



ChemBioPower Inc.

Clean Chemicals & Power

May 3, 2021

Toronto City Council Meeting on Road Salt Reduction

Good Afternoon Council Members,

On behalf of ChemBioPower, the Alberta Sugar Beet Growers and our academic partners in Canada, Europe and the U.S.A., we would like to brief the City Council about our current renewable chemical project. Our current project should yield 4,500 tons of the non-corrosive, non-poisonous de-icing compound, Potassium Formate (KCOOH).

Potassium Formate is the most effective deicer for the preservation of road and airport infrastructure. The US EPA estimates that every ton of road salt cause approximately \$825 in damage to concrete, bridges and vehicles. Analysis of Michigan's 2 million tons deployed, purchased at \$110 Million, creates about \$1,500 Million in damages annually. For example, the City of Edmonton was forced to abandon calcium chloride due to corrosion issues. Potassium Formate is used extensively at airports and crucial infrastructure in Europe. In Denver, both the DIA and Bronco Stadium use it extensively to protect crucial assets.

Our company is developing a process and the equipment to convert beet sucrose, from Southern Alberta and Southern Ontario, to renewable chemicals, hydrogen carriers and low carbon fuels. The ChemBioPower system uses two stages, converting sucrose, oxygen and carbon dioxide to formic acid and water. Formic acid and formates, derivatives of the acid, can be used for drilling fluid, heat transfer (coolant), water purity, plastics and, most importantly, ice removal.

We estimate the cost per lane-mile using potassium formate brine is about \$450, obviously more expensive than conventional sodium chloride brine. On the other hand, especially over bridges and overpasses, Potassium Formate is completely benign to concrete and re-enforcing bars, while completely non-poisonous to the ecosystems in nearby streams, lakes and rivers. Reducing the destructive cost of at least \$950 per ton of salt to nickels is worth the extra up-front cost. Even if Potassium Formate brine was just used on bridges, overpasses, parking lots, subways entrances and municipal buildings, the cost savings would be substantial to city, while eliminating the plague of salt residue.

In agricultural water and city cooling systems, descaling becomes easier because formic acid is effective at removing salts. Calcium salt will form when calcium carbonate is dissolved in water. The calcium salt of formic acid is about ten times more soluble than that of phosphoric acid. Formates do not create any by-products that pose a potential risk of eutrophication (such as phosphate, nitrate). Formate degradation consumes less oxygen than of comparable acids. In fact, calcium formate and sodium formate are food additives.

Ontario has world class wind resources and vast agricultural capacity. Importantly, our process can utilize excess wind and solar power, storing excess energy in formic acid, formates and recycling carbon dioxide. Although Ontario is the center of traditional chemical processing in Canada, in the near future, the Province can become a global center for green chemical technology and the "Power & Plant to X Industry". Today, Germany leads the "Power to X" Industry.

Currently, Ontario and Alberta are the sole sugar producing regions in Canada. The Canadian Beet Growers can produce over 1,000,000 Metric tonnes of beets annually. Sugar beets are remarkable carbon dioxide sinks, capturing 38% of their mass in greenhouse gases. Using sugar beets to produce deicers and to capture carbon dioxide helps reduce the looming problems of infrastructure collapse from corrosion and excess carbon emissions from chemicals.

Regards

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