BIOMASS

Waste wood offers 'greener' steel options

PHOTO: MICHAEL SOMERVILLE

Drums containing biomass material being pyrolised (chemically decomposed by heat) in a commercial coke oven.

By REBECCA THYER

SUFFICIENT biomass residues exist in forestry, agricultural and horticultural waste to meet the charcoal needs of the Australian steel industry, creating opportunities for the industry to further 'green' some of its processes.

A collaborative project involving the Minerals Down Under Flagship, the Cooperative Research Centre for Sustainable Resource Processing, BlueScope Steel and OneSteel surveyed available biomass resources – such as woody residue from forestry and wood processing, and agricultural, horticultural and woody weed residues – from eastern and southern Australia. Dry residues from all regions added up to 7.5 million tonnes annually. If the R&D is fully successful, this biomass, when transformed into charcoal and bio-oil, could potentially replace 1.2 million tonnes of coal and 0.5 million tonnes of liquid fossil fuel without significant process changes.

CSIRO project leader Michael Somerville says most of the biomass comprises forest residues (45 per cent). The remainder is wood-processing residues (30 per cent) and non-forestry residues such as biomass from grain crops (25 per cent).

Mr Somerville says the work builds on ongoing research to substitute fossil fuels with sustainable resources. "We want to understand the technical issues of charcoal substitution for coal and coke, what we can use as substitutes and if we can get charcoal of the required quality."

Although this potential charcoal resource cannot replace all the industry's carbon needs, Mr Somerville says its use could lead to a large net reduction of non-renewable carbon dioxide emissions from the Australian steel industry of up to 5.7 million tonnes annually, if the benefits from renewable carbon and bio-oil can be realised.

Charcoal is highly reactive compared with coke, produces very low sulfur and nitrogen emissions, and is greenhouse gas neutral. Successive plantings of trees and crops absorb carbon dioxide liberated in the steel-making process.

Mr Somerville says the next stage is larger-scale plant trials. "Our first step is the preparation of a significant amount of low-volatile charcoal for use in re-carburising trials at OneSteel's Sydney Steel Mill. We want to produce sufficient charcoal and confirm that it can perform successfully."

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Industry strives for balance

OPEN SPACE

SHARIF JAHANSHAHI
THEME LEADER, DRIVING SUSTAINABLE PROCESSING THROUGH SYSTEM INNOVATIONS, MINERALS DOWN UNDER FLAGSHIP

Australia is blessed with both mineral and environmental richness. An important challenge for the minerals industry is to manage and reduce any tensions between the two. We must ensure that using our mineral resources does not come at the expense of the environment.

The industry can only operate through the existence of an unspoken social 'licence to operate'. This licence grows out of an assumption by the community that the benefits of mineral operations outweigh its negative impacts.

Given this, it is vital that the industry uses innovative technologies to minimise the negative impacts and maximise the benefits of mineral operations.

CSIRO established the Minerals Down Under National Research Flagship to help improve the economic, environmental and social performance of Australia's minerals industry.

One of the Flagship's goals is to help the industry achieve a step-change reduction in its waste, emissions and water consumption over the next 15 years.

The Flagship has initiated a number of projects to achieve this goal. One of these is the use of biomass as a partial replacement for coal in the production of iron and steel (see story above). This results in a net reduction in greenhouse gas emissions from steel production; it also reduces methane emissions from forestry residues and can enhance soil quality if trees are grown in salinity-prone areas.

Another project involves dry granulation of the molten slags generated during iron and steel production. This reduces water use while helping to turn a high-volume waste product into a saleable feedstock for the production of 'green' cement. The process also involves the capture of high-grade heat from molten slags; this heat can be used as an energy source for other processes.

Other projects involve adopting a whole-of-system approach to identify ways to minimise the volume of wastes and heavy metals entering the environment, and identifying opportunities to create value from processing waste streams, thereby minimising the impact on the environment and improving industry's bottom line.