

General Department of Economic and Financial Affairs of Khuzestan

Preparation and Compilation of Investment Opportunities in The Province
Investment Opportunity Studies Report

Vinyl Acetate Copolymer Production Plan

(Attachment Number 1)

V-2

Date: 2023/03/11

In the name of God

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1) Location of the project

1-1- Province

Khuzestan province is located in the southwest of Iran (in 47° 42' to 50° 39' east of the Greenwich meridian and 29° 58' to 32° 58' north of the equator). The area of Khuzestan province is 63,238 square kilometers. With a population of 4,994 thousand people in 1400SH, it is the fifth most populous province in Iran (after Tehran, Khorasan Razavi, Isfahan and Fars provinces). **Ahvaz** is the capital of Khuzestan province and is located in the 880km of Tehran. This province is bordered by ILAM province from the northwest, Lorestan province from the north, CHAHARMAHAL and BAKHTIARI, KOHGILUYEH and BOYERAHMAD provinces from the northeast and east, the Persian Gulf (330km long) from the south and Iraq (330km long) from the west. The location of Khuzestan is in the west of Zagros mountains. Due to the vastness of its plains, the border with Iraq and the Persian Gulf, and the distance from other provincial centers have placed this province in a strategic position.

1-2- Bandar Mahshahr city

According to the latest national divisions of 1401 of the Ministry of Interior, this province has 29 counties, 70 districts, 145 villages, 90 cities and 3 special governorates. The latest political divisions of the province are described in figure (3). Bandar Mahshahr city is one of the cities of Khuzestan province, centered in Bandar Mahshahr city. Mahshahr city, with a population of over 300 thousand people, has 6% of the province's population. This city has a common border with HENDRIJAN, OMIDIYEH and RAMSHIR cities from the east, Shadgan city from the west, Ahwaz city from the north, and the Persian Gulf from the south. This city is located 18 km from Imam Khomeini Port, 95 km from Abadan and 110 km from Ahvaz.

Mahshahr port is located in the arid and extra-arid of geographical region in a wide and flat area with 591 thousand hectares. Due to the rapid increase in temperature during spring, the area becomes dry and rough and the value of the pastures reduces drastically. Mahshahr port is located in the plains of Khuzestan province which makes it a flat area with no ups and downs. The climate is hot and humid with a temperature varies between 50 degrees in summer and zero degrees in winter. But the humid becomes so annoying during summer which can reach to 100%. The average rainfall in this area is 195mm. Due to its saline and alkali soil, Mahshahr port has a weak vegetation. Jujube and Tamarisk trees are scattered there.

Mahshahr is a port and industrial city which makes it the center for land, maritime and rail transit routes of goods from the important and strategic port of Imam Khomeini. The most important industries of Mahshahr includes petrochemicals and shipping. The presence of waterways and proximity to Iraq and Kuwait have made this region a critical industrial location for importation and exportation. The economic activity and development of Mahshahr is mostly related to its port capabilities and proximity to the coasts, oil and gas resources of the Khuzestan and related activities. This city, with the port construction for oil and goods exportation, the petrochemical construction of Imam Khomeini port (former Iran, Japan), the development of a petrochemical economic special zone (in which industries are subject to customs facilities for importing goods) along with the construction of huge petrochemical industries, has resulted in the populous and immigrant city.

The cultivation of agricultural products is highly dependent on irrigation. Its main products are wheat, barley, beans, dates, grapes, pomegranates and figs. You can't find any unique handicrafts in this city.

The oil loading docks were the first industrial facilities created in Mahshahr. The port was revived with the national railway construction as well as the establishment and development of the SHAPUR port (Imam Khomeini) in the beginning of the Pahlavi regime. After that, the port became attractive for crude oil exportation and gradually turned to a populous city with the laying of oil pipes and the creation of oil tanks (which transport oil from AGHAJARI to Abadan refinery and from there to Mahshahr port). In the last ten



Figure (1): The Province location in Iran



Figure (2): Location map of Mahshahr in Khuzestan province

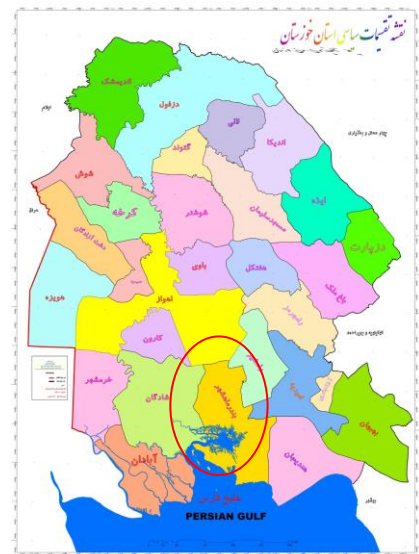


Figure (3): Political divisions of Khuzestan province

years, with the launch of a petrochemical economic special zone in Mahshahr, the city is among one of the most industrial cities not only in Khuzestan but also in Iran. Companies such as TENDGOYAN Petrochemical, FAJR, AMIRKABIR, Maroon, LALEH, ARVAND, Rizal, BU-ALI Sina, Khuzestan, etc. are located in the economic special zone of Mahshahr. Imam Khomeini Port Petrochemical Complex is one of the biggest petrochemical complexes in the Middle East. Other petrochemicals in this city includes, Razi Petrochemical, MARUN Petrochemical, Amir Kabir Petrochemical, Karun Petrochemical, TONDGOOYAN Petrochemical, Khuzestan Petrochemical, FANAVARAN Petrochemical, LALEH Petrochemical, ARVAND Petrochemical, Regal Petrochemical, BU-ALI Sina Petrochemical, FAJR Petrochemical. Amir Kabir University of Technology (Mahshahr branch) was established in 1380 based on a contract between Petrochemical and Amir Kabir University of Technology with the aim of providing the specialized staff needed by the industries of the region. This university is currently admitting students in master's degree (chemical engineering, polymer engineering, polymer industries, polymer engineering, polymerization, chemical engineering, environment, civil engineering) and Ph.D.

2) Project Status

The location of the land in Bandar Mahshahr Industrial Town is proposed with the following specifications and an area of about 22,000 square meters. Taking industrial land in this place requires industry, mining and trade permits and the approval of the industrial estates company and approval of the city's environment. One of the reasons for choosing this location is its proximity to important companies that produce petrochemical products in the province. The distance of this town to Bandar Imam Petrochemical, Fajr, Tandgovian Maroun, Arvand and Chemi Baft is about 40 kilometers. The distance between this industrial town and Bandar Mahshahr city is about 3.5 kilometers.

2-1- ACCESS TO INFRASTRUCTURES

Currently water, gas and electricity infrastructures are available in this estate. It is also well-located in terms of access to transportation. This place is 500 km away from Mahshahr-Handijan road and 40 km from Imam Khomeini port. The distance from Mahshahr airport is 11 km.



Figure (4): The Province location in Iran



Figure (5): The Province location in Iran

Table (1): access to infrastructures

No.	Required Infrastructure	Distance From Project Status	Location Of Infrastructure Provision
1	Water	0.2	Mahshahr port industrial Estate
2	Electricity	0.2	Mahshahr port industrial Estate
3	Gas	0.2	Mahshahr port industrial Estate
4	Telecommunication	0.2	Mahshahr port industrial Estate
5	Main road	0.5	Mahshahr - Hendijan highway
6	Side road	0	Industrial Estate transportation
7	Airport	11	Mahshahr port airport
8	Port	16-40	Mahshahr, Imam Khomeini
9	Railway Station	15	Ahvaz Railway

Edible grade normal hexane is used to extract oil from plant seeds. Therefore, the main consumer of this product are vegetable oil producers. We will explain about the major consumers of edible hexane later in detail. To mention one important fact is that oil producers are scattered all over Iran. Considering the heavy vehicles intended for this project, there is no limitation for the access to target markets. The main input of this process is naphtha which is produced in Bu-Ali Sina Petrochemical and Abadan Refinery. Raw materials can be transferred from these places to the construction site. To recruit qualified engineers, it is possible to use chemical engineering graduates of the existing universities in the province.

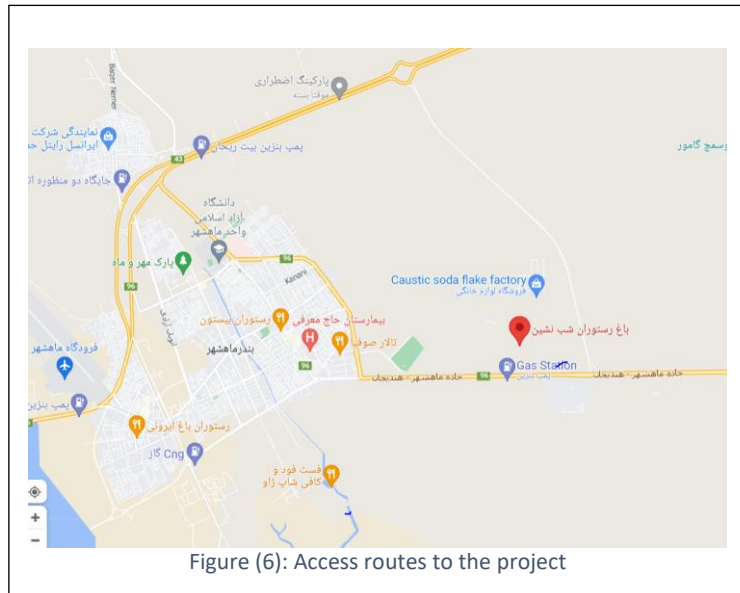


Figure (6): Access routes to the project

3) Technical specifications of the project

3-1- Product

Copolymer is a polymer that is made from two or more different types of monomers that are compatible with each other. The purpose of copolymerization¹ is to improve the quality of the final product. In this way, the polymer can be created with different structures. Many commercially important polymers are copolymers.

Polyvinyl acetate² with the chemical formula $(C_4H_6O_2)_n$ is a compound obtained from the polymerization of vinyl acetate monomers $(CH_3COOCH=CH_2)^3$. This polymer is placed in the category of amorphous, non-crystalline and branched polymers and shows high adhesion in contact with most surfaces. It also has high resistance to ultraviolet rays and oxidation; But it is relatively brittle below the glass transition temperature (about 305°) and very sticky at higher temperatures. This polymer softens at a temperature of about 28 degrees Celsius and loses its brittle state.

Polyvinyl acetate is one of the main components of water-based adhesives such as wood glue, carpet, wood glue, white glue or polyvinyl alcohol glue. PVAc is used in different industries alone or in reactions to prepare other Polymer compounds are used. This polymer is one of the important polymers in the industries of glue, paint, gum, etc. PVAc emulsions are produced on very large scales and provide excellent adhesion to porous surfaces; But they do not perform well on non-porous surfaces. Another important application is in the packaging industry. This material is used as a cheap, non-toxic and odorless adhesive for connecting and sealing high energy surfaces such as paper, cardboard, cotton, wood and many other things.

PVAc is often preferred over other adhesives due to its low price, good light stability and good resistance to yellowing. Among other applications, it can be mentioned as a plasticizer and bulking agent for paint, textile, plastics, cement, etc. It is used as a binder in paper and other industrial coatings, in non-woven fabrics and glass fibers, and in sanitary products such as paper towels. PVAc is used as a reinforcement for porous building stone, especially sandstone.



Figure (7): Polyvinyl acetate

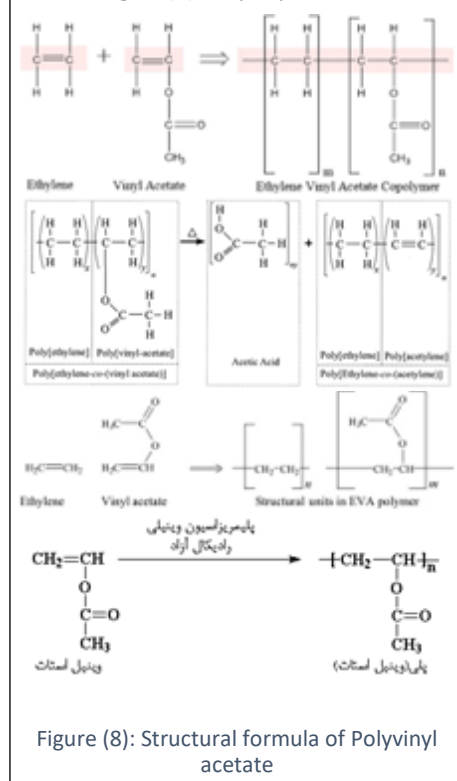


Figure (8): Structural formula of Polyvinyl acetate

1. The process in which copolymer is formed is also called copolymerization.

2. Polyvinyl acetate is an aliphatic synthetic rubber polymer belonging to the polyvinyl ester family.

3. The number of units connected to each other can vary between 100 and 5,000, which means a molecular mass between 850 and 40,000

Polyvinyl acetate molecules do not cross-link, so this substance becomes an insoluble substance and can be dissolved in many solvents other than water. PVAc in most solvents, especially in aromatic hydrocarbons such as benzene and toluene, in chlorinated hydrocarbons such as chloroform, tetra chlorocarbon and Di chloroethyl, in alcohols such as methanol and ethanol, in ethers such as ethyl acetate and butyl acetate and ketones It dissolves in solvents such as acetone and methyl isobutyl ketone. Acids and alkalis are effective on polyvinyl acetate and cause its hydrolysis.

Another application of polyvinyl acetate emulsion is in covers for notebooks and books due to its strong bond, flexibility and non-acidic nature.

Polyvinyl acetate is also used as a raw material for polyvinyl alcohol and polyester resins. Also, vinyl acetate is copolymerized with vinyl chloride and ethylene to produce commercial polymers and with acrylonitrile to produce acrylic threads.

3-2- Project Requirement

3-2-1- Land And Required Infrastructure

For the production of vinyl acetate copolymer, a land area of 22,000 thousand square meters and infrastructure (buildings and other buildings) amounting to 16,000 meters are needed. The specifications of land, main buildings and other required side buildings and investment in them are as described in the table below.

Table (2): Amount of investment in land, landscaping and building

No.	Requirements	Description	Investment Required		Total Cost (Million Rials)
			Required Area	Unit Price of Purchase/Construction	
1	Land purchase 105m * 210 m	Khuzestan, Mahshahr Port city, Mahshahr Port Industrial Estate	22,000	3,500,000	77,000
2	Site preparation and development	According to relative calculations	5,800	5,844,828	33,900
3	Civil works, structures and buildings	Production building	9,000	65,000,000	585,000
		Office and management building	1,500	100,000,000	150,000
		Labor and support building (restaurant, dressing room, prayer room, shower and restroom)	600	60,000,000	36,000
		Water, electricity and gas facilities building	300	100,000,000	30,000
		guard and janitor building	100	70,000,000	7,000
		Other buildings (warehouse, etc.)	4,500	5,000,000	22,500
Total			-	-	941,400

3-2-2- Plant Machinery and Equipment

To produce polyvinyl acetate, vinyl acetate monomer must be polymerized. This polymer can be polymerized by bulk, solution, suspension or emulsion methods⁴. In commercial production, the dominant technique is the emulsion technique. The monomer used for this operation is vinyl acetate, which is one of the important chemical raw materials and is mainly used for the production of PVAc. Vinyl acetate is basically produced as a dispersion in water. The polymerization process (in a steel reactor and at a temperature of 70 to 80 degrees Celsius) involves the reaction between vinyl acetate monomers by immersing them in water. This causes the formation of PVAc emulsion with a milky white color.

The duration of the polymerization process takes 6 to 7 hours and vinyl acetate copolymer is produced each time according to the capacity of the reactor (5 tons). The produced emulsion liquid can be immediately used as vinyl acetate polymer in other products. Polyvinyl acetate is supplied and packaged in 200-kilogram metal barrels, and its powder can be packed in 25-kilogram bags after drying by spray dryer. The supplies and equipment used in the production of polyvinyl acetate are as follows:

Table (3): Plant Machinery and Equipment

No.	Equipment/Machinery	Required investment			Total cost (Million Rials)
		Amount	Purchase Price	Currency	
1	Boiler	10	35,000	(Million Rials)	350,000
2	Steel reactor (5 tons)	10	85,000	(Million Rials)	850,000
3	Condenser	10	45,000	(Million Rials)	450,000
4	Polymerization tank, catalyst and related equipment	20	40,000	(Million Rials)	800,000
5	Storage Tanks for Raw Materials (50 And 30And 20 thousand Liters)	30	2,500	(Million Rials)	75,000
6	Metal structure of tanks	185,000	0.7	(Million Rials)	129,500
7	Electric Pump, Piston Pump, Gear Pump and Dosing Pump	100	500	(Million Rials)	50,000
8	Steel Fittings	10	25,000	(Million Rials)	250,000
9	Other Primary Equipment	1	35,500	(Million Rials)	35,500
Total		-	-	-	2,990,000

4. Emulsion technique is chosen in the present design. Therefore, the final product is in the form of a suspension and is packed in metal barrels. Although in other methods the product is in powder form. If there is a need for powder packaging in the present design, a spray dryer and a bag filling machine should be added to the equipment of the design.

For the engineers needed for this project, graduates of the chemical engineering field of universities in the province can be used. This industrial unit does not need complex equipment and most of them such as material storage tanks, condenser, boiler and reactor steel are produced by many factories inside Iran. Considering the relative cheapness of the raw materials of this equipment and the cheapness of labor, the cost of this equipment is much more economical compared to foreign manufacturers.

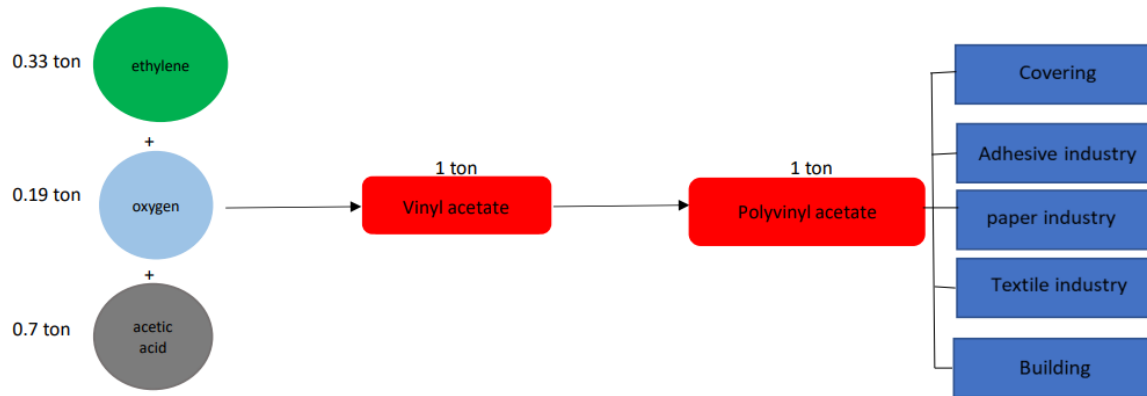


Figure (9): Production steps of vinyl acetate monomer and polymer and its application

Table (4): Machinery and accessories

No.	Equipment/Machinery	Unit of measurement	Type of equipment	Required investment		Total cost (Million Rials)
				Amount	Unit Price (Million Rials)	
1	Distribution Of Electricity / Demand Price	Kw	Facility	700	6	4,200
2	Several Electrical Cables	M	Facility	2,000	4.0	8,000
3	Electrical Equipment	Amount	Facility	100	40	4,000
4	The Cost of Panel Boards and Related Electrical Equipment	Amount	Facility	100	320	32,000
5	Water Branch	-	Facility	1	2,000	2,000
6	Other Water Conveyance Equipment	Amount	Facility	1	3,000	3,000
7	Firefighting, Safety and Health Equipment, etc.	Capsule	Facility	50	30	1,500
8	Gas Piping	M	Facility	2,000	5	10,000
9	Gas Branching	-	Facility	1	5,500	5,500
10	Water Heater and Heater	Machine	Facility	5	350	1,750
11	Ventilation Systems for Toilets and Bathrooms	Fan	Facility	10	36	360
12	Air Conditioner	Set	Facility	10	850	8,500
13	Evaporative Cooler	Set	Facility	10	250	2,500
14	Gas Heater	Ton	Facility	10	100	1,000
15	Industrial Heater	Machine	Facility	20	150	3,000
16	2.5 Ton Pallet Jack with Scale	Machine	Vehicle	10	360	3,600
17	3 Ton Forklift	Machine	Vehicle	3	16,000	48,000
18	ZAMYAD Diesel Van	Machine	Vehicle	3	6,000	18,000
19	SAMAND Soren Car	Machine	Vehicle	3	7,000	21,000
20	Operation Equipment	Machine	Equipment	1	5,000	5,000
21	CCTV System	Set	Facility	1	5,000	5,000
22	Office Stuff	Set	Office Equipment	22	1,800	36,000
23	Restaurant Equipment	Set	Office Equipment	45	30	1,050
24	Medical Equipment	Set	Office Equipment	1	2,000	2,000
25	Other Facilities	-	Facility	1	2,040	2,040
Total				-	-	229,000

3-2-3- Raw Materials and Intermediate Parts

In the present plan, the main raw material is vinyl acetate monomer, which will be supplied from the domestic market (currently Shazand Petrochemical). It is worth noting; Since 2009, a project under construction in the field of vinyl acetate monomer production has been implemented in Mahshahr port and is expected; It will be put into operation soon and the access to the raw material of the present project will be easier. The capacity of the plan under construction to produce vinyl acetate monomer is 160,000 tons per year.

In the current situation, vinyl acetate monomer is bought and sold in the commodity exchange and the transaction price is determined there. The specifications of raw materials and packaging for the production of vinyl acetate copolymer are as described in the table below.

Table (5): Costs of Raw Material for Production

No	Title	Producti on quantity at maximum performance	Unit	Average price of the perchance unit (Rials)	Purchas e unit	Consumpti on per product unit	Amount of consumption in nominal capacity (cubic meters)	The cost of raw materials at the maximum nominal capacity (Million Rials)
1	Mono vinyl acetate (Shazand Petrochemical)	45,000	Ton	313,153,000	Ton	0.4750	21,375	6,693,645
2	Antifoam	45,000	Ton	600,000,000	Ton	0.004	180	108,000
3	Antifreeze/ Ethylene glycol	45,000	Ton	1,100,000,000	Ton	0.005	225	247,500
4	Other chemicals	45,000	Ton	450,000,000	Ton	0.005	225	101,250
5	Emulsifier	45,000	Ton	1,500,000,000	Ton	0.011	495	742,500
6	Water	45,000	Ton	0	Cubic meter	0.50	22,500	0
7	Packaging materials (200 kg barrel)	45,000	amo unt	3,000,000	amount	5	225,000	675,000
Total		-	-	-	-	-	270,000	8,567,895

3-2-4- Management and human resource

For the production of vinyl acetate copolymer, 70 manpower will be needed in the production and management and support department as described in table (6).

Table (6): Management and Human Resource

No	Level of skill	Number of staff	Average basic salary
1	Senior	26	215,000,000
2	Mid-level	9	120,000,000
3	Junior	35	104,615,385

Number Of Direct Mid-Level Staff Required	9	Person
Number Of Direct Junior Staff Required	35	Person
Number Of Direct Senior Staff Required	26	Person
Total	70	person

4) Ownership and legal permissions

4-1- land ownership

The suitable place to implement the project is in Bandar Mahshahr industrial estates. The right to exploit the land in the mentioned industrial town is 3,500,000 Rials. The ownership of the land will be given to the investors after the exploitation. It is worth noting; This town is subject to the rules and regulations of developed industrial towns. In order to take industrial land in this town, it is necessary for the investors to obtain the legal permits mentioned in paragraph 3-4. Of course, if the construction in the settlement is rejected; It's better; This unit should be established in Bandar Imam economic zone.

4-2- Intellectual Property and Concessions

In order to produce vinyl acetate copolymer, relatively high technical knowledge is not required. Technical knowledge is considered to exist in the country. The production must be in accordance with the national standard 2782.

4-3- Legal permissions

In order to produce this product, we need similar legal permits (visiting permit and exploitation permit) from the Khuzestan Province Industry and Mining Organization, and an environmental permit. It is worth noting; Material transfer processes are suitable in steel pipes and tanks and produce in conditions that do not transfer material outside. Polyvinyl acetate can be stored under normal conditions for at least six months. It is recommended to make sure that the lid of the barrels is completely closed and it is removed from freezing. Polyvinyl acetate is not dangerous for the environment and its contact with the skin does not cause itching and inflammation. This product does not have apparent toxicity, but direct contact with skin or eyes should be avoided. The processing area should also have a proper ventilation system so that the vinyl acetate monomers can be easily removed from the area. Since this substance is used in many products, contact with it can happen easily. But as mentioned before, PVAc has caused sensitivity in humans in rare cases.

5) market research and competition

5-1- Target market introduction

Currently, according to official statistics, 4 active units in the field of vinyl acetate copolymer production with ISIC code 24131162 are reported as described in the table below. Among them, BITA SARKHS SHARQ Chemical Industries in the special economic zone with 6 thousand tons of nominal capacity and Resinfam Company in Isfahan province with 5 thousand tons of nominal capacity per year have the largest production capacity. The total nominal production capacity of vinyl acetate copolymer in the country is equal to 12.6 thousand tons in the year 1400.

Table (7): Active units of vinyl acetate copolymers

province	Title of unit	Year	Nominal capacity (ton)
Economic Special Zone	BITA SARKHS SHARQ Chemical Industries	1389	6,000
Isfahan	RESINFAM	1390	5,000
Alborz	MAHAB SHIMI ALVAND	1384	2,750
Khorasan Razavi	GHOLAMREZA Farvardin (A real person)	1388	900
Total			14,650

Also, there is only one unit with a plan in the field of vinyl acetate copolymer production (the relevant license was taken in 1400 under the name of Mohammad Reza Ebrahimi in Central Province) and so far, no physical progress has been recorded for it.

Table (8): Units with plans to produce vinyl acetate copolymers with ISIC code 2413412302

province	Title of unit	Year	Nominal capacity (ton)
Markazi	Mohammad Reza Ebrahimi	1400	2,000
Total			2,000

The customs tariff code of vinyl acetate copolymers in basic forms is 39013000. According to the customs statistics, the country's import amount in the table below has increased and is reported to be around 12.8 thousand tons in 2019. At present, a large amount of the country's needs is met from import sources.

Table (9): Import of vinyl acetate copolymers in primary forms with tariff code 39013000

Year	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399
Imports volume(ton)	9,627	9,308	10,621	10,920	10,603	10,654	1,232	17,151	Not available	12,877
Value (million Rials)	279,517	346,054	1,052,794	606,649	531,316	549,578	101,001	1,331,387		1,002,479
Value (1000 USD)	25,582	20,788	42,117	22,826	17,925	17,506	2,949	31,738		23,869

According to the customs statistics, the amount of the country's export was also insignificant, and in 2019, no statistics were recorded for the export of vinyl acetate copolymer.

Table (10): Export of ethylene and vinyl acetate copolymers in primary forms with tariff code 39013000

Year	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399
Export volume(ton)	710	73	66	0	5	0	44	119	Not available	0
Value (million Rials)	11,888	1,189	1,797	0	180	0	2,769	10,570		0
Value (1000 USD)	1,078	96	73	0	6	0	79	252		0

The global market of vinyl acetate in 2018 is calculated and predicted to be 7442.9 million dollars; to reach USD 12,143.2 million by 2026 and grow at a CAGR⁵ of 6.3% from 2019 to 2026. Due to the increase in the consumption of these compounds in the electrical, electronic and packaging sectors, Asia and the Pacific have accounted for the largest share in 2018. Moreover, China, Japan, and South Korea are the leaders in the electronics sector, thus increasing the demand for vinyl acetate.

5. Abbreviated "Compound annual growth rate" means annual compound growth rate, a special term for a business and investment that determines a fixed amount for the return of capital in a period of time with the ratio of geometric expansion

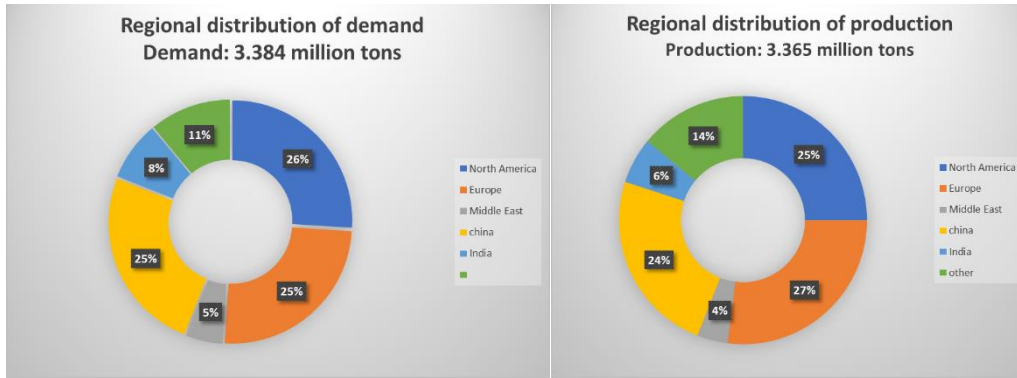


Figure (10): Regional distribution of supply and demand

Market conclusion: Polyvinyl acetate is one of the most widely used intermediate products in the world's chemical industries. This polymer is obtained from vinyl acetate monomer (VAM) and often in an emulsion polymerization process. Vinyl acetate is also from the reaction of acetic acid and Oxygen is produced with ethylene acetylene. In 2019, about 62% of vinyl acetate was supplied to produce polyvinyl Acetate has been used.

The amount of polyvinyl acetate production in 2020 is reported to be 3 million and 365 thousand tons per year. China alone It is the largest producer and consumer of polyvinyl acetate in the world. North America and Europe also due to high demand in their complementary industries, they are the main producers and consumers of this substance.

The biggest companies producing polyvinyl acetate in the world are Arkema, Celanese, Dairen and DOW.

The interregional trade of polyvinyl acetate with a volume equal to 207 thousand tons per year (equivalent to 6% of consumption) shows that this material in the international level of tradability is low. Of course, it is important to mention that the total trade between countries is probably more than

This is the amount.

8) Financial Plan

8-1- Cost Estimation

Generally, there are two ways to fundraise for this project, fixed capital and initial working capital. The required investment before utilization is provided through fixed capital. Initial working capital will be used during utilization. Fixed capital includes, purchasing land, construction and landscaping, machinery and equipment, facilities, office stuff and pre-production costs. These types of costs are incurred at the beginning and before operation and are consumed during the life of the project according to their service life. Working capital includes the capital required during the operation of the project. The working capital of a production unit is the set of facilities, inventories and work in progress, as well as the liquidity required for the exploitation of fixed capital in order to maintain the operation.

Determining the basic amount for inventories, work in progress and claims depends on the supply, production and sales capacity and business environment. In this section, the evaluation and estimation of the required investment (based on the price of the base year 1401 SH) is proposed.

Table (12): Cost Estimations

No.	Subject	Amount (Million Rials)
1	Total Fixed Investment Costs	4,713,600
2	Total Net Working Capital Requirements	1,112,006
3	Total Production Costs (Annual)	9,803,149
4	Depreciation	455,223
5	Total Investment	5,825,606
6	Unit Cost (By Product Type)	-
7	Vinyl acetate copolymer	220

Table (13): Fixed Capital Estimations (Capital Costs)

No.	Subject	Cost (Million Rials)	
1	Purchasing land	77,000	
2	Landscaping and land improvement	33,900	
3	Civil operations and construction of buildings	830,500	
4	Production machinery and equipment	2,990,000	
5	Service equipment	229,000	
6	Protection and environmental equipment	0	
7	Overhead costs	0	
8	Pre-Production Expenditure (As described in Table (15))	Prior to investment studies	6,860
		Project management	121,254
		Obtaining technology	8,986
9	Unexpected costs	416,100	
Total		4,713,600	

The primary items included in working capital are:

- Raw materials (domestic and foreign): in order to prevent interruptions in the production flow according to the type of industry, the amount of production, the source and the number of materials, the necessary time interval from the stage of ordering to the stage of receiving the materials, the time of delivery and transportation, the amount. Raw materials, auxiliary and packaging required as a source of working capital items and its storage duration for a period of time are determined. In the present plan, the material inventory cover period is considered to be equal to 30 days.
- Manufactured goods and in the process of manufacture: taking into account the stages and methods of production, the time required to manufacture the goods and keep them in the examined warehouse, and the related costs are considered as working capital. In the present plan, the coverage period for the product under construction and the manufactured product is 1 and 10 days, respectively. With this calculation, the total stock of goods is equal to 41 days.
- Claims of expected funds from sold products that are collected in a short period of time. The duration for expected funds must be determined. According to the economic condition of Iran, cash is preferred.
- Revolving fund to finance the company's current expenses is considered as cash balance or revolving fund for a period of time in working capital based on production costs (without considering the cost of raw material production and depreciation). 30 days is considered in this plan.

Table (14): Total Net Working Capital Requirements (Production Costs)

No.	Subject	Amount (Million Rials)
1	Raw Materials Inventory	713,991
2	Work In Progress	24,662
3	Finished Product	259,828
4	Accounts Receivable	0
5	Cash-In-Hand	113,524
6	(Commercial Accounts Payable)	0
Total Net Working Capital Requirements		1,112,006

Table (15): Pre-Production Expenditure

No.	Subject	Description	Total (million Rials)
1	Incorporation	-	50
2	Obtaining Licenses / Production License	-	800
3	Studying, Consulting, Research and Development, Traveling, Visiting and Participating In Local Exhibitions, Etc.	1.5 thousandth of the investment costs of the project	6,860
4	Property Insurance	2 thousandth of depreciable fixed assets	9,150
5	Survey Fee, Financing, Contract and So On	Survey fee 0.5 thousandth, other 2.5 thousandth	10,980
6	Cartography, Supervising	2 thousandth of contract expenses	7,710
7	Staff Training	Equivalent to 3 days of Staff salary	1,276
	Wages And Salaries During the Construction	Equivalent to the salary of 15 personnel in 36 months	97,528
	Other Expenses	2.0%	2,746
Total			137,100

8-2- Sales Revenue

The global price of vinyl acetate copolymer in the market changes according to the fluctuations of desire. In the current situation, vinyl acetate copolymer and similar products similar to vinyl acetate chloride are offered in the domestic market on the energy exchange. The selling price based on the last release of this product to the market is equal to 342631 Rials per weight. Based on this (according to the production plan), the total sales amount of the project in 1405 at the fixed price of 1401 is estimated to be 3,855 billion Rials. This figure will increase in the next watt due to the increase in production years and will increase by more than 15.18 billion Rials.

Table (16): Project Revenue in The First 5 Years of Production Phase (Billion Rials)

No.	Subject	Q ₁	Q ₂	Q ₃	Q ₄	Total 1 st Year	Total 2 nd Year	Total 3 rd Year	Total 4 th Year	Total 5 th Year
1	Vinyl acetate copolymer	0	0	1,927	1,927	3,855	10,793	12,335	13,877	15,418

8-3- Length of Production Phase

The construction period of the plan is equal to 36 months and it is considered to start from the second 6 months of 1402. Based on this, the operation of the project is expected in the second six months of 1405. The duration of the project is considered to be 5 years.

Table (17): Planning Horizon

Title	Month	-	year	Length of construction phase (months)	Start of phase (months)	Length of production phase (years)
Project identification	11	/	1401	36	6	5
Beginning of construction phase	7	/	1402			
Beginning of production phase	7	/	1405			
End of production phase	12	/	1409			

8-4- Break-Even Analysis

From an economic point of view, break-even point analysis is an important technique that is used to study the relationship between costs, income and profit. The break-even point is the point at which total cost and total revenue are equal. In other words, it is used to analyze the effect of product volume change on the profit. The break-even point is calculated for 100% of practical capacity (year 1409SH onwards) below.

$$\text{Break-even sales value (Rials)} = \frac{\text{Total fixed costs}}{1 - \frac{\text{Total variable costs}}{\text{Sales value}}}$$

$$\text{The number of sales at the break-even point} = \frac{F_C}{S - V_C}$$

FC = Total Costs VC= Average Variable Costs Q = Quantity of Sales S = Unit Price

$$\text{Break-even sales value} = \frac{694,694}{1 - \frac{9,093,963}{15,418,395}} = 1,693,602 \text{ (Million Rials)}$$

$$\text{The number of sales at the break-even point} = \frac{694,694,422,500}{489,472,857 - 288,697,246} \approx 3,460$$

$$\text{Break-even ratio (\%)} = \frac{1,693,602}{15,418,395} = 11.0\%$$

Table (18): Project break-even point estimation

(Million Rials)

Title	Production 7/1405-12/1405	Production 1406	Production 1407	Production 1408	Production 1409	Production 1410	Production 1411
Sales revenue	3,854,599	10,792,877	12,334,716	13,876,556	15,418,395	15,418,395	15,418,395
Variable costs	2,377,728	6,395,023	7,294,669	8,194,317	9,093,963	9,093,963	9,093,963
Variable margin	1,476,870	4,397,854	5,040,047	5,682,239	6,324,432	6,324,432	6,324,432
Variable margin ratio (%)	38	41	41	41	41	41	41
Fixed costs	364,460	660,141	678,454	696,767	694,694	684,619	684,619
Break-even sales value	951,231	1,620,069	1,660,410	1,701,569	1,693,602	1,669,040	1,669,040
Break-even ratio (%)	24.7	15.0	13.5	12.3	11.0	10.8	10.8

- According to COMFAR Results

Based on the calculations of COMFAR software, the break-even point including operating and non-operating costs, is 1,693 thousand billion Rials and it will be achieved in the 11% of the practical capacity.

In the mentioned formula, the break-even point is determined by the relationship between fixed costs and the difference between unit sales price and unit variable costs. Therefore, three practical results are obtained from it:

- The higher the fixed costs, the higher the break-even point.
- The greater the difference between unit sales price and variable operating costs, the lower the break-even point. In this case, fixed costs are absorbed faster through the difference between unit sales price and unit variable costs.
- One of the break-even points is disproportionate. Since it makes the company vulnerable to changes in production (sales) levels.

8-5- Cost-Benefit Analysis

In project analysis, one of the most common methods is the **Benefit-Cost Ratio**. In this method, the ratio of the current value of possible benefits to the current value of costs is obtained. If this ratio is greater than one, the plan has economic justification for implementation. In terms of this index, the plan has favorable conditions.

Net Present Value is one of the other evaluation methods which is calculated according to the following relationship:

$NPV = \text{The Present Value of The Total Cost of The Period of Construction Phase and Production Phase} - \text{The Present Value of The Total Income of Construction Phase and Production Phase}$

$NPV = \text{The Present Value of The Fixed Assets Depreciation} + \text{Initial Investment} - \text{The Present Value of The Future Cash Flows}$

The **net current value** of the project at a discount rate of 30% is over 2,506 billion Rials, which shows that the project is economically feasible.

One of the other methods of evaluating investment plans **internal rate of return**. In fact, the internal rate of return is the interest rate or the discount rate in which the current value of all the plan benefits is equal to the current value of its expenses.

According to the calculations, the internal rate of return of the project is estimated at 51% and compared to the Minimum Attractive Rate of Return, it is favorable.

Table (19): Project Return Index

Index	Amount	Unit of measurement
The Present Value of The Total Cost of The Period of Construction Phase and Production Phase	15,289,699	Million Rials
The Present Value of The Total Income of Construction Phase and Production Phase	17,796,564	Million Rials
NET PRESENT VALUE (NPV)	2,506,865	Million Rials
Cost-benefit RATIO (B/C)	1.16	-
INTERNAL RATE OF RETURN (IRR)	51.0%	Percent
NPV RATIO (PI)	0.75	Rial per Rial of investment
NORMAL PAYBACK	2.24	Year

Profitability Index (PI) indicates how much economic profit will be obtained for each unit of money invested during the lifetime of the project.

Project Investment payback is the period of time required to recover the project investment from net income, measured in years. In other words, it shows the length of time taken for the initial investment to be returned. This index shows the speed of investment return and the level of project risk coverage. The ROR (simple) of the project is estimated according to the calculations of 2.24 years after operation (equal to the year 1407).

8-6- Sensitive Analysis

In the sensitivity analysis of the plans, the percentage of changes in the internal rate of return (IRR) is measured in relation to the change in some basic parameters and variables. In this plan, the analysis has

been carried out by major variables such as sales, fixed and operating costs. Table (20) shows the results of the sensitivity analysis regarding the variables of sales income, fixed assets and operating costs.

8-7-1- Sales Revenue

Changes in sales revenue are mainly caused by alteration in two variables: planned sales amount and product sales price. The results of the sensitivity analysis regarding sales income show; 4% increase in sales revenue of the plan, the internal rate of return will increase from 51% to 55%. On the contrary, in the case of a 4% decrease in sales revenue, the internal rate of return of the project will decrease to 47%.

Table (20): Sensitivity Analysis (Percentage of IRR changes caused by sales revenue, fixed assets and operating costs alteration)

Variation (%)	Sales revenue	Increase in fixed assets	Operating costs
-20%	27%	60%	63%
-4%	47%	53%	54%
0%	51.0%	51.0%	51.0%
4%	55%	50%	48%
20%	70%	44%	37%

8-7-2- Fixed Assets

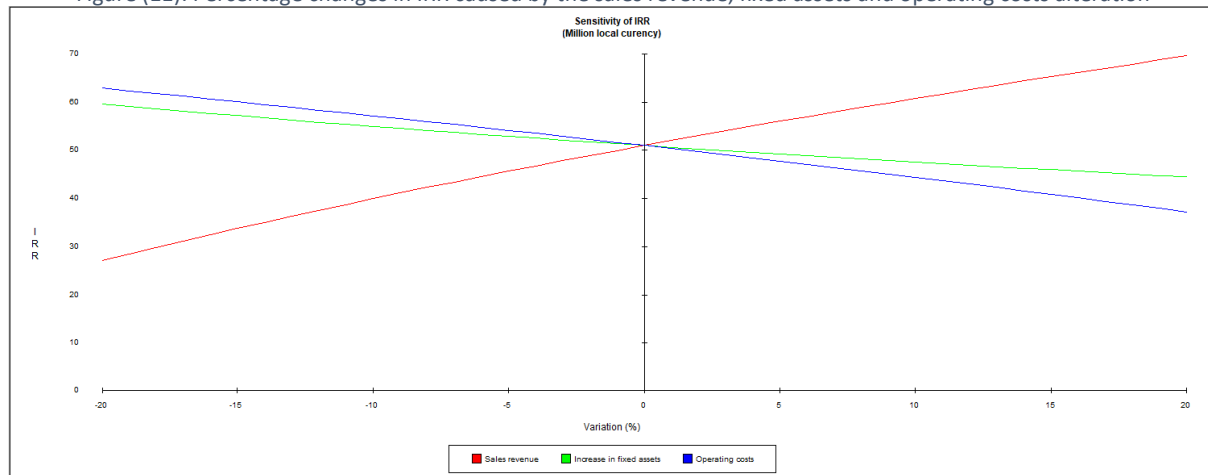
The change in the fixed assets is due to the fixed costs of the initial investment alterations. The results of the sensitivity analysis according to the fixed costs of the plan have been done and it shows that in case of an unexpected 20% increase in the fixed capital costs of the project, the internal rate of return will decrease from 51% to 44%. Conversely, if there is a 20% reduction in the fixed capital costs, the internal rate of return will increase and reach 60%.

8-7-3- Operating Costs

The operating costs of the plan is one of the crucial items in terms of sensitivity analysis regarding its changes. Therefore, unexpected and possible changes should be investigated.

The change in project operating costs is mainly caused by changes in raw material, supply, human resource and finally changes in other overhead costs of projects. If these parameters change, it can be as a result of the change in the technical coefficients of product production or the change in their purchase price. The sensitivity analysis indicates that in case of a 4% increase in the operating costs, the efficiency rate of the plan will decrease to 48%. On the contrary, if the total operating costs of the project are reduced by 4%, the internal rate of return will increase to 54%. Finally, the results of the sensitivity analysis show that the current project has a very high sensitivity to changes in sales revenue (changes in sales amount or sales price) and more considerations should be taken in this regard.

Figure (11): Percentage changes in IRR caused by the sales revenue, fixed assets and operating costs alteration



As you can see, the slope of the IRR change curve is higher relative to the changes in sales revenue compared to other items while the slope of the IRR change curve is lower relative to the changes in fixed assets, which indicates the greater sensitivity of the plan's internal rate of return to sales revenue and its lower sensitivity relative to operating costs and fixed assets.

8-7- Conclusion

The implementation of the project is planned by acquiring a land with an area of 22 thousand square meters and carrying out construction with an infrastructure amounting to 16 thousand square meters. The total investment in land, Civil works, structures and buildings is estimated at 941.4 billion Rials and in Plant machinery and equipment and auxiliary equipment is estimated at 3,635.1 billion Rials. The total pre-production expenditures are also estimated at 137.1 billion Rials. So, the total fixed investment costs (required) are 4,713.6 billion Rials and the total working capital (required) for the project is 1,112 billion Rials. The total investment is provided with the company's shareholders.

The project is expected to be sold at fixed prices equal to 3,855 billion Rials in 1405. This number will rise in the following years due to the increase in production capacity and reach a maximum of 15,418 billion Rials. The net profit of the plan will be positive in all years. The profit is estimated to be 890 billion in 1405 which will be greater in the following years and reach a maximum of 4,511 billion Rials. The average annual profit of the plan is 3,555 billion Rials and the average profit margin is estimated to be 28.6%.

The internal rate of return (IRR) of the project is estimated at 51% and the rate of return is estimated at a maximum of 2.24 years. Also, the net present value of the project's cash flows (NPV) is positive and, considering the expected interest rate of 30%, is equal to 2,507 billion Rials.

The liquidity status of the plan and the payment of dividends to the shareholders from the company's funds are also acceptable. Therefore, if the assumptions and predictions are fulfilled, this plan has favorable profitability and according to the financial results obtained, its implementation is recommended. The economic features of the plan are summarized as follows.

Table (21): Summary of Economic Features

Nominal Capacity and Unit of Measurement	Product Name	Title Of the Project with ISIC Code	Title Of the Project
45,000 tons	Vinyl acetate copolymer	Vinyl acetate copolymer (2411512657)	Vinyl acetate copolymer production plan
Required Human Resource (Person)	Equity Shares (Million Rials)	Total Fixed Capital (Million Rials)	Project Duration
70	1,112,006	4,713,600	36
B/C	Applicant Available Cash (Million Rials)	Net Present Value (NPV) (Million Rials)	IRR (%)
1.2	5,825,606	2,506,865	51.0%
ROI (%)	NPV Ratio / Profitability Index (Rial per Rial invested)	Dynamic Payback Period (Year)	Normal Payback Period (Year)
62	0.75	3.57	2.24
Average Assets Turnover Ratio	Average Net Profit Margin (%)	Average Annual Profit (Million Rials)	Maximum Annual Sales (Million Rials)
1.20	28.6%	3,555,034	15,418,395

8-8- Estimation of currency rate fluctuation during the project implementation

The currency rate at the time of evaluation is included as described in Table (22). In the present plan, it is an important part of the cost of buying foreign equipment and requires foreign currency. Electrode purchase prices are also considered in terms of currency. But the product will be sold mainly in the domestic market. But domestic sales prices adjust very quickly with exchange rate fluctuations. Therefore, exchange rate fluctuations regarding the purchase of foreign equipment will be compensated to a large extent by the income from sales, and exchange rate fluctuations will have the least impact on the evaluation results.

Considering the currency of buying equipment and raw materials, both in the construction phase and in the implementation phase, the following are significant:

- As long as the financing of the project is through foreign currency sources, the number of financial resources required will not change much.
- If the financial resources of fixed and circulating capital are provided through internal sources, the increase in the exchange rate will directly increase the fixed and circulating investment costs and will make it difficult to provide financial resources for the implementation of the plan.

Table (22): Currencies exchange Rate

Unit of Measurement	Unit Price	Currency
Rials	413,204	USD
Rials	451,531	EURO

Exchange rate of Central Bank, Exchange Trading System (ETS) dated 05/25/1402

9) Investment Required, method of fundraising and guarantees

9-1- Foreign Currency Required

The total fixed capital of the plan is Riyal.

Table (23): Foreign (Fixed) Currency Required

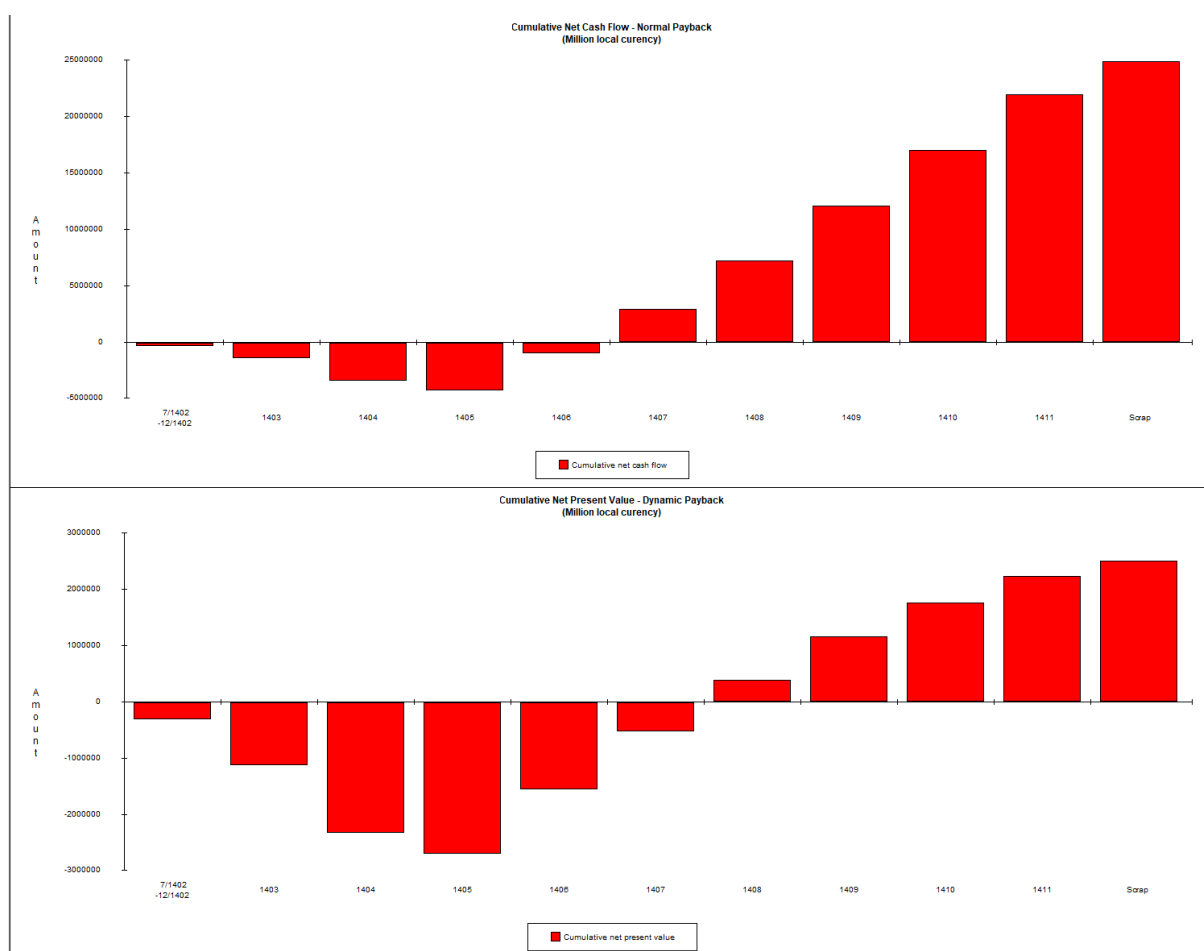
No.	Year	Required Investment
1	Year 1(The second half of 1405 SH)	0
2	Year 2	0
3	Year 3	0
4	Year 4	0
5	Year 5	0

9-2- Model Of Partnership and Fundraising

Participation in the present project and its fundraising process is predicted to be in the form of establishing a company inside Iran. The total required investment is predicted through the investor's contribution. Financing through local banks has not been included in the fundraising process.

9-3- Payback Period

The payback period is the period of time when the initial investment of the plan is compensated from the annual cash funds. The payback period (simple) of the plan is estimated to be 2.24 years (equal to 1407) according to the calculations of CAMFAR.



Dynamic Payback Period of the plan is also estimated at 3.57 years.

10) Incentives, features and benefits of the plan

Some of the financial supports for production companies are loans and bank facilities and tax exemptions which can facilitate the project implementation and provide the favorable condition for investment. In the following, some of these supports will be discussed.

One of the important bank facilities for production units is the long-time repayment period loans up to 70% of fixed capital by the Iran's state banks. This amount can be increased up to 90% for deprived areas if foreign machinery is used. The interest rate of long-term facilities in the industry sector is 23%, which in case of financial prudence, only a part of the interest can be repaid. The repayment period of long-term bank facilities is up to 8 years according to the production plan, the type of technology and the possibility of product exportation.

Another important bank facility is short-term bank loans (6 to 12 months) to use as working capital needed to carry out production processes, which will be provided up to 70% by bank communities. Obtaining short-term facilities to this extent depends on gaining the trust of the operating banks and having an acceptable financial history.

Tax exemption is another incentive for investors to establish factories. To name a few;

- Tax exemption for up to 10 years for implementation in deprived areas
- Tax exemption for up to 4 years for implementation in industrial towns

Investments in the project during implementation is of the investments in developed towns with industrial and mining activities. Since it is located within 30 kilometers of cities with more than 300,000 people, it doesn't have any tax exemption. But if it establishes in another industrial town within a range of more than 30 kilometers from cities with a population of more than 300 thousand people, it can get exempted from Article 132 of the Direct Taxes Law and up to 80% until four years after the date of operation from Article 105 (Direct Taxes Law)⁶.

So, the effective performance tax rate (annual profit) can be reduced to 4% in the first 4 years, and then it will be considered on the basis of 20%. Obviously; If the project location is in one of the deprived areas, it will be subject to 10 years of 100% exemption.

If the manufactured products are sold in foreign markets (provided that they are in excess of the domestic market's needs), the plan's export earnings are subject to the exemption of Article 141. According to Article 141, 100% of the income from exports is exempt from tax.

Obviously, If the legal personality of the partnership is defined as a public company accepted in the stock exchange market during its operation (in such a way that its shares can be traded with stock brokers), this type of company is subject to Article 143 of the Direct Taxes Law and up to 10% of the company's tax will be exempted.

6 - The exemptions of this article will not include the income of production and mining units located within a radius of 120 kilometers from the center of Tehran and 50 kilometers from the center of Isfahan, 30 kilometers from the centers of provinces and cities with more than 300 thousand people (according to the latest census).

(Attachment Number 2)

Summery Sheet

Project introduction	
1. Project Title:	Vinyl acetate copolymer production plan
2. Sector:	Production sub-sector: Industry
3. Products/services:	Vinyl acetate copolymer
4. Location:	Khuzestan province- Mahshahr Port Industrial Estate
5. Project description:	<p>The implementation of the project is planned by acquiring a land with an area of 22 thousand square meters and carrying out construction with an infrastructure amounting to 16 thousand square meters. The total investment in land, Civil works, structures and buildings is estimated at 941.4 billion Rials and in Plant machinery and equipment and auxiliary equipment is estimated at 3.635.1 billion Rials. The total pre-production expenditures are also estimated at 137.1 billion Rials. So, the total fixed investment costs (required) are 4.713.6 billion Rials and the total working capital (required) for the project is 1.112 billion Rials. The total investment is provided with the company's shareholders.</p> <p>The project is expected to be sold at fixed prices equal to 3.855 billion Rials in 1405. This number will rise in the following years due to the increase in production capacity and reach a maximum of 15.418 billion Rials. The net profit of the plan will be positive in all years. The profit is estimated to be 890 billion in 1405 which will be greater in the following years and reach a maximum of 4.511 billion Rials. The average annual profit of the plan is 3.555 billion Rials and the average profit margin is estimated to be 28.6%.</p> <p>The internal rate of return (IRR) of the project is estimated at 51% and the rate of return is estimated at a maximum of 2.24 years. Also, the net present value of the project's cash flows (NPV) is positive and, considering the expected interest rate of 30%, is equal to 2.507 billion Rials.</p>
6. Annual Capacity:	45000 ton

Project Status	
7. Local/internal raw material access:	100%
8. Sales:	15,418,395
Anticipated local market:	100%
Anticipated export market:	0%
9. construction period:	36 months
10. project status:	<ul style="list-style-type: none"> - Feasibility study available? <p>Yes. The feasibility of the project has been evaluated from different aspects and the results of the feasibility study are favorable in terms of market, engineering, financial and economic indicators.</p> <ul style="list-style-type: none"> - Required land provided? <p>Yes. Currently, there is industrial land in Mahshahr Industrial Estate, and it has been selected based on geospatial criteria for the implementation of the project.</p> <ul style="list-style-type: none"> - Legal permission (establishment license, foreign currency quota, environment) taken? <p>Currently, no legal permission is taken so far. According to the investigations, it is possible to obtain legal permission and it has the necessary conditions for obtaining environmental permits.</p> <ul style="list-style-type: none"> - Partnership agreement concluded with local/foreign investor? <p>No</p> <ul style="list-style-type: none"> - Agreement with local/foreign contractor(s) concluded? <p>No</p> <ul style="list-style-type: none"> - Infrastructural utilities procured? <p>If the project is established in Mahshahr Port Industrial Estate, infrastructure facilities such as water and electricity, roads, etc. are available.</p> <ul style="list-style-type: none"> - List of know-how, machinery and equipment concluded? <p>To recruit qualified engineers, it is possible to use chemical engineering graduates of the existing universities in the province. There is no complex equipment needed for this project and most of them, such as material storage tanks, heat exchangers and reactors are produced by several factories inside Iran. Considering the low cost of raw materials for this equipment along with the low-cost labor, the cost price is much more efficient compared to foreign manufacturers.</p> <ul style="list-style-type: none"> - Financing agreement for machinery, equipment and know-how concluded? <p>No</p>

Financial structure

11.

Financial table:

Description	Local Currency Required			Foreign Currency Required	Total Euro
	Million Rial	Exchange Rate	Euro		
Total Fixed Investment Costs	4,713,600	451,531	10,439,150	0	10,439,150
Total Net Working Capital Requirements	1,112,006	451,531	2,462,746	0	2,462,746
Total Investment	5,825,606	-	12,901,896	0	12,901,896

- Value Of Foreign Equipment/Machinery:	0	Euro		
- Value Of Local Equipment/Machinery:	6,621,915	Euro		
- Value Of Foreign Technical Know-How:	0	Euro		
- Value Of Local Technical Know-How:	0	Euro		
- Net Present Value (NPV):	5,551,923	Euro	Net present values discounted to:	1402
- Internal Rate of Return (IRR):	51.0%	%		
- Normal Payback:	2.24	year		
- Minimum Attractive Rate of Return:	30%	%		

General information

12. Project Type: new Project Explanation / Rehabilitation project
 Name / Company name: -
 Address: Khuzestan province- MAHSHAHR Port Industrial Estate
 Tel: +98 916 3418900 +98 06134451004 Fax:
 Email: mh_rahimzade@yahoo.com Website:
 Local entrepreneur: Private Sector government /public sector