<sup>7</sup> Lifting Operations and Lifting Equipment Regulations 1998

## (E6) Planning of lifting operations

### Regulatory initiatives:

- Theme Inspection project "Safe Lifting Operations"
- Participate with industry to identify gaps in lifting requirements and develop appropriate guidance for the management of lifting operations.
- e.g. CAPP in the CNSOPB initiative
- Will propose greater emphasis on planning the lifting operation in guidance and new regulations and standards
- Opportunity for improvement in guidance and in safety assessment and audit processes noted
- Audit and inspection of crane operations and lifting practices.
- Crane operations under Permit to Work. Require Job Safety Assessment.
- Specific procedure for heavy loads
- Loads pre-slung and all slings certified and pre-checked.
- MMS is considering requiring a job hazards analysis (JHA) and subsequent job safety analysis (JSA) and operating procedures for the routine day-to-day activities.
- Managed by individual companies under the Safety Case regime

### Regulatory benchmarks:

- Petroleum Occupational Health and Safety Regulations Offshore Newfoundland, DRAFT November 1989 – Part 14
- Safe Lifting Practices – Volume 2 – Offshore Lifting Operations & Cargo Handling
- Recommended Practice for the Operation and Maintenance of Offshore Cranes, API RP 2D 1999
- Guidelines Respecting Drilling Programs in the Newfoundland Offshore Area, 2000 Appendix E
- Petroleum Occupational Safety & Health Regulations – Nova Scotia, Draft, April 5, 1990
- East Coast Offshore Petroleum Training and Qualifications Guidelines, Canadian Association of Petroleum Producers, (CAPP) Feb 2002
- OMHEC Training Standard March 2003
- LOLER reg 8 Organisation of lifting operations
- HSE guidance L113 *Safe use of lifting equipment* LOLER Approved Code of Practice
- HSE guidance HS (G) 221 *Technical guidance on the safe use of lifting equipment offshore*
- British Standard BS 7121-11 *Code of Practice for safe use of cranes – Part 11 Offshore cranes*
- Step Change Lifting and mechanical handling guidelines
- APPEA Guidelines



(F1) Analysis of lifting accidents

Regulatory initiatives:

Regulations to require duty holders to report accidents to the regulator

Investigation of accidents and dangerous occurrences. Targeted towards serious incidents and those with potential for serious consequences.

Monitoring all incident investigation reports to ensure identification of root cause and corrective action. Review of operators' incident reports.

Recognition that the best remedial actions arise from incident analysis when the investigation is carried out by properly trained persons having sufficient technical background.

Incidents arising from poor design or defects in manufacturing is a very low percentage of the registered incidents

Each regulator maintains a comprehensive incident database.

Promulgate the results of incident analysis to the wider world. For example, NPD published a report in 2000 relating to analysis of 4500 incidents involving the use of offshore cranes in the period 1994 – 1999. The results were presented as the most occurring main causes and the most contributing factors. HSE published a similar report available at [www.hse.gov.uk/research/rrhtm/rr183.htm](http://www.hse.gov.uk/research/rrhtm/rr183.htm)

Incident analysis used to prepare safety alerts, influence revisions in relevant codes such as API RP 2D, and, where necessary, to propose additional regulations. The results are input to regulatory strategies to help decide enforcement priorities and targeting of resources.

(B4) Static and dynamic crane rating

**Regulatory initiatives:**

Current load charts are required in crane cab by regulation. Inspectors check the crane for both dynamic and status load charts. The inspectors also check for correct load charts based on the cranes configuration.

MMS has concerns about the availability of dynamic load charts for older cranes. As a result MMS is considering rulemaking that would require all cranes to have dynamic load charts. The rulemaking may also require all load charts to be regenerated according to API Spec 2C, Fifth edition

All offshore cranes in jurisdiction required to have Rated Capacity Indicators (safe load indicators) programmed for static and dynamic load indication at minimum 3 sea state conditions.

Operating procedures distinguish between static and dynamic loads.

Consideration of proposal that only crane manufacturer or competent person can derate crane.

Consideration of proposal that only crane manufacturer with Certifying Authority approval can upgrade crane capacity based on overload and performance tests.

Competence is an essential element to address.

Themed Inspection project on Safe Lifting Operations

Cranes certified annually by third party inspection.

Some regulators note the opportunity to improve guidance, safety assessment, Certificate of Fitness, and audit processes to include crane rating.

**Regulatory benchmarks:**

API Spec 2C 3.3 "Load Rating Charts" static and dynamic load chart are required to be visible to the operator at the control station.

API RP 2D "Crane Rerating" Rerating must be performed by the 2C crane manufacturer or a licensed engineer. New load charts are to be generated by the 2C crane manufacturer or a licensed engineer.

API Spec. 2C 3.3(b) The basis for the load chart will be clearly marked on the load chart.

Nova Scotia Offshore Certificate of Fitness Regulations. April 11, 1995  
Petroleum Occupational Safety & Health Regulations – Nova Scotia, Draft,  
April 5, 1990

Rules for Certification of Lifting Appliances, DNV 1994

Code for lifting Appliances in a Marine Environment, 1987, LRS

General regulations for the Petroleum Activity (NPD), Norsok R-003 standard  
for lifting operations and references in that document

Schedule of Specific Requirements as to Offshore Petroleum Exploration and  
production 1995 [the Petroleum (Submerged Lands) Act]– Part 7, Cranes  
Winches and Lifts - enforced in State waters and used as guide in  
Commonwealth waters.

LOLER Regulation 7 Marking of lifting equipment.

HSG 221 Technical guidance on the safe use of lifting equipment offshore

(B1) Hook snagging on the supply boat

**Regulatory initiatives:**

Identify gaps in lifting requirements and develop appropriate guidance for the management of lifting operations. Improvement opportunity noted. Will propose safety features on crane i.e. "run-a-way protection" on winch drums.

NPD and the industry have put the focus on the supply chain, thus including all parties from suppliers to platforms. All aspects related to the safety of lifting operations are addressed. Focus being put also on the training and competence of personnel involved in lifting operations implementing new competence standards (e.g. OMHEC) and using simulator training facilities.

NPD - Normally well organized deck on the supply boats. The technical requirements for offshore cranes are such that they are equipped with both AOP and MOP systems. In addition the crane shall be designed in a way that leaves the crane drivers cabin brake down as a last component

Use only safety hooks, not snap hooks on cranes. Plan cargo placement on vessel deck. Supplement the manifest by e-mailing a digital photograph to the installation showing how the loads are arranged on the supply vessel deck

DOIR manages an offshore crane driver accreditation system for Western Australia state waters

**Regulatory benchmarks:**

*OMHEC Training Standard for Offshore Crane Operators and Banksmen*

*UKOOA Guidelines for the safe packing and handling of cargo to and from offshore location*

(E3) Competence of maintenance staff

**Regulatory initiatives:**

Participation in the development of training guidelines with industry.

Training emphasized in the Safety Assessment process.

Audits of training and competency and of inspection, testing and maintenance.

Checking maintenance and repair records. Inspect written reports confirming adequacy of repairs and alterations. Confirmation that preventive maintenance programs have been established in line with API RP 2D.

Opportunity for improvement in guidance and audit noted

Trend towards multi-skilling offshore is seen as a potential problem.

**Regulatory benchmarks:**

Recommended Practice for the Operation and Maintenance of Offshore Cranes, API RP 2D 1999 (4.3.3 and 4.3.1)

Petroleum Occupational Health and Safety Regulations Offshore Newfoundland, DRAFT November 1989 – Part 14

East Coast Offshore Petroleum Training and Qualifications Guidelines, CAPP February 2002.

(E5) Supervision of lifting operations

**Regulatory initiatives:**

Netherlands - Theme Inspection project on Safe Lifting Operations

Norway - Focused on as one of the results of our study of causes of lifting accidents with offshore cranes

Nova Scotia - Will propose greater emphasis on planning the lifting operation in subsequent guidance. Safe Lifting Practices – Volume 2 – Offshore Lifting Operations & Cargo Handling

A study of 7 recent fatal accidents in UKCS focused attention on the supervisory and risk assessment aspects of operations on the deck and drill floor. Inspection under HSE's key program of work KP2 concentrates on supervisory aspects.

**Regulatory benchmarks:**

Petroleum Occupational Safety & Health Regulations – Nova Scotia, Draft, April 5, 1990

API RP2D latest edition

East Coast Offshore Petroleum Training and Qualifications Guidelines, Canadian Association of Petroleum Producers, (CAPP) Feb 2002

Step Change *Lifting and mechanical handling guidelines*

LOLER Reg 8 – Organisation of lifting operations

OMHEC *Training Standard for Offshore Crane Operators and Banksman*

(E7) Inadequate maintenance

**Regulatory initiatives:**

Checking inspection reports (pre-use, monthly, quarterly, and Annual). Visual inspection of the rigging condition and examination of the wire rope inspection program

Maintenance is highly focused in the new Norwegian regulations and standards

HSE key programme KP3 on Installation Integrity includes in depth inspection of the effectiveness of maintenance.

Safety Notices published following recent crane boom collapses on older cranes. Emphasise the importance of reviewing the adequacy of maintenance arrangements to reflect age of crane. Consider more intrusive inspection.

Annual third party inspections.

Participate with CAPP in the C-NSOPB initiative to identify gaps in lifting requirements and develop appropriate guidance for the management of lifting operations, including maintenance arrangements.

Sponsoring research to raise awareness of maintenance issues:

RR 237 Maintenance system assessment

<http://www.hse.gov.uk/research/rrhtm/rr237.htm>

RR 213 Human factors in offshore maintenance

<http://www.hse.gov.uk/research/rrhtm/rr213.htm>

OTO 2001/088 Beyond lifetime criteria for offshore cranes

<http://www.hse.gov.uk/research/otohtm/2001/oto01088.htm>

**Regulatory benchmarks:**

Netherlands - Article 7.18, sub 3 of the Working Conditions Decree

PUWER reg 5 Maintenance of work equipment

LOLER reg 9 Thorough examination of lifting equipment

Prevention of mechanical failures through inspection, testing and maintenance  
API RP 2D 4 and Appendix C, D, E and F for Inspection, Testing and Maintenance. Also API RP 2D 5 and Appendix G for "Wire Rope and Sling Inspection"

Guidelines Respecting Drilling Programs in the Newfoundland Offshore Area, 2000 Appendix E