



جامعة الجميع الذكية
EVERYONE'S SMART UNIVERSITY

Everyone's Smart University

Project (Spring 2021)

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1. Introduction :

In this project we study the investment in Acrylic Acid production plant by using multi methodology which help to discuss its good investment or not.

The Acrylic Acid production plant aims to produce 99.7% of pure Acrylic Acid at a production rate of 150,000 tons per year to compensate for demand in the Middle East. Increasing population, increasing life span and improving lifestyles have all significantly increased the demand and growth of the market for super-absorbent polymers in the developed and developing world, including disposable hygiene products. Most of the market growth is projected to occur in China and India as these countries produce increasing quantities of products using acrylic acid as intermediates, including detergents, coatings, adhesives, sealants, and personal care products . As feedstock costs continue to rise and downstream demand remains flat, the global market for acrylic acid is expected to face challenges in the coming years. Production costs for acrylic acid are expected to continue to increase. Acrylic acid plants may face several competitive challenges from renewable acrylic acid pathways. The selling price of acrylic acid is expected to drop if bio-acrylic acid plants can scale up their process to industrial production levels. Many major companies compete in the market for acrylic acid.

Company	Location	Capacity
Dow Chemical	Texas, US	580
LG Chem	Yeosu, South Korea	510
Zhejiang Satellite Acrylic Acid	Jaxing, China	480
BASF Antwerpen	Antwerp, Belgium	320
BASF	Ludwigshafen, Germany	320
Yantai Wanhua Group	Yantai, China	300
Arkema	Cariling, France	276
Arkema	Texas, US	270
StoHaas Monomer	Marl, Germany	265
Nippon Shokubai	Himeji, Japan	220
Shanghai Huayi Acrylic Acid	Gaoqiao, China	166
Saudi Acrylic Acid (SAAC)	Al-Jubail, Saudi Arabia	160
BASF	Camacari, Brazil	160
BASF Petronas Chemicals	Kuantan, Malaysia	160
BASF-YPC	Nanijng, China	160
Formosa Plastic Industrial CO	Ningbo, China	160
Jiangsu Jurong Chemicals	Taixing, China	160
Sunke	Taixing, China	160

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By 2020, the global consumption rate of acrylic acid is projected to be more than an estimated 8,000 kilo tons. This increase is expected to occur as a result of the use of this product in new applications, including personal care products, detergents, and products for adult incontinence.

2. Literature Review

The payback period refers to the amount of time it takes to recover the cost of an investment. Simply put, the payback period is the length of time an investment reaches a break-even point.

The desirability of an investment is directly related to its payback period. Shorter paybacks mean more attractive investments.

Although calculating the payback period is useful in financial and capital budgeting, this metric has applications in other industries. It can be used by homeowners and businesses to calculate the return on energy-efficient technologies such as solar panels and insulation, including maintenance and upgrades.

3. Methodology

This illustrates cost estimation of an Acrylic Acid producing plant that was conducted by first determining the Fixed Capital Cost which includes: ISBL, OSBL, Engineering Costs, and Contingency Costs. Then, total production cost was determined using turron method which consisted of: Labor Cost, Utility Cost, Raw Material Cost, and Fixed Capital Investment. Lastly, economic analysis was performed to obtain parameters that determine how profitable a plant is such as: Net Present Value (NPV), Internal Rate of Return (IRR), and Return on Investment (ROI).

OSBL, Engineering, and Contingency costs are always shown as percentages of the ISBL cost or the addition of ISBL and OSBL costs. During calculations, important factors have been used to compensate for time and location of the basis in which the empirical formula has been chosen as well as others factors which have been used to compensate for the material of construction in which the empirical formula has been chosen.

3.1 Capital Cost

The fixed capital cost is the total cost of designing, constructing, and installing a plant and the associated modifications required to prepare the plant site. The fixed capital cost is made up of:

1. The inside battery limits (ISBL) which is the cost of the plant itself
2. Site modifications which are offsite or OSBL investment
3. Engineering costs
4. Contingency charges

3.2 ISBL Plant Costs

The ISBL plant cost includes the cost of buying and installing all process equipment that form a plant. Calculating the listed components below were done using empirical correlations that are included in the tables shown in this chapter.

ISBL costs include:

1. All the major process equipment.
2. Bulk items, such as valves, piping, structures, instruments, wiring, insulation, paint, lube oils, solvents, catalysts, etc.
3. Civil work.
4. Installation labor and supervision.
5. Construction costs.
6. Field expenses and services.
7. Construction insurance.
8. Labor benefits and burdens.

3.3 Fixed Capital Cost

Determining the fixed capital cost of a plant requires the summation of the cost of all major equipment to be multiplied by factors for instrumentation and control, material used, equipment erection ... etc. Values used to compensate for those factors.

Total purchase cost of major equipment items (PCE)

Reactor 191,000

Absorption column 69,000

Heater 80,000

Cooler 105,000

Distillation1 73,000

Distillation2 69,000

Total 587,000

3.4 Labor Costs

According to the General Authority of Statistics in Saudi Arabia, the average monthly wage of industrial sector

Employees is 11,500 SAR/month, equal to 3100 (\$/month), equal 36800 (\$/year).

The cost of operating labors will be = $14 * 36800 = 515200$ (\$/year)

Parameter	Value
<i>NoL</i>	2.93
Operators	14

Average salary (\$/years)	36800
Cost (\$/year)	515200

6.6 Raw Material and Product Cost

Utility	Value	Unit
Heater	8.68065E-06	\$/kJ
Cooler	6.81966E-07	\$/kJ
Electricity	0.048	\$/kWh

6.7 Utility Costs

To determine utility costs of the plant, tariff rates for electricity usage and other rates depending on power of unit were obtained from the Saudi Electric Company and. Multiplying the power of each heater and cooler by their respective rates , result in the utility cost of running the plant as shown.

Results & Discussion

The best payback period is the shortest one possible. Getting repaid or recovering the initial cost of a project or investment should be achieved as quickly as it allows. However, not all projects and investments will have the same time horizon, and so the shortest possible payback period needs to be nested within the larger context of that time horizon. For example, the payback period on a mortgage can be decades while the payback period on a construction project or industrial project may be 5 years or less.

Payback period is one of the least rigorous ways in determining how fast an investment will be paid back through the plant, it can be divided into: simple and discounted payback period. A simple payback period does not take interest rate and tax into consideration. Therefore, it is not an accurate way to determine how much time it would take to return the investment. On the other hand, generating a cash flow after tax and interest rate into consideration is a trusted way to get the accurate and applicable payback period.

Simple PBP=Investment / Average AnnualCashflow

Parameter	Raw material	product	By product
	Propylene	Acrylic acid	Acetic Acid
Pricing (\$/ton)	1100	1300	530
Amount (ton/year)	122,412	150,000	23,305.06
Cost (\$/year)	134,653,200	195,000,000	12,351,682.6
Total (\$/year)	134,653,200	207,351,682.6	

Simple PBP = (382,045,444.3) / (103,943,540) = 3.7years

So as result show the payback period is 3.7 years which give good indicator for right investment project.

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