

Production of Purified Terephthalic Acid Using the Spray Process Method

Beena Patel, Chengeto Kazuva, and Saleh Aljarrah

Faculty Advisor: Dr. Johnathan Whitlow, Dept. of Chemical Engineering, Florida Institute of Technology

Abstract

The production of purified terephthalic acid (PTA) is currently done using the Amoco Mid-Century (MC) method. This method uses a Continuously Stirred Tank Reactor (CSTR) for the oxidation of para xylene into PTA. By changing this reaction vessel to a semi batch spray reactor, researchers at the Center of Environmentally Beneficial Catalysis (CEBC) have recently discovered the environmental and economic benefits over using the MC method.

Plant Description

Site: China, due to growing PTA market

Production rate capacity: 1,000,000 metric tons/year

On-Stream factor: 0.9

Operation: 330 day/year

Profitability Analysis

Internal Rate of Return: 25.3%;

Break even: 5th-6th year

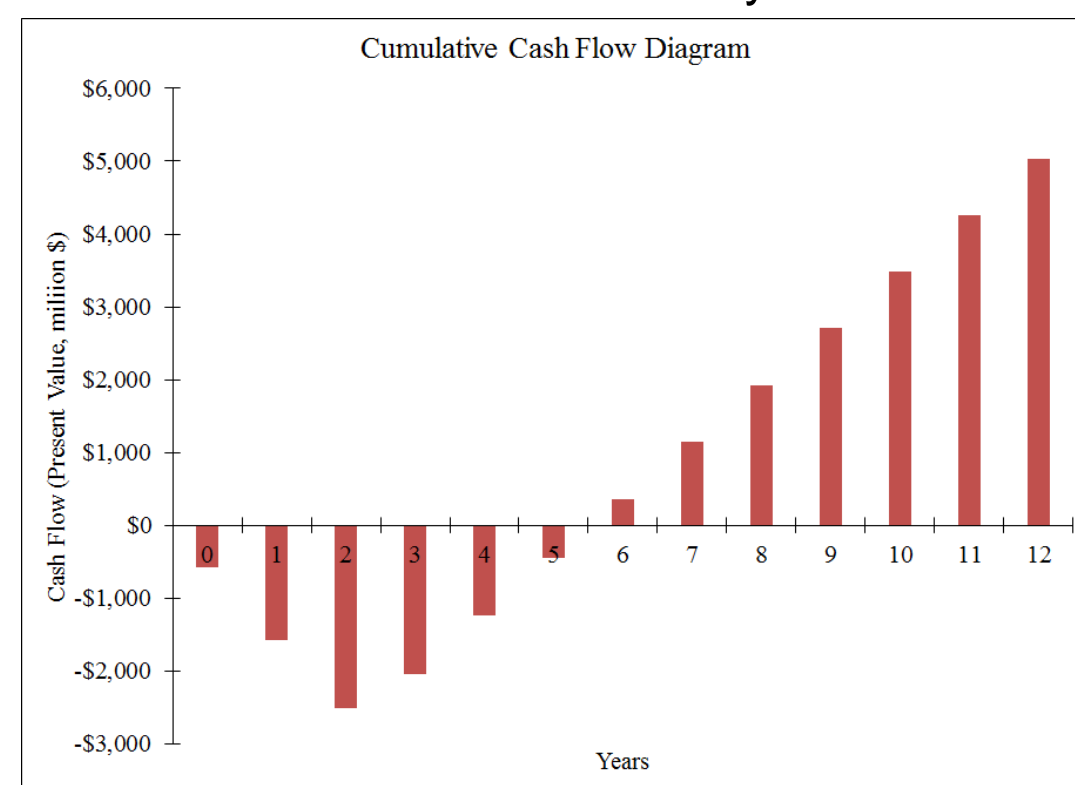


Figure 1: Cumulative Cash Flow Diagram

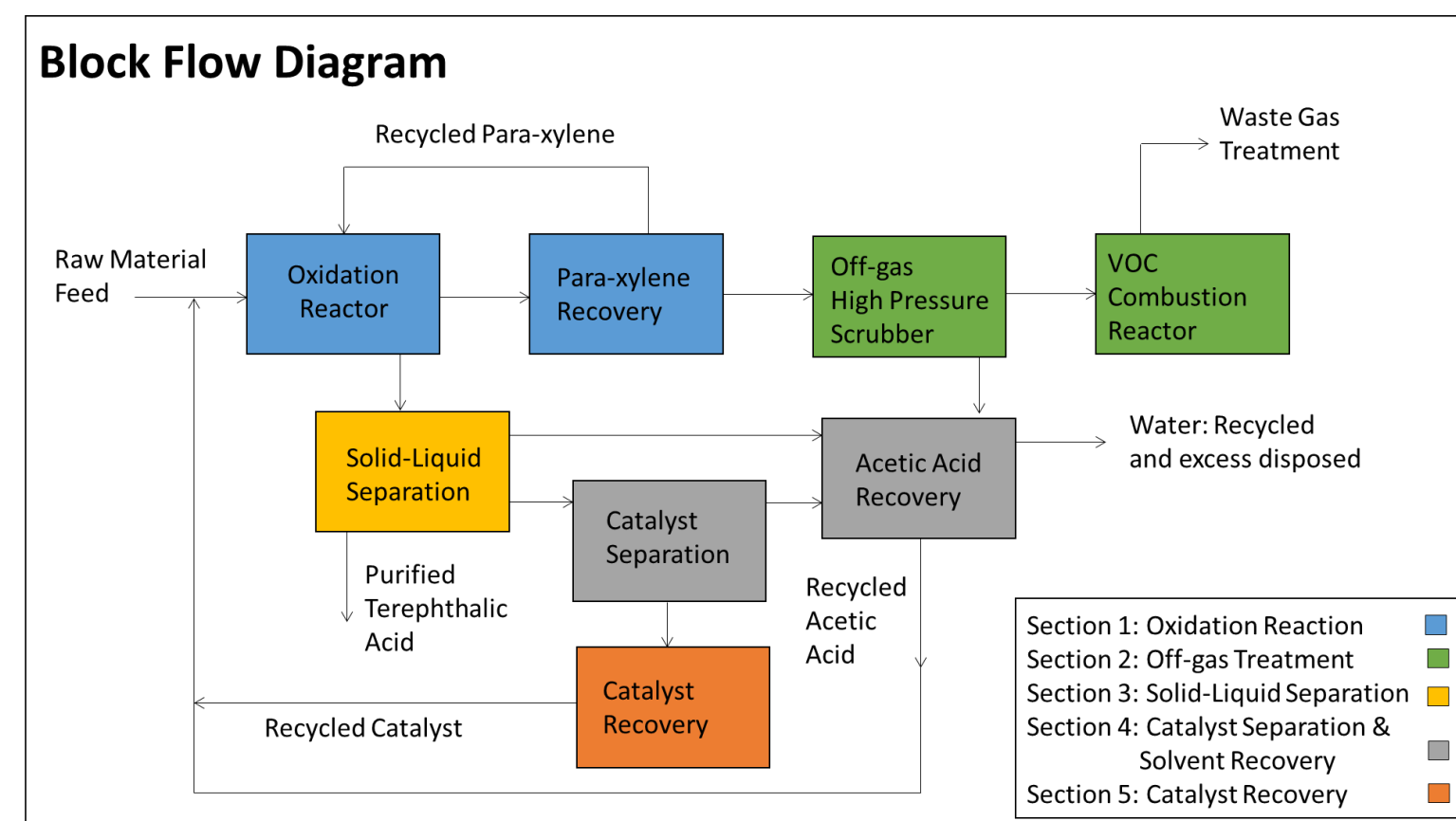


Figure 2: Block Flow Diagram

Table 1: Quantity of Materials

	Flowrate	
	Metric ton/year	kg/h
Substrate: P-xylene	656,100	84,115
Solvent:		
Acetic acid	23,900	3,064
Water	1,312	168
Catalysts:		
- Cobalt Acetate	50	6
- Manganese Acetate	150	19
- Hydrogen Bromide	1,700	218
Air:		
Oxygen	624,000,000	80,000
Nitrogen	2,055,000,000	263,000
Product: PTA	1,000,000	128,200

Cost Summary

Table 2: Capital Cost Summary

Compressors	\$571,773,587
Reactors	\$371,522,315
Towers	\$39,728,208
Heat Exchangers	\$6,502,034
Other	\$392,789
Total Capital Cost	\$989,918,933

Table 3: Manufacturing Cost Summary

Fixed Capital Investment	\$ 2,555,337,337
Cost of Utilities	\$ 5,725,916
Cost of Waste Treatment	n/a
Cost of Operating Labor	\$ 360,000
Cost of Raw Materials	\$ 134,045,681
Cost of Catalyst Recovery	\$ 1,488,718
Cost of Manufacturing	\$ 634,693,708

Uses of PTA

Mainly, to produce Polyester Terephthalate used in:

- Beverage Bottles
- Cooking Utensils
- Food packaging suitable for microwave application
- Fabric

NORTHROP GRUMMAN



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