

Techno-Economic Assessment of Aluminum Waste Management

Authors : Hamad Almohamadi, Abdulrahman AlKassem, Majed Alamoudi

Abstract : Dumping Aluminum (Al) waste into landfills causes several health and environmental problems. The pyrolysis process could treat Al waste to produce AlCl_3 and H_2 . Using the Aspen Plus software, a techno-economic and feasibility assessment has been performed for Al waste pyrolysis. The Aspen Plus simulation was employed to estimate the plant's mass and energy balance, which was assumed to process 100 dry metric tons of Al waste per day. This study looked at two cases of Al waste treatment. The first case produces 355 tons of AlCl_3 per day and 9 tons of H_2 per day without recycling. The conversion rate must be greater than 50% in case 1 to make a profit. In this case, the MSP for AlCl_3 is \$768/ton. The plant would generate \$25 million annually if the AlCl_3 were sold at \$1000 per ton. In case 2 with recycling, the conversion has less impact on the plant's profitability than in case 1. Moreover, compared to case 1, the MSP of AlCl_3 has no significant influence on process profitability. In this scenario, if AlCl_3 were sold at \$1000/ton, the process profit would be \$58 million annually. Case 2 is better than case 1 because recycling Al generates a higher yield than converting it to AlCl_3 and H_2 .

Keywords : aluminum waste, aspen plus, process modelling, fast pyrolysis, techno-economic assessment

Conference Title : ICCBE 2023 : International Conference on Chemical and Biological Engineering

Conference Location : Zurich, Switzerland

Conference Dates : July 24-25, 2023