# TITLE: DEVELOPMENT OF A BULK MATERIAL QUAY PLANNING HEURISTIC

## KEYWORDS OF ASSIGNMENT:

- ✓ Development of dedicated scheduling heuristics
- ✓ Modelling of logistic processes
- ✓ Programming – Software development

**APPRENTICESHIP** ☐          **MASTER THESIS** ■

## CONTENT OF ASSIGNMENT (POSSIBLY ILLUSTRATED WITH PICTURES/DRAWINGS):

The raw materials department (GHV) is responsible for the logistics of the bulk materials from the port up to the plant. The raw materials are delivered by large sea vessels and by smaller barges at our own quay. Portal cranes unload the material onto conveyor belts which transport it either directly to the plant, or to the stockyard for temporary storage. Discharging the vessels as fast as possible is crucial because the company is charged with an additional cost, the so-called demurrage, if it takes longer to discharge a ship than originally agreed in the charter terms. These demurrage costs occasionally become very high as a result of harbor congestion. The bulk harbor coordinator plays a vital role in reducing the demurrage costs. This person is responsible for the quay planning, a berth schedule of unloading activities of all vessels in scope. This schedule depends on the limited amount of crane operators, vessel specifications, the type of raw materials, maintenance schedules, etc. It needs continuous adaptation to unexpected events, such as defects of equipment, weather conditions, etc.



*Figure 1: The Arcelor Mittal Gent bulk material quay. Five large portal cranes can discharge two Panamax bulk carriers and one barge simultaneously. The coordination of the discharging activities will be scheduled by the quay planning heuristic.*

The numerous variables to be considered combined with the volatility of the schedule imply that the manual quay planning provided by the bulk harbor coordinator is often very good, but rarely optimal. The sheer size and complexity of the problem requires an optimization heuristic.

In this master thesis, you will design and implement an optimization quay scheduling heuristic that minimizes the demurrage cost of the planning. The calculated schedule should satisfy hard constraints such as the available resources, infrastructure limitations, and specific terms in the charter agreement. This heuristic should produce an improved quay schedule within a reasonable computation time.

This master dissertation provides the opportunity to get hands-on experience in a state-of-the-art steel plant, to work together with industry specialists in optimizing techniques, and to contribute to technological innovation. In the first part of the work, you will get familiar with the daily berth operations at the quay. In the next phase, you will perform a literature study and select an appropriate heuristic. In the final phase, you will implement the heuristic and evaluate it based on real data and costs.

## OBJECTIVES:

➢ Propose heuristics suitable for the problem
➢ Evaluate their performance using a set of realistic input data
➢ Make founded conclusions based on your computational results

## EXPECTED COMPETENCIES (KEYWORDS):

✓ General knowledge of optimization techniques
✓ General programming skills

## NUMBER OF STUDENTS:

➢ 1

## TARGET GROUP: BACHELOR/MASTER/… & SPECIALISATION(S)

➢ 2nd master ING/IR

## LOCATION:

➢ ArcelorMittal Gent Systems & Models (John Kennedylaan 51, 9042 Gent) + at home

## PROMOTORS:

➢ Industrial: Roeland Schelfhout
➢ Academic: ………………………………………………………………………………..

## FIRST CONTACT:

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