GRADUATION PROJECTS

Delft University of Technology

FACULTY OF MECHANICAL, MARITIME AND MATERIALS ENGINEERING
Department of Marine and Transport Technology

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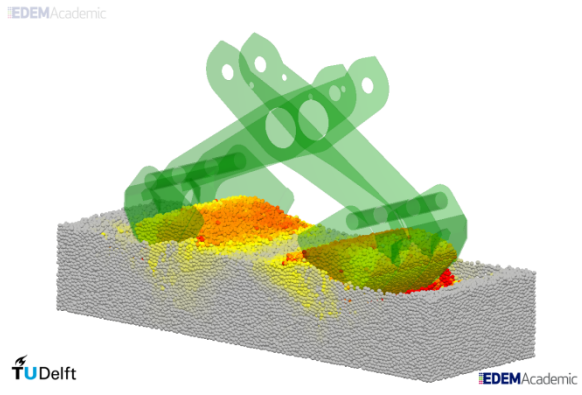
Supervisor:	S.W. Lommen / D.L. Schott	Assignment type:	Graduation
Creditpoints (EC):	35	Confidential:	Yes

GRADUATION PROJECTS:
1. Structural and detailed engineering for optimization of grab design for iron ore pellets
2. Developing Discrete Element Model of a grab for iron ore

Grabs are used for unloading dry bulk cargo vessels; they grab dry bulk material such as iron ore or coal in the vessel and transfer the grabbed material to a hopper on the quay. The request for higher payloads, shorter cycletimes and longer lifetime results in a permanent desire of a more efficient grab.

Development of grabs and other types of bulk handling equipment is still a complicated process: predicting the performance of a new design is hard, as continuous models are not very suitable due to the particulate nature of the dry bulk material. The current design process of bulk handling equipment such as grabs is based on years of experience and consists of designing a prototype, building it in the factory and evaluating it at a test site. This is an expensive process involving high risks and long R&D times. Virtual prototyping could be a promising solution in predicting the performance of bulk handling equipment such as grabs and an affordable lowrisk way to improve grab designs.

A validated model using the Discrete Element Method (DEM) and Multibody Dynamics (MBD) has been developed at TU Delft and is ready to be used for predicting the performance of a virtual prototype grab. This combined model computes the behavior of the individual particles as well as and the behavior of the grab. With this tool, the performance of virtual prototypes can be compared, indicating whether a design change is an improvement or not. As many variables can influence the performance of a grab, finding an optimal performance is a challenging task.



Currently there are two MSc thesis assignments defined within this project:

1. Practical design and detail engineering of a grab for iron ore pellets. Current research has resulted in a new (virtual) concept to grab iron ore pellets (freeflowing material). The next step is to investigate how this concept can be transformed into a grab ready for bulk handling.
2. Developing a DEM/MBD model for the handling of a more difficult to handle material such as iron ore. This material can behave more cohesive, consists of smaller particles and a wider particle size distribution compared to iron ore pellets and as a result other material models have to be used within the simulation environment.

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The research will be carried out together with the industrial partner of this project, Nemag B.V., a leading Dutch grab manufacturer. A monthly allowance will be offered and the office location of the student is open for discussion. During this project you will be coached by ir. Stef Lommen and dr.ir. Dingena Schott of the section Transport Engineering and Logistics as well as the Engineering team at Nemag B.V.

Interested in this project? Students can apply for this position by sending an email to michel.corbeau@nemag.com or s.w.lommen@tudelft.nl.

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