CONSTRUCTION AND OPERATION OF A WORK VESSEL LOCATION AND NAVIGATION INFORMATION SYSTEM FOR FISHING PORT CONSTRUCTION

by
Shimpei Nagano[1], Masaaki Wada[2](Ph.D.), Shuichi Tanaka[3], Masayuki Fudo[4] and Akira Nagano[5](Ph.D.)

1. PURPOSE OF RESEARCH

When Tsunami and typhoon attack ports, a large amount of drifts materials and debris appears and fills in basin of port and waterway. The first work to do is open the waterway buried with debris and drifts by work vessels. Work vessels are dredger and crane vessels.

After then, cargo ships carry relief goods to the port. The work vessels carry out recovery work for the destroyed port facilities. In large-scale disaster ex. East Japan great earthquake disaster, the work vessels at the disaster area are destroyed, therefore work vessels must be dispatched from the other areas. In East Japan great earthquake disaster, it took nine days to dispatch work vessels to destroyed ports from another area.

In order to promptly dispatch work vessels, the following three conditions are necessary. (1) to catch the location of work vessels, (2) to determine the necessary work vessels and (3) to rapid navigation to the damaged ports under the weather conditions. Therefore, the location information of work vessels are acquired by GPS(Global Positioning System) and the location information are transmitted in real time via the Internet. We construct a system that accumulates the location information sequentially and displays the current locations and navigation history information of the each work vessels. In addition, the work vessels location and navigation information is accompanied with the weather condition information on the wind direction, wind speed, wave height and wave direction at the current location and the destination. Therefore, it is a system that can ensure the safety of the action of the work vessels at the time of a disaster.

In order to verify the effectiveness of this system with weather condition information, we installed GPS and transmitters in 35 work vessels in the Nagasaki prefecture waters area. After that, the system has been put to practical use.

2. RESEARCH CONTENTS

Work vessels location and navigation information system is constructed in order to take quickly measures for large scale disaster of port and plan dispatching work vessels to construction site of port. The outline of the system is as follows.

All 35 work vessels in Nagasaki Prefecture were equipped with GPS antennas, GPS chart plotters and internet data transmission equipment for catching the location of work vessels. Location information is received from the GPS antenna and transmitted to data server by the NMEA 0183 standard. In addition to location information, the data includes work vessels speed, course, and time are accumulated to server. The transmitter is equipped with a 3G transmission module, which sends the data of work vessels every five minutes via internet. There is the AIS(Automatic Identification System) that identifies the location of a ship. However, the GPS and 3G-transmission method were adopted for comparison of expenses and convenience of construction of system program. In addition, the coastal area of Japan (distance of 22.2 km from coast line) is a communicable range of 3G-trannsmission.

[1] The Graduate School of Future University Hakodate, Japan. g3216002@fun.ac.jp
[2] Future University Hakodate Professor, Japan
[3] Nagasaki Port Construction Association, Japan
[4] Construction Division Fisheries Infrastructure Department Fisheries Agency, MAFF, Japan
[5] All Japan Fishing Port Construction Association, Japan

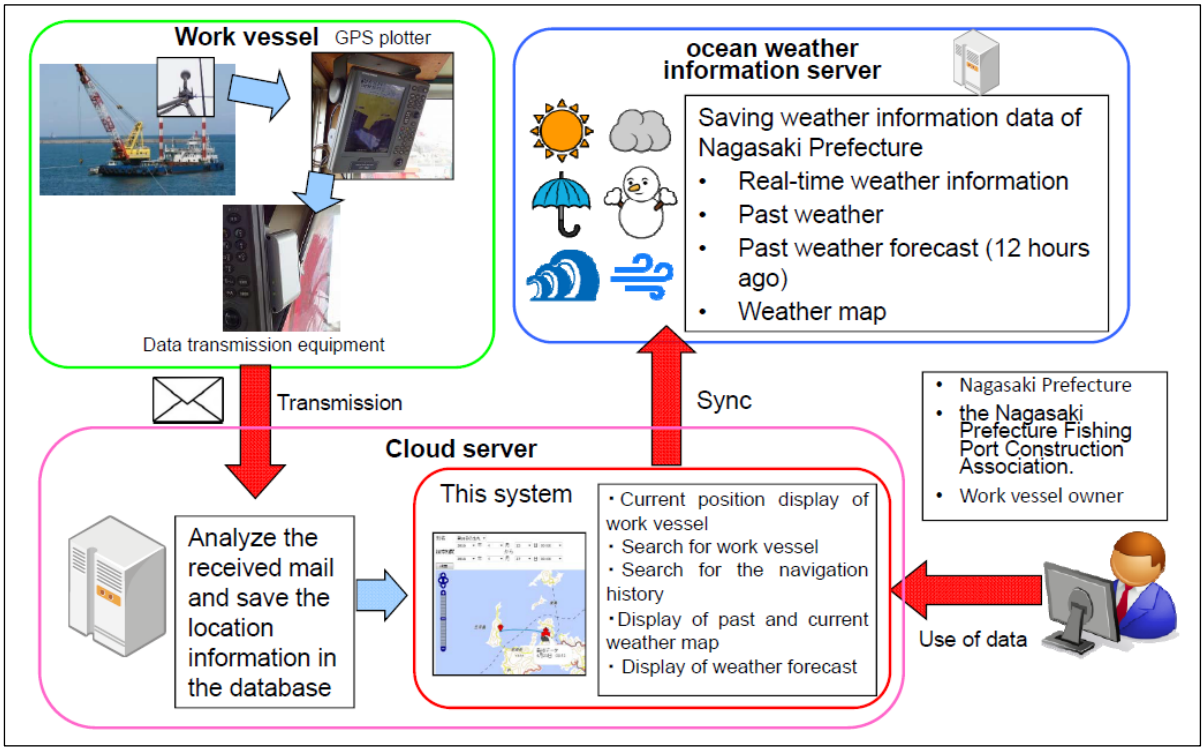
The system is programmed so that when a work vessel is unable to send data outside of the 3G service range due to being in far open sea or in the shadow of a mountain, the data is accumulated in the transmitter and sent all together once the vessel returns within the service range. The data sent by internet are received on a server and accumulated in a database.

The system is constructed to display current location and navigation history from the accumulated data of work vessels, with weather information of every work vessels location. For weather information, forecasts issued by the Meteorological Agency are saved in the same database.

Currently, the Nagasaki Harbor Fishing Port Construction Association manages the location navigation information system of 35 work vessels. Therefore, when the disaster occurs it is possible to dispatch work vessels quickly. And they have prepared the system that can efficiently dispatch work vessels to construct ports.

3. MAIN CONCLUSION

Construction of the work vessel location and navigation information system with weather information for port restore and construction port quickly. The Nagasaki Harbor Fishing Port Construction Association manages the location navigation information system of 35 work vessels. The Nagasaki Harbor Fishing Port Construction Association can dispatch the necessary work vessels to restore and construct port quickly. In order to take measures to large-scale disasters throughout Japan, it is necessary to participate in this system on not only 35 working vessels in Nagasaki prefecture's waters but also working vessels in waters all over Japan.



Work vessel location and navigation information system