

IMPLEMENTATION OF CLEANER PRODUCTION IN CHEMICAL INDUSTRIES: TYPICAL INDUSTRIAL CASE STUDY FOR ACRYLONITRILE PRODUCTION

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Abstract

Acrylonitrile is one of the important petrochemical used for various applications in fiber and rubber industries as well as for commercial purpose. This chemical now a days preferably manufactured by ammoxidation process. However, this process also generates toxic and hazardous materials – HCN, CH₃CN, etc... as byproduct. If the Principles of Cleaner Production are applied to Ammoxidation process, then by appropriate technological process modification, the whole process can be successfully converted into an eco – friendly process. Two routes, Ammoxidation process (Route – I) and Ammoxidation coupled with Cynation (Route – II) have been considered for the purpose of implementation of Cleaner Production Principles (CPP) in manufacture of Acrylonitrile. Critical thermodynamic analysis has been carried out for each and every reaction involved in the manufacturing processes – Route – I as well as Route - II. The detailed Material and Energy Balance calculations for both Routes have been performed and its summary is presented in this paper. Cleaner Production Analysis indicates that Route – II appears to be more environmentally friendly in comparison to Route – I. Furthermore, the degradation of cyanide waste by microbiological treatment is also one of the good alternatives to make the process environmentally friendly. Thus by applying C. P. Principles, pollution can be reduced considerably and the route under consideration – Ammoxidation coupled with Cynation becomes an eco – friendly route.

Keywords: Cleaner Production, Ammoxidation, Acrylonitrile, HCN, toxic, hazardous, eco – friendly.

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