



Islamic Republic of Iran

Ministry of Economic Affairs and Finance

General Department of Economic Affairs and Finance of North Khorasan



Aluminum Fluoride and Cryolite In Jajarm Industrial Park

Center of Investment Services of North Khorasan

2021 April

Summary of Technical-Economical Pre-Feasibility Study

The name: Aluminum Fluoride and Cryolite

Sector: Industrial

Subsector: Metal Products

ISIC Code: 211512335 , 24112482

The owner of:

Organization of Economic Affairs and Finance (North Khorasan)



The ADDRESS:

Iran, North Khorasan, Jajarm

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1 Abstract

1.1 Project Profile - Summary Sheet

Table 1: Summary Sheet

Project Introduction			
Project Title	The Aluminum fluoride and Cryolite		
Sector	Industrial		
Sub Sector	Metal Products		
Location	Iran, North khorasan, Jajarm		
The County	Jajarm		
Products / Services	Aluminum fluoride (10,000 tons) Cryolite (3000 ton) Plaster (32,000 ton)		
Annual Nominal Capacity	13,000	Tons	
The Raw Material	Aluminum Hydroxide, Sulfuric Acid, Calcium Fluoride, Sodium Hydroxide, Packaging Equipment		
Employment	99	Person	
Land Area	15,000	m^2	
Floor Area	5,230	m^2	
Energy and Water Consumption	Water Consumption	10,000	m^3 in year
	Electricity Consumption	550	KW
	Gas Consumption	2,500,000	m^3 in year
Fixed Capital	955,813	Million Rial	
Working Capital (The First Year)	482,056	Million Rial	
Payback Period	3.41	Year	
Net Present Value (NPV)	1,512,794	Million Rial	
Internal Rate Of Return (IRR)	49	%	
Modified Internal Rate of Return (MIRR)	27	%	
Break Even Point	25	%	
The Exchange Rate (Dolar)	240,000	Rial	
Description	In this project, all the materials related to the study of the Aluminum fluoride and Cryolite market especially domestic and foreign supply and demand, are examined.		

Table 2: Legal Authorizations

Licensure Status:	
Issuance status	Descriptions
Principal Agreement (Establishment licensure)	<input checked="" type="checkbox"/>
Land Allocation	<input checked="" type="checkbox"/>
Environmental Inquiry	<input checked="" type="checkbox"/>
Possibility of Water Supply	<input checked="" type="checkbox"/>
Possibility of Electricity Supply	<input checked="" type="checkbox"/>
Possibility of Electricity Supply	<input checked="" type="checkbox"/>
Possibility of Gas Supply	<input checked="" type="checkbox"/>

Table 3: Total Investment

Descriptions	Local Currency Required			Foreign Currency Required (Million Euro)	Total (Million Euro)
	(Million Rial)	Rate	Equivalent in (Million Euro)		
Fixed Capital	955,813	240,000	3.98	0	3.98
Working Capital	482,056		2.008	0	2.008
Total Investment	1,437,869		5.99	0	5.99

- Value of Foreign Equipment / Machinery: 0 Million Euro
- Value of Local Equipment / Machinery: 2.09 Million Euro
- Net Present Value (NPV): 6.30 Million Euro in Years
- Internal Rate of Return (IRR): 49 %
- Payback Period: 3.41 Years

Table 4: General Information

Company Profile	
Project Type	Establishment <input checked="" type="checkbox"/>
Company Name	North Khorasan Organization of Industry, Mine and Trade
Contact Person (Name and Position)	Morteza HoseyniMasoom
Email	smt.nkh1383@gmail.com
Mobile	09153864144
Tel	05831552
Website	nkh.mimt.gov.ir
Address	North Khorasan Province, Bojnurd, North Khorasan Organization of Industry, Mine and Trade
Company's Legal Structure	Government <input checked="" type="checkbox"/>

2 Project Location

2.1 Province: North khorasan

2.2 The County: Jajarm

Jajarm county is a county in North Khorasan Province in Iran. The capital of the county is Jajarm. The county has three districts: Central District, Jolgeh Sankhvast District, and Jolgeh Shoqan District. The county has three cities: Jajarm, Sankhvast, and Shoqan. This project will be construct in part 052 with coordinates (446777,4094368) in Jajarm industrial park. Location of project is shown in Figure 1.

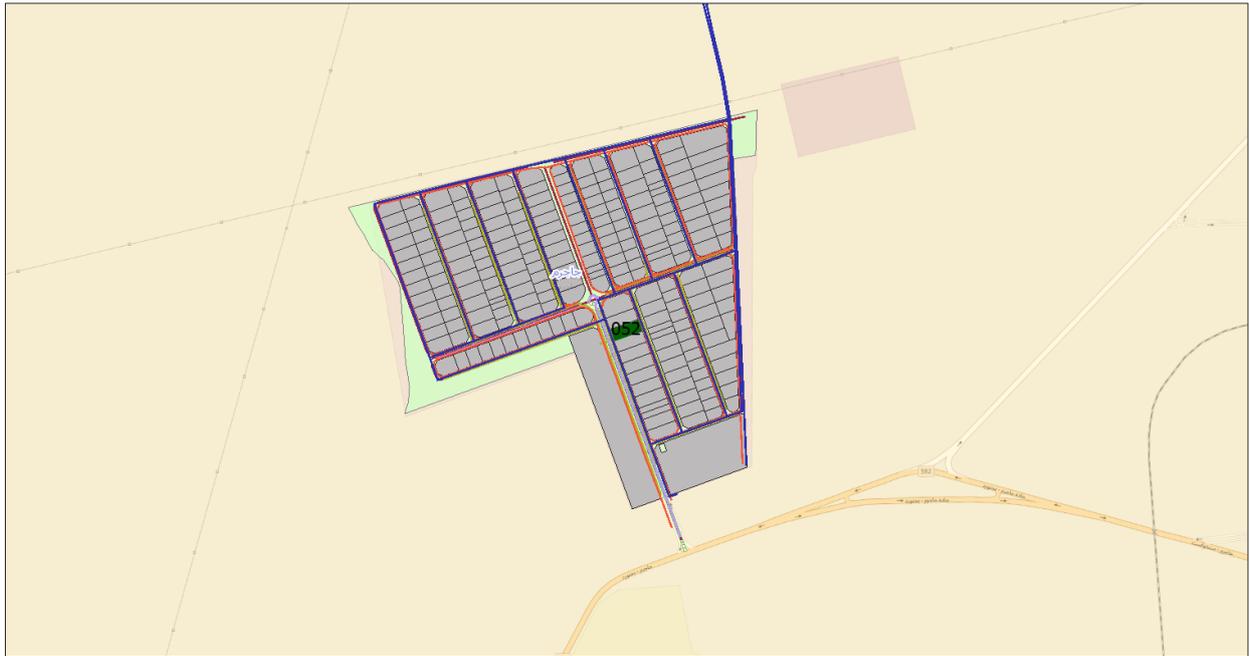


Figure 1: Location of Proposed Land in Jajarm Industrial Park

2.3 The Project: Aluminum fluoride and Cryolite

2.4 Access to the Infrastructures

Table 5: Access to Infrastructures

No.	Needed Infrastructures	Distance to the Project	The Supply Infrastructures
1	Water	0	is provided
2	Electricity	0	is provided
3	Gas	0	is provided
4	Telecommunications	0	is provided
5	High way	<1 km	is provided
6	Sub way	0	is provided
7	Airport	155	is provided
8	Amirabad Port (Behshahr)	340	is provided
9	Bandar Abbas Port	1,473	is provided
10	Rail way station of Joveyn	106	is provided
11	Rail way station of Jajarm	35	is provided

3 Technical Specifications of Plan

3.1 Product

Table 6: Project Specifications Based on ISIC Code

The Project	ISIC Code	Customs Tariff	Environmental Category
Aluminum fluoride	211512335	28261200	
Cryolite	24112482	28263000	

In this project, all the materials related to the study of the Aluminum fluoride and Cryolite market especially domestic and foreign supply and demand, are examined.

Considering that there is currently no factory in the field of production of aluminum fluoride and cryolite in the country and all needs are met through imports and in the conditions of sanctions due to the significant increase in prices of these products, the production capacity of downstream industries like aluminum ingots, it has been reduced by up to 50%, so in order to solve this problem and get out of this dependence, as well as to reduce costs, it is necessary to build this factory.

Due to the fact that aluminum fluoride and cryolite products are used in the industries of production of aluminum ingots, glass and glaze, pharmaceuticals, insecticides, etc. as one of the important raw materials. On the other hand, there is no factory in the country to produce these products, so all the needs of the country are met through imports. On the other hand, sanctions have increased the cost of these products, which has reduced the production capacity of domestic factories. Therefore, by increasing production in the country and lowering their cost price compared to similar imported goods, domestic consumers increase their production and also increase the production of downstream industries. According to the country's need for aluminum fluoride above 24,000 tons and cryolite above 5,000 tons, so the total products of this factory with a capacity of 10,000 tons of aluminum fluoride and 3,000 tons of cryolite can be easily sold in the country. At the same time, export conditions are very suitable for these two products.

3.2 Project's Requirements

One of the most important factors that affect the quality of the final product is the quality and analysis of raw materials entering the process. A small change in the analysis of these materials causes a significant change in product quality. Among the raw materials, the quality of aluminum hydroxide is of special importance because it directly affects the production of aluminum fluoride and cryolite, so that in production, direct aluminum fluoride $Al(OH)_3$ is reacted with hydrofluoric acid and after crystallization, the solution is filtered and the resulting cake filter is dried and finally anhydrous aluminum fluoride is produced. In the production of cryolite, aluminum hydroxide is dissolved in sodium hydroxide and a solution of sodium aluminate is produced, and by adding hydrofluoric acid to this solution, cryolite precipitates. Finally, the crystalline product is separated by filtration and transferred to dryers to remove moisture. The most important steps in the production of aluminum fluoride are synthesis and drying because in these steps the quality of the final product is determined. In these steps, by precisely controlling the ratio of raw materials, temperature, time, pH, additives, etc., the desired final product is obtained; therefore, accurate control of these conditions is extremely important. In the production of cryolite, the most key step is the synthesis in which the conditions of the work process must be under strict control. Among, the important parameters in this stage are the ratio of raw materials, temperature, time, pH, additives, etc., which strongly affect the quality of the final product.

3.3 Space and Infrastructure Required

Table 7: Land Purchase Costs (Million Rial)

Specifications	Area (m^2)	Price per m^2	Cost		
			Paid Cost	Needed Fund	Total
A piece of land in Jajarm	15,000	0.5	0	7,500	7,500

Table 8: Site Preparation and Development Costs (Million Rial)

Description	Working Capacity	Unit	Unit Price	Paid Cost	Needed Fund	Total
Excavation	10,000	cm	0.3	0	0	3,000
Wall Construction and door	650	Sm	9	0	0	5,850
street construction (5% of the amount of land)	750	Sm	7	0	0	5,250
Green space and Lighting (1% of the amount of land)	150	No	8	0	0	1,200
Total				0	0	15,300

Table 9: Civil Works, Structures and Buildings Costs (Million Rial)

Description	Area (m ²)	Unit Price	Paid Cost	Needed Fund	Total
Production Hall	3,500	25	0	0	87,500
Raw material warehouse	700	30	0	0	21,000
Product warehouse	700	30	0	0	21,000
Office building	300	45	0	0	13,500
Guardroom & welfare	30	45	0	0	1,350
Total			0	0	144,350

Table 10: Infrastructures

No	Description	Unit	Annual Consumption	Unit Cost (Rial)	Total (Million Rial)
1	Water consumption	m ³	10,000	7,000	70
2	Electricity consumption	Kwh	2,750,000	1,100	3,025
3	Gas consumption	m ³	2,500,000	1,200	3,000
4	Gasoline	Litr	20,000	30,000	600
5	Unforeseen	5% of the above			193
Total					6,888

3.3.1 Equipment and Machinery

Table 11: Plant Machinery and Equipment Costs (Million Rial)

Description	Unit Cost	Costs Required				Total
		Local Costs	Costs Of Currency		Cost To Complete	
			Rate	(Million Euro)		
Material handling equipment, storage, and reaction tanks	-	180,400	240,000	0.75	0	180,400
Dust collector systems	-	45,500		0.18	0	45,500
Absorbent columns	-	50,000		0.2	0	50,000
filtration	-	42,500		0.17	0	42,500
Dryers	-	155,600		0.64	0	155,600
Gas purifiers	-	28,500		0.11	0	28,500
Total Cost of Machinery		502,500		2.09	0	502,500

The exchange rate is: 1 € = 240,000 Rial

3.3.2 Raw Material and Intermediate Components

Table 12: Raw Material and Intermediate Components (Million Rial)

Description	Unit	Total Consumption of the Raw Material	Price per Unit of Raw Material	Annual Cost of Providing Material
Aluminum hydroxide	<i>Ton</i>	12,000	75	900,000
sulfuric acid	<i>Ton</i>	25,000	11	275,000
CaF ₂	<i>Ton</i>	26,000	60	1,560,000
NaOH	<i>Ton</i>	3,500	20	70,000
packing	<i>Numner</i>	45,000	0.5	22,500
Total				2,827,500

3.3.3 Management and Human Resources

Table 13: Salary of Administrative Staff (Million Rial)

No.	Position	Number of Shifts	Personnel per Shift (No.)	Total Staff (People)	Monthly Salary (per Person)	Annual Salary
1	manpower (in Administrative sector)	-	-	16	30.9375	5,940
2	manpower (in Production sector)	-	-	83	48.976	48,780
Total				99	79.9135	54,720

4 Market Study and Competition

4.1 Examining Supply And Demand Trends

The amount of domestic supply or production of heat treatment based on production licenses (according to the information of the ministry of industry, mine and trade) is zero. So there is no active unit yet.

The amount of imports to the country is based on the information of the Tehran Chamber of Commerce, Industries, Mines and Agriculture at <http://www.tccim.ir> according to the (There is no data for 2019 and 2020 so the information is considered as the initial data for the forecast for the coming years from 2015 to 2018) following table.

Table 14: The Amount of Imports of Aluminum fluoride From 2015 to 2018

Year	Customs Tariff	Imports (ton)	Countries
2015	28261200	4,059	China, Jordan, UAE
2016	28261200	3,656	China, Jordan, Italy, England
2017	28261200	4,345	China, Jordan, Italy, England
2018	28261200	3,475	China, Jordan, UAE, England

The following chart shows the prediction of production according to the Table 14 based on linear regression.

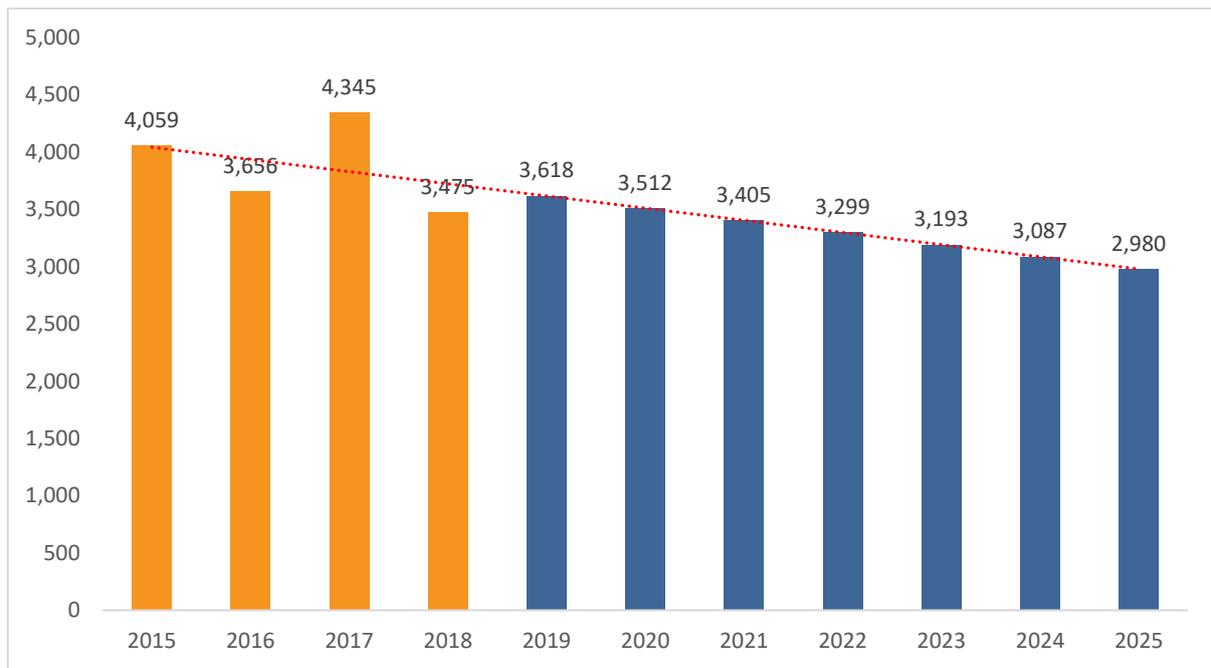


Figure 2: The Prediction of Imports of Aluminum fluoride

As the Figure 2Error! Reference source not found. shows the prediction of imports is decreasing.

Table 15: The Amount of Imports of Cryolite From 2015 to 2018

Year	Customs Tariff	Imports (ton)	Countries
2015	28263000	5,144	China, Jordan, UAE
2016	28263000	4,403	China, Jordan, Italy, England
2017	28263000	2,659	China, Jordan, Italy, England
2018	28263000	3,897	China, Jordan, UAE, England

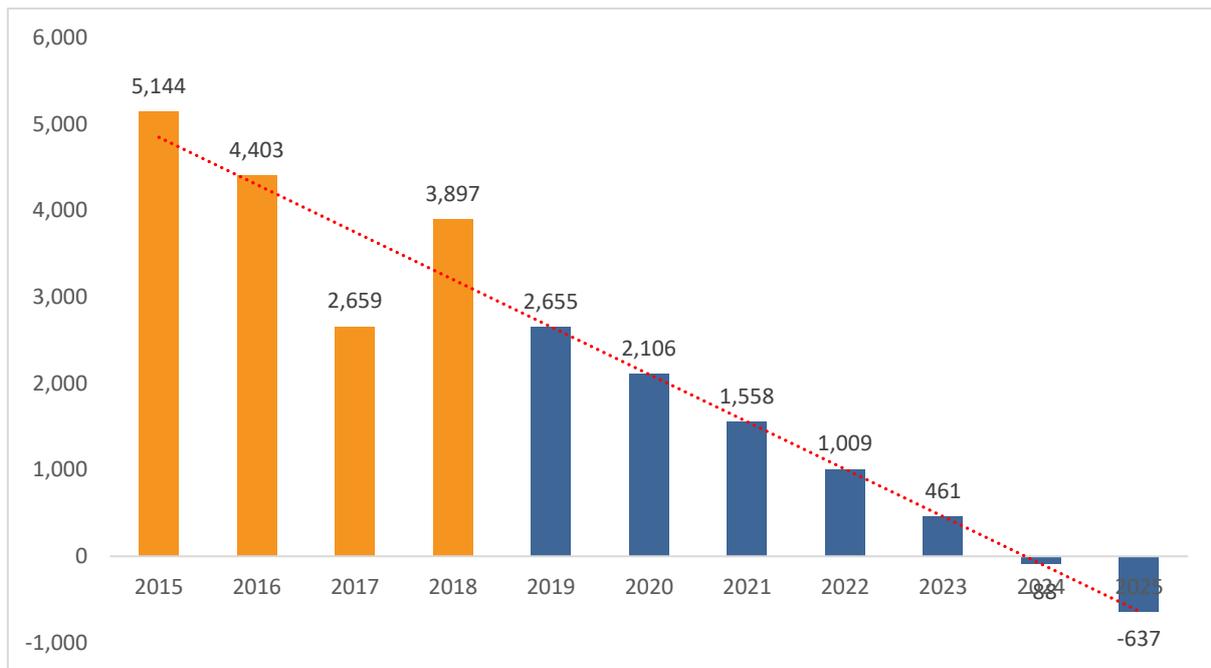


Figure 3: The Prediction of Imports of Cryolite

As the Figure 3Figure 2Error! Reference source not found. shows the prediction of imports is decreasing.

The amount of exports to the country is based on the information of the Tehran Chamber of Commerce, Industries, Mines and Agriculture at <http://www.tccim.ir> according to the following table.

Table 16: The Amount of Exports of Aluminum fluoride

Year	Customs Tariff	Exports (Tons)	Countries
2015	28261200	0	-
2016	28261200	0	-
2017	28261200	0	-
2018	28261200	10	Iraq

The following chart shows the prediction of exports based on linear regression.

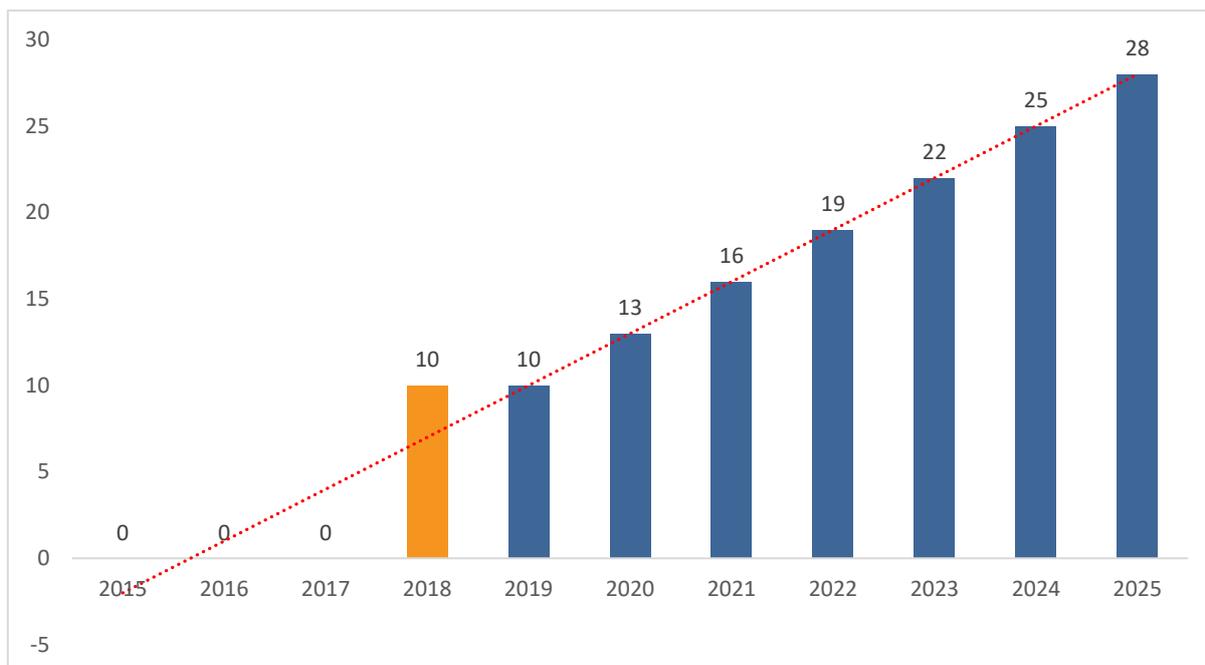


Figure 4: The Prediction of Exports of Aluminum fluoride

Error! Reference source not found. shows the prediction of exports of aluminum fluoride is increasing. The exports of cryolite is zero.

5 Financial Projection

5.1 The Cost Estimate

Table 17: Total Investment (Million Rial)

No.	Subject	Cost
1	Fixed Capital	955,813
2	Working Capital	482,056
Total Investment		1,437,869

Table 18: Fixed Capital (Million Rial)

Subject	Paid Cost	Cost Required			Total Cost	
		Local Cost	Foreign Exchange Cost			Needed Fund
			Rate	(€)		
land purchase	0	7,500	240,000	0.03	0	7,500
Landscaping	0	15,300		0.06	0	15,300
Building	0	144,350		0.6	0	144,350
Machinery, and equipment	0	502,500		2.09	0	502,500
Laboratory equipment	0	10,000		0.04	0	10,000
Facilities	0	39,500		0.16	0	39,500
Transportation	0	26,000		0.1	0	26,000
Office and services equipment	0	1,297		0.005	0	1,297
Pre-operation costs	0	122,474		0.51	0	122,474
Unforeseen (10% of the above items)	0	86,892		0.36	0	86,892
Total Fixed investment	0	955,813		3.98	0	955,813

Table 19: Working Capital (Million Rial)

Subject	Day	Total
Packaging material (2 months raw materials and packaging)	60	471,250
Salary (2months salary)	60	9,120
Imprest fund (15 days of water, electricity, fuel and repair costs)	15	1,686
Total		482,056

Table 20: Fixed and Variable Costs

No.	Production Cost	Fixed Cost		Variable Cost	
		%	Cost	%	Cost
1	Raw material	0	0	100	2,827,500
2	Energy & utility	20	1,378	80	5,510
3	Repair & Maintenance	20	6,715	80	26,858
4	Production salary	70	38,304	30	16,416
5	Depreciation	100	84,777	0	0
Total Production Costs			131,174		2,876,285

5.2 Break-Even Analysis

Table 21: Break-even Analysis

Period	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Break-even ratio (%)	19.47	18.33	17.29	16.34	15.45	14.24	13.57	12.97	12.41	11.91

5.3 Sensitivity Analysis of IRR

Table 22: Sensitivity Analysis of IRR

Variation (%)	Sales Revenue	Increase In Fixed Assets	Operating Costs
-20.00%	-32.82%	76.19%	121.68%
-16.00%	4.34%	73.18%	109.93%
-12.00%	21.06%	70.42%	98.22%
-8.00%	35.45%	67.89%	86.56%
-4.00%	49.42%	65.55%	74.94%
0.00%	63.39%	63.39%	63.39%
4.00%	77.43%	61.38%	51.88%
8.00%	91.56%	59.51%	40.40%
12.00%	105.76%	57.76%	28.79%
16.00%	120.02%	56.12%	16.57%
20.00%	134.32%	54.59%	1.95%

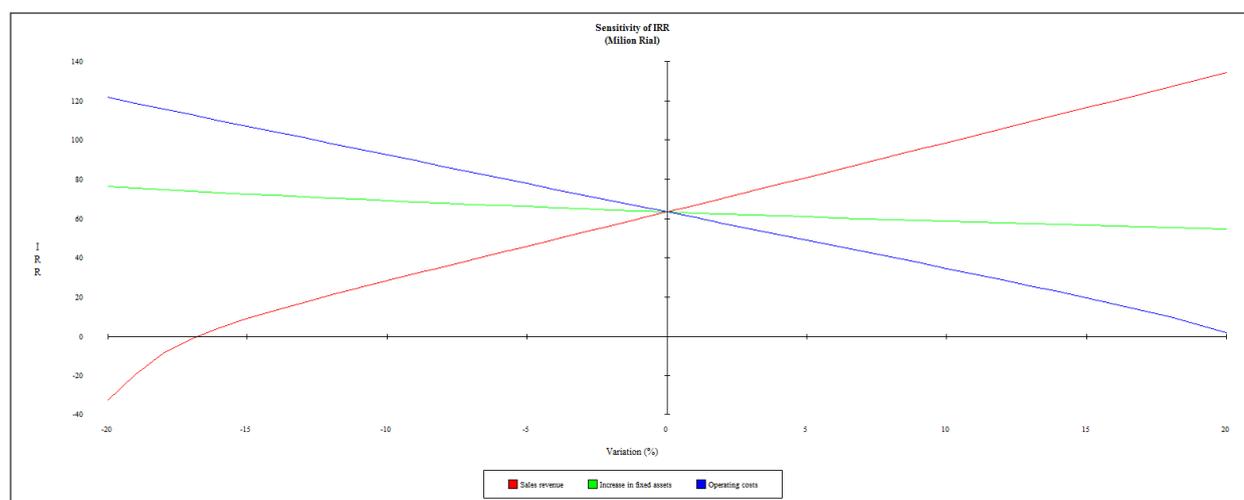


Figure 5: Sensitivity Analysis of IRR

6 Duration of Project Operation

The time of doing early stages and completing its process is about 16 months.

Table 23: Action Plan and Implementaion Schedule

Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Land Purchase	■																								
Constructing Buildings		■	■	■	■	■	■	■	■	■															
Execution of Facilities									■	■	■														
Order, Purchase of Machinery											■	■	■												
Landscaping													■	■											
Machinery Strat-up and Trial Production															■	■	■								

7 Incentives, Features And Advantages of Project

North Khorasan Province is a province located in northeastern Iran. Bojnord is the capital of the province. This province contains many historical and natural attractions, such as mineral water springs, small lakes, recreational areas, caves and protected regions, and various hiking areas. Advantages of the agriculture of this province involves favorable and diverse climatic conditions and other parameters affecting growth.