HILTCRC

Australian Government
Department of Industry, Science and Resources

AusIndustry
Cooperative Research Centres Program

PROJECT SUMMARY

RP1.012: PREVENTION OF STICKING IN H_2 FLUIDISED BED DRI PRODUCTION

OVERVIEW

The steel industry needs to de-carbonise, with a likely low carbon route being the production of steel from hydrogen DRI using existing or emerging fluidised bed processes (CIRCORED, HYFOR, HYREX), followed by melting in an electric furnace.

At present Australian iron ores are utilised in the traditional blast furnace ironmaking process, with no current supply to DRI processes. The suitability of Australian ore fines and magnetite concentrates as mined/after beneficiation needs to be assessed in fluidised bed processes with particular emphasis on maximising operating temperature while preventing sticking. However, the reduction kinetics of Australian ore fines in a fluidised bed reactor are relatively unexplored.

PROJECT DETAILS

The aims of the project are to:

- Investigate the fluidised bed production of DRI from South Australian and Pilbara hematite-goethite fine iron ores over a range of low temperature operating conditions and anti-sticking measures including the use of anti-sticking additives (e.g. MgO, CaO, lime kiln dust) as well as varying fluidising gas composition (i.e. inert gases to increase gas density) and/or fluidisation velocity (i.e. fluidisation regime)
- To experimentally investigate the reducibility behaviour of Australian ores using hydrogen gas atmosphere in the Thermogravimetric Analyser (TGA)
- To extract kinetics during low-temperature operation of fluidised bed reduction experiments
- Gain a fundamental understanding about the mechanism underpinning the sticking phenomenon in fluidised beds and assess the role anti-sticking additives such as MgO in alleviating its impact
- Measure the wall friction and internal angles of friction for DRI produced with anti-sticking additives to inform materials handling system design

IDENTIFIED PATHWAYS

Low-carbon iron exports from Pilbara ores.

OUTCOMES

HILT CRC Industry partners will be able to assess the suitability of their ores for emerging fluidised bed DRI production processes, de-risk the decision making about these new technologies, and make informed decisions on decarbonisation pathways suitable for their products. Kinetic models arising from the planned work will support improved FB DRI design decision making, based on testing data specifically with Australian ores.

PROJECT LEADER

- Associate Professor Tom Honeyands, The University of Newcastle

INDUSTRIES

- Iron & Steel

TOTAL PROJECT VALUE

- $2,762,162 (cash and in kind)

COMMENCED

01 October 2023