Utilizing *Impact MB*® to Increase Nitrogen Content of Compost

Introduction: Bioconversion of organic by-products into commercial grade compost is a sustainable solution to recycling organic wastes and is also a rapidly growing industry. From saving landfill space and reducing carbon intensive methane emissions, to replacing needed organic matter and nutrients into depleted soils, composting and compost use has been increasing its infrastructure, product applications, and public demand over the past decade. While the industry has seen expansion in environmental end–use applications in recent years, growing vegetation continues to be the largest use for compost products across the United States (US).

Nitrogen (N) is typically the limiting nutrient to growing vegetation in land-based ecosystems, no matter the location, climate, soil quality, or selected crop or plant materials. From agriculture and garden products, to specialty bulk soil blends, supplying the right amount of N at the correct time is both science and art to those that work in these industries. While compost has typically been utilized as a soil amendment (rather than fertilizer), it is a source of N, albeit much lower than commercial organic and mineral fertilizers. Total nitrogen (TN) content for compost ranges from 0.5 to 2.0% (as is basis), with a typical level near 1.2% or approximately 12.0 lb/yd^3.

Manufacturing N fertilizer is an expensive and energy intensive process. Because N fertilizer manufacturing (the Haber-Bosch Process) is extremely energy intensive (with concomitant carbon emissions), N fertilizer market prices generally mirror the market volatility of crude oil. Most market experts agree the price of oil, and therefore the price of N fertilizer, will continue to steadily rise, with the potential for wild fluctuations and volatility in the process. For the end users of N fertilizers this is not encouraging news as increasing N costs will likely increase the cost of most types of agricultural, garden, ornamental, turf, and lawn production and maintenance operations. As of March 19, 2013, a barrel of oil was trading for $92.28 (bbl), and ton of anhydrous ammonia N fertilizer was selling for $887.00. In 2011, the US was a net importer of N fertilizer, importing a record 10.8 million tons, according to the USDA. Since 1960, the demand for chemical fertilizer for agriculture alone has increased by nearly 500%.

During the commercial composting process, N from organic wastes are bioconverted from inorganic forms into organic form. Unfortunately, during this process, a fraction of the N is lost to volatilization in the form of ammonia-N gas. This is often due to one or more of the following: low moisture content, high pH, low C:N ratio, high initial ammonia-N content of organic feedstocks, frequent turning, and even elongated time periods during the thermophilic phase of composting. Proper management and processing can help to minimize this N loss, however, it is commonly accepted that some N will be lost to volatilization during the composting process. This inefficiency in the process (e.g. loss of ammonia) is considered an air pollutant in some regions, and also contributes to the reduced content and availability of N in the final compost product. By decreasing (or eliminating) this inefficiency, composters can simultaneously reduce pollution and increase the value of their finished product. A compost product with a higher N content can increase consumer demand, and in some cases may be able to help consumers reduce their N fertilizer expenditures. Additionally, a compost manufacturer that can reduce potential ammonia emissions will find even greater support from the environmental community, environmental regulators, and sustainability driven consumers.

Impact MB® is a liquid-form technology made from a phytogenic extract that has been proven to inhibit the volatilization of N, thereby preventing the formation of ammonia-N, and leading to a reduction in N loss during the composting process. By inhibiting N loss, a greater amount of N can be retained within the organic material of the compost during the manufacturing process, leading to an increased N content in the finished compost product.

New Research: A recent study was conducted to evaluate the addition of Impact MB® on the N content of compost when applied during the composting process. Results from the study found the application of Impact MB® had a strong quantitative and statistically significant effect on TN and NH_4-N, increasing these N species as much as 41% and 133%, respectively. This increase in N also resulted in lowering (or narrowing) the C:N ratio of the treated applications. Commercial composters are already finding a financial benefit to offering a product with increased N content, and end-users are finding greater value in purchasing and/or using a higher N content compost product. For example, increased compost N content can offset N fertilization requirements in garden and crop production, thereby saving the end-user financial expenditures in production and maintenance costs. In this study, compost treated with Impact MB® increased N by 2.6 to 5.6 lb/yd^3, representing a fertilizer value of $1.40 to $3.02/ lb/yd^3. Utilizing Impact MB® can simultaneously reduce N fertilizer requirements, a highly energy intensive (and carbon intensive) manufacturing process, thereby conserving energy resources and reducing carbon footprint; potentially reducing nutrient runoff from fertilizers due to lower fertilizer application rates; and preventing or reducing potentially ammonia gas that can contribute to volatile organic compounds (VOC) emissions.

Case Study: ***Sonoma Compost*** operates a commercial composting facility in Sonoma County, California. This operation manages approximately 80,000 tons/year of green waste and poultry feathers using the windrow composting method, and produces compost products for vineyards, landscapers, and municipalities. To evaluate Impact MB®, Sonoma Compost added the technology to approximately 500 lb/yd^3 of organic feedstock material at the beginning of the composting process and again after 10 days. The organic materials were composted for approximately 10 weeks and compared to compost managed in the same manner without the addition of Impact MB®. At the end of the experiment compost with Impact MB® had a Total N content of 1.47%, while the untreated compost only had 1.24%. Nitrogen analysis showed the increase in N was nearly all in the form of Organic-N, increasing from 1.03% to 1.27%. Organic-N is beneficial for compost product users as it is generally slow release, allowing for availability in parallel with plant uptake requirements, and is generally less mobile in runoff conditions, thereby protecting precious water bodies.

Case Study: ***Engle and Gray Compost*** located in Santa Maria, California manufacturers 100,000 lb/yd^3 of compost per year made from green waste and biosolids using the windrow composting method. Engle and Gray manufactures compost products primarily for the landscape and erosion control industries. To evaluate the effectiveness of Impact MB®, Engle and Gray added the technology to their windrows once per week for the first three weeks of the composting process, which includes 90 days of active composting and approximately 30 additional days of curing. At the end of the composting process, the treated compost was analyzed and compared with compost that received no treatment application. The compost treated with Impact MB® had a Total N content of 1.09%, while the untreated compost had a Total N content of 0.87%. Similar to the Sonoma Compost case study, nearly all of the increase came in the form of Organic N, whereas the treated compost had an Organic N content of 0.94%, relative to 0.66% for the untreated compost.

Conclusions

- Impact MB® is an all-natural technology listed by the Organic Materials Review Institute (OMRI) and completely nontoxic and safe for humans, plants, and wildlife.
- A simple application of Impact MB® at the initial wetting of feedstocks results in increased nitrogen retention of finished compost, as well as reduced nitrogen volatilization of ammonia, VOCs and other odors commonly associated with the composting process.
- On-going studies indicate that the use of Impact MB® enhances both the active and curing phases of the composting process.