



Impact Story n° 2

Biomass Storage Safety

Bioenergy makes up 6% of Canada's total energy supply and can create enough energy to heat 42,000 single detached homes each year. Researchers at the Canadian Forest Service's Canadian Wood Fibre Centre (CWFC) are finding safe and innovative ways to bring bioenergy to more communities across the country.

Bioenergy is a sustainable and renewable energy source that comes from living organisms, such as trees and their by-products including wood and bark. As biomass is the foundation of bioenergy, the CWFC's Christopher Helmeste and Dr. Suzanne Wetzel, along with their partners, have been busy researching practices and tools that will safeguard those who work with and store wood biomass.

Storing biomass while maintaining its high quality is a critical step in bridging the gap between supply and demand as Canada's bioenergy market grows. The more efficiently and safely biomass is stored, the better the clean energy it produces can be harnessed.



Research that matters

Christopher and Suzanne, in partnership with FPInnovations and the University of Toronto, helped to research various phenomena encountered during biomass storage such as self-heating; thermal buildup inside piles mainly caused by microorganism growth that can sometimes lead to spontaneous combustion. By conducting several experiments on monitored woody biomass piles in Manitoba and Nova Scotia, the team's findings have contributed toward a better understanding of the self-heating process as well as the development of improved pile management strategies for various types of woody biomass to reduce the risk of self-heating fires. Their study on biomass safety and incident trends also raised awareness about storage hazards such as asphyxiation due to off-gassing, fires, dust explosions, microorganism growth and other health concerns faced when working around stored biofuel.

Christopher and Suzanne, in partnership with PAMI (Prairie Agricultural Machinery Institute) and CanmetENERGY (Natural Resources Canada), also studied natural air-drying as a way to produce higher value dry wood fuel while minimizing material loss to decomposition and moisture content. Lighter, drier woody biomass is cheaper to transport and could save bioenergy producers more than \$40,000 in transportation costs each year.

Drying biomass before storing reduces the chance of the biofuel decomposing in storage. Just a one percent increase in natural air-drying and a one percent decrease in material loss can save the forest sector \$10 million in just five years. The researchers also found that reduced air-dried biomass resulted in a positive net energy gain of up to 32%. That means that more energy is gained than lost in the drying process.

This research can support energy users too, especially rural and Indigenous communities as they transition from diesel and propane to cleaner biomass energy. This new knowledge means communities can also increase their economic independence without compromising safety or the environment as they use their woodlots and forests for bioenergy.

The research and technology transferred has national implications that will support bioenergy facilities and rural and Indigenous communities across the country. The CWFC is continuing this work to increase our understanding and expand the safe and sustainable use of biomass for bioenergy.

Leading bioenergy research in Canada

Biofuel is a clean and renewable energy source for Canadians to use as we transition from fossil fuels. The research, technology transfer and collaboration being conducted by the CWFC with communities and the forest sector makes biofuel safer, more effective and accelerates Canada's path to becoming a leader in clean energy.

Learn more

Read more about biomass fuels https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/files/NRCAN_BB_no1_e_acc.pdf (Natural Resources Canada)

For more information, please contact: rncan@nrcan-rncan.gc.ca.

See the complete research studies here:

Krigstin S, Wetzel S, Jayabala N, Helmeste C, Madrali S, Agnew J, Volpe S, 2018. [Recent Health and Safety Incident Trends Related to the Storage of Woody Biomass: A Need for Improved Monitoring Strategies.](#)

Krigstin S, Helmeste C, Wetzel S, Volpe S, 2020. Managing self-heating & fuel quality changes in forest residue wood waste piles. *Biomass and Bioenergy*, 141, 1-12.

Krigstin S, Helmeste C, Jia H, Johnson KE, Wetzel S, Volpe S, Faizal W, Ferrero F (2019) [Comparative analysis of bark and woodchip biomass piles for enhancing predictability of self-heating.](#)