

Energy research Centre of the Netherlands (ECN): multi-purpose thermal converter 'WOB'



Figure 1: ECN's WOB; suitable for combustion, gasification and pyrolysis experiments.

Introduction

The 'WOB' is a lab-scale atmospheric bubbling fluidised bed facility suitable for combustion, gasification and pyrolysis experiments. The inner diameter is 74mm (bottom) and 108mm (top). Electrically heated walls both enable the simulation of adiabatic conditions and can provide the power needed for heat demanding processes like pyrolysis. Air, oxygen, argon, nitrogen and steam can be added as fluidising medium. The gas passes a cyclone and can be analysed using the comprehensive facilities of the Energy research Centre of the Netherlands (ECN). The gas is either flared or used for further research.

Agglomeration

A standard test has been developed to quantify the agglomeration risk of a fuel under realistic process conditions. The fuel (approximately 1kg/h) is gasified with air for 4 hours at 750°C. Subsequently, the temperature is raised stepwise with 25°C (by adjusting the electric heating power) every 30 minutes until agglomeration occurs. A high 'agglomeration temperature' corresponds to a low agglomeration risk. The actual agglomeration is characterised by a sudden change of pressures in the bed, see Figure 2. Several measures (e.g. additives like sewage sludge, dolomite, kaolin, magnesite) preventing agglomeration have been identified using this test.

Heat Balance Studies

By varying the electric heating power of the WOB, gasification processes can be simulated ranging from large-scale (low heat loss) to small-scale plants (high heat loss).

Fuel Gas Generator

The WOB has been used extensively as a fuel gas generator for further research. Several (innovative) gas cleaning systems (e.g. tar reduction by plasma, thermal treatment, adsorption) have been connected downstream of the WOB. Also several new gas analysis methods (e.g. the determination of concentrations of water, tar, argon) have been tested using the WOB as stable gas generator.

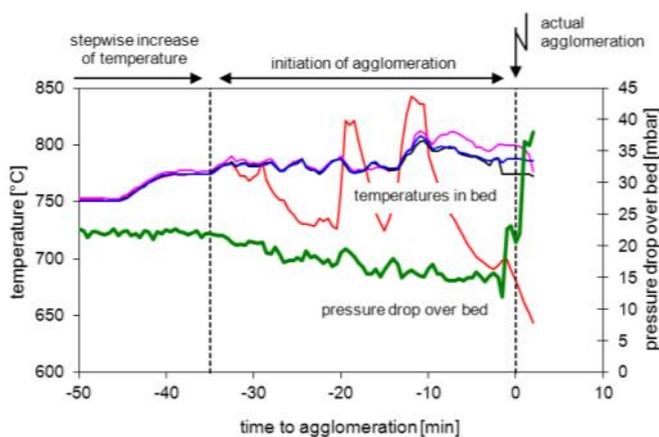
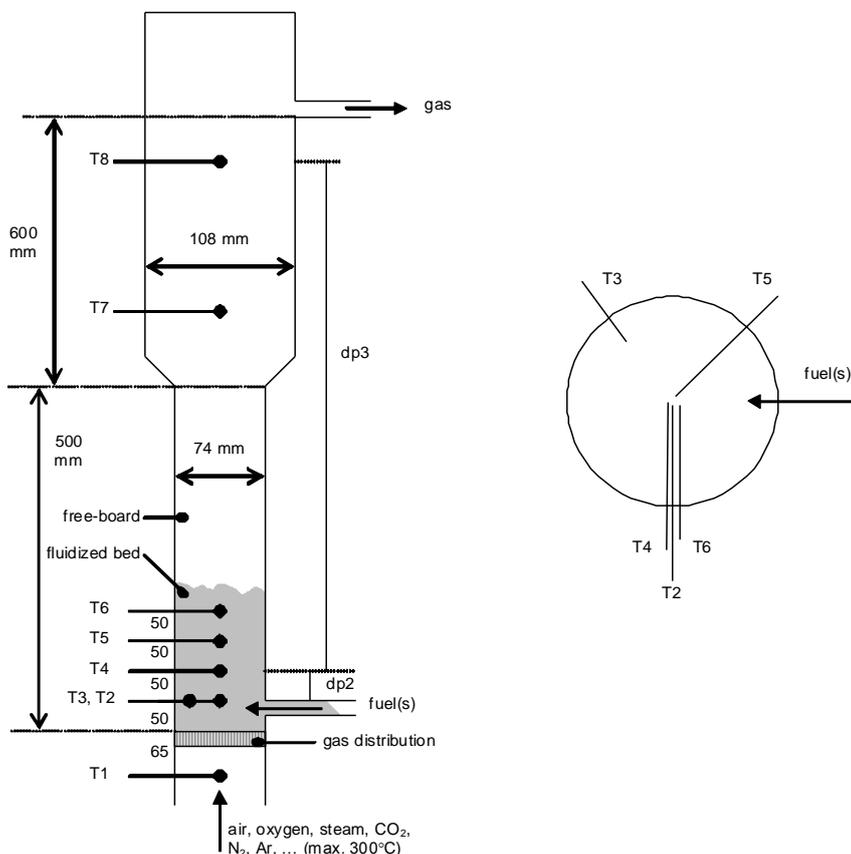


Figure 2: Last 50 minutes of standard agglomeration test in WOB with *Miscanthus*; at approximately 780°C the fluidised bed agglomerates.

Continued on next page

PARTNER PROFILE

Energy research Centre of the Netherlands (ECN): multi-purpose thermal converter 'WOB'



Flexible Tool

The WOB has been used to gasify many fuels and mixtures, but has also been proven to be suitable for both the pyrolysis and combustion of fuels for research on e.g. char yield and quality resp. effects on NO_x emissions and quality of ash. Among the fuels tested are wood, straw, RDF and manure. The schematic overview shown in Figure 3 provides information on the size of the WOB and the location of different thermocouples. For more information on the WOB please contact one of the contacts detailed below.

Figure 3: Schematic outline of the size of the WOB and the location of the thermocouples.

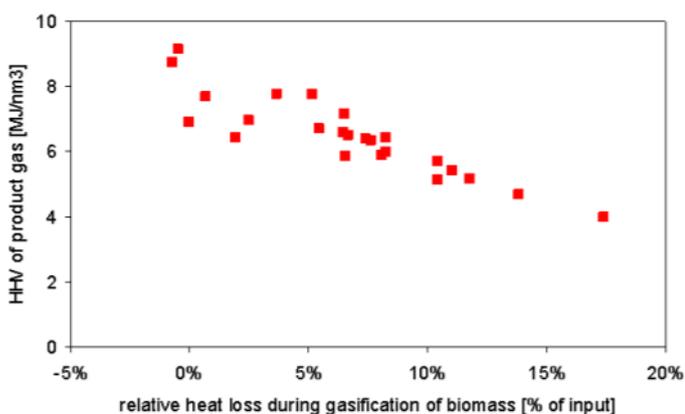


Figure 4: Heating value (HHV) of fuel gas from WOB as a function of heat loss.

Contact

For further details about how to apply to utilise ECN's facilities as part of the BRISK initiative contact:

Project Leader

Luc Rabou

T: +31 88 515 4467

E: rabou@ecn.nl



WOB

Berend Vreugdenhil

T: +31 88 515 4504

E: vreugdenhil@ecn.nl



W: www.ecn.nl