Apprenticeships & Theses

ArcelorMittal

TITLE: ANALYSIS AND MITIGATION OF DIOXIN FORMATION ROUTES IN THE IRON ORE SINTERING PLANT

KEY WORDS OF ASSIGNMENT:

- ✓ Fundamental study and modelling of industrial production processes
- ✓ Experimental data analysis
- ✓ Process design optimization
- ✓ Dioxin formation and mitigation

SUMMER APPRENTICESHIP ☐ MASTER THESIS ☒

CONTENT OF ASSIGNMENT:

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

To ensure the desired chemical and mechanical properties of the blast furnace feed, the iron ore undergoes a high-temperature pretreatment in the sintering plant. A mixture of iron ore, fluxes and coke breeze as solid fuel is spread out along a moving grid conveyor belt and ignited at the top with burners. By means of ventilators and the resulting underpressure below this conveyor belt, the ignited flame front is forced through the chain burden from top to bottom, forming a solid *sinter cake* which is afterwards crushed into coarse particles. The flue gases are collected at the bottom of the conveyor for post-treatment and drained to the chimneys afterwards.

Environmental measurements on the flue gases show a persisting dioxin content, despite an abatement system in place by means of mineral adsorbent injection. The cause of this dioxin formation has not yet been elucidated. Although process conditions are closely monitored and a large set of experimental data is available, the sintering plant lacks a process model that provides fundamental insight on the potential sources of dioxin formation in the process chain. To lower the environmental impact of its operations, ArcelorMittal Belgium values such tools to adjust its operation properly.

This master thesis aims at a fundamental understanding of the dioxin formation mechanisms which could potentially emerge in the sintering processes. In addition, the adsorption process which abates the dioxin content in the flue gas should be further understood. Based on a theoretical literature study and a thorough notion of the actual operation of the sintering plant, the candidate will analyze and interpret the available experimental data and identify actual and potential future sources of dioxins in the sintering process. Based on these outcomes, the master student will suggest and assess both effective and realistic adjustments in operation and/or installations to put the proposed dioxin reduction into practice.

The candidate will have the opportunity to get hands-on experience in a state-of-the-art steel plant, work together with industry specialists in optimizing techniques and contribute to technological innovation.

OBJECTIVES:

- ➢ Fundamental understanding of the iron ore sintering production process, dioxin formation and abatement mechanisms and the link between them
- ➢ Identification of actual and potential future sources of dioxin formation
- ➢ Recommendations on future process operations and/or installation design for dioxin abatement

EXPECTED COMPETENCES (KEY WORDS):

- ✓ General data analysis techniques
- ✓ Chemical reactions and adsorption phenomena
- ✓ Reaction & reactor engineering

NUMBER OF STUDENTS:

- ➢ 1

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TARGET GROUP:

- 2nd master IR (chemical engineering)

LOCATION:

- Office Systems & Models ArcelorMittal Belgium (John Kennedylaan 51, 9042 Gent), at home

PROMOTORS:

- Industrial : Laurenz Peleman (Systems & Models, ArcelorMittal Belgium) supported by Kenneth Toch (Blast Furnaces and Sinter plants, ArcelorMittal Belgium) and David Strubbe (Blast Furnaces and Sinter plants, ArcelorMittal Belgium)
- Academic : ……...

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