

Serious Accident : Case 3

While hoisting cargo with a deck crane, the wire rope broke and the cargo fell into the hold of the barge

Outline: While the cargo ship (Vessel A), alongside with No.3 pier of Yamashita wharf in Section 1 of Yokohama Quarter, Keihin Port, on her starboard side, hoisting cargo using her No. 3 Crane from the hold of the barge (Vessel B), which was moored on Vessel A's portside, the hoisting wire rope of the deck Crane broke and the cargo fell into the hold of Vessel B at around 1005 hours on September 1, 2008.

Among barge crew and stevedores aboard Vessel B, five stevedores were thrown out by the impact. As a result, one stevedore was dead and three of them suffered bruises.

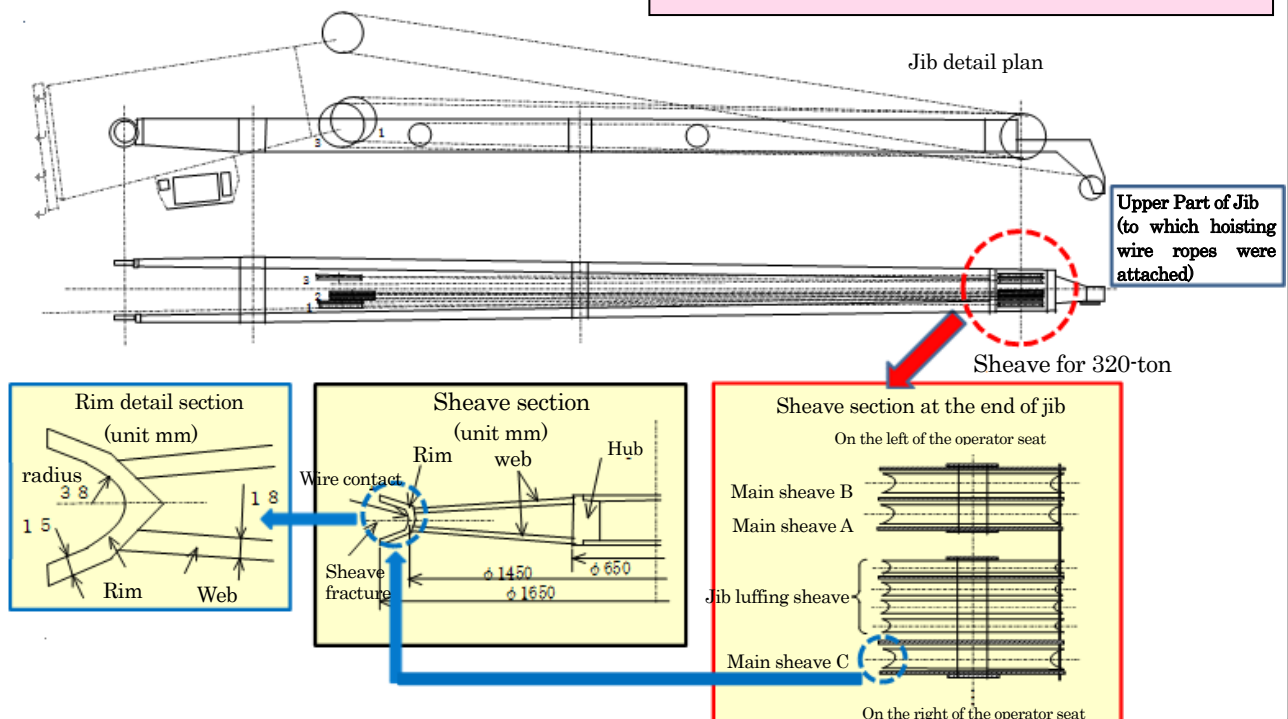
Events Leading to the Accident

Seven stevedores on board Vessel A and other stevedores hung four hoisting wire ropes (the Grommets) to the hook block of Crane No. 3 for hoisting a 320-ton load (the Main Hook Block). Then the jib (*1) was turned toward the portside direction, and the four Grommets were hooked to the four hoisting metal fittings of the Cargo that was in the hold of Vessel B, which was moored alongside Vessel A.

*1: A "jib" is an arm that extends outward from the Crane's driving gear.

After receiving a signal from the master, an ordinary seaman operated Crane No. 3 and stretched out the slacks of the hoisting wire rope (the Main Wire) and the four Grommets, and then started hoisting the Cargo by operating Crane No.3 at around 0940 hrs. At around 1000 hrs, the Cargo was lifted from the hold bottom of Vessel B. When the Cargo reached a level of approximately 7 to 8 meters above the hold bottom at around 1005 hrs, the Main Wire suddenly broke and the Cargo fell onto the hold bottom of Vessel B.

Jib and Sheave



Analysis of the Break of the Wires

It is considered probable that tension on the Main Wire was sharply reduced due to the fracture of the entire circumference of the rim of the Main Sheave C (*2), and then the Main Wire dropped into the gap caused by the fracture and came to a stop on the hub, when a jolting overload larger than its break load was inflicted on the wire, leading to a break.

It is considered probable that: the rim of the Main Sheave C had small cracks in its backside portion of the wire guide surface and its surface was hardened due to the cold forming used in its manufacture, resulting in ductility reduction. In addition, residual stress was not completely removed from the rim. As a heavy cargo weighing approximately as much as the Safe Working Load was hoisted, conditions that allow brittle fracture were created inside the rim while Crane No.3 was in operation, thus finally resulting in the break.

It is considered probable that, through bending and shaping the material by cold forming and the elongation and narrowing down process during the rim production, the surface of the rim underwent substantial hardening, and caused significant ductility reduction.

* 2: A "sheave" is a pulley on which a wire is hanged.

Three out of the eight persons, consisting of the seven stevedores of the cargo handling company and the towing manager who were working on board Vessel B, were able to safely move to a barge that was moored to the portside bow of Vessel B, but five stevedores fell into the water. Among the five stevedores who fell into the water, four were rescued by the vessel and barges that happened to be near the accident site, but one stevedore went missing.

In early evening of the day of the accident, the divers that were searching for the missing stevedore found him at the sea bottom, and he was confirmed dead. Among the four rescued persons, three were bruised.

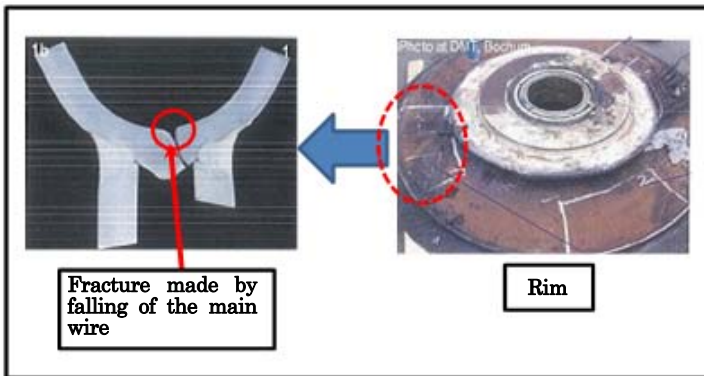
Vessel B sustained a fracture at the bottom of the hold because of the cargo, and sank.

Analysis of the Cause of the Death and Injuries

It is considered somewhat likely that one of the stevedores was hit either by a Main Hook Block or a Grommet that fell, and was killed.

It is considered probable that the other three stevedores suffered bruises by the impact sustained either when the Cargo fell into the hold of Vessel B or when they fell into the water.

Each of the four stevedores wore a helmet and safety shoes.



State of Rim Fracture

Jib luffing sheave Main Sheave C



Sheaves at the end of Jib (Crane No. 3)

Information regarding Vessel A

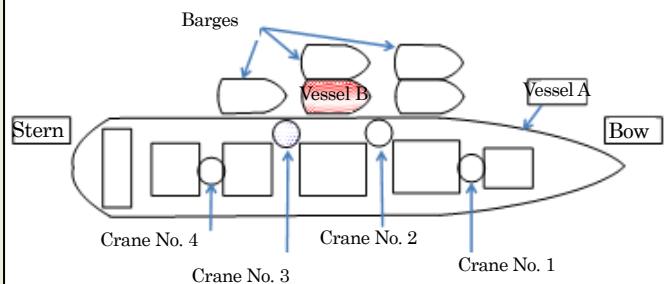
Vessel A underwent a special survey on its four deck Cranes on August 13, 2008, at a dockyard in Shanghai, the People's Republic of China. This survey was carried out by the classification society (*3), Germanischer Lloyd (GL), wherein Crane No.2 and No.3 went through a load test of hoisting a 352-ton load that was 1.1 times as heavy as the Safe Working Load (*4) stipulated by GL rule. Both Cranes successfully passed this test.

*3: "Classification Society" is a nonprofit corporation that establishes standards for the construction of ships and onboard facilities. The organization inspects ships based on the standards and grants ship-class certificates.

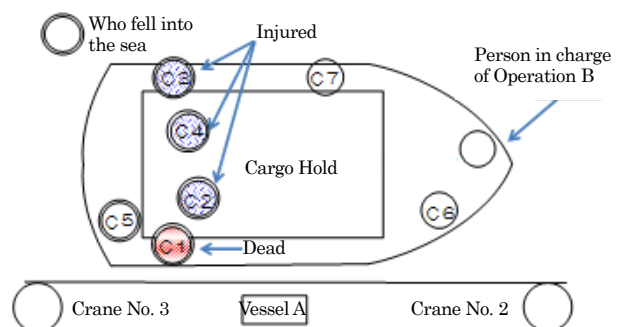
*4: "Safe Working Load" is the maximum load a Crane can handle safely. The acronym S.W.L is often used. This value represents the capacity of the Crane in combination with maximum outreach (maximum turning radius that allows hoisting of the S.W.L)

Vessel B Positioning

Vessel B Position



Positioning of Stevedores and Towing Manager on Vessel B



Crane No. 1 Crane No. 2 Crane No. 3 Crane No. 4



Full View of Vessel A (after the accident)



Vessel B which Sustained a Fracture at the Bottom

Information regarding the Cargo

According to the cargo planning prepared by the Contract Company and the technical data sheet prepared by the Electrical Manufacturer for the cargo submitted by the ship management company of Vessel A, the Cargo was a steam turbine driven generator for a power plant made by the Electrical Manufacturer, with dimensions of approximately 11.4 m long, 5.5 m wide and 4.6 m high, and with the weight of 314 t.

Hoisting attachment Grommet (hoisting wire ropes)



The Cargo immediately before the accident

Proposals (Safety Recommendations)

The Board, based on the result of the accident investigation, recommended as follows to Crane manufacturers (safety recommendations) .

Recommendations to the Crane Manufacturers

It is considered somewhat likely that this accident was caused in the following sequence: While Crane No.3 of Vessel A was hoisting the Cargo, the rim of Main Sheave C at the extremity of the jib fractured, causing the Main Wire's precipitous drop into the gap caused by fracture. This caused a break in the Main Wire, and also, finally, the fall of the Cargo, Main Hook Block, and grommet onto Vessel B.

This accident occurred in spite of the fact that Crane No.3 had passed a load test three weeks earlier, and a later investigation revealed the occurrence of a brittle fracture on the fractured surface of Main Sheave C, and various sized cracks were observed on Main Sheave E's surface.

In the face of these findings, crane manufacturers should, when they produce a rim that requires strong bending and shaping processes as a part of a weld construction sheave, perform proper control of manufacturing processes, including the selection of materials.

The investigation report of this case is published on the Board's website (issued on June 27, 2011)

http://www.mlit.go.jp/jtsb/eng-mar_report/Rick_Shineimaru18.pdf

(This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.)