



Organization of Investment and Economic
and Technical Assistance of Iran
Investment Services Center of
Yazd Province

Introduction of Investment Opportunities in Yazd Province

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PRODUCTION OF PRINTING INK USING CERAMIC NANO-PIGMENTS

SUMMARY OF TECHNICAL-ECONOMICAL FEASIBLE STUDY

SUBSECTOR: INDUSTRY

ISIC 2422312494



Preparation and editing :

Iran Ceramic Technology Development Center



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Introduction

The use of pigments for decorating ceramic products is very old in Iran and the world. Our ancestors used a variety of natural pigments to create beautiful paintings on mosaic tiles, religious centers and homes, and their knowledge of pigments and color variations was amazing. They used colored metals, oxides and various salts to color the glaze. They created a wide range of color with their skill and changing oven conditions and glaze composition.

Today, the limitation of natural resources, the limited color spectrum, the low temperature stability and the difficulty of controlling the uniformity of the composition of natural pigments have reduced its role in the modern industry and the need to produce synthetic pigments is more felt.

Therefore, synthetic pigments were produced on a mass scale for various industries. Gradually, with the advent of new technologies such as "digital printing technology", the need to produce printing inks containing "nano pigments" was felt.

Synthetic pigments no longer meet the needs of new technologies, and new methods of synthesis of "nano pigments" need to be designed and implemented.



General Indicators of Yazd Province

Economic Indicators

1. GDP : 4.680 million Euro
2. GDP per capita : 4440 Euro

Social indicators

1. The population : 1,138,533 people
2. Population growth rate : 2.5%
3. Population density : 2.5 people per square kilometer
4. The percentage of young population 24.29%
5. Urbanization rate : 85.3%

The contribution of various economic sectors

1. Agriculture 8/3%
2. Industry and Mine 46.3%
3. Services 45/4%

Geographical Indicators

1. Area: 74,781 square kilometers (The eighth city of the country)
2. Neighboring Provinces: Fars, Isfahan, South Khorasan, Kerman
3. Number of Counties: 10 and number of cities: 21

The statistics of social and geographical indicators related to 2014 and the statistics of economic indicators related to 2016.

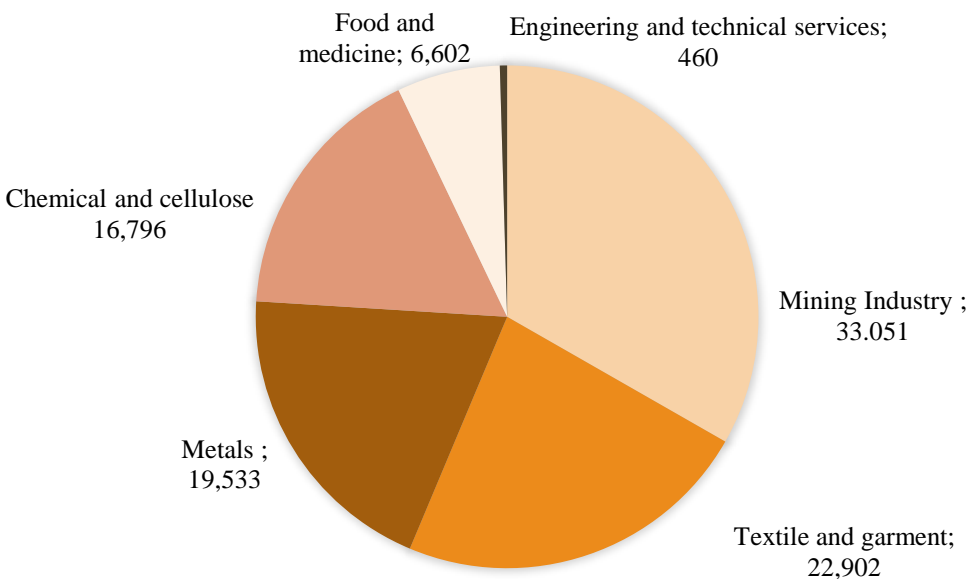
A look at the industrial sector of Yazd province

There are more than 3,600 industrial units with the production licence producing more than 800 types of commodities.

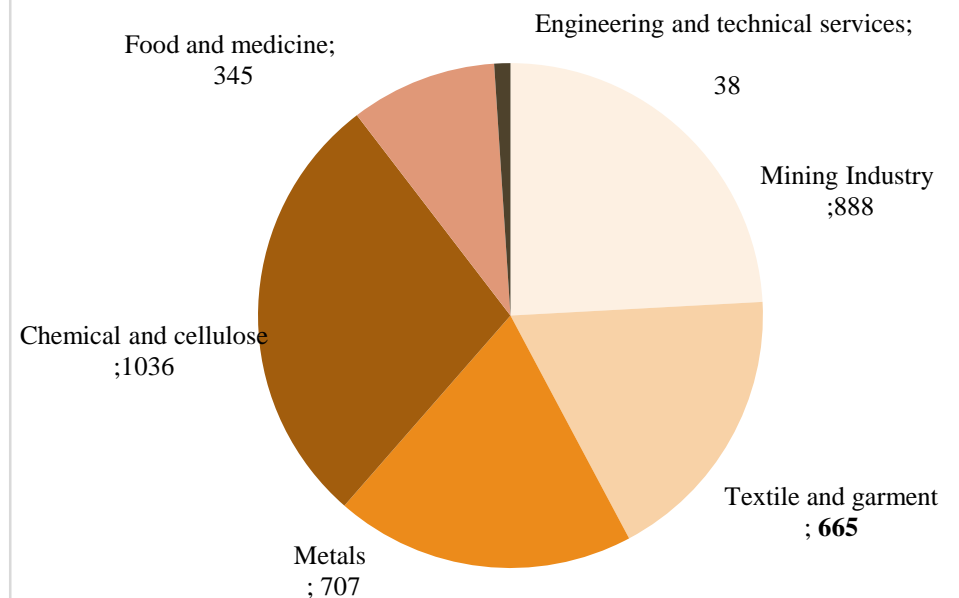
The fourth industrial province of the country

More than 95 % of the industries of Yazd Province constitute small and medium - sized industries (*SME*)

The country's first ranking in the production of tiles and second ranking in textile production



Distribution of Industrial Units of Yazd Province



Industrial employment distribution of Yazd Province 6

Project's Location

Yazd province with about 74781 square kilometers (4.6 percent of the country) is the eighth largest province of the country. It is located in the central part of Iran's plateau on the margin of the Kavir Lut plain. It is located in the west of Isfahan, Fars from the south and Southwest, southern Khorasan is east of Kerman and neighboring east and south east. In terms of political-administrative divisions, this province has 10 cities, 21 districts, 45 villages and 21 urban centers. This province has 14 industrial estates, 17 industrial zones and 1 special economic zone in the fields of textile, metal, chemical, food, electricity and electronics, non-metallic and cellulose minerals, and has the proper infrastructure for the establishment of industrial units.

Production of printing ink using Ceramic nano-pigments will be implemented in Meybod city industrial city

Longitude of the project: 32.16627

Latitude of the project: 54.098985



Access to the Infrastructure

- Having numerous power plants with a nominal capacity of 2500 MW
- Having three gas pipelines with a capacity of 50 million cubic meters per day
- Supply of petroleum products required through national pipelines

Energy



- Provincial Geographic Position (Crossing of North-South and East-West Transportation Corridor)
- The first rank of rail transit in the country (more than 876 kilometers of railroad tracks) and the railroad crossroads
- Having an international airport for cargo and passenger transportation with easy access

Transportation



- 14 industrial towns, 17 industrial districts with a total area of 7000 hectares
- It covers about 1,000 active units and 1,400 units under construction.
- The existence of Yazd Special Economic Zone with an area of over 570 hectares

Industrial areas



product introduction

Pigments in the tile industry are used in the following applications: Granule staining and body staining, glaze and dyeing, making color printing paste to create rolling and siding designs, enhancing body whiteness with white pigments And opacity, the use of metallic complexes in solution, to create designs in granite bodies and digital printing inks containing ceramic nano pigments is nowadays more widely used than metal complexes to decorate granite bodies. In the past, soluble salts were used in this application, which gradually replaced the metal complexes. These pigments react with the body during baking after penetrating the surface of the raw body. The presence of metallic cations in the glass phase or the deposition of their colored oxides causes color spots in the body. Digital printing inks are more complex.

In combination with these inks it is necessary to use nano pigments or metal complexes. As can be seen in most

applications, artificial ceramic pigments are used to decorate glazes and tile bodies.

The variety of pigments with different properties and structure is very high. Understanding the structure, composition and method of making ceramic pigments will help to understand the limitations of using these pigments in digital printing inks.



Current marketing situation

Ceramic pigments are widely used in ceramic, porcelain tile and colored glass because of their high temperature resistance as well as resistance to the environment. Currently the pigments and solvents used for digital printing ink in the ceramic tile industry are all imported. Due to the growing demand and export of ceramic products, the need to localize pigments and the printing industry is felt more than ever.

Considering consumption of between 4 and 12 grams of ink per square meter, averaging about 8 grams per square meter, and considering more than 10,000 tile ovens worldwide, more than 90 percent of production lines worldwide, They are equipped with digital printing, which is also true in European countries. Trends in machine and ink prices predict a 9 percent decline in digital hardware and an 8 percent increase in ink annually, and in the coming years the value of the ink sector will increase more than the machine. The production of ceramic tiles in Iran is 381 million square meters per year, which requires an average of 4,000 tons of ink per year to produce this product, and 8,000 tons of inks, pigments and solvents per annum. The need to import the country.

Currently, Iran is the fifth largest manufacturer and exporter of ceramic tiles in the world. And it has become a market for ink in countries such as Italy, Spain, Germany and more recently China and India.

On average, the remaining imported inks reach the Iranian consumer in the range of 130 to 250 thousand dollars, while the finished price of this product will, on average, come from localized raw materials in the range of 40 to 80 thousand tomans. Indeed, the significant price differences between these two product groups drive us to invest and strive for national production in the industry.

Product specifications and market

Row	Product	Target Market				Innovation
		Regional	Provincial	Country	Export	
1	Production of nanosilver	--	*	--	*	Domestic production
2	Solvent production	--	*	--	*	Domestic production
3	Ink printing production	--	*	--	*	Domestic production

Considering consumption of between 4 and 8 grams per ink per square meter, which averages about 6 grams per square meter, and considering more than ten thousand tile ovens worldwide, over 90% of the lines appear to be Production around the world, equipped with digital printing

Raw material and how to access them

Row	Technical Specifications	Supplier / Manufacturer
1	Titanium dioxide	Foreign
2	Boric acid	Domestic
3	Heavy alcohol	Domestic
4	Fatty acid	Domestic
5	Diethyl ether	Domestic
6	Caustic Soda	Domestic
7	Ethanol	Domestic
8	Dispersing additive	Foreign
9	Chromium oxide	Foreign
10	Tin oxide	Foreign
11	Silica	Domestic
12	Cobalt oxide	Foreign
13	ZnO	Domestic
14	iron oxide	Domestic
15	Calcium carbonate	Domestic

Technical Reviews

Manufactured products and proceeds from its sale:

Row	Description	Number of monthly entries	Received value	Service sales revenue
1	Production of printing	150 Tone	-	13500000000000

Number and Characteristics of Employment in the Project:

Row	Department	Type of workforce	Employment Number	Monthly Wage (Rials)	Monthly Wage (Rials)
1	Management	Manager	1	100000000	100000000
		Expert Office Management	2	40000000	80000000
		Services	1	20000000	20000000
2	Technical and Maintenance	Technical manager	1	90000000	90000000
		Maintenance Expert	2	40000000	80000000
3	Production and Laboratory	production manager	1	90000000	90000000
		Laboratory Manager	1	60000000	60000000
		Laboratory Expert	2	40000000	80000000
		Solvent Production Manager	1	60000000	60000000
		Solvent Production Expert	1	40000000	40000000
		Pigment Production Manager	1	60000000	60000000
		Pigment Production Expert	1	40000000	40000000

Number and Characteristics of Employment in the Project:

Row	Department	Type of workforce	Employment Number	Monthly Wage (Rials)	Monthly Wage (Rials)
3	Production and Laboratory	Ink Production Manager	1	60000000	60000000
		Ink Production Expert	1	40000000	40000000
		quality control manager	1	60000000	60000000
		quality control expert	3	40000000	120000000
		Shift officer (non-office time)	2	60000000	120000000
		services	1	20000000	20000000
		Worker	18	20000000	360000000
4	Research and Development	Research and Development Manager	1	90000000	90000000
		Expert research and development	1	40000000	40000000
5	Trading	commercial manager	1	90000000	90000000
		Office of Marketing and Sales	2	40000000	80000000
		Services	1	20000000	20000000

Number and Characteristics of Employment in the Project:

Row	Department	Type of workforce	Employment Number	Monthly Wage (Rials)	Monthly Wage (Rials)
6	Accounting	Manager	1	60000000	60000000
		Accountant	1	40000000	40000000
7	Information Technology	Manager	1	60000000	60000000
		IT expert	1	40000000	40000000
8	Facilities	Facilities	2	40000000	80000000
9	storeroom	Head of the warehouse	1	60000000	60000000
		Warehouse Expert	1	40000000	40000000
		Worker	2	20000000	40000000
		Services	1	20000000	20000000
10	Vehicle	Export	1	40000000	40000000
		Worker	4	20000000	80000000

Number and Characteristics of Employment in the Project:

Row	Department	Type of workforce	Employment Number	Monthly Wage (Rials)	Monthly Wage (Rials)
11	Accounting	Manager	1	60000000	60000000
		Accountant	1	40000000	40000000
12	Sentry	Guardian	1	40000000	40000000
		Worker	3	20000000	60000000
13	Dining room	Chef	1	40000000	40000000
		Services	2	20000000	40000000
Total			71	2640000000	
Average personnel cost per kilogram of ink			23467		

Building and Construction

Row	Department	Space	Office Equipment (Rials)	Office Area (sqm)	Hall (sqm)	Cost (Rials)
1	Management	Management Office	600000000	60		
2	Technical and Maintenance	office	100000000	30		
		Spare parts warehouse	100000000	40	100	
3	Production and Laboratory	Management			150	
		Solvent production			200	
		Production of silicone			350	
		Ink production				
		Lab	600000000	150		
		Quality Control	100000000	20		
4	Research and Development		150000000	20		
5	Trading		200000000	20		

Building and Construction

Row	Department	Space	Office Equipment (Rials)	Office Area (sqm)	Hall (sqm)	Cost (Rials)
6		Accounting	200000000	20		
7		Information Technology	100000000	20		
8		installation	100000000	40		
9		Stocks of raw materials and products	100000000	20	200	
10		Vehicle	50000000	20	100	
11		sentry	50000000	20		
12		Prayer room	20000000	50		
13		W.C-3		50		
14		Dining room	200000000	200		
15		Communication between units	120	300		
Total			2900000000	1000	1400	14000000000

Fixed capital cost

Row	Description	Total cost (Rials)
1	Office Building (1000 sqm)	15000000000
2	industrial shed(1400sqm)	14000000000
3	office equipment	2900000000
4	Industrial and laboratory equipment	28269000000
5	Required license fee	4000000000
	Total	35459000000

Costs before operation

Description	cost (Rials)
Office Building (1000 sqm)	10637700000
Total	10637700000

Fixed capital

Description	cost (Rials)
Capital costs	35459000000
Costs before operation	10637700000
Total	365227700000

The complete equipment includes the following items:

Row	Description		Number	Total cost
1	Transport equipment	Forklifts	2	4000000000
		Derrick	1	1000000000
		pickup trucks	1	1000000000
2	Warehouse equipment	Shelf and etc		500000000
		Source of storage of raw materials and liquid products – 10m ³	10	1500000000
3	Pigment Making Equipment	Filter Press	1 device	500000000
		Balmill-Alumina inner wall 500 kg	2 device	1700000000
		Refiner	5 device	10000000000
		1500 degree furnace - volume 2000 liters - electric	4 device	24000000000

The complete equipment includes the following items:

Row	Description		Number	Total cost
3	Pigment Making Equipment	1500 degree laboratory furnace - 20 liters	1 device	500000000
		Dryer -150 ° - volume of 2000 liters - gas	2 device	1400000000
		Powder Filter	7 device	700000000
		Pigment Powder Filter	5 devices -20 microns	4000000000
		Pigment Mill	5 device	4000000000
4	Solvent making equipment	Mixer - 2 tones - 150 ° - Gas - With separate steam output	2 device	4000000000
		2-ton solvent phase separation source	2 device	300000000
5	Ink production equipment	Particle Measuring Machine	1 device	11400000000
		Viscometer and conductivity	1 device	11400000000

The complete equipment includes the following items:

Row	Description		Number	Total cost
5	Ink production equipment	Laboratory Ink Production Machine - 1L	1 device	2850000000
		Mixer-1 ton - mixing pigment and solvent	5 device	5000000000
		Homogenizer - 60 liters - speed of at least 13 m / s	16 device	167740000000
		Mixer-polyethylene for ready ink storage -2 ton-low round	5 device	10000000000
6	Ink filter system - 1 and 3 micrometer filters		5 device	11400000000
7	Weight of raw material - 1 ton		3 device	300000000
8	Weighting of raw materials - 10 kg		3 device	1500000000
9	Packing system			2000000000
Total				282690000000

Fuel and energy

Row	Description	unit	Annual consumption	Unit Cost (Rials)	Total Cost (Rials)
1	Electricity	KWh	10000000	2000	20000000000
2	Water	Cubic meters	10000	13500	135000000
3	Gas	Cubic meters	500000	1000	500000000
4	Petrol	Liters	3500	10000	35000000
5	Heating and cooling niches				500000000
Total					21170000000

Raw materials (annually)

Row	Description	unit	Annual consumption	Unit Cost (Rials)	Total Cost (Rials)
1	Titanium dioxide	Kg	132000	400000	52800000000
2	Antimony oxide	Kg	4500	450000	2025000000
3	Calcium carbonate (micronized mesh granulation 325)	Kg	50400	1600	80640000
4	Boric acid	Kg	3600	50000	180000000
5	Heavy alcohol	Kg	450000	50000	22500000000
6	Fatty acid	Kg	630000	120000	75600000000
7	sulfuric acid	Kg	54000	70000	3780000000
8	Caustic Soda	Kg	30000	70000	2100000000
9	ethanol	Liters	60000	80000	4800000000
10	Dispersing additive	Kg	72000	900000	64800000000

Raw materials (annually)

Row	Description	unit	Annual consumption	Unit Cost (Rials)	Total Cost (Rials)
11	Chromium oxide	Kg	50400	1100000	55440000000
12	Tin oxide	Kg	95190	1100000	104709000000
13	Silica	Kg	136800	8500	1162800000
14	Cobalt oxide	Kg	75600	5000000	378000000000
15	ZnO	Kg	127800	230000	29394000000
16	Iron oxide	Kg	54000	50000	2700000000
Total					800071000000

Maintenance costs (annual)

Row	Description	unit	Annual consumption	Unit Cost (Rials)	Total Cost (Rials)
1	Ceramic bush	Number	400	3000000	1200000000
2	Furnace repair				600000000
3	Mixer repair				300000000
4	Ball mill Repair				300000000
5	Maintenance and replacement of filters				11800000000
6	Repair of ink production machines				6800000000
7	Zirconia bullet	kg	3600	5600000	20160000000
8	Alumina bullet	kg	7500	80000	600000000
	Total				41760000000
Average maintenance cost per kilogram of ink					23200

Sales price and annual revenue

Pricing Strategy

Price is based on two strategies:

1. Costs plus capital gain margin That is the minimum price is 75000 Toman.
2. Market Price : The market price varies between 95000 and 110000 depending on the market conditions and the raw material rate which is 95000 Toman as a price in this plan.

The results in the following table are based on the estimated minimum price of 75000 Toman.

Row	Description	Number of entries per year	Received value	Service sales revenue
1	Production of printing ink	1800 tone	750000	1350000000000

Summary Of Economics Issues

Description	Value	Description	Value
Total fixed investment (million Rials)	365227700	capacity	1800 Tone
Working Capital (million Rials)	227336080	Net current value of NPV (million Rials) at a discount rate of 20%	519
internal rate of return (IRR)	61.8	Pay back	2.9 years

• 2.9 years



Payback

- 0.0043million Euro
(per euro 120,000 Rilas)
- At a discount rate of
24%



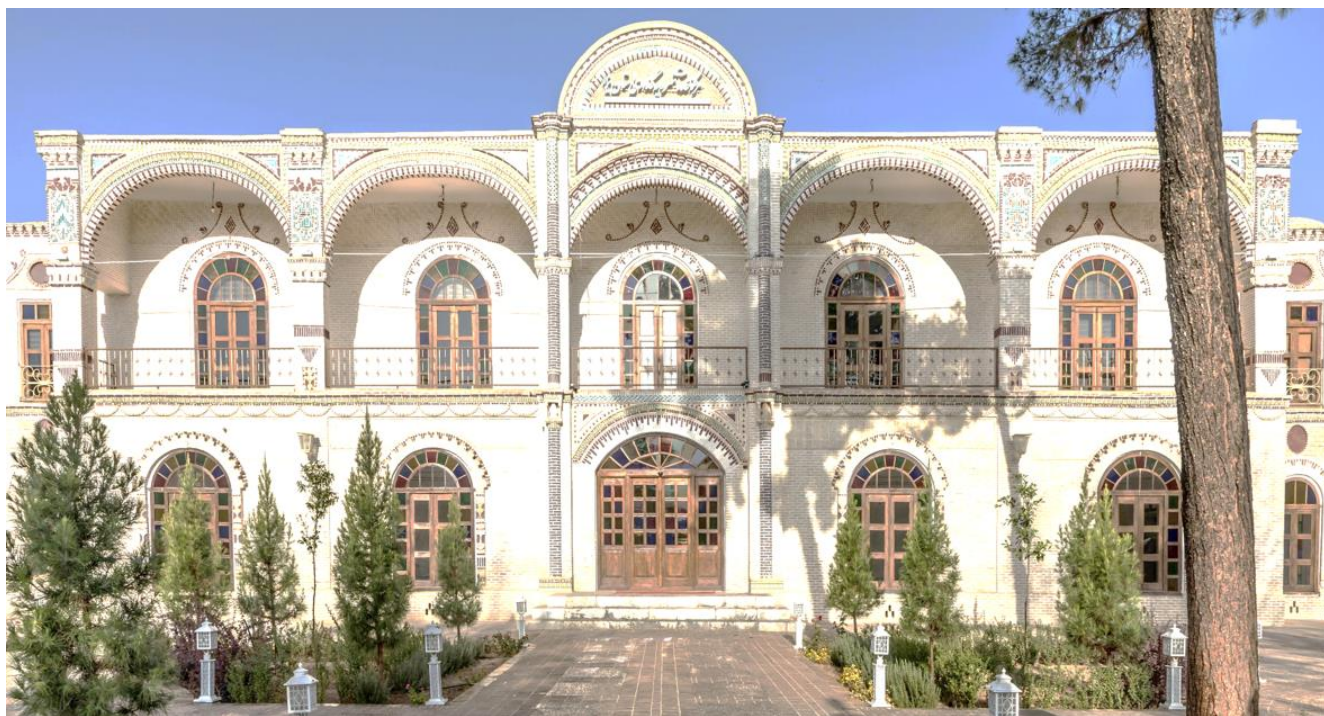
NPV

• 61.8%



IRR

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