

PRODUCTION OF p-Nitroaniline

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SUMMARY

The aim of this project is to design a p-nitroaniline (PNA) production plant, which is going to supply the demand of Turkey. Since PNA is a dye intermediate, this demand comes especially from the dye industry, which has a crucial role in manufacturing all over the world. The base capacity for the design is determined using trade data of Turkey and projection for the future years, using the consumption behavior of these countries: China, India, Brazil, Argentina. According to the capacity of dye industry in Turkey, manufacturing of p-nitroaniline is a vital necessity and there isn't any facility producing of p-nitroaniline in Turkey. According to the marketing research, the demand today is about 400-500 tons/month. Therefore, the capacity is defined as 500 tons/month. Furthermore, taking the location of dye manufacturers using PNA into account, Yalova is chosen for the facility.

It is a fact that high capacity facilities require critical precautions economically and environmentally. Although p-nitroaniline is a very important raw material in dye industry, the technique used by all PNA producers causes hazardous wastes such as chlorine, which effects the environment and human health. However, there is a new technique of p-nitroaniline production which is based on green chemistry principles. Besides green chemistry, this new process is also an example of cradle to cradle design. The technique has never been applied so far because of cost of replacing the existing plant with the plant based on new technology and requirements of operators. In this study, the new technique of p-nitroaniline production is explained and the facility is designed.

P-nitroaniline has wide applications, is used in different type of dyes such as direct dyes, acetate dyes and disperse dyes. All these three dyes are produced in China; yet only direct dye is produced both in China and India. Average production of PNA for India is 550 MT/month and 4000 tons/month for China. China is the major exporter of PNA whereas India is the major importer. Europe imports a substantial quantity, countries like Brazil and Argentina are also minor importers.

The price of materials in this new technique are; benzamide (BA) \$278.00/kg, methanol \$8.00/kg, p-nitroaniline product \$37.50/kg, nitrobenzene (NB) \$24.00/kg, tetramethylammonium hydroxide (TMAOH) \$395.00/kg, oxygen \$0.16/kg, ammonia \$0.52/kg. Material cost is calculated based on these raw material prices. Equipment and labor costs are calculated and showed in Appendices.

As a result, the facility based on new technique of p-nitroaniline production will be a big supplier for dye industry in Turkey. In addition, hazardous waste effects are completely eliminated. This new technique of p-nitroaniline will not only decrease import amounts but also lead a clean world.