CONVERSION-READY FEEDSTOCKS FOR BIOREFINING

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A conversion-ready feedstock is an industrial-scale feedstock resource for which the chemical and physical properties of that resource are within the engineered performance parameters of biorefinery handling and conversion systems; in other words, all preprocessing, blending, sorting, leaching, drying or anything else necessary to make a feedstock ready for conversion/utilization is done prior to that feedstock being delivered to the biorefinery conversion systems. Due to the diversity, variability, and uncertainty associated with large-scale biomass resources, raw biomass resources do not meet conversion-ready specifications. Passive feedstock supply systems (often referred to as "conventional"), while minimizing operating costs, lack the feedstock preprocessing capabilities necessary to ensure that chemical and physical properties of raw biomass resources are consistently within conversion system engineering performance guarantees. Direct coupling of a passive feedstock supply system to sophisticated biorefining conversion systems has reduced the operability of biorefining conversion systems to less than 50%. Integrating active biomass preprocessing controls (e.g., drying, sorting, sizing, fractionating, leaching, densifying, etc.) can mitigate off-spec performance deviations of large-scale biomass resources in directly coupled downstream conversion systems. However, temporally and physically decoupling feedstock supply and handling from conversion systems affords the opportunity to continue using passive supply system options as appropriate, thus balancing higher cost, active controls with simpler, more cost-efficient passive controls. Decoupling feedstock supply from biorefining allows greater opportunities to manage supply risks and incorporate value-added upgrading of the biomass to increase its convertibility and/or market fungibility. As such, there is a need to fully recognize the magnitude of biomass variability and uncertainty, as well as the cost of failing to design feedstock supply systems that can mitigate biomass variability and uncertainty. A paradigm shift is needed, from biorefinery designs using raw biomass feedstocks to advanced feedstock supply systems that deliver conversion-ready feedstocks.