

Improving Offshore Crane Safety

1. Purpose

The purpose of this discussion paper is to draw industry attention to opportunities for improvement of the management of offshore crane safety, thereby reducing the risks to personnel and the environment from dropped objects and crane failures.

NOPSEMA notes that the statements and examples provided in this paper are not sweeping statements about all of industry, but examples of where deficiencies have been observed and improvements are clearly required.

This paper shall be distributed prior to the workshop in July 2021.

2. Scope

The topic may be applied to all types of cranes installed on offshore facilities; however, it should be acknowledged that much of the inputs observed are in relation to offshore pedestal cranes.

3. Introduction

Within Australian Commonwealth waters there are 67 offshore pedestal cranes in operation on 35 permanently installed production facilities. Additionally, there are several other types of cranes and hoists on facilities as well as a fluctuating number of mobile drilling and vessel facilities fitted with large cranes.

Lifting operations carry inherent dangers and rely on safe cranes to ensure the risks are reduced to as low as reasonably practicable (ALARP).

In the period 1 July 2020 to 20 May 2021, NOPSEMA recorded 29 crane-related notifications of dangerous occurrences from duty holders. This was a significant increase in notifications from previous years and many of these incidents were common across duty holders. This number does not include notifications in relation to dropped objects. NOPSEMA deemed that, in the majority of cases, these occurrences were sufficiently serious to be escalated for further investigation.

Based on the observed trends in degraded crane safety, NOPSEMA has issued a safety bulletin in relation to the safe operation of cranes with reduced capacity.

NOPSEMA considers these notifications of dangerous occurrences as lead indicators of risks associated with cranes not being appropriately managed. As such it is clearly an issue that industry needs to acknowledge and address.

Problem statement

Increased instances of dangerous occurrences involving pedestal cranes suggests that crane safety is not being appropriately managed across the offshore oil and gas industry.

As a result, there is an elevated risk of an incident involving the collapse of an offshore crane and/or a load being dropped, resulting in personnel injury or fatality, a major accident event or a major environmental event.

4. Trends observed in investigations

NOPSEMA inspectors have collated the information gathered for dangerous occurrences related to pedestal cranes observed and recorded in investigation reports. They determined that these trends appear to fall within 3 broad categories:

- 4.1 Inspection and management of corrective maintenance
- 4.2 Competency of personnel
- 4.3 Failure to apply lessons learned.

Details of the observed trends and NOPSEMA's expectations are detailed in the following sections respectively.

4.1. Inspection and management of corrective maintenance

4.1.1. Crane inspection reports - Corrosion

Crane inspection reports carried out by duty holder in-house specialists or third-party contractors provide vague qualitative findings with respect to the categorisation of structural corrosion and its associated risks to personnel and/or environment. For example:

- Crane inspectors do not appear to consistently utilise the duty holder's corrosion guides, classification society standards or other standard nomenclature when describing corrosion. Qualitative descriptions of corrosion, such as "extensive", "surface" and "local" have been sighted by NOPSEMA.
- Findings of corrosion on crane structures appear to prompt further inspection in lieu of instigating repairs, where repairs would appear necessary.
- The prevalence of cranes operating in a de-rated capacity, due to the corrosion of the crane structure, is evidence that the reports of corrosion were either not assessed or fully understood.

Expectation

Corrosion-related findings in crane inspection reports should be written so that duty holders are able to gain a clear understanding of the extent and depth of corrosion and how this relates to risk and fitness for service. Furthermore, the location description of the corrosion should identify the criticality of the location to the continued safe operation of the crane.

Duty holders should assess the corrosion using risk-based techniques and, when necessary, repair the anomalies in accordance with agreed standards. Unassessed corrosion findings on cranes cannot be accepted.

4.1.2. Inspection - Corrective works

Deficiencies and anomalies, identified from pre-start inspection checklists and other inspection reports, are not being actioned and/or do not appear to be subject to the correct level of prioritisation based on risk. For example:

- Crane operators are the personnel who are most familiar with the cranes that are in use. As part of their normal duties, and in accordance with industry norms, crane operators conduct pre-start inspections of their crane and report all deficiencies and anomalies.
- NOPSEMA has observed instances where the duty holders are not raising corrective work orders to address deficiencies and anomalies identified by crane operators in the pre-start inspection checklists.
- The priority being assigned to corrective actions to address crane anomalies from pre-start inspection checklists and other inspection reports do not appear to be risk based and do not reflect the status of the crane as a Safety Critical Equipment.

Expectation

Cranes are Safety Critical Equipment, and all reports of deficiencies and anomalies must be assessed by competent personnel, in a timely fashion and actioned appropriately.

4.1.3. Quantitative data

Duty holders do not review or understand the quantitative data provided by crane operators, inspectors, and maintainers. For example:

- NOPSEMA has observed in its inspection reports instances where quantitative data such as the records of crane usage, slew bearing wear, oil analysis and wire rope diameter reductions is collected, however,

the assessment of this data with other historical data to assess longer term wear and fatigue of components is not being undertaken.

- NOPSEMA has observed during its inspections that duty holders' processes to review and action quantitative data is sporadic and is not dependant on the competency of those managing the crane.
- In general, the instructions and methods written in duty holders' processes are not always clear and concise nor always provided to the third-party inspection and maintenance contractors undertaking crane inspection tasks or for the assessment of data. For example, the data acquired for slew bearing wear must be acquired in a repeatable method and noting that it may be conducted by different contractors or crane inspectors over time.
- When the quantitative values are sighted by NOPSEMA, it has been observed that there are either errors in the recording or missing data sets.
- Wire rope inspection acceptable/rejection criteria is clearly stated in industry standards. When wire rope inspection reports are sighted by NOPSEMA, the application of the standards reflect poorly on the competency of the inspector/crane operator to assess the rope condition.
- Duty holders are not recording crane operating times consistently and some appear unaware of their level of use for comparison against the requirements of maintenance standards, such as API RP 2D.

Expectation

Duty holders must assess the wear of the cranes and their critical components to ensure the risks are reduced to ALARP.

The competency of wire rope inspectors must be improved as wire rope deterioration is a single point of failure of cranes.

4.1.4. Crane Original Equipment Manufacturers

Duty holder engagement with the crane Original Equipment Manufacturers (OEM) appears to be sporadic and ad-hoc. For example:

- NOPSEMA has observed during its' inspections that the duty holders have often established third-party inspection and maintenance contractors but have not established formal links to the crane OEM. Crane OEMs hold all the design information for their cranes and are best placed to determine fitness for service and/or repair methodologies.
- Without these formal OEM links, duty holders were observed to be unaware of OEM issued safety alerts.
- Communications with OEMs is often directed through the third-party crane inspection and maintenance contractor. On occasion this was found to create difficulties due to the OEMs' perception that the duty holder's third-party inspection and maintenance contractor are competitors, either locally or overseas.

- Communications from some OEMs to duty holders, sighted by NOPSEMA during its inspections, have been observed to be unclear, and the duty holder could not clearly ascertain whether the associated crane was safe for continued use.
- NOPSEMA would encourage the use of crane safety-related forums so OEM, duty holders and their inspection and maintenance contractors can jointly identify developing issues and implement mitigation strategies. These forums would also have the benefit of establishing working relationships so that, when a crisis does occur, the OEM's position or suggested remediations are communicated with greater clarity and speed.

Expectation

Crane OEMs hold all the design information for their cranes and are best placed to determine fitness for service and/or repair methodologies.

To ensure risk mitigation, duty holders and their third-party inspection and maintenance contractors must ensure that clear channels of communication are formally established and maintained.

4.1.5. Crane inspection and operating standards

Crane inspection and operating standards are not applied by the duty holder and/or duty holders do not understand the application of the respective standards. For example:

- Crane standards are divided into two groups: Design Standards and Operating Standards. Some Design Standards reference onto the Operating Standards. NOPSEMA has identified this matter in previous guidance and Regulator articles.
- NOPSEMA has observed the reference of three crane wire rope acceptance/rejection criteria standards in one Safety Case. Due this multiple listing of standards it becomes unclear which standard is intended to be applied when inspecting the wire rope.

Note: OPGGS(S) Regulation 2.7 requires that the facility safety case must specify all Australian and international standards that have been applied or will be applied, in relation to the facility or plant used on or in connection with the facility.

- When a crane is inspected to its nominated standard, NOPSEMA expects that a formal written record is issued by the crane inspector indicating that the crane has PASSED (or otherwise) the inspection and is fit for continued service in accordance with the applied standard. Certification, for example NATA-endorsed certificates demonstrating third-party inspection contractor processes and inspector

competency, must be available. These records must include regular audits and assessment by the certifiers, for example NATA.

- It is noted that API RP 2D, in its foreword, states that duty holders, inspectors and crane operators are *"... encouraged to follow the recommendations outlined {therein} and to modify or supplement them with any practices or procedures with are more appropriate provided the minimum recommendations and the intent of the programs stated herein are met"*.

Expectation

Crane inspection and operating standards represent the minimum requirements. NOPSEMA expects duty holders to apply these standards and, where appropriate, supplement them with their own procedures.

Inspections and testing, completed by -organisations accredited by bodies such as NATA, with endorsed certificates provides risk mitigation and demonstrates that the third-party inspection contractor has processes in place that are periodically audited and provides risk mitigation.

4.2. Competency

4.2.1. Competency of inspectors and maintainers

Duty holders' processes do not adequately describe the required competency of the crane inspector and crane maintainer and how duty holders verify the competency of inspectors and maintainers. For example:

- NOPSEMA has observed during its inspections that duty holders' processes often do not describe the competency standard required, the level of experience or the differentiation between maintenance trades and crane inspectors.
- In addition, there appears to be limited utilisation of established industry association practices to train, qualify and validate crane inspectors and maintainers. For example, API qualification, OEM training, Lifting Equipment Engineers Association (LEEAA) training or NATA accreditation of inspection companies.
- Competency must be demonstrated through education, qualification, experience and verification. NOPSEMA has observed during its inspections that duty holders often appear to rely on experience alone, and competencies are not being maintained. Once an inspector has been initially deemed competent duty holders do not appear to consider periodic re-verification.

Expectation

Crane inspection and maintenance competency requirements must be clearly described in duty holders' processes.

Inspections & testing, completed by organisations -accredited by bodies such as NATA, with endorsed certificates provides risk mitigation and demonstrates to NOPSEMA the competence of those undertaking the activity.

4.2.2. Duty holder lifting management responsibility

Duty holder personnel with responsibilities to manage crane safety do not appear competent to make informed decisions on the continued safe operation of the crane. For example:

- Not all duty holders have their own in-house crane and lifting specialists. NOPSEMA has observed during its Inspections that duty holders often assign their mechanical or structural Technical Authority as the crane/lifting management responsibility.

For example, a structural Technical Authority's primary role and experience is typically not in cranes and lifting operations and is therefore often reliant on third-party contractor support for subject matter expert advice. The third-party contractors however have no authority to ensure anomalies are addressed and subject to commercial realities that can compromise their view.

- Personnel with management responsibility for cranes do not appear to have verifiable baseline competency to make independent decisions on their crane fitness for service and/or ensuring the reduction of associated risks to personnel at the facility.

Expectation

Duty holders must ensure that those personnel with management responsibilities for the safe operation of cranes on their facility have the required competency and authority to assess the crane fitness for service and/or ensuring the risks to personnel at the facility are reduced to ALARP.

4.3. Lessons learned

Duty holders are not consistently learning the lessons from previous near misses at their facility. For example:

- NOPSEMA has observed during its investigation of notifiable incidents that duty holders are investigating lifting related dangerous occurrences with inexperienced investigation teams. In addition, duty holders are not analysing the incidents to recognise whether there are systemic trends.

- NOPSEMA has observed during its inspections that crane operation and maintenance audits are not routinely completed, in part due to a lack of competent personnel. Duty holders' audits of their processes is a fundamental risk mitigation function.
- There does not appear to be pan-industry sharing of lessons learned or sharing of information and experiences between duty holders, third-party inspection and maintenance contractors, and OEMs to ensure the industry learns from incidents.

Expectation

Duty holders must ensure that investigations are undertaken diligently and without prejudice. The learnings from investigations must be followed-up and actioned with authority.

Audits of crane operations and maintenance is a fundamental risk mitigation function that must be routinely completed, and outcomes actioned.