

MASTER

The Relative Contribution of NO Formation Mechanisms at an Integrated Steel Mill

Huisman, Geert H.

Award date:
2023

[Link to publication](#)

Disclaimer

This document contains a student thesis (bachelor's or master's), as authored by a student at Eindhoven University of Technology. Student theses are made available in the TU/e repository upon obtaining the required degree. The grade received is not published on the document as presented in the repository. The required complexity or quality of research of student theses may vary by program, and the required minimum study period may vary in duration.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain

The Relative Contribution of NO Formation Mechanisms at an Integrated Steel Mill

by

G.H. Huisman

MSC THESIS

Assessment committee

Member 1 (chair): Prof.dr.ir. D.M.J. Smeulders
Member 2: Prof.dr.ir. J.A.V. Oijen
Member 3: Dr.ir. M.F.M. Speetjens
Advisory member 1: T. Meenks

Graduation

Program: Mechanical Engineering
Capacity group: Energy Technology
Supervisor: Prof.dr.ir. D.M.J. Smeulders
Date of defense: June 5, 2023
Student ID: 1048123
Study load (ECTS): 45
Track: -

The research of this thesis has been carried out in collaboration with *Tata Steel IJmuiden B.V.*
This thesis is confidential for a period of 2 years until the publication date January 1, 2024.

This report was made in accordance with the TU/e Code of Scientific Conduct for the Master thesis.

Disclaimer: the Department of Mechanical Engineering of the Eindhoven University of Technology accepts no responsibility for the contents of MSc theses or practical training reports.

The Relative Contribution of NO Formation Mechanisms at an Integrated Steel Mill

G.H. HUISMAN

Department of Mechanical Engineering, Eindhoven University of Technology, PO BOX 513, 5600 MB, Eindhoven, the Netherlands

This report was made in accordance with the TU/e Code of Scientific Conduct for the Master thesis

Compiled May 14, 2023

In this study, the relative contributions of the thermal, fuel and prompt nitric oxide (NO) mechanisms were investigated at an integrated steel mill. Results show that the contribution of the fuel NO mechanism is at least 25%. At a Coking Plant operated on Coke Oven Gas, the thermal and fuel mechanisms contribute for 75% and 25%, respectively. At a Sinter Plant operated on Coke Oven Gas, fuel NO forms the largest contribution with more than 99%, which is divided into 90% fuel NO originating from nitrogen components in coke breeze, and 10% fuel NO as a result of hydrogen cyanide (HCN) and ammonia (NH₃) in Coke Oven Gas. The prompt mechanism is negligible for both plants due to the NO reducing ability of HCN and NH₃, simultaneously in the flame front. Suggestions for experiments are given which, in addition to the relative, can determine the absolute values of fuel NO production at an integrated steel mill.
