Properties over Process: Why Understanding the Properties of Waste Materials is Critical to Treatment and Recovery

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The main process types for the treatment and valorisation of biodegradable waste streams, including composting and anaerobic digestion, have extremely narrow ranges of operating parameters and margins for optimal efficiency, due to physical, chemical and biological limitations. By contrast, the presented feedstocks are highly variable and are generally suboptimal. Emphasis is often placed on system engineering, which is necessary and essential, however, understanding the material properties is a prerequisite and arguably more important to achieve optimal treatment outcomes. This paper revisits some of the basic operational requirements of these biodegradable waste treatment systems. Several examples are discussed, based on experience and work in our laboratory, that demonstrate the profound effects of waste properties on the physical, chemical and biological conditions in process reactors. These include dry solids, the composition of major organic substrates, and also the effects of supplementing the anaerobic digestion process with other waste products as alkali pretreatment, and potentially conductive, materials.