

WOOD PELLETS



WOOD PELLETS ARE OFFERING OPPORTUNITIES FOR A CLEANER-BURNING BIOFUEL BUT MAJOR CONCERNS ARE OVERSHADOWING THEIR POTENTIAL. TONY BI AND UBC'S CLEAN ENERGY RESEARCH CENTRE ARE ENGINEERING SOLUTIONS



Canadians consume less than 20 per cent of the 1.2 million tonnes of wood pellets produced in Canada each year.

Each year, more than one million tonnes of wood pellets – made of waste wood from B.C. forests – are shipped to Europe to meet a growing demand for a clean-burning biofuel. Composed entirely of compressed sawdust or forest residues, wood pellets generate far fewer emissions than conventional firewood and are the subject of a unique research effort within UBC's Clean Energy Research Centre.

“The forest industry in B.C. has supported the sale of wood pellets to Europe for some time,” says Dr. Xiaotao (Tony) Bi, a member of the Biomass and Bioenergy Research Group (BBRG) and a professor in UBC Vancouver's Department of Chemical & Biological Engineering. “They are widely used for home and district heating and power generation and they are an important future feedstock for biorefineries. But they also incur some major storage and transportation problems.”

A health-and-safety issue concerning off-gassing during storage is the most pressing problem to be tackled by Bi and his BBRG colleagues, Drs. C. Jim Lim and Shahab Sokhansanj in the Department of Chemical & Biological Engineering (the latter also of the Oak Ridge National Laboratory) and Dr. Taraneh Sowlati in the Department of Wood Science.

“When wood decomposes in storage, it depletes oxygen while off-gassing carbon dioxide, carbon monoxide and methane,” Bi explains. “In European ports, workers have been severely injured or killed by exposure to these toxic gases when unloading the pellets from ships. Equally concerning is the tendency of the pressure-formed pellets to break apart during loading and unloading, generating a combustible dust that has caused several fires at major ports.”

To address these and other issues, Bi and colleagues are creating what they call an “engineered high-quality wood pellet” composed of modified wood fibres that improve the pellet's durability, shelf life and energy density. In collaboration with industry, the UBC team is developing procedures to suppress fires during handling and reduce their incidence in the long term. They are also quantifying the off-gassing of stored pellets in order to build a Material Safety Data

Sheet for industry and to determine optimal storage and transportation conditions, including proper ventilation.

Enhancing emissions

According to Bi, the net greenhouse gas emissions from combustion of wood pellets exported from Canada to Europe over the whole life cycle (24 kg CO₂/GJ) are much lower than natural gas (57 kg CO₂/GJ) and coal (90 kg CO₂/GJ). They also generate lower particulate emissions than coal, heating oil, firewood and unprocessed wood residues. Bi reasons this should encourage domestic demand for wood pellets, but Canadians consume less than 20 per cent of the 1.2 million tonnes of wood pellets produced in Canada each year.

Bi believes the hesitation to embrace wood pellets in Canada is fuelled in part by a public perception that they generate smoke and particulates like raw firewood. However, strict manufacturing standards require wood pellets to have a low moisture and ash content for a smokeless, uniform burn. Bi and colleagues are conducting several life cycle analysis case studies to examine the economic, environmental and human health implications of converting to wood pellet fuel in Canadian homes, district heating systems and emerging biorefineries.

“There is a lot of international interest in this technology,” Bi notes. “Sawmills and lumber mills in B.C. generate roughly six million tonnes of wood residues each year. We only use slightly more than a million tonnes, so there is plenty of available supply for wood pellets. Furthermore, there is an abundant supply of trees killed by mountain pine beetle that wither on the stand because they cannot be used for timber or pulp, but they could be converted to wood pellets.” ■■

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