



**Daryl McCartney, Ph.D., P.Eng.**  
Professor  
Department of Civil & Environmental Engineering  
University of Alberta  
&  
Executive Director & Director of Research  
Edmonton Waste Management Centre of Excellence (EWMCE)

## EXPERIENCE SUMMARY

Dr. McCartney is a Professor of Solid Waste Engineering at the University of Alberta and Executive Director of the EWMCE. He has 40 years of experience in the environmental engineering field - 28 of those years focused on organic waste utilization, including teaching undergraduate and graduate engineering courses on mechanical, biological, and thermal processing of municipal solid waste. Dr. McCartney spent his last sabbatical year in Europe at three of the top solid waste management research centres in Europe (United Kingdom, Spain, and Germany). He has served on the editorial board of the Journal of Compost Science & Utilization since 2001 and served on many technical review committees, including the editorial group for the 2013 Technical Document entitled, "Municipal Solid Waste Organics Processing," published by Environment Canada.

In the past five years, Dr. McCartney has received \$1.6 million in organic utilization research grant funding. During his career, he has authored or co-authored 170 journal manuscripts, conference papers, and technical report publications (13 peer reviewed journal manuscripts published in the past six years). Dr. McCartney's primary research interest is organic waste utilization, including: composting process engineering and operations; integration of anaerobic digestion technologies within organic waste management infrastructure; carbon accounting; and pathogen inactivation.

## RELEVANT EXPERIENCE

- **Institutional organic waste diversion:** project director of a team investigating best technologies for organic waste source separation, collection, and processing at a large educational institution (population of 52,000). Potential technologies evaluated included: gasification, anaerobic digestion, and composting. Project provided the fundamental experience and knowledge for the development of a two-day short-course on organic waste diversion for Industrial, Commercial, and Institutional (ICI) sectors.
- **Life cycle carbon accounting:** served as technical expert and/or project manager on numerous life cycle carbon accounting and green house gas projects, for example: anaerobic digestion and composting of the organic fraction of municipal solid waste in Alberta (for Climate Change and Emissions Management Corporation, Province of Alberta); leaf and yard waste diversion in the residential and ICI sectors in Alberta (for Alberta Environment & Parks, Province of Alberta); and biosolids processing in the Edmonton Capital Region (for Drainage Services, City of Edmonton).
- **Anaerobic digestion technology selection:** served on the technical steering committee for selection and procurement of a 40,000 tonne per year anaerobic digestion facility treating the organic fraction of MSW.
- **Optimization of composting processes:** served as technical expert on the optimization of various composting technologies for municipal and industrial clients in the Provinces of Alberta and Manitoba.

### EDUCATION

Ph.D. Environmental Engineering (1991)  
University of Manitoba  
Winnipeg, MB, Canada.

Organizational Leadership (2003) Resolution Skills Centre, Winnipeg, MB.

Executive Program  
Alberta School of Business  
(2011) University of Alberta

### AREAS OF EXPERTISE

Fundamental understanding of engineering science applied to anaerobic digestion, composting, and land application technologies.

Integration of anaerobic digestion technology into composting infrastructure.

Assessing organic waste utilization technologies for potential implementation in small to large-scale municipal and business settings.

Facilitating operational excellence at organic waste processing facilities.

Life cycle carbon accounting assessments of organic waste management programs including determination green house gas offset credits.

### AFFILIATIONS

Editorial Board, Journal of Compost Science & Utilization.

Member of Solid Waste Association of North America (SWANA), Compost Council of Canada (CCC), & Recycling Council of Alberta (RCA).

### LOCATION

Edmonton, Alberta, Canada

### CONTACT

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- **RELEVANT RESEARCH PROGRAMS**

- ✓ **Institutional organic waste utilization:** (\$416,600; 2011 to 2016; University of Alberta, Facilities & Operations).
- ✓ **Integration of anaerobic digestion technology into composting processing facilities:** (\$407,900; 2013 to 2016; Waste Management Services, City of Edmonton; MITACS).
- ✓ **Use of Tire Derived Aggregate as compost bulking agent:** (\$63,900; 2014 to 2015; Alberta Recycling Management Authority; Waste Management Services, City of Edmonton).
- ✓ **Optimization of compost facility pre-processing technology:** (\$332,400; 2010 to 2016; Waste Management Services, City of Edmonton; MITACS).
- ✓ **Composting of gasification residuals:** (\$27,500; 2015; Enerkem Biofuels; Alberta Innovates – Technology Futures).
- ✓ **Advanced treatment of recycled organic matter:** (\$165,000; 2010 to 2014; Natural Sciences and Engineering Research Council of Canada).
- ✓ **Technical feasibility of using treated wood as composting bulking agent:** (\$134,500; 2011 to 2014; Natural Sciences and Engineering Research Council of Canada; Waste Management Services, City of Edmonton).
- ✓ **Pathogen inactivation in biosolids composting environments:** (\$90,700; 2009 to 2012; Natural Sciences and Engineering Research Council of Canada; Waste Management Services, City of Edmonton).

- **MOST SIGNIFICANT RESEARCH CONTRIBUTIONS**

- ✓ **Compost Sanitary Assurance:** While there are significant benefits to the practice of recycling organic waste, there is also an increased risk of human exposure to pathogenic organisms. In order to investigate temperature in full-scale composting environments, we developed a temperature probe that behaves like a particle of compost - the first of its kind in the world. The probe was designed to have properties of size and density similar to those of compost particles. These probes were used to study temperature contact times at the particle level in full-scale composting environments. Key research findings included: systematic temperature sampling of compost piles, as is widely practiced, tends to underestimate the spatial and temporal temperature variability, which could lead to false conclusions about the sanitary conditions of the final product; and using molecular methods, it was found that a significant number of pathogens were in a viable but not culturable (VBNC) state - this was the first study to clearly demonstrate *E. Coli* and *Salmonella* can survive in a VBNC state at appreciable concentrations throughout a typical composting cycle.
- ✓ **Greenhouse gas emissions:** Our research group has been active in assisting with the development of greenhouse gas (GHG) emissions and carbon offset credits associated with the Province of Alberta's Specified Gas Emitters Regulations. We have quantified GHG emissions and carbon offset credits for: (1) the Province of Alberta (diversion of leaf and yardwaste); (2) Drainage Services, City of Edmonton (biosolids management strategy); and (3) Climate Change and Emissions Management Corporation, Province of Alberta (anaerobic digestion technology used to treat the organic fraction of municipal solid waste in the Province of Alberta). The latter work showed that GHG emission reductions of 1.5M tonnes of CO<sub>2e</sub> could be achieved with this project by 2050 and adoption of the technology into the whole Alberta market could lead to GHG emission reductions of 33M tonnes of CO<sub>2e</sub> by 2050.
- ✓ **Pollution prevention in municipal solid waste composting systems:** Our research group investigated the sources of trace metal contamination during full-scale composting of the organic fraction of municipal solid waste. This research led to the development of the first testing protocol to quantify metal transfer from contaminants within a composting environment and assisted with the identification of the most significant contaminants within the waste.
- ✓ **Critical bulking agent requirement test:** The biological load cell (biocell) was developed in our laboratory as a physical model of the windrow composting environment. The apparatus was the first system in the world to include a compressive load in a physical model of the composting process. It was also used to define the critical bulking agent requirements of wet feedstocks such as food waste. The apparatus has drawn attention from several researchers, designers, and operators and is now used at several composting facilities.