



Investigation report

S3/2007M

Hatch crane safety

Original report made by G. Th. Koning MM MSHE, senior investigator

This investigation report has been written to improve safety and prevent new accidents. The report does not address the possible responsibility or liability caused by the accident. The investigation report should not be used for purposes other than the improvement of safety.

Onnettomuustutkintakeskus
Centralen för undersökning av olyckor
Accident Investigation Board

Osoite / Address: Sörnäisten rantatie 33 C **Address:** Sörnäs strandväg 33 C
FIN-00500 HELSINKI 00500 HELSINGFORS

Puhelin / Telefon: (09) 1606 7643
Telephone: +358 9 1606 7643

Fax: (09) 1606 7811
Fax: +358 9 1606 7811

Sähköposti: onnettomuustutkinta@om.fi tai etunimi.sukunimi@om.fi
E-post: onnettomuustutkinta@om.fi eller förnamn.släktnamn@om.fi
Email: onnettomuustutkinta@om.fi or first name.last name@om.fi

Internet: www.onnettomuustutkinta.fi

Henkilöstö / Personal / Personnel:

Johtaja / Direktör / Director Tuomo Karppinen

Hallintopäällikkö / Förvaltningsdirektör / Administrative Director Pirjo Valkama-Joutsen
Osastosihteeri / Avdelningssekreterare / Assistant Sini Järvi
Toimistosihteeri / Byråsekreterare / Assistant Leena Leskelä

Ilmailuonnettomuudet / Flygolyckor / Aviation accidents

Johtava tutkija / Ledande utredare / Chief Air Accident Investigator Hannu Melaranta
Erikoistutkija / Utredare / Air Accident Investigator Tii-Maria Siitonen

Raideliikenneonnettomuudet / Spårtrafikolyckor / Rail accidents

Johtava tutkija / Ledande utredare / Chief Rail Accident Investigator Esko Värhtiö
Erikoistutkija / Utredare / Rail Accident Investigator Reijo Mynttinen (vv, leave of absence)
Erkki Hainari (→28.2.2010)

Vesiliikenneonnettomuudet / Sjöfartsolyckor / Marine accidents

Johtava tutkija / Ledande utredare / Chief Marine Accident Investigator Martti Heikkilä
Erikoistutkija / Utredare / Marine Accident Investigator Risto Repo

Muut onnettomuudet / Övriga olyckor / Other accidents

Johtava tutkija / Ledande utredare / Chief Accident Investigator Kai Valonen

ISBN 978-951-836-263-3

Multiprint Oy, Helsinki 2009



G.Th. Koning MM MSHE, senior investigator

In close co-operation with the following parties;



Lead investigating state; The Accident Investigation Board, Finland



Substantially interested state; The Directorate of Shipping and Maritime Affairs, Netherlands Antilles



Substantially interested state; The Transport and Water Management Inspectorate, Netherlands



The Dutch Safety Board; Provided senior investigator G.Th. Koning MM MSHE for the investigation in the Netherlands



SISÄLLYSLUETTELO

INTRODUCTION	V
1 FINDINGS ON THE HATCH CRANE ACCIDENTS.....	1
1.1 Investigations and recommendations.....	1
1.2 The actions taken by the crane manufacturer	4
2 FURTHER INVESTIGATION	7
2.1 The socio-technical model of system operation in practice	8
2.2 The role of the ISM-Code	10
2.3 The actions taken by different parties	11
3 CONCLUSIONS.....	13
4 RECOMMENDATIONS.....	15

APPENDICES

- Appendix 1. D-Investigation report: MS GRACHTBORG's hatch crane accident in Kokkola, Finland, on 11 August 2007

INTRODUCTION



Figure 1. Hatch crane on board a vessel (not involved in an accident).

A hatch crane accident took place on m/s Singeldiep in Kotka port, Finland, on 11 January 2006, when the hatch covers of the vessel sailing under the flag of the Netherlands Antilles were to be opened as loading restarted. The second mate and the AB of the ship had opened the hatch covers together and the mate drove the crane meant to lift and move hatch covers on top of hatch No. 1, closest to the bow. The AB thought that the mate would leave the crane there. The mate, however, started to move the hatch cover alone and he was lifting the cover when it came loose and fell into the cargo hold. When falling, the hatch cover pulled the crane from its rails and the other end of the crane collapsed over the hatch edge into the cargo hold. The mate, who had been in the driver's place on top of the crane, fell a distance of c. 5 metres on paper rolls and was seriously injured. The victim died from his injuries at the hospital. The investigation was completed on 15 November 2006. The investigation report MS SINGELDIEP, fatal accident in Kotka port on 11.1 2006 is available on AIBF's web page <http://www.onnettomuustutkinta.fi/38910.htm>.

Less than a year later another hatch crane accident took place on 10 August 2007 when a cargo vessel Grachtborg experienced a failure with the hatch crane. The crane together with a hatch cover toppled over into the hold damaging a stevedore's tractor. The first mate was badly injured but survived the accident. This type of accident occurred already eight times in the past seven



years, injuring six seafarers severely and unfortunately was the cause of death for three among them. The investigation report concerning the Grachtborg's accident is appended to this safety study.

At the investigations by the Commission at the Netherlands Antilles and the Maritime Board of Inquiry at the Netherlands into the causes of the accidents several lessons to be learned were reported. Despite these inquiries the accidents are still happening.

Within the scope of learning from incidents and accidents on board ships on which the ISM code is based as well, it is remarkable that owners and interested parties are not able to prevent further accidents with these cranes. As it is still a high risk operation which can result into fatal injuries, a thematic study had been started to alert the maritime industry as a whole and the Dutch and Dutch Antilles in particular.

As the latest incident on board the Grachtborg, which happened in the Finnish port of Kokkola, was the third one in a Finnish port, the Finnish authorities were able to lead an investigation into the particular incident and the following safety study. Due to lack of knowledge of the Dutch language, the Dutch Safety Board was invited to have one of the senior investigators be part of the investigation team.

With additional knowledge of the Transport and Water Management Inspectorate, the Directorate of Shipping at the Netherlands Antilles and full co-operation of the Netherlands based manufacturer of the hatch cranes, Coops-Nieborg and the Dutch Ship Owner Association all aspects could be investigated.

1 FINDINGS ON THE HATCH CRANE ACCIDENTS

1.1 Investigations and recommendations

In order to have a complete view of the problem with these types of cranes a study has been executed on the findings of the Dutch Maritime Board of Inquiry located in Amsterdam. The Maritime Board of Inquiry investigated seven of these incidents.

The first investigation had been carried out in 1992 in a period in which these types of cranes were introduced on board vessels trading mostly in Western Europe. After five consecutive years in which no accidents were reported the second investigation by the Board was carried out in 1998.

Again a relative long period without reported accidents passed. But after a serious accident in 2002, in the years 2003 to 2006 five serious accidents happened. Three of these accidents unfortunately resulted in loss of lives of crewmembers. All accidents were investigated by the Maritime Board of Inquiry of the Netherlands.



Figure 2. Figure showing a broken wheel. Due to the regular movement of the hatch crane and corrosion, the steel rail is slightly becoming thinner. This results in parts of the wheel to rest on the welding of the rail to the deck, instead of resting on the rail itself. The weight of the crane is not divided over the wheel anymore but resting on the thin cheeks at both sides of the wheel. The photograph is showing the broken cheek.



Figure 3. Figure showing the lifting hooks. They deformed as they slid along the pockets and losing the hatch cover. This resulted in toppling over of the hatch crane, injuring the driver of the crane (in three cases resulting in the death of the driver).

The year 2007 resulted in an all time high of three incidents with these types of cranes respectively in May (m.s. Gouweborg), July (m.s. Keizersborg) and August (m.s. Grachtborg). Fortunately these incidents happened without loss of lives.

The investigations of the Maritime Board of Inquiry in Amsterdam, The Netherlands, resulted in reports with findings, conclusions and recommendations. After the first accidents the Board recommended technical solutions and proposed that on board vessels, equipped with these cranes, the procedures could be improved. The recommendations were like the following (translated from the reports of the Maritime Board of Inquiry);

- From this accident and all previous accidents caused by hatch cover cranes it can be learned that if one wants to work safe, this work should be done by three people. If there is a person on starboard side as well as on port side to check if the hooks are fitted to the pocket and additionally check if the rails are free from obstacles or other persons, the crane operator can pay full attention to driving and hoisting with the crane.
- Again the Board has to identify that the tragic accident on board is due to the fact that the hooks were not fitted correctly to the pockets on the port side, and during movement of the hatch crane came loose and made the crane to tumble. A check from a second helper could have avoided this accident. At most hatch cranes the operating desk is at the starboard side where the starboard lifting hooks can be seen. The port side lifting hooks can not be seen from this position. Checks on these hooks with a second person are a necessity if one wants to work safe. The accident could also have been avoided if the hatch crane had been fitted with 'rail claws'.

The 'rail claws' the Maritime Board is referring to can be seen in the following picture taken on board a Russian cargo vessel. The claws prevent the crane from derailing or toppling over.



Figure 4. The rail claw, which prevents the crane from derailing or toppling over.

But after the several incidents which resulted in deaths on board, the Board addressed the competent authority with the following recommendations;

- The Board recommends the competent authority to investigate the possible regulatory measures in which these cranes fit, and have the latest design developments tested and as soon as possible have these developments made compulsory.
- The Maritime Board of Inquiry recommends the authorities to judge the latest developments of the manufacturer of the hatch cranes and to consider to have these developments compulsory and to have the regulations amended where necessary.

The competent authority in the Netherlands is like it is in most countries the Shipping Inspectorate. This Inspectorate is part of the Netherlands Ministry of Transport and Water Management. The reactions of the Netherlands Transport and Water Management Inspectorate to the recommendations of the Board were the following;

Quote: *The first of July 2005 the 'Arbeidsomstandighedenwet', the Netherlands' version of the Council Directive, has been adapted to the European Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work. This directive is from 1989 and has*

the aim to assure that workers in the European Union are guaranteed a certain level of safety and health in their working environment.

The Dutch 'Arbeidsomstandighedenwet' and related 'Arbeidsomstandighedenbesluit' also describe the measures to be taken when using lifting and hoisting gear. The associated 'Arbeidsomstandighedenbesluit' has specific articles for cranes and hatches, article 7.18, 7.18a, 7.20 and 7.25. At January 1, 2007 the revised version of the 'Arbeidsomstandighedenwet' entered into force with the aim to give the employers and employees the responsibility for safety and health at work. It is necessary to have the enterprises install measures for improving safety and health, by performing Risk Inventarisation and Evaluation. Details for safety and health at work are no longer a responsibility for the government. Unquote

A hatch crane is a lifting appliance constructed to lift pontoon hatch covers and carry them forward and/or aft of the ship. With the hatch crane it is also possible to place a longitudinal bulkhead in the hold for the carriage of a bulk cargo of grain.

For this type of hatch crane the same regulations are in force as for other lifting appliances. Unfortunately it became apparent last year that on the ships fitted with a portal hatch crane in 26% of the cases the alarm bell and the signalling light(s) did not work. In 17% of the cases the crane was moved with only one available person. (Final report from the Netherlands Transport and Water Management Inspectorate; "Toezicht Bemannning" (Assessing Crew) 27 September 2007).

Already in 1993 a study on safety problems with cranes in general, resulted in the following conclusion; 'Safety problems of cranes have changed and so have our views of what safety is all about. New EC safety standards provide good principles on how to assess risks and to devise prevention measures in design, and especially on how to integrate safety in the design process.' (Crane Accidents and their prevention revisited Kari Häkkinen, Helsinki, Finland Safety Science 16 1993 (267-277)).

1.2 The actions taken by the crane manufacturer

A visit to the manufacturer in January 2008 revealed that the manufacturer has already put a lot of effort in reducing the risks of operating the crane.

As far as the manufacturer is concerned, the main risks of operating the hatch crane are;

- Improper hooking of the cover, resulting in loosing the cover from the crane
- Colliding or derailing as a consequence of hitting persons or objects
- Derailing of the hatch crane due to changes to the original design of the ship, improper loading of the ship or lack of maintenance.

The manufacturer mentioned its concerns of lack of maintenance and other risks undertaken by ships managers by regularly addressing the ship owners using their cranes. The manufacturer is building a database with all known incidents and dates of neces-

sary maintenance in order to have a view of the size of the possible risks. With this information several measures have been taken to prevent incidents or reduce the risk of injuries.

Beside the technical measures the manufacturer has put effort in a short instruction video (about 5 minutes), highlighting the main procedures to prevent incidents with the crane. A copy of this video can be obtained at the manufacturer.

As manufacturer Coops & Nieborg BV is explaining, it is the ship owners' responsibility to take the relevant measures on board its vessels. But as long as these measures prove to be incomplete the manufacturer would be pleased when the improvement of the cranes could be justified by certificates based on regulatory requirements.



2 FURTHER INVESTIGATION

It appears that the authority is recognising the problem but not able to get a hold on it. In these particular cases the ISM code could be used as a system to improve the use of these cranes. Although the manufacturer of the crane has adapted several features to improve the safety record of these cranes not all of these features are used on existing ships.

In this paragraph we will have a closer look at these problems and possible methods to improve safety, along the socio-technical model of system operations as shown in the figure below.

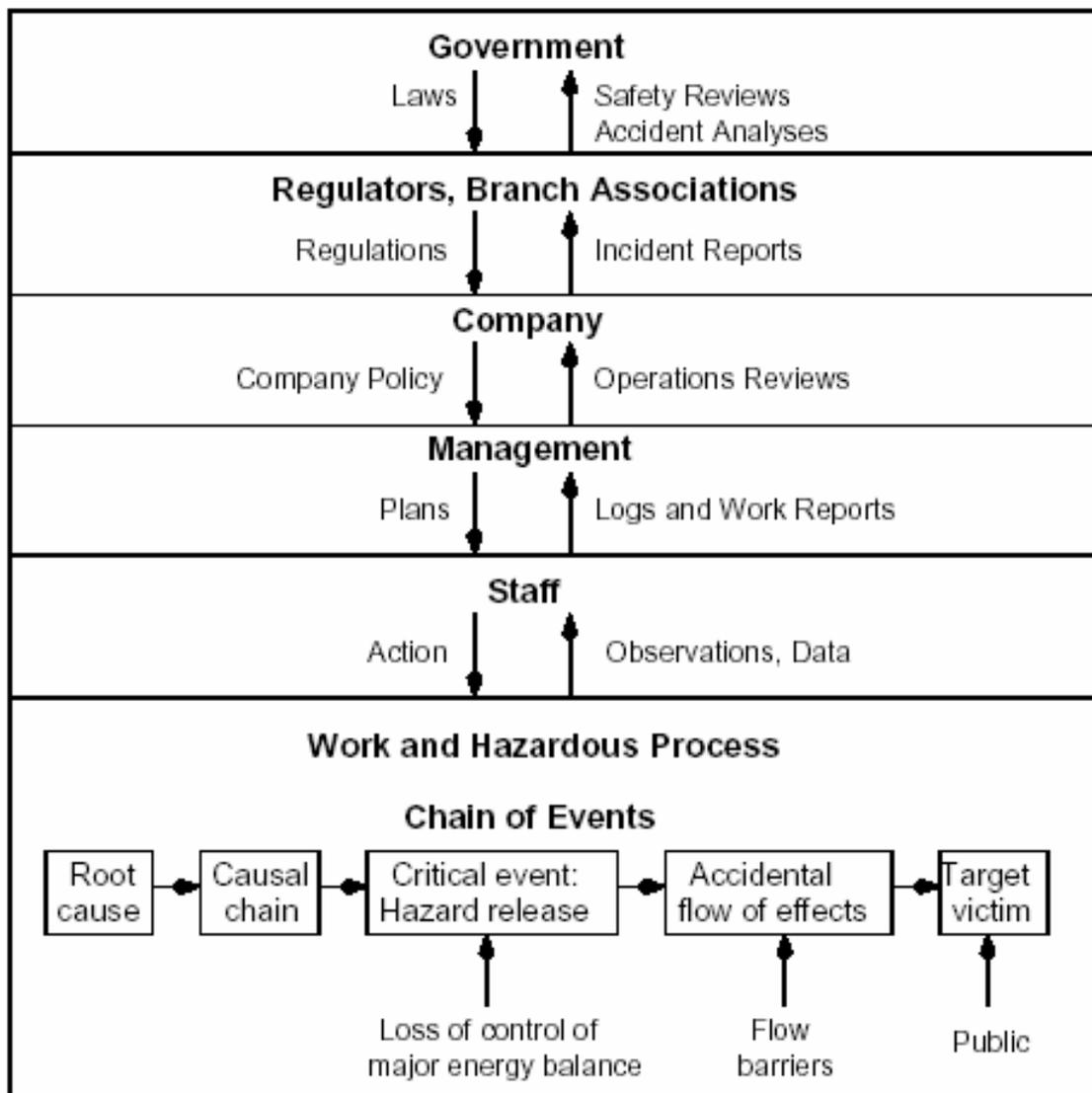


Figure 5. Rasmussen and Svedung socio-technical model of system operations

2.1 The socio-technical model of system operation in practice

The employer and employee are both working for better circumstances assuring safety and health at work. The employer will be responsible but it is obligatory to have meetings with the employees;

- Employers have to investigate the risks, propose improvements and evaluate. They have to give instructions about the identified risks and the measures taken. Especially younger employees should be given extra attention. Part of this is taken up with the familiarization plan on board. According to the Dutch Owners Association (KVNR) especially the management on board should also bear in mind that the new generation of officers has an almost indefinite faith in the techniques on board. These officers have to learn to deal with the possibility of operational surprises as incidents usually are.
- Employees should follow safety instructions and use the personal protective aids provided by the employer. And not as it is noticed on board many ships override the alarms, not following procedures and trying to do their work on their own, instead of working as teams, especially with hatch cover movements.
- An employer can have additional support of external services for safety and health if considered necessary.
- The Labour Inspectorate has a possibility to sanction if work is not according to the regulations. However sanctioning is the last regulatory measure to take. If accidents happen the Labour Inspectorate and/or the Inspectorate for Transport will investigate the cause(s).

The above described responsibilities are derived from the 'Arbeidsomstandighedenwet', as applicable to Dutch flagged ships. The Dutch Antilles flagged ships and ships flying other flags do not have to comply to these specific regulations, but all ships have to be certificated and comply with the International Safety Management Code (ISM).

According to the described socio-technical model of system operation there is a link between all parties involved. Each party is obliged to itself and the parties which it is connected to, to practice own responsibility in the aim to prevent future incidents.

At the different levels this can be addressed to the particular party. If we take the socio-technical model of system operation the following parties can be identified;

- Staff, equal to the officers on board responsible for the safe operation of the ship. They are charged with the implementation and follow up on procedures for the operations on board. If these responsibilities are not adequately manned it is possible to apply for example Behavioural Based Safety programs initiated by management of the company.

- Management, responsible for facilitating the staff with the tools necessary to fulfil their task in an operational environment with the risks reduced (ALARP/ALARA, as low as reasonably possible/achievable). With the compulsory ISM code they are obliged to make use of the Code. But instead of taking ISM as a compulsory system, management should be focussed at the advantages the system can give. With proper use of ISM throughout the company the management can even use it as a trade off. Similar possibilities can be seen in the offshore and chemical industry. Companies use the low figures of lost time injuries (LTI) as a way to promote safety.
- Company, at this level responsibility for compliance with all regulations both class and flag as well as international regulations. The company should use these regulations as a tool to learn and adapt to changing conditions. For example regulations in force are the minimum required. By measuring the circumstances on board with incident reports, audit reports and regular interviews with crew involved, companies can create a positive cycle in which safety and economy can go hand in hand.
- At this level the regulators (IMO, governments), branch associations (owner associations, inspectorates (class / maritime inspectorates) are active at various points in the life-cycle of the ship and its company. Usually on technical matters but also focussing at human factors and looking for ways to improve both. These organisations should also focus especially at own responsibility of the respective companies and the crews on board the ships. The only way to enhance safety on board is to dedicate responsibility with prescribed tasks with enough capability for the crew to take adequate decisions at critical moments in time.
- The government should only be responsible for monitoring the right safety levels in the companies flying its flag. This can be done by audits, incident reports and Port State Control results. With the focus on safety and environment the governments should use the last but not least possible instrument in order to assure safety. By withdrawing the safety management certificate if safety is at stake. The accidents with the hatch cranes were serious enough to take actions. They were taken, but companies were given too much time. In this period other incidents occurred and neither was serious enough to withdraw the DOC or SMS.

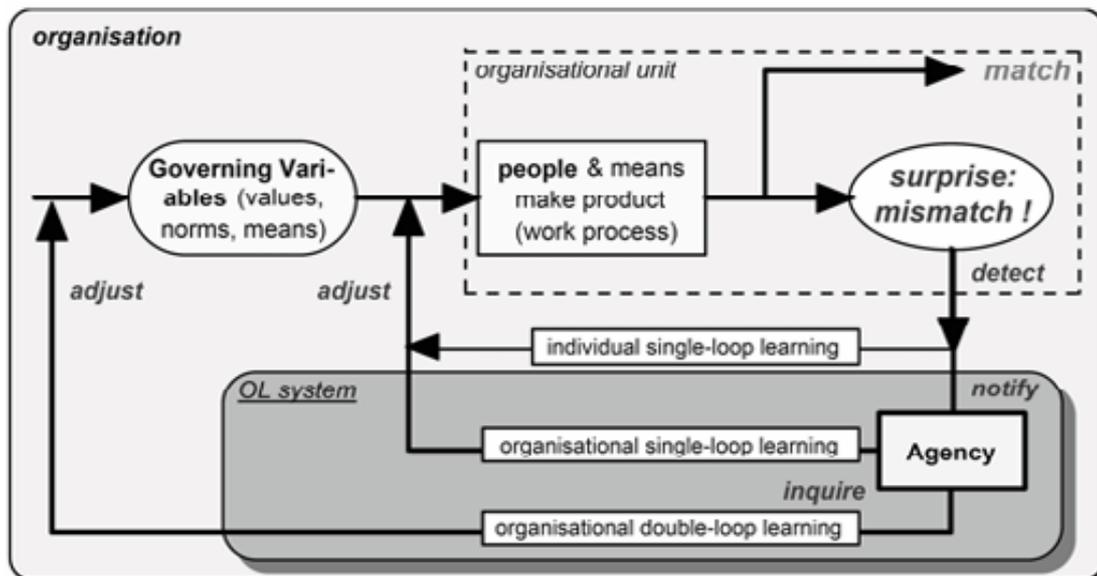


Figure 6. Figure showing the learning loop by Argyris.

2.2 The role of the ISM-Code

All ships do have to comply with the ISM Code. The International Safety Management Code (ISM) is the internationally adapted code to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property. According to the safety management objectives the Company should, inter alia:

- provide for safe practices in ship operation and a safe working environment,
- establish safeguards against all identified risks, and
- continuously improve safety management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection.

The cornerstone of good safety management is commitment from the top. In matters of safety and pollution prevention it is the commitment, competence, attitudes and motivation of individuals at all levels that determines the end result.

According to these objectives it would be expected that companies do take all necessary measures to prevent accidents, and in these cases accidents with hatch cranes. As it is mentioned in the Code the safety management system should ensure:

- compliance with mandatory rules and regulations, and
- that applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and maritime industry organizations are taken into account.

According to article 9 of the Code, reports and analysis of non-conformities, accidents and hazardous occurrences should be made. As the Code describes in article 9:

- 9.1 The safety management system should include procedures ensuring that non-conformities, accidents and hazardous situations are reported to the Company, investigated and analysed with the objective of improving safety and pollution prevention.
- 9.2 The Company should establish procedures for the implementation of corrective action.

2.3 The actions taken by different parties

When investigating the available material in only one of the cases a report was found that could be used to inform the management of the company. There was no evidence found of using the ISM as mentioned in the Code.

However during the investigation for this safety study it was also found that various members of the above mentioned socio-technical system took their responsibility. The manufacturer provided several technical solutions and introduced a DVD with instructions to open/close the hatches. Various companies in the Netherlands joined the manufacturer with enhancement of their systems on board.

On the other hand the Directorate of Shipping and Maritime Affairs at the Netherlands Antilles were confronted with a company threatening to change the flag of the ship if the Directorate asked too much questions about enhancement of the system used on board. At the end of the line this company followed their threats and changed flag of the ship in order to avoid further necessary improvements.



3 CONCLUSIONS

The first inventory of the available reports, laws and recommendations gave the idea that all is said and done to prevent accidents with these types of cranes. Last but not least the Maritime Board of Inquiry recommended the competent authority to take action.

The competent authority has not been able to act accordingly. With the various reports it can be concluded that the equipment can be dangerous to people using it, even when the right procedures are followed. The equipment and procedures should be enhanced to the now available conditions.

None of the accidents had directly resulted in real improvements at the specific companies. As found in the documentation the manufacturer has provided several improvements. But do to the additional high costs of these improvements companies are not always implementing the new equipment features.

Nowadays it is found that several Dutch companies are working with the latest improvements and even considering new approaches to the use of these hatch cranes.

None of the accidents resulted in a written report and improvements as meant by the ISM code. However the investigation revealed that companies are undertaking measures to improve the equipment on existing ships. But at least at one occasion the company was intending to use the stricken crane again after repairs.

In order to enhance safety it should be considered that some companies still seeking to avoid maximum safety by having the ship to fly a flag of convenience after being in trouble under a well known flag.



4 RECOMMENDATIONS

The parties concerned are recommended to establish a thorough learning culture at all levels in order to enhance safety on board.

The maritime inspectorates are recommended to use the ISM code as reference and tool in order to criticize safety where it is at stake.

Inspections should not be focussed on techniques. The Human Factor is the ultimate factor to recognise in the prevention of accidents. It is recommended to the maritime inspectorate to extend the focus on this part of safety.

September 2009.

Appendix 1. MS GRACHTBORG's hatch crane accident in Kokkola, Finland, on 11 August 2007

by Accident Investigation Board of Finland



D INVESTIGATION

D8/2007M

MS GRACHTBORG

Date 20.11.2007

Investigator Harri Halme

Event information

<i>Date and time</i>	<i>11.8.2007 at 23:45</i>
<i>The site</i>	<i>Kokkola, AWT terminal</i>
<i>Nature of the event</i>	<i>Deck crane accident</i>
<i>Parties</i>	<i>Chief mate of the vessel the vessel ms Grachtborg, PJPC, 2820 GT length 89.72m, draught 5.67, built in 1997, the Dutch Antilles</i>
<i>Consequences or damage</i>	<i>The mate was injured, the crane was damaged, there was damage to the deck hatch, the machine in the hold and the structures of the vessel</i>
<i>Weather conditions</i>	<i>The accident took place indoors in a large port terminal, into which the vessel can be driven in. The wind was from behind the vessel.</i>
<i>Lighting conditions</i>	<i>Indoor lighting, a few dozen lux (estimate)</i>

Description of the events

The accident took place late on Saturday night. The vessel was loading bagged calcium chloride in pallets and FIBCs. The dock workers had finished their work at 23:40 and they were leaving for the weekend. The dock workers were lifted from the hold of the vessel by means of a man cage. The dock workers were in the man cage when the accident took place and they saw the whole event.

According to the master of the vessel he ordered the chief mate to close the hatches in the aft part of the vessel, because wind and rain were coming from the sea behind the vessel. The vessel was in an all-weather terminal, into which the vessel can be driven in. The back wall of the terminal is open.

Appendix 1/2 (6)

According to that told by the master, when he and the other mate were on their way to assist in the move of the hatches, the chief mate was already on top of the deck-hatch crane. It was the purpose of the master to go to the portside of the vessel (BB) and for the other mate to go to starboard to ensure that the hooks were properly placed in the hooking pockets.

According to the safety instructions of the shipping company, when deck hatches are moved, two persons have to ensure that the lifting hooks are placed in the hooking pockets of the hatch on both sides of the cargo hold. As they were still on their way, the mate had already lifted the deck hatch using the crane and the crane was along midships. The chief mate was lifting hatch number 7, which weighs 13 tons. According to the master the crane moved in an odd way and a moment later the deck hatch and the crane fell down. The lower right-hand side of the crane, the rail wheels, slid over the end of the hatch and the hatch fell into the cargo hold, about 7–8 metres. The right edge of the hatch remained against the edge of the cargo hold. The chief mate was at the controls of the crane, from where he then fell into the cargo hold as the crane capsized.

An ambulance was immediately called to the vessel and the mate was taken to hospital. According to the examination, the mate broke his rib and he received bruises, but no more serious damage. One of the wheel loaders in the cargo hold of the vessel, the Volvo L 70, was badly damaged as the hatch fell on top of it. The machine was so badly damaged that the insurance company redeemed it. The second wheel loader remained intact.

The master notified the shipping company and the authorities of the event. The police visited the vessel and interviewed its master and the injured mate. The police took breath tests of the persons with the result zero and performed its own investigation.

The maritime inspector was notified by the Vaasa emergency centre. The maritime inspector further notified his own superiors of the matter. The maritime authority also notified the occupational safety inspector. The maritime inspectors (2 persons) and the occupational safety inspector visited the vessel on Monday morning. The occupational safety inspector examined the matter as a work accident and the maritime authorities as a maritime safety issue.

According to the working-hour record, there was nothing unusual in the working hours of the injured mate in the days before. A new seaman was ordered to the vessel to replace the injured mate and the injured mate did not sail onboard the vessel.

The vessel would have been ready on Monday August 13th without the accident. Now it had to be unloaded for the seaworthiness inspection. Because it was estimated that the deck hatches did not go in place well and tightly enough to avoid the risk of the load getting wet, the decision was made to order another vessel to fetch the load. The damaged vessel was allowed to sail to the shipyard in Poland for repairs. The purpose is for the shipyard to repair the deck crane as well as hatches 6, 7 and 8. Before the voyage the water tightness of the hatches had to be improved with tarpaulins. The Ms Grachtborg could leave Kokkola for the shipyard at 16:60 on Wednesday April 15th.

Analysis

The crane manufacturer as well as in this case also the shipping company expect in their own safety instructions that there are persons alongside the cargo hold to ensure that the lifting hooks are correctly placed in the hooking pockets of the cargo hatch. The chief mate of the vessel did not comply with the safety instructions. In connection with the accident investigation of the MS SINGELDIEP¹ (B1/2006M) it became evident that working with the crane alone in violation of instructions is common.

Nor had the crane been regularly inspected. An initial inspection on the crane had been conducted in 1997 and there were no inspection records after that. The crane was manufactured by the Dutch company Coop & Nieborg Hoogezand and the reference list on its home site includes the Grachtborg. An earlier investigation showed that the maintenance instructions mainly dealt with the greasing of movable parts. Hoisting equipment of a vessel used to handle cargo has to be subjected to regular scheduled tests. The deck crane of deck hatches is not one of these.

The deck crane of the vessel is of a type which has suffered similar accidents in different parts of the world. In structure, the crane is light as already noted in an earlier accident investigation. Its acquisition price is clearly cheaper than for example that of a hydraulic hatch system, where the hatches may be raised upwards to each end of the cargo hold. Hatches lifted with a crane are slower to handle than hydraulic hatches, but they are common because of their lower price. Several accidents have taken place in the past few years when operating cranes of this type.

The hooking pockets have been constructed so that they can well bear the load caused by the hatch when the hook is in the right position. The side plate of the hooking pockets is meant to ensure that the hook remains connected to the planned spot carrying the load. It is not the purpose of the side plate to carry the load.

The weight of a cargo hatch is 13 tons and the maximum allowed load of the crane is the same. When the lifting hooks are properly in the hooking pockets of the deck hatch, the whole structure becomes stiff for the period of the lifting and the move. If the lifting hooks are not exactly in their rights places, the structure is shaky. Also regarding this accident, it can be assumed that all the lifting hooks were not correctly in the hooking pockets. The rails of the crane are at the level of the deck and the rail wheels have a flange of a few centimetres to keep them from falling off the rails. Also the trim and roll have an effect on safe work and the manufacturer of the crane has set a maximum for these values.

When the hooks are placed wrong, a small sway or tug will cause the deck hatch to slide from the top of the hook and the crane to become loose. In this case, the hatch falls lifting the wheel off the rails.

The crane manufacturer has instructed that the places of the locking wedges, the hooking pockets, be clearly painted. Likewise, the hooks have been painted. In addition, according to the instructions, the centre line of the hatch should be painted on the hatch cover. The hook pockets were painted white. After the accident of the MS SINGELDIEP, in spring 2006, the investigators have noticed that the hatch markings had been painted only in one-third of the corresponding vessels that visited Finnish ports.

¹ MS SINGELDIEP, fatal accident in Kotka port on 11.1 2006, <http://www.onnettomuustutkinta.fi/38910.htm>

Appendix 1/4 (6)

The crane was an older model, in which there is no security to keep the rail wheel from falling off the rail and capsizing. In newer cranes the falling of the rail wheels off the rails is structurally prevented by equipping the wheel with a security plate. It prevents the wheel from rising off the rail. Also in the newest ones the crane controls are at one end of the crane so that the crane driver can himself see how the hooks are placed at the other end.

The same type of crane had a corresponding accident in Kotka. In that case the mate also fell into the cargo hold of the vessel and sustained fatal injuries. In 2003, there was also a similar accident in Sweden, where the mate died.

From the perspective of the occupational safety of the dock workers it is absolutely necessary that they are not in the cargo hold when the deck hatches of the vessel have to be moved. The communication between the vessel and the dock workers has to be clear and there is no room for misunderstandings. The stewedoring company had clarified its instructions to vessels to the effect that the crew of the vessel is not allowed to move and lift deck hatches if there are dock workers in the cargo hold of the vessel.

The investigator's recommendation for measures

Accidents that have occurred with this type of deck crane should be examined more closely. What is the number of accidents and are they very common, for example at European ports? This could be done in co-operation with the authorities of different countries. On the basis of vessel traffic and the cargoes it is possible to deduct the most common ports used by this type of vessel in Europe. Also the manufacturer should be asked to submit further information on these accidents.

The clarification would give a basis for a better estimation of the requirements of safe work. At present safe work focuses on the instructions of the manufacturer to ensure the lifting work when it start and when the hatches are moved. These safety instructions are commonly breached.

The dangers of this type of deck crane should be better communicated. The dock workers have to be aware of these dangers and they must be able to prepare for dangerous situations with the help of sufficient safety instructions.

International co-operation between the authorities should be further developed.

Sources

Crew list
Photographs
Inspection report of the occupational safety inspector
Notification of the maritime inspector 1988/375/2007



Figure 1. The hatch cover and the crushed tractor in the cargo hold.



Figure 2. MS GRACHTBORG's collapsed hatch crane.

Appendix 1/6 (6)



Figure 3. Another case on 2007.