

# Production of 10 TPD of Aniline from Nitrobenzene and Hydrogen

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## A. Background

Aniline, also known as amino benzene or benzenamine, is an aromatic amine with the formula  $C_6H_5NH_2$ . It is mainly used as a raw material in the production of methylene diphenyl diisocyanate (MDI), an intermediate in polyurethane manufacture. MDI production alone accounts for over 95% of world aniline consumption. Aniline is also used as an intermediate for dyes and pigments, explosives, agricultural chemicals and pharmaceuticals. It was first commercially produced using nitrobenzene as starting material around 1930. This pathway remains the most common method for aniline production today. Currently, almost all existing plants producing aniline from nitrobenzene are integrated with facilities to produce nitrobenzene from benzene.

## B. Flowsheet description

The flowsheet simulates the production of 10 TPD of Aniline from Nitrobenzene with addition of Hydrogen. The feed stream consists of Nitrobenzene and Hydrogen. The composition of the feed stream is 75% Hydrogen and 25% Nitrobenzene. The feed is sent at conditions of 600K, 1 atm and at a mass flow rate of 600kg/s. This stream (feed) is sent to a conversion reactor where the conversion of the reaction is fixed at 99.9%. Since the conversion is very high, the product stream from the reactor has a composition of 33% Aniline and 66% Water with negligible amounts of the reactants (approx. 1%). The product stream is then passed through a cooler where it is cooled to 300K. The cooled water is then sent to the distillation column where Water is removed through the distillate stream and Aniline obtained through the residue stream. Aniline obtained is at a purity of almost 99 %. This flowsheet is based upon the following webpage link <http://www.chemengonline.com/aniline-production-nitrobenzene-liquid-phase-intratec-solutions/>

### C. Results

A simple process flowsheet for the production of aniline from Nitrobenzene and Hydrogen was developed and simulated using DWSIM and the results are displayed below

Master Property Table				
Object	Water	Feed	Aniline	
Mass Flow	602126.6	2160000	1557664.9	kg/h
Mass Flow (Mixture) / Aniline	3652.466	0	1551977.1	kg/h
Mass Flow (Mixture) / Nitrobenzene	0.2444242	2058860	2058.2513	kg/h
Mass Flow (Mixture) / Hydrogen	101.14478	101140	7.5955285E-07	kg/h
Mass Flow (Mixture) / Water	598372.75	0	3629.5987	kg/h