Title: Development of a stockyard planning heuristic for raw materials storage

Key words of assignment:

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

Summer apprenticeship ☐   **Master thesis** ■

Content of assignment:

ArcelorMittal Gent is a steel production company which is situated alongside the canal Gent-Terneuzen in the port of Gent. It produces flat steel products, used amongst others in the automotive industry.

The raw materials department (GHV) is responsible for the logistics of the bulk materials from the port up to the plant. A quick overview: large sea vessels and barges deliver bulk raw materials to the site. These materials need to be discharged as fast as possible onto conveyor belts and are transported to their storage location in the stockyard area. If the plant demands some type of raw materials, a partially mutual trajectory of conveyor belts is used to reclaim the material. This results in a competitive usage of the infrastructure for ship discharging tasks and for supplying the production needs. Production demands are always given absolute priority. Hence, ship discharging activities can be postponed and the ship will charge demurrage costs due to its delay.

The stockyard planning model is part of a larger project to optimize the raw materials flow, and to minimize discharge and demurrage costs. Intelligent allocation of the available free space at the raw materials stockyard area is crucial for this. Now, these decisions are made manually and ad-hoc. This has some huge consequences. If some part of the stockyard area is filled with a certain ship load, this location will only become available again after several weeks or even months. Moreover, the assignment could lead to task interference in the future. For example, a simultaneous demand of several raw materials from the same stockyard area could jeopardize the production continuity. Another possible conflict occurs if raw materials can only be reclaimed from and stacked at the same stockyard. If we can predict the long-term impact of a current allocation at the stockyard, we can select the best option for the long term, even though it might appear to be an inferior decision at this moment.

The stockyard planning model considers the present stockyard layout, the planned arrival (ship ETA) and estimated consumption rate of all types of raw materials, as well as large maintenance and standstills of the infrastructure known in advance. The main goal of the model is to determine the optimal location of each raw material in such a way that production and discharging demands can be fulfilled as much as possible. This means that the optimal stockyard planning should minimize the total cost related to raw materials logistics, without violating its specific constraints (e.g. stockyard capacity).

In this master thesis, you will design and implement several optimization heuristics to assign amounts of raw materials (either as the whole batch or partially divided). You will test the heuristics using historical production data. You will assess the "best" heuristic based on its performance and whether it is computationally feasible.

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.

Objectives:

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

EXPECTED COMPETENCES (KEY WORDS):

- ✓ General knowledge of optimization techniques / operations research
- ✓ General programming skills (Python, C#, C++,...)
- ✓ Data analysis and statistics

NUMBER OF STUDENTS:

- ➤ 1

TARGET GROUP: BACHELOR/MASTER/ … & SPECIALIZATION(S):

- ➤ Master of science in engineering (computer science, operations research, …)

LOCATION:

- ➤ Systems and Models ArcelorMittal Gent, John Kennedylaan 51, 9042 Gent

PROMOTORS:

- ➤ Industrial   : Roeland Schelfhout
- ➤ Academic   : …………………………………………………………………………………..

FIRST CONTACT:

- ➤ Sofie De Croock: stages@arcerlormittal.com or 09/347.42.16
- ➤ To check the availability of this master thesis, please mail to stages@arcelormittal.com