

An Indian-Australian research partnership

Project title

Early detection of agglomeration during fluidized bed conversion of solid fuels at high temperatures

Project number: IMURA0140

Monash University supervisors: A/Professor Sankar Bhattacharya and Professor Paul Webley

Monash University contact: A/Professor Sankar Bhattacharya;

Email:sankar.bhattacharya@eng.monash.edu.au

IITB supervisors: Professor Anuradda Ganesh

IITB contact: Professor Anuradda Ganesh; Email: aganesh@iitb.ac.in

The research problem

Fluidized bed combustion or gasification is ideally suited for processing of a variety of reactive coal types and biomass because of the inherent advantages of low process temperatures and fuel flexibility. However, ash-related operating problems, such as agglomeration, often cause unscheduled outages resulting in high operational and maintenance cost. Origin of these problems can be traced back to the ash chemistry and operating conditions. However, early detection of such problems will allow adjusting process conditions to manage the problems.

Project aims

The project will involve experimental work, analysis of pressure drop signals and mathematical modelling of agglomerate forming reactions and resultant compounds. By generating fundamental information, the project will serve two major aims: advance the understanding of agglomeration characteristics of three different types of coals under both combustion and gasification conditions, and development of a monitoring method for early detection of agglomeration.

Expected outcomes

Major outcomes will include:

- Information on characteristics and mechanisms of bed agglomeration in coal gasification/combustion processes; effects of different process parameters on the type and degree of agglomeration in the fluidized bed combustors/gasifiers.
- Prediction of the formation of agglomerate compounds under different process conditions
- Development and application of a monitoring technique for onset of agglomeration.

Which of the above Theme does this project address?

Clean Energy

How will the project address the Goals of the above Theme?

High efficiency is a pre-requisite for reduction of coal consumption and CO₂ emission from any coal conversion process. This project will address an issue that prevents efficient operation of fluidized bed combustors and gasifiers for a variety of coals.