

Summary

The first grabs in action seem to be constructed by the Italian Lorini towards the end of sixteenth century, and were used for dredging purposes in Venice. Since then, many different types of grabs have been designed, also in various other fields of application, like mining and bulk handling. Although the basic principle remained unchanged, grab design has improved drastically, and thereby increasing grab efficiency. The grab is still dominant among ports and terminals worldwide as the preferred machine for the discharge of bulk carriers. Recently there are no developments in grab design. In order to improve current grab design, the existing design theories must be described. What kind of grabs are currently used to handle specific materials and how are they classified? How do they operate? Which factors influence the closing process of a grab, and what forces occur when closing a grab? And what is known about the interaction between the equipment and the material?

There are many types of grabs for many different applications, each one having its own purpose and properties. The choice of a type of grab depends on functional demands. Dual scoop grabs are best known. Other types are for example the orange peel grab, the rock handling grab, the wood grab and the demolition grab. Grabs can be classified in relation to the functioning of the closing mechanism, in relation to the number and shape of the scoops and in relation to the material to be handled.

The clamshell grab, the trimming grab and the scissors grab are the best known dry bulk handling grabs and are described in detail in this report. The main differences between these three types are the closing path, the cutting force development, the deadweight – payload ratio and the capacity.

From the beginning of the previous century research has been carried out concerning grab production. It becomes clear that, after some publications in the beginning of the previous century, no major researches has been carried out between 1935 and 1959. Conversely, a lot of research has been done between 1959 and 1980. After this period not much grab design research has been found, other than University of Technology of Delft related literature.

When comparing the advantages and disadvantages of the clamshell grab, the trimming grab and the scissors grab it can be concluded that the scissors grab seems to be the best in its field of application, but the choice for a specific grab always depends on the exact functional demands.

From the existing literature, it can be concluded that a lot of research has been done in order to increase grab production and efficiency with respect to clamshell grabs. Because it is not clear in what extend the results could be applied to the design of the scissors grab, it is recommended to do experiments with models or real scissors grabs in order to verify these theories. The filling process of a grab is very complex and therefore it is hard to predict the exact production. The interaction between the grab and the material seems to be crucial in predicting the production of a specific grab. The filling process of the grab and the soil friction forces must therefore be further investigated.