

# Purification of Crude Biodiesel Fuel by Electrical Fields - Part III Economical Assessment

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**ABSTRACT:** The present study reports the result of economical assessment for new Bio-Diesel Fuel (BDF) purification technology using electric field. Electric field is applied to emulsified water/glycerin particles in crude biodiesel fuel by means of removing injected washing water, Alkali metal and Residual glycerin. This process is so called electro-demulsification. Esterification process of using sodium hydroxide catalyst is considered in this study. Traditional purification processes, such as water washing, acetic acid washing, dry filtration technologies are compared. Initial investment cost (Fixed capital cost), total manufacturing cost, and net manufacturing cost are considered for the estimation of BDF production cost. Current market price on April & Decemner 2008 is used for the calculation in this study. The result shows that new purification technology reduced the production cost by 2~3% on the estimation basis comparing to the other traditional technologies. Characteristics of new technology reduced unit operation cost as well as maintenance cost, results in reducing the production cost.

Keywords: biodiesel, demulsification, esterification, transesterification, economic aspect.

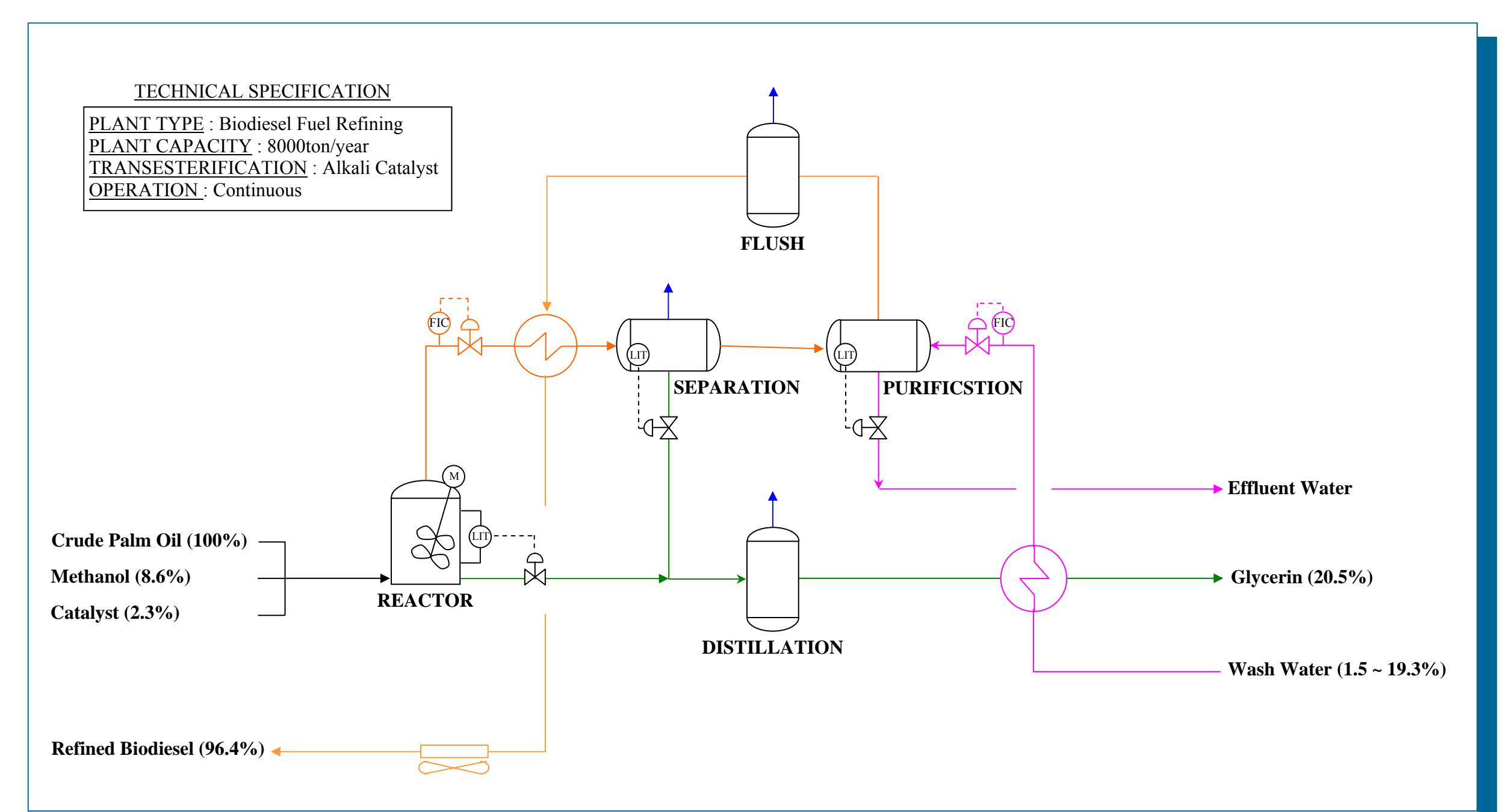


Figure 1. MATERIAL BALANCE.

TABLE 1. COMPARISON RESULT OF ECONOMICAL ASSESSMENT (k-US\$/year)

Description		I. Wet	II. Dry Filtration	III. Electro - Demulsification
Purification Tank	(Tank ID×L, m)	(0.8×10) 166	(0.8×10) 166	(0.4×2) 231
Others		1320	1320	1344
<b>Fixed Capital Cost</b>		<b>1486</b>	<b>1486</b>	<b>1575</b>
Catalyst/Resin/Solvent		540	724	540
Utilities		115	←	117
Waste disposal		270	4	45
Others		6490	6480	6487
Direct manufacturing		7415	7323	7189
Indirect Manufacturing		450	←	453
Others		1623	1608	1593
<b>Manufacturing Total</b>		<b>9488</b>	<b>9381</b>	<b>9235</b>
Glycerin credit		1348	←	←
Biodiesel		6644	←	←
<b>Revenue Total</b>		<b>7992</b>	←	←
<b>Break-even price of biodiesel (US\$/ton)</b>		<b>1499</b>	<b>1482</b>	<b>1459</b>
<b>Annual profit before TAX</b>		<b>1499</b>	<b>1389</b>	<b>1243</b>

## [CONCLUSIONS]

### Case I — Wet Water Washing

Conventional and major industrial purification technology. Required wash water and disposal cost. (Additionally, 225k-US\$ on Direct production cost)

### Case II — Dry Filtration (Ion Exchange Resin)

Washing media (Water, Acid, Hexane etc) is not required. Required resin cost. Assume 0.02US\$/L as direct production cost. (Additionally, 184k-US\$ on Direct production cost)

### Case III — Electro-demulsification (NATCO Technology)

New demulsification technology introduced in this study. Required high voltage transformer operation. (Additionally, 6%(89k-US\$) on Capital cost, and 1%(2k-US\$) on Utility cost for electricity) Total manufacturing cost is 2.7%(253k-US\$) lower than Wet water wash case.

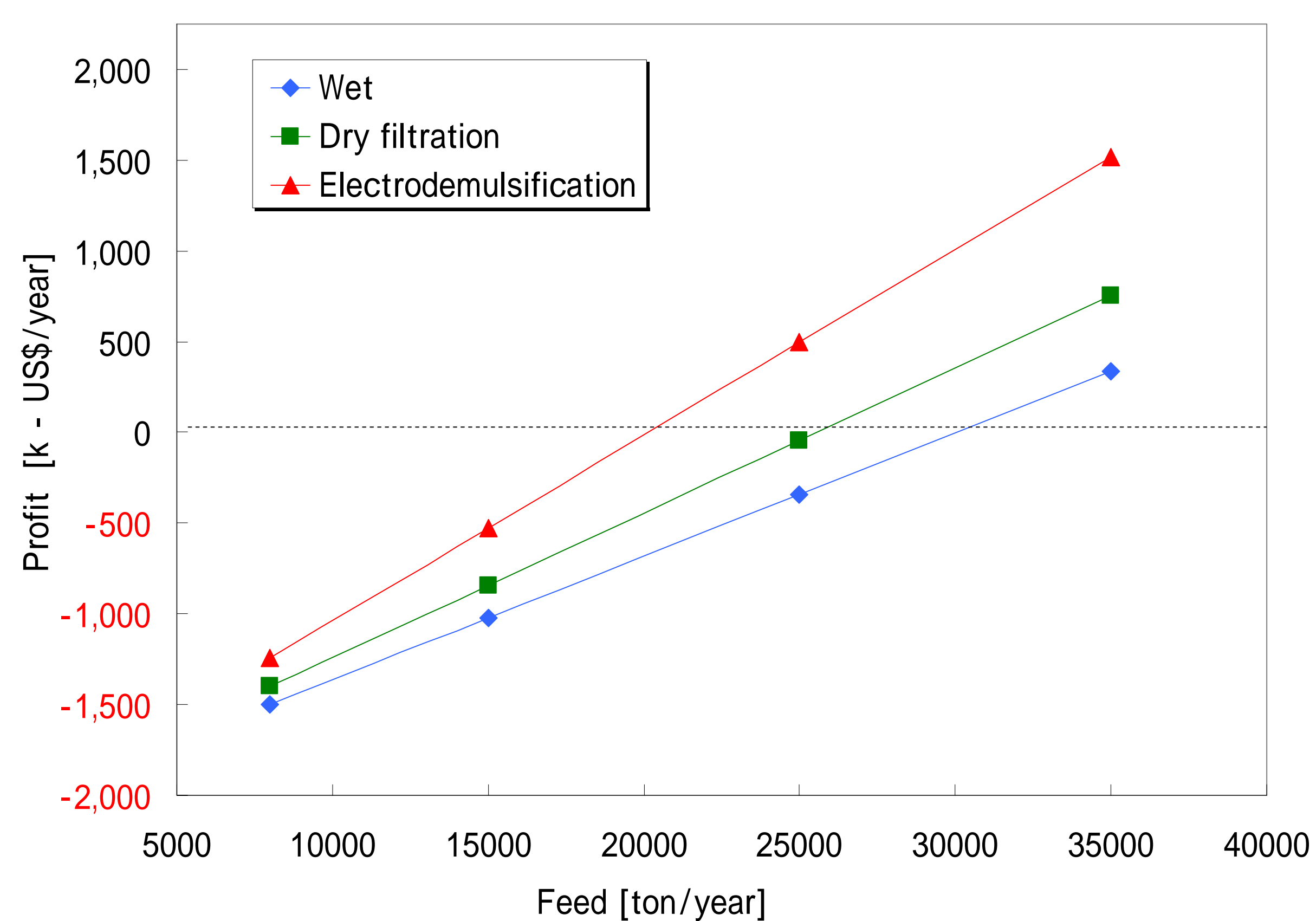


Figure 2. PROFIT AND PLANT CAPACITY.

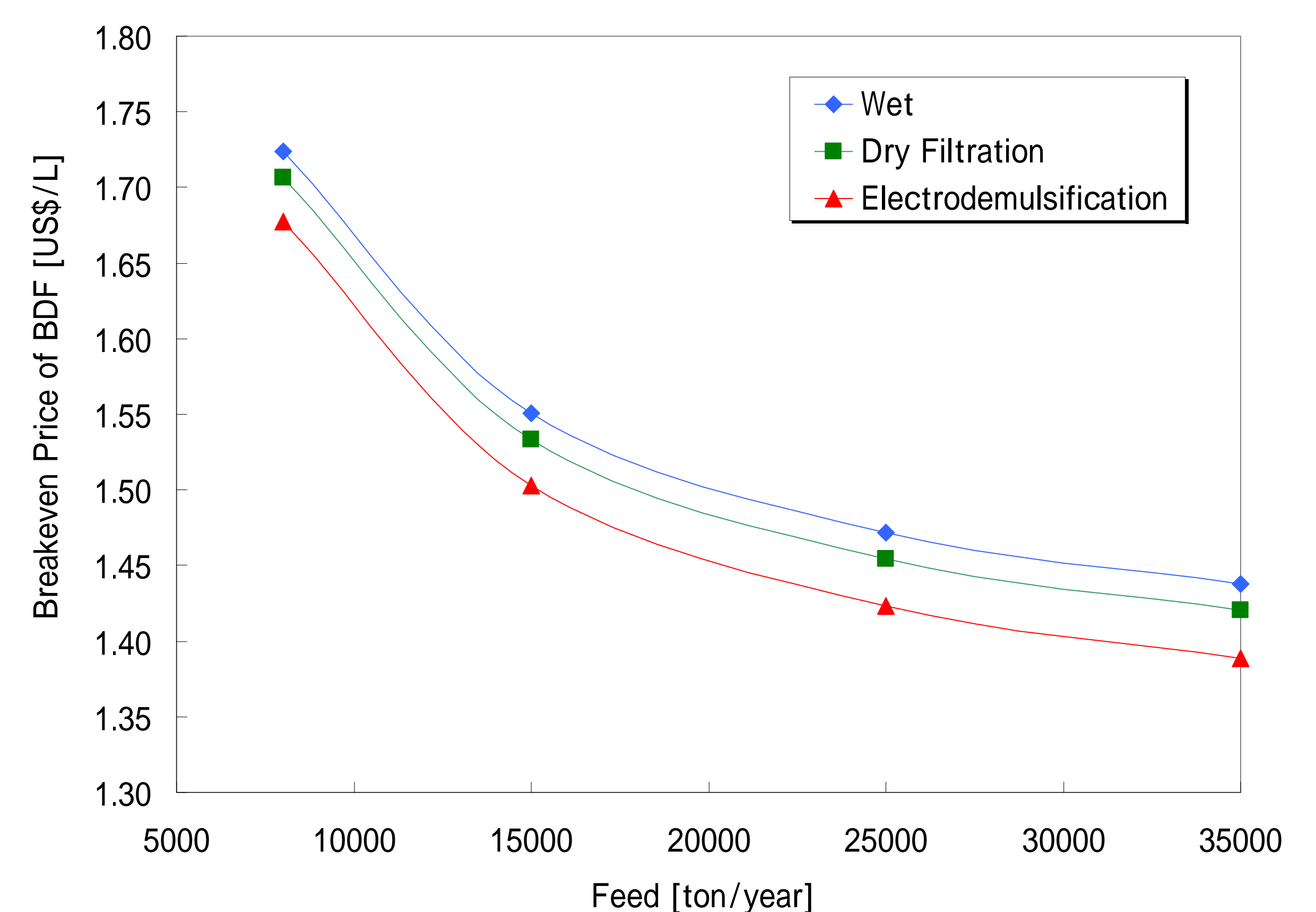


Figure 3. BREAK-EVEN PRICE OF REFINED BIODIESEL.