

THE OPIMIZATION OF ANCHOR EQUIPMENT DUE TO THE SPECIFIC ANCHORING AREA

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SUMMARY

The anchoring equipment are determined accordingly by considering the applicable parameters, those are maximum current speed, maximum wind speed, maximum significant wave height. In the parallel work, the references of those applicable parameters are identified on the Indonesia's port anchorage area. In order to get more reliable result of anchoring equipment, additional work is conducted based on these references applicable parameters of port's anchorage area. This work will analyse the strength of anchor chain of chosen vessels based on the environmental conditions of its anchorage area. The strength of anchor chain presented with the safety factor is used as a reference in determining the New Minimum Breaking Load (MBL). Furthermore, new MBLs are analysed to determine new properties of the anchoring equipment. The step then verified by anchor chain strength analysis using the anchor property according to the results that have been generated. Thus, the optimal anchoring equipment will be obtained in accordance with the environmental conditions of its anchorage area.

Keywords: Anchoring equipment, port's anchorage area, environmental condition, optimization, breaking load

NOMENCLATURE

L	Length of Chain (m)
OD	Outer Diameter of Chain (m)
Z or EN	Equipment Number
Tp	Peak of Wave Period (s)
D	Depth (m)
SF	Safety Factor
MBL	Minimum Breaking Load (kN)
BKI	Biro Klasifikasi Indonesia
IACS	International Association of Classification Society

1. INTRODUCTION

The anchor equipment is determined based on Classification Society Rules with the environmental conditions, those are maximum current speed, maximum wind speed, and maximum significant wave height. It is assumed that those conditions occurred in the severe ocean location, it might be on the North Atlantic Ocean. In the parallel work, the environmental conditions in the port of Indonesia are also identified, so it will be obtained more reliable and optimal results of anchoring equipment.

This work will analyse the strength of anchoring equipment i.e. anchors and its chains using 10 samples of the vessel. The initial stage is to identify the initial anchor chain tension in the Indonesian environment. Then also analyse the relationship between the anchor chains tension and holding power anchor, so it will be known that the initial tension of the anchor chain obtained does not exceed MBL or proof load anchor.

The strength of the anchor chain presented with the safety factor is used as a reference in determining the New Minimum Breaking Load (MBL). Furthermore, new MBLs are analysed to determine new properties of

the anchoring equipment. The step then verified by anchor chain strength analysis using the anchor property according to the results that have been generated. In addition, verification results will be verified using the ratio of the anchor chains length compared to the depth in which the vessel operates. Thus, the optimal anchoring equipment will be obtained in accordance with the environmental conditions of its anchorage area.

2. MOORING ANALYSIS

2.1 Model Definition

The vessel model was chosen with a variation of type and size to represent vessels operating in Indonesia in general. There are 3 types of vessels in which each consists of 3 sizes. The length of the chain written in Table 1 is the length of the total chain i.e. the summation between the portside and the starboard. Specifically, for the type of barge or pontoon that the length of the anchor chain only required 50% of the recommended length then the length written in Table 1 is the length of 1 part of the anchor chain [3].

2.2 Environmental Condition

The anchor equipment is determined based on Classification Society Rules [3] with the following environmental conditions:

- a) Wind speed 25 m/s, current speed 2.5 m/s, no waves, for:
 - maximum possible water depth maintaining a scope of six
 - shallow water depth with maximum possible scope