A MULTIDISCIPLINARY APPROACH ON CONTAMINATION CHALLENGES TO INTRODUCE RENEWABLE CHEMICALS AND BIOFUELS PRODUCTION IN BRAZILIAN SUGARCANE MILLS


Mills typically operate at a certain level of contamination (bacteria and native/wild yeasts), which is responsible for the majority of the total determined loss in sugar/ethanol industry efficiency. Sugarcane mills do not typically adopt “Clean in Place” (CIP) methods as food or pharmaceutical industries do. Therefore, In the present study, a multidisciplinary group (sugar mills process engineers, biologists and project estimate engineers) used the Six Sigma Methodology to assess the main sources of contamination and to propose possible minimum mitigation actions to support the implementation of production of chemicals and biofuels using microorganisms not tolerant to that contamination environment (e.g recombinant microorganisms). Based on literature data (technical and scientific), VOC (voice of customer – interviews) analysis and Customer Priorities Ranking considering all the sugar mill process steps, those with higher opportunities of improvement considering cost versus benefit were: mash preparation (mixer, pipes, tank and heat exchanger), fermentor and cooler heat exchanger, process water, clarified juice decanter and pre-fermentor. Potential contamination causes for each of these steps were evaluated and mitigation actions were proposed. Considering sugar mill practices and engineering concepts on piping design and cleaning process, a list of recommended equipments was created to compose a mitigation package (process design improvement) and a project capital estimate was done using estimating best practices closely aligned with AACCE (Association of Cost Engineers) Recommended Practices.