

## TITLE: OPTIMIZING THE LIFECYCLE AND OUTPUT QUALITY OF A SECONDARY SINTER BREAKER BASED ON INDUSTRIAL DATA AND FEM STUDY

### KEY WORDS OF ASSIGNMENT:

- ✓ Sinter plant and quality
- ✓ Abrasive wear
- ✓ Structural calculation based on empirical data
- ✓ Finite Element Method (FEM)
- ✓ Mechanical design and Material properties

SUMMER APPRENTICESHIP

MASTER THESIS

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

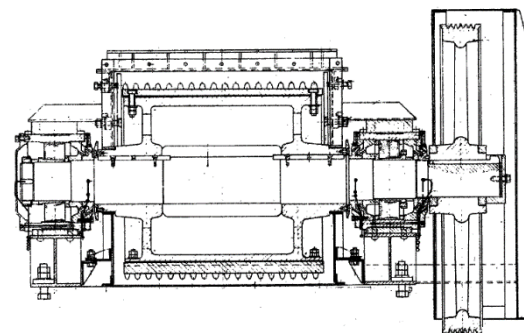
ArcelorMittal Gent is a steel production company situated in the port of Ghent. The considerable flat steel products output is, among others, sustained by the high hot metal production rate and quality at the two blast furnaces. Both these benchmark parameters depend on a constant strength and granulometric distribution of the sinter produced in the sinter plants.

To ensure the desired chemical and mechanical properties of the blast furnace feed, the iron ore undergoes a high-temperature sintering treatment. The solid *sinter cake* that is created is crushed afterwards in different steps into coarse particles.

Part of this process is situated in the secondary sinter breaker (i.e. roller crusher).

Both the current structural design and material properties of the breaker scales need to be improved to increase the service life of the scales, as well as properties of the sinter grain size distribution at the output.

In this respect, also rejection criteria need to be defined.



Based on an analysis of the incoming sinter mix, the forces acting on the breaker need to be quantified. Also the wear patterns of the current breaker scales should be analyzed in detail. The combination of both these results will form the foundation for the design improvements. The new design should be compared to the old one, based on a FEM study, also taking into account the desired grain size distribution of the sinter mix.



The master thesis will consist of a pre-study of the process and setup, combined with a data-acquisition and analysis phase.

Secondly, the analysis outcome is to be translated in an improved design in a structural way, including a study to optimize the material properties and treatments for the breaker scales. A FEM study will be used to determine the quality of the resulting design and determine rejection criteria.

Finally, this should result in a longer and more cost-efficient life cycle of the sinter breaker as well as an optimized granulometric distribution of the outgoing sinter mix.

### OBJECTIVES:

- Get to know the sub-process in the sinter breaker & physical build-up
- Determine and acquire the required dataset
- Translate the data analysis results into a structural design and material selection through means of a FEM study.
- Make a prognosis of the effect on the life cycle and output quality

- Determine rejection criteria for a reliable exploitation, taking the desired grain size distribution into consideration.

**EXPECTED COMPETENCES (KEY WORDS):**

- ✓ Data acquisition and analysis
- ✓ FEM study
- ✓ Mechanical design & Material selection
- ✓ Good communication and presentation skills
- ✓ Open and critical mindset

**NUMBER OF STUDENTS:**

- 1

**TARGET GROUP : BACHELOR/MASTER/ ... & SPECIALISATION(S):**

- Master of science in Electro-Mechanical engineering

**LOCATION:**

- Department offices of Blast furnaces and Sinter plants (HOS) & at home or university

**PROMOTORS:**

- Industrial : Laurens Lambert (HOS)
- Academic : /

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