

General Department of Economic and Financial Affairs of Khuzestan

Preparation and Compilation of Investment Opportunities in The Province

Investment opportunity studies report

Magnesium production plan from brines



(Attachment Number 1)

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V2

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 11 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.

Bandar MAHSHAHR city is located in a dry and semi-arid geographical region and is located in a wide and flat area with an area of 591 thousand hectares in the plains area. The rapid increase in temperature in the spring makes the nature of the region dry and harsh and reduces the value of the pastures. The city of Bandar MAHSHAHR is located in the plains of Khuzestan and is not very rough and low and high and is mostly flat. The weather in MAHSHAHR is hot and humid. Its temperature varies between 50 degrees in summer and zero degrees in winter. MAHSHAHR has very hot and humid weather in summer. so that the relative humidity reaches 100%. The average rainfall in this area is 195 mm. Due to its salty and alkaline soil, Bandar MAHSHAHR has a weak vegetation cover, and KONAR and GAZ trees are scattered there.

MAHSHAHR is a port and industrial city and the highway of land, sea and rail transit routes for goods from the important and strategic port of IMAM KHOMEINI, and the most important industries of MAHSHAHR are petrochemicals and shipping. The presence of water borders and proximity to IRAQ and KUWAIT have made this region an important industrial and import and export point. The activity and economic development of MAHSHAHR port is mostly based on port capability and proximity to the coasts and proximity to oil and gas resources of the Khuzestan plain and related activities. This city was developed by the construction of an oil and goods export port and after that the petrochemical construction of IMAM KHOMEINI Port (IRAN, formerly JAPAN) and also by the creation of a special petrochemical economic zone (where industries are subject to customs facilities for the import of goods) and the construction of huge industries. Petrochemical has caused this city to become an immigrant-friendly city and has a high density.

In this city, the cultivation of agricultural products is highly dependent on irrigation. Its main products are wheat, barley, beans, dates, grapes, pomegranates and figs. There are no special crafts and workshops in it.



Figure (1): The Province Location in Iran



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

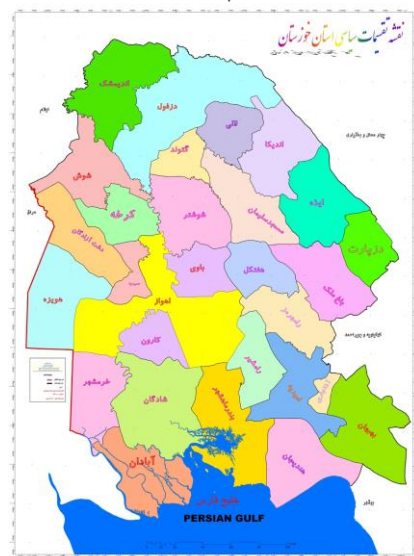


Figure (3): Political divisions of Khuzestan province

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 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, TONGGOOYAN 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 the special economic zone of Imam Khomeini Port is proposed with the following specifications and an area of about 7500 square meters. This special area is located in the vicinity of Imam Khomeini Port. According to the laws and regulations, obtaining land in this place requires industry, mining and trade permits and the approval of the Khuzestan Industrial Estates Company and the environmental approval of Bandar MAHSHAHR. The reason for this choice is the fact that raw materials are imported and the need to export manufactured products. It is worth mentioning; In case of settling in other industrial areas, customs, clearance and transportation costs will increase the cost price of the manufactured product and reduce the possibility of competition with imported products in the domestic market.

2-1- Access to infrastructures

Currently, there are water, electricity and gas infrastructures in this special economic zone. In terms of

access to transportation, this town is in a good location. The distance between the selected location and the AHVAZ-Bander IMAM KHOMEINI Road is equal to 0.7 km and it is in the vicinity of the Imam Khomeini Port. Bandar MAHSHAHR Airport is also located 20 km away from the place.



Figure (4): The Province location in Iran



Figure (5): Image of the location of the economic visa area

Table (1): access to infrastructures

No.	Required Infrastructure	Distance From Project Status	Location Of Infrastructure Provision
1	Water	0	Imam Khomeini Port Special Economic Zone
2	Electricity	0	Imam Khomeini Port Special Economic Zone
3	Gas	0	Imam Khomeini Port Special Economic Zone
4	Telecommunication	0	Imam Khomeini Port Special Economic Zone
5	Main road	0.7	Ahvaz – Imam Khomeini port highway
6	Side road	0.2	Communication ways of Imam Khomeini port
7	Airport	20	Bandar MAHSHAHR Airport
8	Port	0	Imam Khomeini Port
9	Railway Station	0	Imam Khomeini Port Special Economic Zone Road

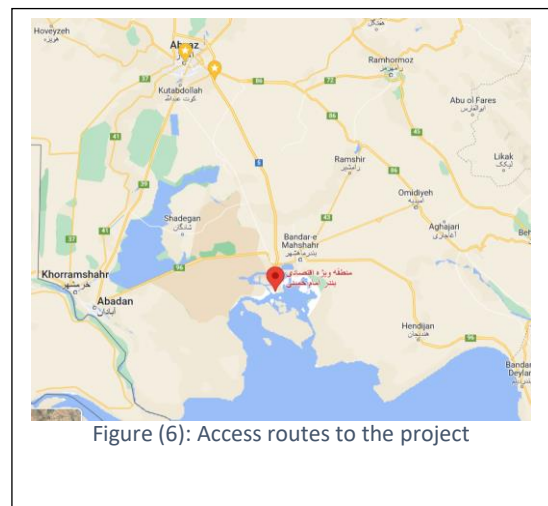


Figure (6): Access routes to the project

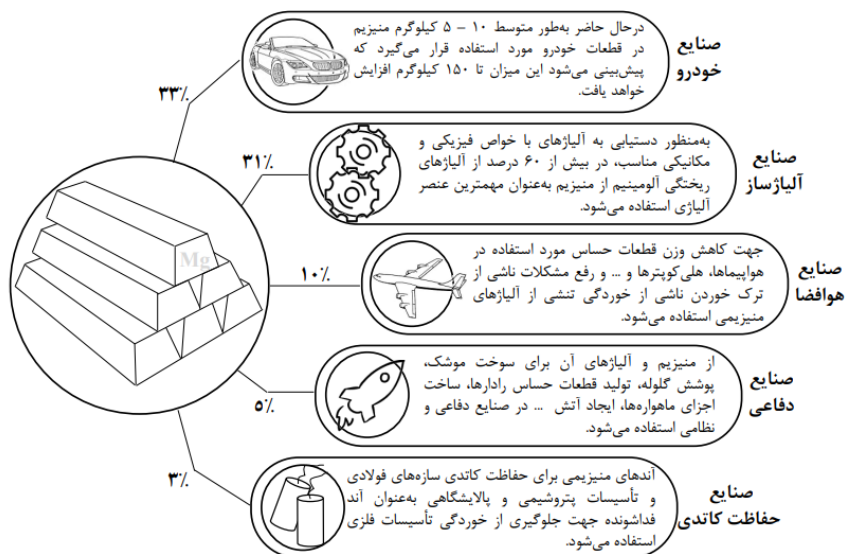
3) Technical specifications of the project

3-1- Product

Magnesium was first identified as an element by BLACK in 1755 and was produced for the first time in 1808 by DAVY by electrolysis of magnesium chloride by mercury cathode. BOSSI succeeded in extracting magnesium in 1828 by regenerating molten magnesium chloride with potassium vapor. In 1833, FARADAY electrolyzed molten magnesium chloride and produced molten magnesium and chlorine gas. The first industrial production of magnesium by means of electrolysis of molten carnallite goes back to 1886 in HEMMLINGEN, Germany, until in 1940, L.M. PIGON established the first metallothermic magnesium extraction plant in Canada, based on the first German inventions. In them, dolomite was regenerated by FERROSILIS under vacuum.

The global demand for magnesium metal as a light metal for use in automotive, aerospace, military, alloying, etc. industries is expanding so that magnesium metal as the future metal of the world and in the list of raw and strategic materials of developed countries including the Union Europe is located. Due to its lightness, mechanical properties and suitable thermal resistance, magnesium has replaced common metals (steel, cast iron, aluminum, etc.) in various industries, especially automotive, which makes cars lighter and significantly reduces fuel consumption. Also, magnesium and its alloys are one of the important metals in the development of defense and aerospace industries. In recent years, the global demand for magnesium has grown significantly, especially in the automotive industry and the aluminum alloy production industry, and it is expected that with the increase in the share of magnesium in the production of automobile parts, the percentage of demand for this metal will increase in the coming years. Also, the expansion of steel and aluminum industries in the countries of the Persian Gulf and the use of magnesium as a desulfurization agent in the steel industry and as an alloying element in the aluminum industry has increased the demand for magnesium in the countries of the region.

Figure (7): Application of magnesium and its alloys in various industries



Comparing the properties, production process and technology, raw materials, energy required for production and environmental issues show that Iran has better capacities for magnesium production compared to aluminum. Also, the process of replacing magnesium and its alloys instead of aluminum in the industry, especially in the automotive industry, doubles the importance of this issue. Magnesium is 30% lighter than aluminum and its production process is less complicated. The energy used to produce magnesium is natural gas, which in addition to being cheap and available in the country, also has less pollution. The raw materials for the production of magnesium (dolomite, sea water and salt water) are abundant, cheap and available in Iran, while the raw materials for the production of aluminum (bauxite) are more expensive and imported.

3-2- Project Requirement

3-2-1- Land And Required Infrastructure

For the production of magnesium from brines, a land with an area of 4000 square meters and construction infrastructure (niches and other buildings) of production amounting to 1050 meters are needed. The specifications of the 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 m ²	Unit Price (Rial)	
1	Land purchase	4 thousand square meters in special economic zone of IMAM KHOMEINI Port	4,000	0	0
2	Site preparation and development	According to relative calculations	2,950	7,423,729	21,900
3	Civil works, structures and buildings	Production building (21*30)	630	150,000,000	94,500
		Office and management building	200	120,000,000	24,000
		Other buildings (warehouse, etc.)	220	120,000,000	26,400
Total			-	-	166,800

3-2-2- Plant Machinery and Equipment

Table (3): Plant Machinery and Equipment

No.	Equipment/Machinery	Required investment			Total cost (Million Rials)
		Amount	Unit Price	Currency	
1	Storage and sedimentation tanks (40 cubic meter customized polyethylene)	15	850	Million Rials	12,750
2	Agitator	2	2,500	Million Rials	5,000
3	Filtration system	5	30,000	Million Rials	150,000
4	Gas drying oven	5	22,000	Million Rials	110,000
5	Material melting furnace up to 850 temperatures	3	18,000	Million Rials	54,000
6	Electrolytic cell (power supply, tanks, insulators, copper connections and electrodes, etc.)	5	16,500	Million Rials	82,500
7	Pipes and fittings	5	12,000	Million Rials	60,000
8	Electro pumps	50	800	Million Rials	40,000
9	Water purification and desalination system	1	150,000	Million Rials	150,000
10	Induction furnace and ingot casting equipment	1	200,000	Million Rials	200,000
11	Other internal equipment	1	35,750	Million Rials	35,750
Total		-	-	-	900,000

• All the required equipment can be produced and supplied in the country.

The extraction of metals from sea water is generally done for two important reasons, the first reason is that, on the one hand, the mineral resources on land are facing the risk of being depleted or reduced, and the other reason is that some countries lack some mineral resources or are facing a shortage. For example, JAPAN has invested heavily in extracting metals such as uranium and lithium from seawater.

The extraction of metals from the brines resulting from the desalination process and sea water is inevitable due to two environmental reasons and the lack of resources on earth. For this reason, various technologies (including electrolytic methods, ion exchange resins, absorbents, ultrafiltration membranes) have been used for this purpose. The electrolysis method is the oldest method and at the same time the most widely used method.

Magnesium oxide obtained from minerals dries sea water and is made into briquettes with a reducing agent such as coal powder and magnesium chloride solution. The obtained briquette is calcined and chlorinated at a temperature of about 1100 degrees to produce molten magnesium chloride. Then the obtained magnesium chloride is injected directly into the electrolysis cell which operates at a temperature of 740 degrees. Other chloride compounds such as sodium chloride and calcium chloride are added to improve thermal conductivity and change the viscosity and density of the electrolyte. Magnesium is deposited as droplets on the cathode and grows towards the electrolyte surface, while chlorine diffuses into the anode and is recycled to produce Magnesium chloride.

Table (4): Auxiliary and service plant Equipment

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	1,500	18	27,000
2	Several Electrical Cables	M	Facility	1,500	4.0	6,000
3	Electrical Equipment of The Greenhouse Lighting System	Amount	Facility	53	40	2,100
4	The Cost of Panel Boards and Related Electrical Equipment	Amount	Facility	10	320	3,200
5	Water Branch	-	Facility	1	3,000	3,000
6	Other Water Conveyance Equipment	Amount	Facility	1	2,000	2,000
7	Piping for drinking water, fire water and...	m	Facility	500	8	4,000

No.	Equipment/Machinery	Unit of measurement	Type of equipment	Required investment		Total cost (Million Rials)
				Amount	Unit Price (Million Rials)	
8	Other plumbing (electricity, etc.)	m	Facility	500	3	1,500
9	Firefighting, Safety and Health Equipment, etc.	Capsule	Facility	10	30	300
10	Gas Piping	M	Facility	1,000	6	6,000
11	Gas Branching	-	Facility	1	20,000	20,000
12	Water Heater and Heater	Machine	Facility	3	350	1,050
13	Air conditioning equipment	Fan	Facility	6	36	216
14	Air Conditioner	Set	Facility	5	600	3,000
15	Gas heater	ton	Facility	0	150	0
16	Pickup truck	Machine	Vehicle	1	8,000	8,000
17	Riding	Machine	Vehicle	1	7,000	7,000
18	Workshop and laboratory tools and equipment	Machine	Equipment	1	12,000	12,000
19	CCTV System	Set	Facility	1	2,000	2,000
20	office Equipment	Set	Equipment	3	700	2,100
21	Restaurant Equipment	Set	Equipment	27	30	810
22	Medical Equipment	Set	Equipment	1	1,000	1,000
23	Other Facilities	-	Facility	1	29,724	29,724
Total				-	-	142,000

3-2-3- Raw Materials and Intermediate Parts

Sources of brines are the most important raw materials for the production of magnesium by electrolysis. The specifications of other raw materials for magnesium production are as described in the table below.

Table (5): Costs of Raw Material for Production

No.	Title	Average price (Rials)	Consumption per product unit	Amount of consumption in nominal capacity	The cost at the maximum nominal capacity (Million Rials)
1	brines	0	772	1,158,301,158	0
2	Caustic Soda	233,333	0.005	5,791,506	1,351,351
3	Hydrochloric	130,000	0.03	48,000	6,240
4	Graphite electrode	2,460,000	0.002	2,500	6,150
total		-	-	-	1,363,741

The other mentioned chemicals are among the materials produced by the petrochemical industries and their supply in the domestic market does not face any restrictions. Consumable electrodes are also imported items and it is possible to resort to foreign markets for their supply.

3-2-4- Management and human resource

To produce magnesium from brines, a total of different process units, 28 manpower is needed, which is explained in Table (6).

Table (6): Management and Human Resource

No	Level of skill	Number of staff	Average basic salary
1	Senior	13	237,500,000
2	Mid-level	3	150,000,000
3	Junior	12	85,000,000

Number Of Direct Mid-Level Staff Required	3	Person
Number Of Direct Junior Staff Required	12	Person
Number Of Direct Senior Staff Required	13	Person
Total	28	person

4) Ownership and legal permissions

4-1- land ownership

The suitable place for the implementation of the special economic zone plan is Imam Khomeini Port. The right to use the land in the mentioned place is low and the related costs are not included in the plan. Land ownership will be according to the conditions and restrictions related to special economic zones. In order to acquire industrial land in this town, it is necessary for investors to obtain initial approval from the executive management of the Imam Khomeini Port Special Economic Zone and then obtain the legal permits listed in paragraph 4-3. Of course, if the construction in the settlement is canceled, it is better to build this unit in a place where there is access to sea water or recycled brine.

4-2- Intellectual Property and Concessions

In the past years, the production of magnesium and magnesium alloys in Iran was a new and unknown industry, and magnesium production had not taken place in the country. By conducting scientific researches on a laboratory and semi-industrial scale by the researchers of Sharif University of Technology, the technical knowledge of magnesium ingot production in the country has been obtained and a laboratory and semi-industrial product is produced. The use of this technical knowledge on an industrial scale will lead to the production of the first magnesium ingot factory in Iran in South Khorasan province and the production of

this product inside the country. According to the available information, most of the equipment and machines used in the FERDOUS magnesium ingot production factory was made domestically, and the design, construction and operation of the factory was done under the conditions that Iran was under the embargo of major powers. Also, in the design of FERDOUS magnesium ingot factory, the experience of domestic experts in the design of the magnesium production process and the optimization of variables affecting the process have been used, and the technical knowledge of magnesium production is completely localized and available to Iranian experts and graduates. Therefore, in order to produce magnesium from brines, it is necessary to use the knowledge of specialists of knowledge-based companies. Because the technical knowledge in question exists in the country and various articles have been compiled based on the results of laboratory and semi-industrial production. Therefore, the intellectual property related to obtaining industrial licenses and design knowledge and production engineering can be provided to the investment applicant who has the relevant team.

4-3- Legal permissions

In order to produce this magnesium, we need legal permits such as (establishment permit and exploitation permit) from Khuzestan Province Industry and Mining Organization, and environmental permit. It is worth noting; The material production processes use sea water and materials such as sodium hydroxide and do not cause chemical pollution in the environment. Therefore, the production of this product in the mentioned special economic zone will not cause serious problems for the environment and it is possible to obtain environmental permits.

5) market research and competition

5-1- Target market introduction

The main consumption of magnesium and its alloys is related to the production of automotive die-cast parts and the aluminum alloying industry. Aerospace and automotive industries are among the most important consumers of magnesium alloys, aluminum-magnesium alloys, steels containing magnesium and cast iron. Other applications of magnesium include iron casting and desulfurization of steel, production of ductile or unbreakable cast iron, weapon fuel, pure uranium processing, titanium recycling, sacrificial anodes of steel structures, wastewater treatment and removal of heavy metals and silicates in the removal process. Ammonium pointed out.

According to the statistics of the Ministry of Mining Industry and Trade until 1401, there are three active units producing magnesium ingots with ISIC code 2720512477 in the provinces of SOUTH KHORASAN, QOM and MAZANDARAN. ROYAL metal ingot Company with a nominal capacity of 6000 tons per year, RAHAVARD Magnesium PARSIAN Engineering with a nominal capacity of 3000 tons per year and ANDISHE Magnesium Recycling Company with 750 tons per year are operating.

Table (7): active units producing magnesium ingots

Province	production unit	year of license	Nominal capacity (tons)
SOUTH KHORASAN	royal metal ingot company	1392	6,000
QOM	RAHAVARD Magnesium PARSIAN Engineering	1397	3,000
MAZANDARAN	Recycling ANDISHEH magnesium	1400	750
total			9,750

Also, 11 units with plans to produce magnesium ingots with ISIC code 2720512477 in the provinces of ARDABIL, KHORASAN RAZAVI, NORTH KHORASAN, ZANJAN, QAZVIN, QOM, LORESTAN and HAMEDAN have received licenses until 1401. The specifications of the units with plans in the field of magnesium ingot production are as described in the table below.

Table (8): Units with a plan to produce magnesium ingots

province	Unit Name	year of license	Physical progress (%)	Nominal capacity (tons)
ARDABIL	MASOUD KHUJASTE	1400	0	60,000
KHORASAN RAZAVI	Ferrosilicon and magnesium ATINE	1397	30.03	12,000
NORTH KHORASAN	Arad Lian FRAVER Arya	1400	31.8	6,000
ZANJAN	SAEED ASOYAR	1400	0	12,000
QAZVIN	Diamond PARS Alloy	1400	1	12,000
QOM	BARAZESH Industrial Engineering	1400	0	12,000
LORESTAN	SEYYED AZIZ ALLAH MIRBARATI	1400	0	3,000
LORESTAN	MASOUD KHUJASTE	1399	0	60,000
HAMEDAN	Ferrosilicon West PARS	1398	69.9	12,000
HAMEDAN	ALI KAHZADI	1400	0	6,000
HAMEDAN	MEHRDAD DARI	1400	0	6,000
total				201,000

The customs tariff code is "Magnesium with a purity of at least 99.8%", 81041100. According to the customs statistics, the amount of export of this product from the country during the years 1390 to 1398 is shown in the table below.

Table (9): Export of magnesium with a purity of at least 99.8% during the years 1390 to 1399

year	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399
Export weight (tons)	0	0	0	0	0	463	0	0	Not available	0
Rial value (million Rials)	0	0	0	0	0	30,510	0	0		0
Dollar value (thousands of dollars)	0	0	0	0	0	977	0	0		0

Also, the customs tariff code of "Magnesium with a purity of less than 99.8%" is 81041900, which according to the customs statistics, the number of exports of this product from the country during the years 1390 to 1399 is shown in the table below.

Table (10): Export of magnesium with a purity of less than 99.8% during the years 1390-1399

year	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399
Export weight (tons)	0.9	0	0	0	0	561	0	0	Not available	0
Rial value (million Rials)	20.9	0	0	0	0	45,118	0	0		0
Dollar value (thousands of dollars)	2	0	0	0	0	1,440	0	0		0

According to the customs statistics, the amount of magnesium imports with customs tariff code 81041100 and 81041900 respectively is shown in the following table.

Table (11): Import of magnesium with a purity of at least 99.8% during the years 1390-1399

year	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399
Import weight (tons)	995	628	800	834	1,004	0	707	684	Not available	610
Rial value (million Rials)	35,631	43,241	65,558	62,223	69,489	0	57,532	77,128		63,822
Dollar value (thousands of dollars)	3,268	2,134	2,646	2,332	2,368	0	1,693	1,773		1,520

Table (12): Import of magnesium with a purity of less than 99.8% during the years 1390-1399

year	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399
Import weight (tons)	80	13	192	662	354	0	670	555	Not available	487
Rial value (million Rials)	2,156	898	27,414	50,013	30,509	0	61,593	64,766		56,789
Dollar value (thousands of dollars)	197	73	1,087	1,914	1,026	0	1,815	1,548		1,352

According to forecasts, the demand for magnesium in the automotive industry and aluminum alloy is growing, and the amount of magnesium imports is also indicative of this. It is expected that the country's need for magnesium will increase greatly with the growth of replacing magnesium parts in the automotive industry and the production of aluminum alloys in industries such as SOUTH ALUMINUM, ALMAHDI and IRALCO. Setting up industrial magnesium production units in the country, considering Iran's advantages in this industry, in addition to the possibility of meeting the domestic needs, the possibility of exporting this product to European countries and PERSIAN GULF countries, which demand more than 250,000 tons of magnesium annually Provides.

The largest amount of magnesium and magnesium alloy imports in the world is related to the countries of America, Canada, Germany, Japan, England, Mexico, South Korea, France, Holland, etc., which in total reaches more than 400 thousand tons per year. Also, the border countries of the Persian Gulf and Turkey import more than 30 thousand tons of magnesium and magnesium alloys annually.

Taking into account the conditions of production and consumption as well as the problems mentioned in the Chinese industry, the outlook of the magnesium industry goes to the developing side that has access to energy resources and can Low cost of energy to produce a competitive product that the Middle East region has the best position in this field as the energy pole of the world. China's industry is one of the largest consumers of magnesium in the coming years, and among various industries, especially automotive and alloying, the use of magnesium brings a bright future for the magnesium industry.

6) Physical progress of the project

No Yes

This plan is created and defined to cover the needs of the country. There has been no progress in the implementation of this project so far.

7) Operational plan and implementation scheduling

The implementation of the project stages until its operation is planned for 24 months, and the operation of the project is expected from the beginning of 1405. The schedule of the project is presented in Table (13).

Table (13): Project Scheduling

year	1402				1403				1404				1405			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Operations/Season																
Pre investment studies	■															
Fundraising and starting	■	■														
Obtain legal permissions			■	■												
Providing engineering services			■													
Land purchase and preparation			■													
Selecting contractor			■													
Equipping site			■													
Construction and landscaping				■	■	■	■	■	■	■	■	■				
Order, purchase and transportation of machinery							■	■	■	■	■	■				
Machinery installation												■				
Facilities					■	■	■	■	■	■	■	■				
Hiring and onboarding of staff												■				
Unexpected delays													■			
Trial production													■			
production phase													■	■	■	■

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 staff 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 (14): Cost Estimations

No.	Subject	Amount (Million Rials)
1	Total Fixed Investment Costs	1,297,360
2	Total Net Working Capital Requirements	107,479
3	Total Production Costs (Annual)	1,892,757
4	Depreciation	127,373
5	Total Investment	1,404,839

Table (15): Fixed Capital Estimations (Capital Costs)

No.	Subject	Cost (Million Rials)	
1	Purchasing land	0	
2	Landscaping and land improvement	21,900	
3	Civil operations and construction of buildings	144,900	
4	Production machinery and equipment	900,000	
5	Service equipment	142,000	
6	Protection and environmental equipment	0	
7	Overhead costs	0	
8	Pre-Production Expenditure As described in Table (17)	Prior to investment studies	2,050
		Project management	21,200
		Obtaining technology	4,810
9	Unexpected costs	60,500	
	Total	1,297,360	

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 method of supplying materials, the time interval required from the order stage to the stage of receiving the materials, the delivery and transportation time, the amount of raw materials, auxiliary materials and packaging required as one of the working capital items and its storage period is determined for a period of time. In the current plan, the coverage period of material inventory is considered equal to 15 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 goods under construction and manufactured goods are 3 and 5 days, respectively. With this consideration, the total stock of goods is equal to 23 days.
- Claims of expected funds from sold goods that are collected in a short period of time. The duration of the expected funds must be determined. In the current plan, according to the conditions of the Iranian market, cash is considered.
- Revolving salary for paying the company's current expenses is considered as cash balance or revolving salary in the calculation of capital in circulation based on production costs (without considering the costs of production of raw materials and consumption). In the present plan, the equivalent of 30 days is considered.

Table (16): Total Net Working Capital Requirements (Production Costs)

No.	Subject	Amount (Million Rials)
1	Raw Materials Inventory	56,823
2	Work In Progress	14,429
3	Finished Product	24,646
4	Accounts Receivable	0
5	Cash-In-Hand	11,582
6	(Commercial Accounts Payable)	0
	Total Net Working Capital Requirements	107,479

Table (17): Pre-Production Expenditure

No.	Subject	Description	Total (million Rials)
1	Incorporation	-	150
2	Obtaining Licenses / Production License	-	550
3	Studying, Consulting, Research and Development, Traveling, Visiting and Participating in Local Exhibitions, etc.	One and a half thousandth of the investment costs of the project	2,050
4	Property Insurance	Equivalent to 2 thousand depreciable fixed assets	2,540
5	Survey Fee, Financing, Contract and So On	Expert fee 0.5 thousand, other cases 2.5 thousand	0
6	Cartography, Supervising	equivalent to 2 per thousand contract costs	2,130
7	Other's	Staff Training	equivalent to 15 days of personnel salary
		Wages And Salaries During the Construction	equivalent to the salary of 5 people in 24 months
		Other Expenses	2.0%
Total			28,060

8-2- Sales Revenue

Currently, the magnesium market does not have an integrated market. This metal is not one of the commodities that are offered in the commodity exchange. The market needs are provided by two active production companies and importers. The maximum nominal production capacity of the plan is equal to 1500 tons and the selling price of magnesium in the country is considered to be around 3.17 dollars per kilogram. Based on this (according to the production plan), the total sales amount of the plan in 1405 at the fixed prices of 1402 is estimated to be equal to 1,245 billion Rials. This figure will increase in the following years due to the increase in production capacity and will increase to a maximum of 2,490 billion Rials.

Table (18): 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	magnesium ingots	297	297	297	297	1,189	1,427	1,664	2,378	2,378
2	Industrial water	14	14	14	14	56	68	79	113	113
Total		311	311	311	311	1,245	1,494	1,743	2,490	2,490

8-3- Length of Production Phase

The construction period of the plan is equal to 30 months and it is considered to start from the beginning of 1402. The duration of the project is considered to be 5 years.

Table (19): Planning Horizon

Title	Month	-	year	Length of construction phase (months)	Start of phase (months)	Length of production phase (years)
Project identification	1	/	1402	30	12	5
Beginning of construction phase	7	/	1402			
Beginning of production phase	1	/	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 1408SH onwards) below.

$$\text{Break-even sales value (Rials)} = \frac{\text{Total Fixed Costs}}{1 - \frac{\text{Total Variable Costs}}{\text{Sales Value}}}$$

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

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

$$\text{Break-even sales value} = \frac{222,760}{1 - \frac{1,181,675}{1,743,000}} = 691,705 \text{ (Million Rials)}$$

$$\text{The number of sales at the break-even point} = \frac{222,760,204,800}{6,434,109 - 4,362,035} \approx 107,506 \text{ (ton)}$$

$$\text{Break-even ratio (\%)} = \frac{691,705}{1,743,000} = 39.7\%$$

Table (20): Project break-even point estimation

Million Rials

Title	Production 1405	Production 1406	Production 1407	Production 1408	Production 1409	Production 1410	Production 1411
Sales revenue	1,245,000	1,494,000	1,743,000	2,490,000	2,490,000	2,490,000	2,490,000
Variable costs	864,352	1,023,014	1,181,675	1,657,659	1,657,659	1,657,659	1,657,659
Variable margin	380,648	470,986	561,325	832,341	832,341	832,341	832,341
Variable margin ratio (%)	31	32	32	33	33	33	33
Fixed costs	208,468	215,614	222,760	242,698	240,057	239,666	239,666
Break-even sales value	681,845	683,943	691,705	726,048	718,147	716,977	716,977
Break-even ratio (%)	54.8	45.8	39.7	29.2	28.8	28.8	28.8

- According to COMFAR Results

Based on the calculations of COMFAR software, the break-even point including operating and non-operating costs, is 692 billion Rials and it will be achieved in the 39.7% 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 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 1,403 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 28.1 % and compared to the Minimum Attractive Rate of Return, it is favorable.

Table (21): Project Return Index

Index	Amount	Unit of measurement
The Present Value of The Total Cost of The Period of Construction Phase and Production Phase	4,481,288	Million Rials
The Present Value of The Total Income of Construction Phase and Production Phase	4,831,080	Million Rials
NET PRESENT VALUE (NPV)	349,793	Million Rials
Cost-benefit RATIO (B/C)	1.08	-
INTERNAL RATE OF RETURN (IRR)	28.1%	Percent
NPV RATIO (PI)	0.34	Rial per Rial of investment
NORMAL PAYBACK	3.83	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 amount of project risk coverage. The ROR (simple) of the plan is estimated to be 3.83 years (equal to the year 1407) 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 (22) 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 28.1 % to 32%. On the contrary, in the case of a 4% decrease in sales revenue, the internal rate of return of the project will decrease to 24%.

Table (22): 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%	3%	35%	42%
-4%	24%	29%	31%
0%	28.1%	28.1%	28.1%
4%	32%	27%	25%
20%	46%	23%	11%

8-7-2- Fixed Assets

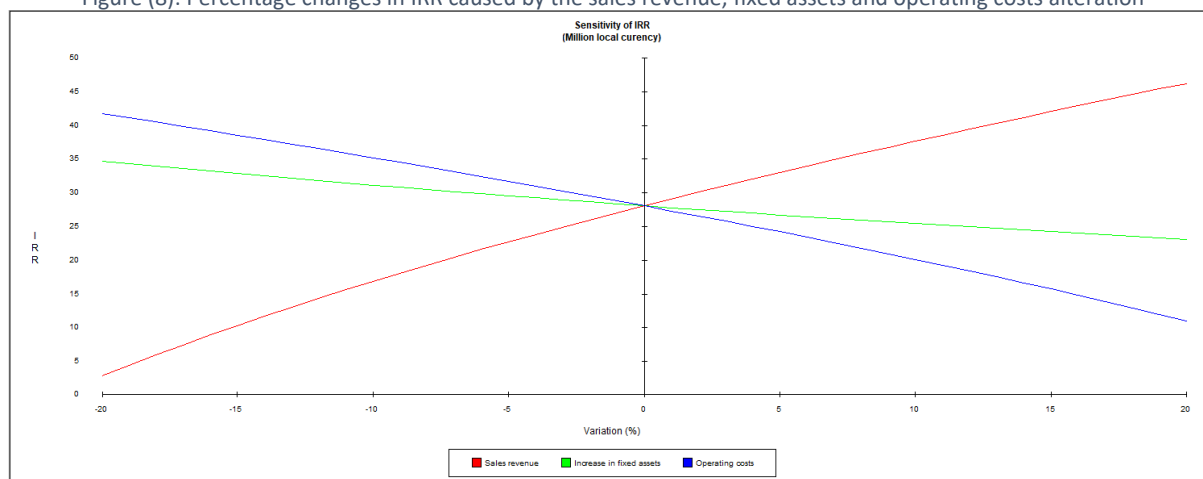
The change in the fixed assets is due to the fixed costs of the initial investment alterations. The results of the sensitivity analysis according to the fixed costs of the plan have been done and it shows that in case of an unexpected 20% increase in the fixed capital costs of the project, the internal rate of return will decrease from 28.1 % to 23%. Conversely, if there is a 20% reduction in the fixed capital costs, the internal rate of return will increase and reach 35%.

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 20% increase in the operating costs, the efficiency rate of the plan will decrease to 11%. On the contrary, if the total operating costs of the project are reduced by 20%, the internal rate of return will increase to 42%. 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 (8): 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 with the acquisition of land with an area of 4000 square meters and the construction of 1050 square meters. The total investment in land and building is estimated at 167 billion Rials and the total investment in main and secondary equipment is estimated at 1103 billion Rials. The total pre-operational costs are estimated at 28 billion Rials, with this calculation, the total fixed capital required is 1297 billion Rials and the total working capital required for the project is estimated at 107 billion Rials. It is expected that the entire investment of the project will come from the resources of the company's shareholders.

The project is expected to be sold in 1405 at fixed prices equal to 1,245 billion Rials. This figure will increase in the future due to the increase in production years and will increase by more than 2,490 billion Rials. The net profit of the plan has been positive in all years. The profit figure in 1405 is equivalent to 172 billion. The profit increases in the following years and reaches a maximum of 593 million Rials. The average annual profit of the project is 494 billion Rials and the profit margin is expected to be 21.7%. The internal rate of return (IRR) of the plan has also increased by 28.1 percent and the investment return period (PBP) is estimated at 3.83 years. Also, the actual net cash flow of the plan (NPV) has been positive and, considering the expected rate of 20%, is equal to 350 billion Rials.

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

Table (23): Summary of Economic Features

Nominal Capacity and Unit of Measurement	Product Name	Title Of the Project with ISIC Code	Title Of the Project
1500 Ton	magnesium ingots	magnesium ingots (2720512477)	Magnesium production plan from brains
Required Human Resource (Person)	Equity Shares (Million Rials)	Total Fixed Capital (Million Rials)	Project Duration
27	107,479	1,297,360	24
B/C	Applicant Available Cash (Million Rials)	Net Present Value (NPV) (Million Rials)	IRR (%)
1.1	1,404,839	349,793	28.1%
ROI (%)	NPV Ratio / Profitability Index (Rial per Rial invested)	Dynamic Payback Period (Year)	Normal Payback Period (Year)
32	0.34	5.85	3.83
Average Assets Turnover Ratio	Average Net Profit Margin (%)	Average Annual Profit (Million Rials)	Maximum Annual Sales (Million Rials)
1.15	21.7%	447,627	2,490,000

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 (24) Table (21). The purchase and sale price is proportional to the market price and is adjusted to a large extent under the influence of the exchange rate increase. Although the equipment required by the project is mainly domestic, the exchange rate fluctuations affect their prices, but the increase in the exchange rate leads to an increase in sales revenue and offsets the effects of the equipment price increase. It can be said that exchange rate fluctuations have little effect on the results that will be evaluated.

Table (24): 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 (25): Foreign (Fixed) Currency Required

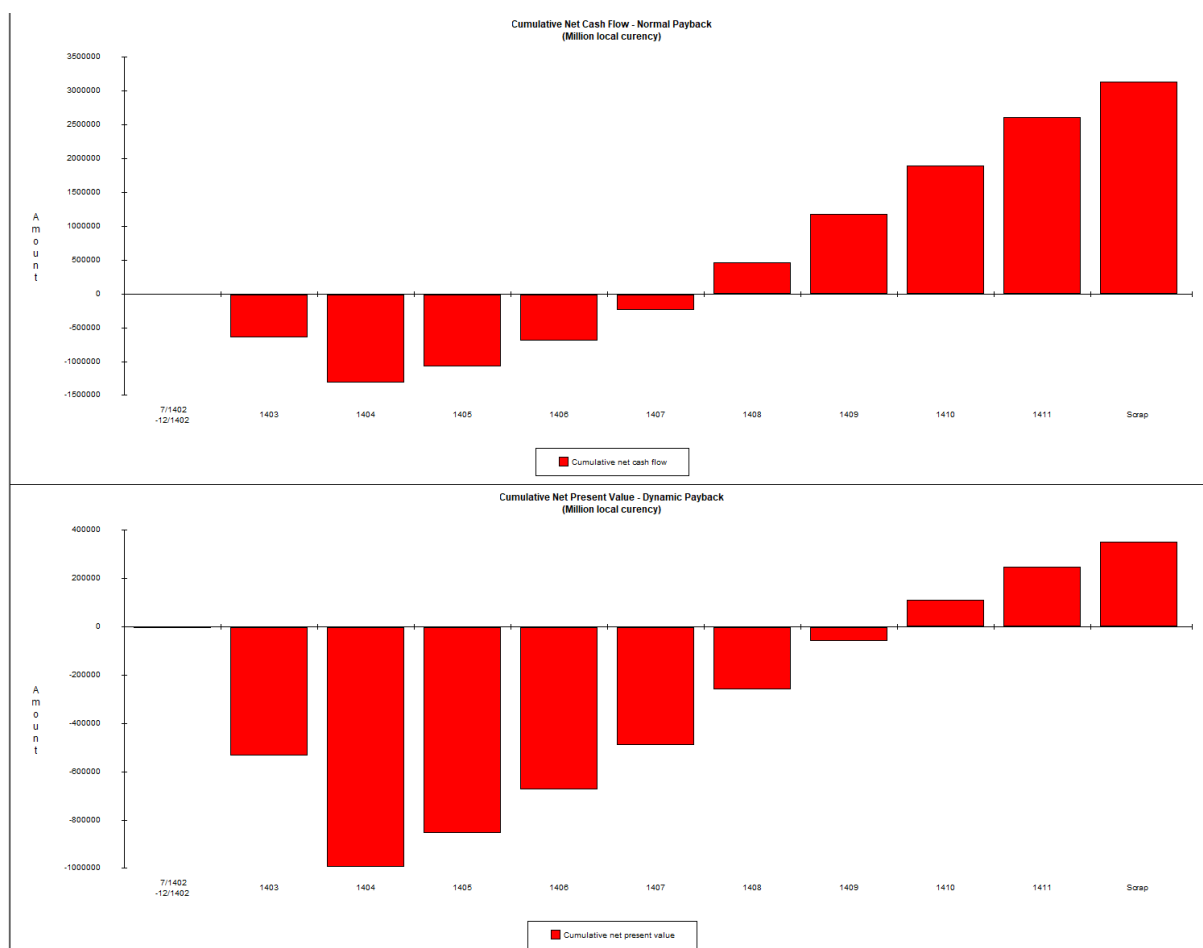
No.	Year	Required Investment
1	Year 1 (1403)	0
2	Year 2	0
3	Year 3	0
4	Year 4	0
5	Year 5	0

9-2- Model Of Partnership and Fundraising

Participation in the present project and its financing is foreseen in the form of establishing a company inside the country. The total financial resources needed are predicted through the investor's contribution and have not been included in order to implement the facility plan of domestic banks.

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 (normal) of the plan is estimated to be 3.83 years (equal to 1408) according to the calculations of CAMFAR.



Dynamic Payback Period of the plan is also estimated at 5.85 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)¹.

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 (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.

1 - 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)

Summary Sheet

Project introduction
1. Project Title: Magnesium production plan from brain
2. Sector: Production sub-sector: Industry
3. Products/services: magnesium ingots
4. Location: KHUZESTAN- MAHSHAHR- special economic zone of BANDAR IMAM
<p>Project description:</p> <p>The implementation of the project is planned with the acquisition of land with an area of 4000 square meters and the construction of 1050 square meters. The total investment in land and building is estimated at 167 billion Rials and the total investment in main and secondary equipment is estimated at 1103 billion Rials. The total pre-operational costs are estimated at 28 billion Rials, with this calculation, the total fixed capital required is 1297 billion Rials and the total working capital required for the project is estimated at 107 billion Rials. It is expected that the entire investment of the project will come from the resources of the company's shareholders.</p> <p>The project is expected to be sold in 1405 at fixed prices equal to 1,245 billion Rials. This figure will increase in the future due to the increase in production years and will increase by more than 2,490 billion Rials. The net profit of the plan has been positive in all years. The profit figure in 1405 is equivalent to 172 billion. The profit increases in the following years and reaches a maximum of 593 million Rials. The average annual profit of the project is 494 billion Rials and the profit margin is expected to be 21.7%. The internal rate of return (IRR) of the plan has also increased by 28.1 percent and the investment return period (PBP) is estimated at 3.83 years. Also, the actual net cash flow of the plan (NPV) has been positive and, considering the expected rate of 20%, is equal to 350 billion Rials.</p>
5. Annual Capacity: 1500 ton

Project Status
6. Local/internal raw material access: 100%
7. Sales: 2,490 (billion Rials) Anticipated local market: 100% Anticipated export market: 0%
8. construction period: 24 months
<p>9. project status:</p> <ul style="list-style-type: none"> - 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 the special economic zone, and based on the topography criteria of this area, it is a suitable place for the construction of the plan. Of course, in order to settle in this area, it is necessary to obtain the necessary approvals. - Legal permission (establishment license, foreign currency quota, environment) taken? Yes. It is possible to obtain legal permits for this plan. In order to settle in the industrial town, the project must obtain legal permits from the organization of industry, mining, trade and environment of Ahvaz city. - Partnership agreement concluded with local/foreign investor? No - So far, no partnership agreement has been prepared for the implementation of the project. This plan has the necessary features to attract shareholders' financial resources. - Agreement with local/foreign contractor(s) concluded? No, so far, no agreement or contract has been concluded for the purpose of manufacturing domestic and foreign machinery. - Infrastructural utilities procured? - If the project is located in the special economic zone, the infrastructure facilities of water and electricity, roads, etc. are available. - List of know-how, machinery and equipment concluded? - In this plan, magnesium production is considered by electrolysis method. Easy access to magnesium chloride and cheap electricity are very important in the electrolysis method. Of course, the required manpower and energy consumption in the electrolysis method is much lower than the silicothermic method, but the amount of investment in this method is higher. - Financing agreement for machinery, equipment and know-how concluded? No

Financial structure

11. Financial table:

Description	Local Currency Required			Foreign Currency Required	Total Euro
	Million Rial	Exchange Rate	Euro		
Total Fixed Investment Costs	1,297,360	451,531	2,873,247	0	2,873,247
Total Net Working Capital Requirements	107,479	451,531	238,033	0	238,033
Total Investment	1,404,839	-	3,111,280	0	3,111,280

- Value Of Foreign Equipment/Machinery:	0	Euro		
- Value Of Local Equipment/Machinery:	2,307,704	Euro		
- Value Of Foreign Technical Know-How:	0	Euro		
- Value Of Local Technical Know-How:	0	Euro		
- Net Present Value (NPV):	774,682	Euro	Net present values discounted to:	1402
- Internal Rate of Return (IRR):	28.1%	%		
- Normal Payback:	3.83	year		
- Minimum Attractive Rate of Return:	20%	%		

General information

12. Project Type: new Project Explanation / Rehabilitation project
 Name / Company name: -
 Address: KHUZESTAN- MAHSHAHR- special economic zone of BANDAR IMAM
 Tel: +98 916 3418900 +98 061 34451004 Fax:
 Email: mh_rahimzade@yahoo.com Website:
 Local entrepreneur: Private Sector government /public sector