General Department of Economic and Financial Affairs of Khuzestan

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

(Edible Hexane Production Plan))

(Attachment Number 1)

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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 63,238square kilometers. With a population of 4,994 is 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- County

According to the latest national divisions of the Ministry of Interior in 1401SH, this province contains 29counties, 70 districts, 145villages, 90cities and 3special governorates. The latest political divisions of the province are described in Figure (3). **County Mahshahr port** is the center of Mahshahr city. Mahshahr with a population of over 300thousand people, has 6% of the province's population. This city has a mutual border with Hendijan, 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 in 18km from Imam Khomeini Port, 95km from Abadan and 110km from Ahvaz.

Mahshahr port is located in the arid and extra-arid of geographical region in a wide and flat area with 591thousand 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 50degrees 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



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(which transport oil from AGHAJARI to Abadan refinery and from there to Mahshahr port). In the last ten 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 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 proposed land is in Mahshahr port Industrial Estate with the following specifications and an area of about 13,000 square meters. Acquiring industrial land in this place requires approval from ministry of industry, mining and trade, industrial estates company and environment protection agency. One of the reasons for choosing this land is the proximity to important petrochemicals companies. The distance from this town to Imam Port Petrochemical, FAJR, TONDGOOYAN Petrochemical, ARVAND and SHIMIBAFT is about 40 kilometers and about 3.5 kilometers to Mahshahr port





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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.

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				

Table (1): access to infrastructures

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.





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3) Technical specifications of the project 3-1- Product

Hexane with the chemical formula C6H14 is a colorless liquid that has a mild gasoline smell; This chemical is highly flammable and has a very low density; The density of hexane is 0.6548 g/mL and its molar mass is 86.17 g/mol. Due to the non-polar molecule, the organic compound of hexane is not soluble. Hexane is also sensitive to light, heat and oxidizing substances. This compound strongly reacts with substances sodium hypochlorite, chlorine, containing calcium hypochlorite or concentrated oxygen. Hexane is one of the main components of crude oil and natural gas. It can be extracted from light and heavy naphtha, light diesel, BTX (benzene, toluene and xylene) and Raffinate. Hexane is a chemical compound that is used in many industries and laboratories namely furniture, leather and perfume industry, fabric and handicrafts, waterproofing production, shoe manufacturing, as well as the printing and rubber industry. Edible normal hexane is usually produced for non-local consumption. Although it is used in various industries, this toxic substance is very harmful to human health.

Since hexane evaporates quickly and boils at a temperature of 154.4 (F), it is a suitable option for extracting edible oils. The main use of hexane is as a solvent to extract edible oils from edible seeds such as sesame, cotton, flax, soybean, corn, peanut and canola.

In the extraction process, the vegetable oil is mixed with a cold stream of hexane and freezes the oil. After oils separation process, they are being melted and hexane is separated during the evaporation process. This process is also used to reduce the oil in fish. Edible hexane is used as an organic solvent in the solvents manufacturing process. Edible hexane is used as an auxiliary agent in the formation of the geometric shape of tablets in the pharmaceutical industry, which removes the hexane by drying prior to packaging. However, due to the formation of the toxic composition of Hexane-2,5 Dione in the body's metabolism system, it has been omitted from the formulation of pharmaceutical tablets and normal heptane

are used instead. Edible hexane is used in laboratory applications as well as non-polar compounds extraction.







3-2- Project Requirement

3-2-1- Land And Required Infrastructure

To produce hexane, a land with an area of 8,000 square meters and construction infrastructure for production (industrial shed and other buildings) amounting to 3,830 meters is required. The specifications of the land, main buildings and other required side buildings along with the amount of investment are described in the table below.

No.			Inve	Investment Required			
	Requirements	Description	Required Area	Unit Price of Purchase/Construction	(Million Rials)		
1	Land purchase 89 * 90 m	Khuzestan, Mahshahr Port city, Mahshahr Port Industrial Estate	8,000	5,687,500	45,500		
2	Site preparation and development	According to relative calculations	4,000	3,450,000	13,800		
	Civil works, structures and buildings	Production building	2,100	55,000,000	115,500		
		Office and management building	300	80,000,000	24,000		
3		Labor and support building (restaurant, dressing room, prayer room, shower and restroom)	300	60,000,000	18,000		
		Water, electricity and gas facilities building	30	100,000,000	3,000		
		guard and janitor building 50		70,000,000	3,500		
		Other buildings (warehouse, etc.)	1,050	5,000,000	5,250		
		Total	-	-	228,550		

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

3-2-2- Plant Machinery and Equipment

Hexane is produced from crude oil. There are two methods for producing and extracting the organic compound of hexane, which are as follows:

Method 1: By creating a phase balance between the gas and liquid states, heavier hydrocarbons are separated from volatile substances. As a result, hexane is produced.

Method 2: Hexane is separated from other hydrocarbons by using the boiling point. The best method for producing edible normal hexane is the hydrogenation of naphtha. In this way, the extracted hexane aromatics are less than 20 ppm and its sulfur is less than 1 ppm. This aromatic is free of any type of unsaturated hydrocarbon. To obtain it, the following steps are taken:

At first, the naphtha is being heated in a heat exchanger at a temperature of about 70 to 180 degrees Celsius. Then, a stoichiometry of hydrogen is added to the naphtha under a pressure of about 5 to 30 bar. The prepared naphtha and hydrogen feed mixture is passed through a parallel reactor containing nickel catalyst based on alumina. In the following steps, the naphtha will be free of any excess hydrogen in the separator tank. In this way, the resulting material will be edible grade paraffin solvent. The best ratio of aromatics to naphtha in the obtained material is less than 20% of its weight.

Group 81 are used as catalysts in the catalyst reduction tank. Alumina-based nickel catalyst is usually used in the production of edible normal hexane with the amount of about 10 to 70% of its weight.

Achieving pure hexane is complicated and requires high level of technology and knowledge. Some of the old methods of hexane purification are the molecular sieve absorption process (in the way that straight chain paraffin is trapped in the holes of the sieve and the hydrocarbon group passes through them), azeotropic distillation, partial distillation and extractive distillation.

Hexane is being distributed in 220-liter metal barrels. The required equipment for edible hexane production includes,

- Heat exchanger: To heat the naphtha up to a temperature of about 70 to 100 degrees Celsius.
- Parallel reactor: To pass the mixed naphtha with stoichiometry of hydrogen, while this reactor contains nickel catalyst based on alumina.
 - Separator tank: To separate the extra hydrogen removed from the reactor with the aim of obtaining edible grade paraffin solvent.
 - Catalyst regeneration tank: In this tank, Group 8 is used as a catalyst based on a neutral compound.
 - Storage tanks for raw materials: Strong and safe tanks that store raw materials and protect them from the risk of ignition.



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According to the mentioned process, required equipment and machinery are as follows;

Table (3): Plant Machinery and Equipment								
		1	Required investme	ent	Total cost (Million			
No.	Equipment/Machinery	Amount	Purchase Price	Currency	Rials)			
1	Heat Exchanger	1	205,000	يورو	92,564			
2	Parallel Reactor	1	65,000	يورو	29,350			
3	Separator Tank	1	70,000	يورو	31,607			
4	Catalyst Recovery Tank and Related Equipment	1	80,000	يورو	36,122			
5	Storage Tanks for Raw Materials (50 And 30 thousand Liters)	6	1,800	ميليون ريال	10,800			
6	Tanks' Metal Structure	17,500	0.7	ميليون ريال	12,250			
7	Cool Air Mixer and Condenser	1	25,000	ميليون ريال	25,000			
8	Electric Pump, Piston Pump, Gear Pump and Dosing Pump	15	500	ميليون ريال	7,500			
9	Steel Fittings	1	19,000	ميليون ريال	19,000			
10	Other Primary Equipment	1	4,807	ميليون ريال	4,807			
	Total	-	-	-	269,000			

Chemical engineering graduates can be recruited as the required engineers of this project. 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.

				Req	Total	
No.	Equipment/Machinery	Unit of measurement	Type of equipment	Amount	Unit Price (Million Rials)	cost (Million Rials)
1	Distribution Of Electricity / Demand Price	Kw	Facility	149	6	894
2	Several Electrical Cables	М	Facility	1,000	3	3,000
3	Electrical Equipment of The Greenhouse Lighting System	Amount	Facility	50	40	2,000
4	The Cost of Panel Boards and Related Electrical Equipment	Amount	Facility	4	320	1,280
5	Water Branch	-	Facility	1	450	450
6	Other Water Conveyance Equipment	Amount	Facility	1	1,500	1,500
7	Firefighting, Safety and Health Equipment, etc.	Capsule	Facility	25	30	750
8	Gas Piping	М	Facility	400	4	1,600
9	Gas Branching	-	Facility	1	1,500	1,500
10	Water Heater and Heater	Machine	Facility	4	350	1,400
11	Ventilation Systems for Toilets and Bathrooms	Fan	Facility	5	35	175
12	Air Conditioner	Set	Facility	3	850	2,550
13	Evaporative Cooler	Set	Facility	5	250	1,250
14	Gas Heater	Ton	Facility	5	100	500
15	Industrial Heater	Machine	Facility	2	150	300
16	2.5 Ton Pallet Jack with Scale	Machine	Vehicle	0	360	0
17	3 Ton Forklift	Machine	Vehicle	1	16,000	16,000
18	ZAMYAD Diesel Van	Machine	Vehicle	1	6,000	6,000
19	SAMAND Soren Car	Machine	Vehicle	1	7,000	7,000
20	Operation Equipment	Machine	Equipment	1	1,000	1,000
21	CCTV System	Set	Facility	1	2,500	2,500
22	Office Stuff	Set	Office Equipment	16	1,800	28,800
23	Restaurant Equipment	Set	Office Equipment	27	20	530
24	Medical Equipment	Set	Office Equipment	1	600	600
25	Other Facilities	-	Facility	1	421	421
	Total	-	-	82,000		

Table (4): Auxiliary and service plant Equipment



Figure (9): Hexane Production Steps





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3-2-3- Raw Materials and Intermediate Parts

Raw material of the composition and production formulation in this project includes light and heavy naphtha and hydrogen, which will be supplied from local market (Abadan Oil Refining Company in Khuzestan province). Light and heavy naphtha traded in Iran's energy exchange, so that transaction price is determined there. The specifications of raw materials and packaging for the production of edible hexane are described in the following table.

				Table (5	costs of Rav	v Material f	or Production				
	No.	Title	Title Production quantity at maximum capacity		le Production quantity at maximum capacity		Average price of the perchance unit (Rials)	Purchase unit	Consumpti on per product unit	Amount of consumption in nominal capacity	The cost of raw materials at the maximum nominal capacity (Million Rials)
	1	Light Naphtha	Light 5,000 ton		125,334	cubic meters	4.3	21,250	2,663		
	2	Hydrogen 5,000 ton		ton	500,000	cubic meters	32	160,000	80,000		
	3	Heavy Naphtha	5,000	Ton	175,156	cubic meters	2.8	14,000	2,452		
	4	Packaging Material (Barrel)	5,000	amount	3,000,000	amount	4.545	22,727	68,182		
Total		Total	-	-	-	-	-	217,977	153,297		

3-2-4- Management and human resource

For edible hexane production, 53 human resources will be required in the production, management and support department as described in table (6).

No	Level of skill	Number of staff	Average basic salary
1	Senior	23	179,130,435
2	Mid-level	5	100,000,000
3	Junior	25	83,846,154

Table (6): Management and Human Resource

5	Person
25	Person
23	Person
53	person
	5 25 23 53

4) Ownership and legal permissions

4-1- land ownership

The suitable location for this project is in Mahshahr Port industrial estate. The legal right for exploiting the land is 5,687,500 Rials. This estate is subject to the rules and regulations of developed industrial estates. Having legal permits which are mentioned in 3.4 section are required to obtain a land in this estate. If the construction phase in this estate gets rejected, it should be established in Imam Port Economic Special Zone.

4-2- Intellectual Property and Concessions

High level of knowledge is required to produce edible hexane which exists in Iran. The production must be in accordance with the national standard 5318, 5774 and 9398.

4-3- Legal permissions

Legal permits such as establishment permit, operation license and from the Khuzestan Province Industry and Mining Organization are necessary in order to produce this product, we need legal permits such as (establishment permit and operating permit) from the Khuzestan Province Industry and Mining Organization, and environmental permit. It is worth noting that material should be transferred through steel pipes and tanks. Hexane production takes place in conditions where there is minimal leakage and release of materials to the outside.

shown in the table below.



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5) market research and competition 5-1- Target market introduction

Currently, there is no specific edible hexane production unit. According to official statistics, the active units of normal hexane with ISIC code 2320412388 and 2320412483 are reported in the table below.

Among the 8 active production units, IMAM KHOMEINI Oil Refinery in Shazand located in Markazi Province with 50 thousand tons and ZAHEDIN Chemical Complex in Qom province with 60 thousand tons of nominal capacity have the highest production capacity. The total nominal capacity of hexane production in Iran is equal to 217 thousand tons in 1400 SH.

	Table (7): Active Units Producing Normal Hexane and Hexane									
Title of product	province	Title of unit	Year	Nominal capacity (ton)						
	Markazi	Shazand Imam Khomeini Oil Refinery	1399	50,000						
Normal hexane	Economic Special Zone	EXIR HALAL ASSALUYEH .CO	1400	40,000						
	Isfahan	Isfahan Oil Refinery	1400	12,000						
	Qom	ZAHEDIN Chemical Complex	1394	60,000						
	Tehran	SALAR SHEMI Shahryar	1400	20,000						
Hexane	East Azerbaijan	Tabriz Oil Refinery		15,000						
	Isfahan	FARSHID SHAHREZA Chemistry	1398	15,000						
	Mazandaran	FARSHID SHAHREZA Chemistry	1400	5,000						
	Total									

 Total
 217,000

 The customs tariff code of saturated acyclic hydrocarbons is 29011000. According to customs administration statistics, the import volume has decreased and is around 2.8 thousand tons in 1399 SH, as

Table (8): Iran Imports										
Year	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399
Imports volume(ton)	1,348	1,284	7,081	6,324	6,444	0	425	21,405		2,888
Value (million Rials)	23,464	28,811	202,307	241,081	228,957	0	33,937	908,051	Not available	195,430
Value (1000 USD)	2,132	2,042	8,147	9,029	7,748	0	975	21,563		4,653

According to customs administration statistics, the export volume has seen a huge decline and reached a negligible amount.

Year	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399
Export volume(ton)	15,563	10,181	3,532	0	22,998	45,378	45	22,257		171
Value (million Rials)	175,795	169,646	78,864	17	575,188	970,853	2,422	548,214	Not available	23,488
Value (1000 USD)	14,371	7,086	3,174	1	19,203	31,514	71	12,843		101

Table (9): Iran Exports

Hexane production was amounted 64.2 million tons in 2017 worldwide. In the United States, 30% of the total consumption of hexane is employed for soybeans oil extraction.

Moreover, the worldwide consumption volume of normal hexane is estimated to be around 2.7 million tons per year, of which 80% belongs to the food industry and only 20% to petrochemical processes. But the demand pattern in Iran is very different compared to the rest of the world. According to the estimates, currently more than 96% of the normal commercial hexane demand in Iran is employed in the petrochemical industry and mainly in heavy polyethylene (HDPE) production units.

According to the investigations, the consumption of industrial normal hexane in Iran is estimated to be around 26 thousand tons per year, of which approximately 25 thousand tons are in the petrochemical industry, 700 tons are in the food industry and only 300 tons are employed in other industries. It is used internally as a solvent.

In heavy polyethylene production complexes, 10 kg of hexane is consumed for every ton of polymer produced, which needs to be added to the process through the make-up flow. According to the petrochemical plans being implemented inside Iran, it seems that the demand for this product will reach more than 40 thousand tons per year in the coming years.

The surveys conducted indicate that the growing demand for this product in the petrochemical industry over the past years has caused the players in the market to create a supply. So that the country's demand is provided internally and from importation. Countries like Romania are among the biggest exporters. Therefore, creating a specific structure in providing this product which is required by the petrochemical industries is an evident matter.

All vegetable oil producing countries use edible normal hexane to extract oil from vegetable seeds. Asia and India are the biggest consumers of this material. It is worth mentioning that India is known as one of the largest producers of edible hexane in the world. Countries like China, Thailand and Iran in Asia are also considered as other major producers of this product.



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Edible normal hexane is widely used in various industries. Due to the Iran's potential and abilities, it is one of the biggest normal edible hexane producers. However, since there are a few production units and the lack of government support, related facilities and required capital, exporting has been a failure in recent years. Meanwhile, the export of edible normal hexane has reached zero tons in 1397 and 1398 SH.

By paying more attention to local manufacturers, not only is it valuable for various industries, but also the country will take step to export edible normal hexane.

Edible normal hexane has a wide, important and extensive application in chemical and petrochemical industries, textiles and food. It also helps to improve the quality of water and soil. Therefore, by establishing more production units of edible normal hexane and making it possible for exportation will bring foreign currency to the country and create more jobs.

6) Physical progress of the project ■ No □ Yes

This is an establishment project and has been defined to cover the Khuzestan province demands. It has no progress so far.

7) Operational plan and implementation scheduling

The time between implementation and utilization is estimated to be 24 months. Project utilization is expected in the middle of 1404 SH. The project scheduling is described in Table (10).

year	1401		14	02			14	03			14	04		14	05
Operations/Season	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
Prior to investment studies		I													
Fundra is ing and starting															
O bta in legal permissions															
Providing engineering services															
Land purchase and preparation					I										
Selecting contractor															
Equipping site						I									
Construction and landscaping															
Order, purchase and transportation of machinery															
Ma c hine ry ins ta lla tio n										I					
F a c ilitie s										I					
Hiring and onboarding of staff															
P ilo t utiliza tio n															
U ne xpe c te d de la ys															
Pilotproduction															
Industrial production															

Table (10): Project Scheduling

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 1402 SH) is proposed.

No.	Subject	Amount (Million Rials)
1	Total Fixed Investment Costs	698,400
2	Total Net Working Capital Requirements	21,147
3	Total Production Costs (Annual)	408,470
4	Depreciation	67,142
5	Total Investment	719,547
6	Unit Cost (By Product Type)	-
7	Edible Hexane	161

Table (12): Fixed Capital Estimations (Capital Costs)

No.		Subject	Cost (Million Rials)						
1	Р	urchasing land	45,500						
2	Landscapin	13,800							
3	Civil operations	169,250							
4	Production r	269,000							
5	Sei	82,000							
6	Protection and	0							
7	C	Overhead costs	0						
	Pre-Production	Prior to investment studies	960						
8	Expenditure	Project management	58,078						
	(As described in Table (14)	Obtaining technology	1,762						
9	Ur	nexpected costs	58,050						
	Total 698,400								

The primary items included in working capital are:

- Raw materials (local and foreign): To prevent any interruptions in production process, production capacity, source and method of supplying materials, length of time during ordering and receiving materials, time of delivery and transportation, the amount of required raw materials, auxiliary materials and packaging are determined as one of the working capital items for one period. In this project, the material inventory coverage period is equal to 6 days (equivalent to the capacity of the material tanks = 100 tons).

- Finished product and work in progress: Considering the steps and methods of production, the required time for production and storage has been determined and the related costs are considered as working capital. In this plan, the coverage period for finished product and work in progress are 1 and 3 days, respectively. With this in mind, the total stock in hand is equal to 9 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.

No.	Subject	Amount (Million Rials)								
1	Raw Materials Inventory	2,555								
2	Work In Progress	672								
3	Finished Product	2,867								
4	Accounts Receivable	0								
5	Cash-In-Hand	15,053								
6	(Commercial Accounts Payable)	0								
	Total Net Working Capital Requirements	21,147								

Table (13): Total Net Working Capital Requirements (Production Costs)



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Table	(14):	Pre-Production	Expenditure
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No		Subject	Description	Total (million Bials)			
INO.		Subject	Description	TOLAI (MIIIION RIAIS)			
1		Incorporation	-	50			
2	Ob	taining Licenses / Production License	-	800			
3	Studyin Trav	g, Consulting, Research and Development, eling, Visiting and Participating in Local Exhibitions, etc.	1.5 thousandth of the investment costs of the project	960			
4		Property Insurance	roperty Insurance 2 thousandth of depreciable fixed assets				
5	Surv	vey Fee, Financing, Contract and So On	Survey fee 0.5 thousandth, other 2.5 thousandth	1,530			
6		Cartography, Supervising	2 thousandth of contract expenses	900			
		Staff Training	Equivalent to 3 days of Staff salary	862			
7	Other's	Wages And Salaries During the Construction	Equivalent to the salary of 13 personnel in 24 months	53,220			
		Other Expenses	7.2.1	1,199			
Total – 60,							

8-2- Sales Revenue

The worldwide price of hexane is between 1 and 1.5 dollars. Currently, the price of hexane in Iran is determined in the energy exchange. The total sales of the project in 1404 at fixed prices is estimated to be 359 billion Rials which will rise up in the following years by increasing the production capacity and will reach to a maximum of 1,434 billion Rials.

Table ((15): Pro	ject Revenu	e in Th	e First 5	Years o	f Production	Phase	(Billion Rials)

No.	Subject	Q1	Q ₂	Q₃	Q4	Total 1 st Year	Total 2 nd Year	Total 3 rd Year	Total 4 [™] Year	Total 5 th Year
1	Edible Hexane	0	0	179	179	359	1,004	1,219	1,434	1,434

8-3- Length of Production Phase

The construction period is 24 months and it is considered to begin in the Q3 of 1402. Accordingly, the project utilization is expected to start in the Q3 of 1404 and it takes 5 years. Table (16): Planning Horizon

		Table (107.110111
Title	Month	-	year
Project identification	11	/	1401
Beginning of construction phase	7	/	1402
Beginning of production phase	7	/	1404
End of production phase	12	/	1408

Length of construction phase (months)	Start of phase (months)	Length of production phase (years)
24	6	5

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 1408SH onwards) below.

Break-even sales value (Rials) =		Total fixed	d cos	ts			
		1– Total variable costs					
		Sal	es va	alue			
The number of sales at the break-even	n poi	nt = $\frac{F_C}{S - V_C}$					
FC = Total Costs VC= Average Varia	ble (Costs Q = Qu	ianti	ty of Sales	S = UI	nit Price	
Break-even sales value		14	6,48	31	_ =	179,418 (Million Bials)	
		1		264,705 1,434,285	-	1, 5) (120 (Willion Wals)	
The number of sales at the break-	=	146,48	80,81	7,500	≈	438 Cubic Meters	
		405,755,714		170 622			
	Breal	<-even ratio (%)	= •	1,434,285	- =	12.5%	



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	Table (17: Project break-even point estimation (Million Rials)											
Title	Production 7/1404- 12/1404	Production 1405	Production 1406	Production 1407	Production 1408	Production 1409	Production 1410					
Sales revenue	358,571	1,004,000	1,219,142	1,434,285	1,434,285	1,434,285	1,434,285					
Variable costs	111,704	200,160	232,433	264,705	264,705	264,705	264,705					
Variable margin	246,867	803,839	986,709	1,169,580	1,169,580	1,169,580	1,169,580					
Variable margin ratio (%)	69	80	81	82	82	82	82					
Fixed costs	92,617	135,942	141,124	146,306	139,781	133,070	133,070					
Break-even sales value	134,524	169,793	174,368	179,418	171,417	163,187	163,187					
Break-even ratio (%)	37.5	16.9	14.3	12.5	12.0	11.4	11.4					

According to COMFAR Results

Based on the calculations of COMFAR software, the break-even point including operating and nonoperating costs, is 182 thousand billion Rials and it will be achieved in the 12.7% 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 breakeven 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= The Present Value of The Total Cost of The Period of Construction Phase and Production Phase - The Present Value of The Total Income of Construction Phase and Production Phase

NPV= The Present Value of The Fixed Assets Depreciation + Initial Investment - The Present Value of The Future Cash Flows

The **net current value** of the project at a discount rate of 30% is over 810 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 74.4% and compared to the Minimum Attractive Rate of Return, it is favorable.

Index	Amount	Unit of measurement
The Present Value of The Total Cost of The Period of Construction Phase and Production Phase	1,625,387	Million Rials
The Present Value of The Total Income of Construction Phase and Production Phase	2,451,033	Million Rials
NET PRESENT VALUE (NPV)	825,647	Million Rials
Cost-benefit RATIO (B/C)	1.51	-
INTERNAL RATE OF RETURN (IRR)	74.4%	Percent
NPV RATIO (PI)	1.62	Rial per Rial of investment
NORMAL PAYBACK	1.93	Year

Table (18): Project Return Index

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 amount of project risk coverage. The ROR (simple) of the plan is estimated to be 1.93 years (equal to the year 1405) according to the calculations.





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 (19) 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 74.4% to 78%. On the contrary, in the case of a 4% decrease in sales revenue, the internal rate of return of the project will decrease to 71%.

Table (19): 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%	57%	88%	79%
-4%	71%	77%	75%
0%	74.4%	74.4%	74.4%
4%	78%	72%	73%
20%	90%	65%	70%

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 74.4% to 65%. Conversely, if there is a 20% reduction in the fixed capital costs, the internal rate of return will increase and reach 88%.

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 73%. On the contrary, if the total operating costs of the project are reduced by 4%, the internal rate of return will increase to 75%. 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 (10): 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 8000 square meters and carrying out construction with an infrastructure amounting to 3830 square meters. The total investment in land, Civil works, structures and buildings is estimated at 229 billion Rials and in Plant machinery and equipment and auxiliary equipment is estimated at 409 billion Rials. The total pre-production expenditures are also estimated at 61 billion Rials. So, the total fixed investment costs (required) are 698 billion Rials and the total working capital (required) for the project is 21 billion Rials. The total investment is provided with the company's shareholders.

The project is expected to be sold at fixed prices equal to 359 billion Rials in 1404. This number will rise in the following years due to the increase in production capacity and reach a maximum of 1,434 billion Rials. The net profit of the plan will be positive in all years. The profit is estimated to be 123 billion in 1405 which will be greater in the following years and reach a maximum of 829 billion Rials. The average annual profit of the plan is 752 billion Rials and the average profit margin is estimated to be 55.7%.

The internal rate of return (IRR) of the project is estimated at 74.4% and the rate of return is estimated at a maximum of 1.93 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 826 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.

Nominal Capacity and Unit of Measurement	Product Name	Title Of the Project with ISIC Code	Title Of the Project
5,000 Ton	Edible Hexane	Edible Hexane (2320412388)	Edible Hexane Production
Required Human Resource (Person)	Equity Shares (Million Rials)	Total Fixed Capital (Million Rials)	Project Duration
53	21,147	698,400	24
B/C	Applicant Available Cash (Million Rials)	Net Present Value (NPV) (Million Rials)	IRR (%)
1.51	719,547	825,647	74.4%
ROI (%)	NPV Ratio / Profitability Index (Rial per Rial invested)	Dynamic Payback Period (Year)	Normal Payback Period (Year)
92.10	1.62	2.55	1.93
Average Assets Turnover Ratio	Average Net Profit Margin (%)	Average Annual Profit (Million Rials)	Maximum Annual Sales (Million Rials)
0.78	56%	662,152	1,434,285

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 (21). The purchase and sale prices are determined with the energy exchange transactions and are adjusted to a large extent under the influence of the currency rate increase.

Therefore, currency rate fluctuations regarding the purchase of foreign equipment will be compensated to some extent by the income from sales which will have a little effect on the evaluation results. So, in the construction and implementation phase, if the financing of the project provided through foreign currency sources, the amount of required investment will not change much.

T	Table (21): Currencies exchange Rate Unit of Measurement Unit Price Currency		
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



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9) Investment Required, method of fundraising and guarantees 9-1- Foreign Currency Required

The fixed foreign investment is required for the purchase of foreign machinery which is estimated at a total of 420,000 euros. It is planned to be paid within two years (24 months according to the completion progress of the project). Other fixed capital costs are in Rials

Table (22): Foreign (Fixed) Currency Required			
No.	Year	Required Investment	
1	Year 1(Q3&Q4 In 1402 SH)	84,000	
2	Year 2	168,000	
3	Year 3 (Q1&Q2 In 1404)	168,000	
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 1.93 years (equal to 1405) according to the calculations of CAMFAR.



Dynamic Payback Period of the plan is also estimated at 2.55 years.



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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)2.

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 produced hexane (provided that it is in excess of the local market) can be exported to foreign markets, it can be exempted from Article 141 and 100% of the income from exports is exempt from taxes.

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.

2 - 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).



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(Attachment Number 2)

Summery Sheet

Project introduction

- 1. Project Title: Edible hexane production plan
- 2. Sector: Production sub-sector: Industry
- 3. Products/services: Edible Hexane
- 4. Location: Khuzestan province- Mahshahr Port Industrial Estate

5. Project description:

The implementation of the project is planned by acquiring a land with an area of 8000 square meters and carrying out construction with an infrastructure amounting to 3830 square meters. The total investment in land, Civil works, structures and buildings is estimated at 229 billion Rials and in Plant machinery and equipment and auxiliary equipment is estimated at 409 billion Rials. The total preproduction expenditures are also estimated at 61 billion Rials. So, the total fixed investment costs (required) are 698 billion Rials and the total working capital (required) for the project is 21 billion Rials. The total investment is provided with the company's shareholders.

The project is expected to be sold at fixed prices equal to 359 billion Rials in 1404. This number will rise in the following years due to the increase in production capacity and reach a maximum of 1,434 billion Rials. The net profit of the plan will be positive in all years. The profit is estimated to be 123 billion in 1405 which will be greater in the following years and reach a maximum of 829 billion Rials. The average annual profit of the plan is 752 billion Rials and the average profit margin is estimated to be 55.7%.

The internal rate of return (IRR) of the project is estimated at 74.4% and the rate of return is estimated at a maximum of 1.93 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 826 billion Rials.

6. Annual Capacity: 5000 ton

Project Status
7. Local/internal raw material access: 100%
8. Sales: 1,434,285
Anticipated local market: 100%
Anticipated export market: 0%
9. construction period: 24 months
10. project status:
- Feasibility study available?
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.
- Required land provided?
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.
- Legal permission (establishment license, foreign currency quota, environment) taken?
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.
- Partnership agreement concluded with local/foreign investor?
NO Agreement with legal /faraign contractor(s) concluded?
- Agreement with local/loreign contractor(s) concluded?
NU - Infrastructural utilities procured?
If the project is established in Mahshahr Port Industrial Estate infrastructure facilities such as water and
electricity roads etc are available
- List of know-how machinery and equinment concluded?
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.

- Financing agreement for machinery, equipment and know-how concluded?

No



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Financial structure

11.	Financial table:					
		Lo	ocal Currency Red	quired	Foreign	Total Euro
	Description	Million Rial	Exchange Rate	Euro	Currency Required	
	Total Fixed Investment Costs	508,757	451,531	1,126,738	420,000	1,546,738
	Total Net Working Capital Requirements	21,147	451,531	46,833	0	46,833
	Total Investment	529,904	-	1,173,571	420,000	1,593,571
-	Value Of Foreign Equipment/Machinery:	420,000	Euro			
-	Value Of Local Equipment/Machinery:	357,355	Euro			
-	Value Of Foreign Technical Know-How:	0	Euro			
-	Value Of Local Technical Know-How:	0	Euro			
-	Net Present Value (NPV):	1,828,549	Euro	Net present values discounted to:		1402/12
-	Internal Rate of Return (IRR):	74.4%	7.			
-	Normal Payback:	1.93	year	equivalent to 23.16 months		
-	Minimum Attractive Rate of Return:	30%	7.			

General information

12. Project Type: new Project ♥
 Explanation / Rehabilitation project □

 Name / Company name: Address: Khuzestan province- Mahshahr Port Industrial Estate

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 Local entrepreneur: Private Sector
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