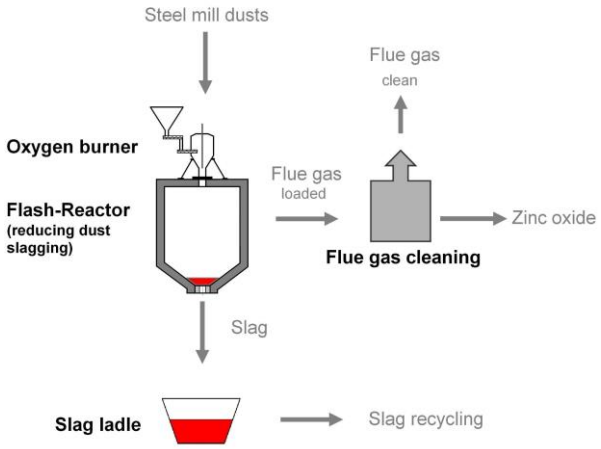
SUCCESS STORY

K1-MET
Competence Center for Advanced Metallurgical and Environmental Process Development

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: COMET-Centre (K1)

Type of project: Project 1.3 "CIrcular economy of metallurgical waste materials", 01.07.2019 - 30.06.2023, multi-firm



Source: Chair of Thermal Processing Technology, Montanuniversität Leoben

DESIGN OF A FULLY SCALABLE DUST BURNER

FOR UPSCALING THE RECODUST – PROCESS, A FULLY SCALABLE BURNER WAS DESIGNED WITH NATURAL GAS AS TRANSPORTING AND COMBUSTION GAS

The iron and steelmaking industry generates large quantities of by-products, such as slags, dusts, and are produced. These residues are rich on valuable materials giving them a high meaning as secondary raw material. A distinctive circular economy has been developed in integrated steel plants. Especially dusts often contain impurities, like zinc making a direct recirculation impossible. It is essential to find innovative dust treatment solutions. One possibility is the RecoDust process. This pyrometallurgical process separates zinc-rich dusts into two fractions, an iron-rich and a zinc-rich product. The iron-rich fraction can be directly recycled in the steel plant.

Adaption of the burner- and dust inserting device

To make the process scalable up to industrial dimensions, it was necessary to design a new burner unit, especially for the use of basic oxygen furnace dusts. The main part of this scalable burner is a pneumatic conveying system. With the aid of this part, the dust is directly transported by the burning gas (natural gas) into the flame. In the Flash-Reactor, the dust being inserted into the flame, melts within a split second. The zinc oxide is reduced, and metallic zinc evaporates. The iron, and all the other non-volatile components accumulate as oxidic phase (slag) on the bottom of the Flash-Reactor. The volatile components, like zinc, lead, and halogens are accumulated and separated as dust in the filter after the exhaust gas line. Advantages of RecoDust are:

- Use of gaseous reducing agents
- No wastes are produced
- No comprehensive dust pre-treatment is necessary

Federal Ministry
Republic of Austria
Climate Action, Environment, Energy, Mobility, Innovation and Technology

Federal Ministry
Republic of Austria
Digital and Economic Affairs

Version 01/2020

SUCCESS STORY

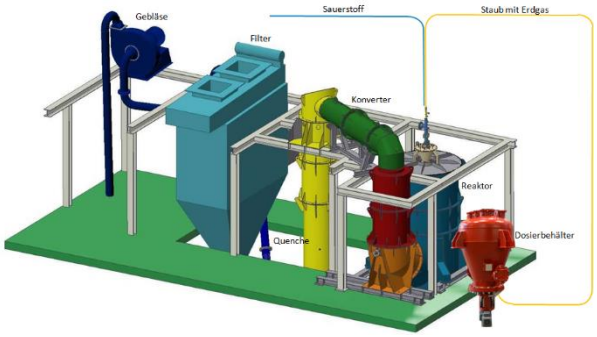


Figure 1: Isometric view of the RecoDust pilot plant, the new feed tank in front (Source K1-MET)

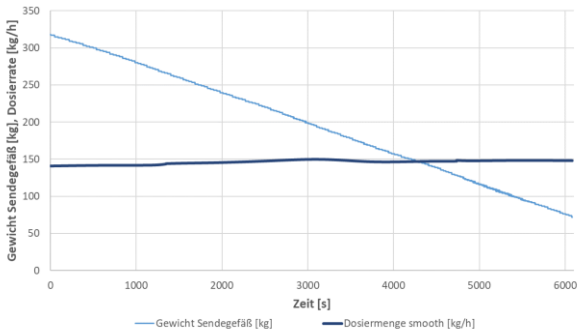


Figure 2: Weight of the pneumatic sender and the dosing rate during the conveying (Source K1-MET)

The dosing rate of the input material and the amount of reducing agents must align with each other. Due to intensive research studies, it was possible to optimize the dosing step. Figure 2 shows the linear decreasing weight of the pneumatic sender and the dosing rate. Especially in this case, the dosing rate is very constant. During the entire experiment with a duration of more than 6.000 seconds, the dosing rate is between 140 and 150 kg/h.

Output and effects

With the new developed innovative design of a dust burner, an important element for the upscaling was done. The constant dosing of the dust input should lead to the best possible effect of the reaction. By the thus enabled circular economy, about 1% of the iron can be recycled in the integrated steel plant.

Project coordination (Story)
Dipl.-Ing. Wolfgang Reiter
Forscher / Dissertant
K1-MET GmbH

T +43 / (0) 3842 402 - 5824
wolfgang.reiter@k1-met.com

K1-MET / COMET-Project 1.3 Work Package 1
K1-MET GmbH
Stahlstrasse 14
Linz 4020, Austria
T +43 / (0)732 69 89 75607
office@k1-met.com
www.k1-met.com

Project partner

- voestalpine Stahl GmbH, Austria
- voestalpine Stahl Donawitz GmbH, Austria
- Montanwerke Brixlegg AG, Austria
- Novolipetsk Group, Russia
- Primetals Technologies Austria GmbH, Austria
- Montanuniversität Leoben, Austria
- University of Applied Sciences - Upper Austria (Wels Campus), Austria
- University of Natural Resources and Life Sciences, Vienna, Austria

This success story was provided by the centre management and by the mentioned project partners for the purpose of being published on the FFG website. K1-MET is a COMET Centre within the COMET – Competence Centers for Excellent Technologies Programme and funded by BMK, BMDW, the provinces Upper Austria, Styria, and Tyrol. The COMET Programme is managed by FFG. Further information on COMET: www.ffg.at/comet

Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

Federal Ministry
Republic of Austria
Digital and
Economic Affairs

Austrian Research Promotion Agency
Sensengasse 1, A-1090 Vienna
P +43 (0) 5 77 55 - 0
office@ffg.at
www.ffg.at