

Proposal for Port Entry Operation to Increase Port Entry Draft of Bulk Carriers

Port Planning Division Port and Harbor Department
AKAKURA Yasuhiro, Head of Division (Dr.Eng.)

(Keywords) Tidal level, UKC, fairway depth, maximum draft, J-Fairway

1. Current status of tidal level use

Bulk carriers and other large vessels normally use tidal levels when entering and leaving ports. This method means waiting for tides, but enables vessels to enter and leave port with a larger draft. Fig. 1 shows the relationship between fairway depth and maximum draft; the fairway depth added to the tidal level is equal to the maximum draft added to the UKC (Under Keel Clearance). In Australia, USA, Netherlands and other countries, UKC is managed by consulting weather and sea condition forecasts; this system makes effective use of tidal levels when vessels enter and leave port. In Japan, on the other hand, port entry operation is fixed; UKC is required to be about 10% of the maximum draft irrespective of weather or sea conditions.

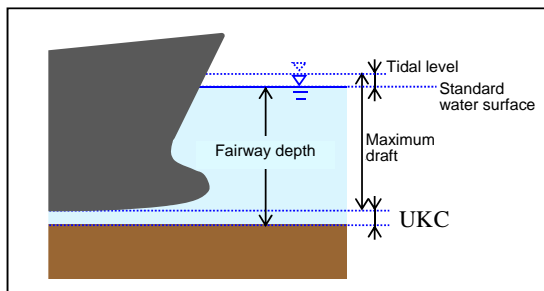


Figure 1. Relationship between fairway depth and maximum draft

2. Port entry operation using J-Fairway

J-Fairway is a program for Class 2 verification of fairway dimensions included in the 2007 amendment to “Technical Standards and Commentaries for Port and Harbour Facilities in Japan”. It can calculate the required fairway width and depth to suit various vessel types, weather and sea conditions. Fairway design is computed using the port entry limits for weather and sea conditions. However, in a normal navigational environment in calm waters, the required fairway depth is smaller than the port entry limit conditions. Thus, if the required UKC when navigating the fairway can be calculated in advance by using predictions for waves and tidal level, it will be possible to navigate with a larger draft without losing navigational safety. As an alternative option, the tide waiting time can also be reduced.

3. Confirmation of effectiveness

Table 1 confirms the effectiveness of port entry operation using J-Fairway, based on the largest class of bulk carrier conceivable under present circumstances in five ports (selected from international bulk strategy ports). Compared to conventional fixed operation, the port entry draft increased by the “UKC difference”, making it possible to increase the cargo by about 3% of total load capacity. When using the same draft but reducing the tide waiting time, it was confirmed that the fairway navigable time was vastly increased. Using J-Fairway for port entry operation allows operators to make effective use of existing facilities. As such, it is hoped that positive changes to operational standards will be considered in each port.

Table 1. Results of case studies
(2 weeks in June 2011)

Port	UKC difference (cm)	Increase in cargo tonnage (MT)	Navigable time ratio (average daily ratio)	
			UKC10%	J-Fairway
Onahama	34		14.0% (3.4)	59.8% (14.4)
Kashima	60	9,000	56.5% (13.6)	91.4% (21.9)
Kisarazu	55	11,200	83.0% (19.9)	96.1% (23.1)
Nagoya	37	2,400	77.7% (18.6)	90.5% (21.7)
Shibushi	35	2,300	43.8% (10.5)	71.4% (17.1)

[Reference]

Transport Policy Studies' Review Vol.15, No. 1
NILIM Research Reports No. 47