**TECHNO-ECONOMIC ANALYSIS OF MIXED PLASTIC WASTE VALORIZATION TO FUEL USING PYROLYSIS**

**Cesar Lubongo1, Paschalis Alexandridis1,\***

1 Department of Chemical and Biological Engineering, University at Buffalo, The State University of New York (SUNY), Buffalo, NY 14260-4200, U.S.A.

*\** palexand@buffalo.edu

**ABSTRACT**

Plastics that are difficult to mechanically recycle can be chemically recycled by pyrolysis into petrochemical feedstock that can be used either as fuel or as a starting material for chemicals or polymers. The objective of this study is to assess the economic feasibility of converting post-consumer plastics to fuel or oil using pyrolysis, and to assess the processing and market conditions required for a successful deployment of pyrolysis technologies. The economic feasibility of converting plastic waste to oil/fuel using pyrolysis is evaluated using as criteria the net present value (NPV) and internal rate of return (IRR). The Lang factor method is used to estimate the cost of the plant (capital and operating cost). Capital expenditures (CapEx), operating expenses (OpEx), and revenue generated by the sale of product are estimated. US market conditions (i.e., feedstock cost, feedstock transportation cost, volume of feedstock available, taxes, wages, tipping fees) are taken into account in estimating operational costs. The plants were evaluated at three scales: 30 tons per day (TPD), 60 TPD, and 100 TPD, each with the option of sourcing feedstock at the current market price (Case 1) or at no cost (Case 2). Investment decisions based on entity basis (unlevered NPV), show the plants can be profitable at scales higher than 60 TPD in both Case 1 and Case 2. However, on equity basis, using current market conditions for analysis, the 30 TPD plant has a negative NPV in both cases, and the 60 TPD and 100 TPD plans are profitable in Case 2 but not in Case 1. Profitability of plastic-to-fuel conversion using pyrolysis is influenced by crude oil prices, feedstock costs, CapEx and OpEx, discount rates, and operating hours.

**KEYWORDS:** Chemical recycling; Advanced recycling; Waste valorization; Circular economy; Techno-economic analysis