Cost models for bio-refinery processes: A comparative review of heuristic techniques

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Abstract There is an urgent need for approximate capital cost estimates of biorefinery plants at the early stage of their development when only limited information is available. A large number of citations uses preliminary cost estimation techniques to decide on the viability of the project and select the most economical route. This study assesses this attempt by investigating five well-known cost methods which rely on the "functional unit" approach (Taylor's step scoring method, Wilson's method, Bridgewater's correlations, Klumpar, Brown, Fromme's process module method, Petley's correlation). For the needs of this evaluation, four biorefinery processes are selected based on the existence of commercial plants to compare on reported costs (Dry Ethanol corn mill, Soyoil Biodiesel production) or their originality and novelty to test the efficiency of the methods on state-of-the-art technologies (Indirectly-heated Biomass Gasification, Ethanol production by SynGas fermentation). The analysis proposes that existing techniques for early-stage estimation of biorenewable processes are obsolete, because they were mostly derived from data of conventional petrochemical processes, which do not comply with the demands of new process technologies. Therefore, improved and diversified cost models should be developed, in order to improve the reliability and accuracy of preliminary cost estimates.