

A Techno-Economic analysis of the Monash Ammonia Process

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Due to the significant carbon footprint associated with conventional ammonia production methods, there has been a growing interest in electrochemical approaches for ammonia production. Although initial yield rates were relatively low in conventional electrochemical methods, a team at Monash University in Australia successfully developed a method capable of producing ammonia with a higher yield at room temperature with 100% faradic efficiency. To assess the potential for scaling up this technology, a techno-economic analysis has been conducted. Assuming a scale of 1 MW for the pilot plant, the NH₃ production rate was obtained as 934.64 kg/day. The total capital cost was estimated at \$736,913, the daily operating cost at \$1192.80, and the daily income at \$977.61. Consequently, the plant incurred a daily loss of \$215.19. Based on these findings, it can be concluded that the scale-up plant is currently not economically viable. This is primarily attributed to the present high cost of the electrolyzer stack and renewable energy. However, there is a promising trend of decreasing costs for electrolyzers and renewable energy. If this trend continues, there is potential for the scale-up plant to become a viable option in the future.

Keywords: Electrochemical nitrogen reduction reaction, Monash Ammonia Process, green ammonia, ammonia electrosynthesis, electrochemical cell