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RESEARCH PAPER

Classification of five Iranian chemical industries based on economic value-added

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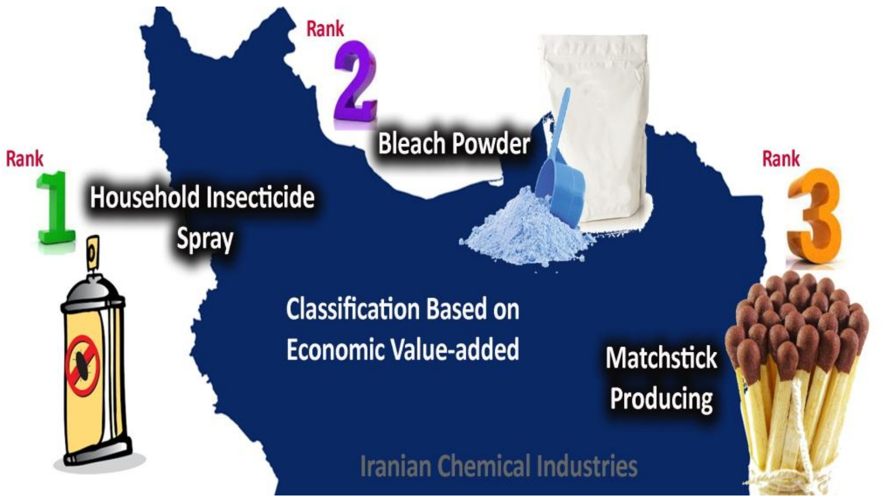
Highlights

- The EVA is used to rank and classify the industrial groups by the statistical center of Iran.
- The project cycle involves site selection, screening, initial assessment, and scoping of significant issues.
- The main variables interfering in the estimation of EVA are the price of products, outlays of energy, costs of feedstock, unforeseen costs of fixed capital, and depreciation costs (maintenance, operational and non-operational fixed annual capital).

Graphical Abstract



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Abstract

The value that is added to the value of intermediate goods in the production process is called Economic Value-Added (EVA). This concept is related to the production process and not to a specific commodity. Due to the wide variety of goods required, most of the needs of society are provided by the Chemical Industries Group. Chemical industries are part of the industry, which convert the chemicals needed by other industries to produce more than 70,000 products through conversion. Raw materials supply the required materials. Sales of the chemical industry can be divided into several broad categories, including basic chemicals (about 35 to 37% of production), life sciences (30%), particular chemicals (20 to 25%), and consumer products (About 10%). The tabulated data were selected from the screening step of project identification in the Environmental Impact Assessment (EIA) plan of industrial projects belong to both the Iranian environment protection agency and Iranian industries organization. To classify the five Iranian chemical industries was employed EVA using empirical equations. Results were allocated for depreciation outlay, and unforeseen costs via considering the percentage of outlays of required land, landscaping, buildings, pavement, and asphalt; Investment in facilities; Investment in equipment and the installation costs; and investment in transportation facilities. Finally, the industries were assorted based on EVA from the highest percentage manifested to the lowest one as well as simple reports of costs in tables. Findings declare that the screening step of industrial projects in project identification is an indispensable stage in conducting an Environmental Impact Assessment (EIA) plan.

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1. Introduction

The industrial sector in the country's economy plays an important role in creating both EVA and jobs. Every sector of the Iranian industries is associated with high diversity. The field of industry is more diverse than other sectors, and there is the capital needed to continue their activities in the economy. However, the highest vulnerability of domestic production is observed in this part of the economy. Many experts consider industrial development as a prerequisite for sustainable economic development and growth (Shinkevich et al., 2020; Salehi et al., 2014; Man et al., 2019). Therefore, due to the significant effects of the industrial sector on macroeconomic variables such as production, consumption, investment, employment, exports, and in general the key role of industry in the development process nationally, it is necessary to provide effective and appropriate support to increase competitiveness and improve the productivity of this sector and achieve the goals of economic growth (Valibeigi et al., 2020; Ifeanyi and Chukwuma, 2016).

According to the report of EIA for developing countries, it has emphasized EIA report based on financial assessment at the project level for industrial projects. Accordingly, a project cycle is divided into 6 stages such as 1) project concept; 2) pre-feasibility; 3) feasibility; 4) design and engineering; 5) implementation; and 6) monitoring and evaluation. The project cycle involves site selection, screening, initial assessment, and scoping of significant issues. The screening and initial assessment of the project cycle encompass issues associated with the energy & materials stream, an inventory of demands and project requirements, staff recruitment, etc for industrial and lots of other projects (Lohani et al., 1997; Madhani, 2011; Asrol et al., 2020; Salehi et al., 2014). The mentioned steps have carried out by the Iranian evaluator team and collected data were processed by the present research initially (Awange and Kiema, 2013; Duinker and Greig, 2006).

The industrial ecology encountered to cover a variety of issues inside its ambient such as issues of pollutants, energy & materials streams, facilities, and equipment implemented, waste stream, and lots of other cases. Each of them has provided hazards, benefits, and challenges in integrated and individual exposures (Sun et al., 2020; Pedro, 2019; Falah et al., 2020; Sabeen et al., 2020). A wide diversity has been reported for the issues in industrial ecology especially in chemical industries ambient. Volatile organic compounds are major pollutants released from the chemical industries that affect human health, the environment, and ecology at the regional and global levels (Noble, 2000). The specific effects of these compounds include their role in reducing stratospheric ozone, global warming, and the carcinogenic effects on semen and human health. These compounds can also cause heart and respiratory disease, headaches, weakness, miscarriage or fetal weight loss, mental illness, and suicide. In addition, excessive concentrations of some components of this group are carcinogenic. After entering the human body, these compounds are metabolized into various compounds known as biological markers (biomarkers). But recent advances in the use of plasma reactors have overcome the health and ecological problems of volatile organic compounds dissipated from industrial environments (Denes and Manolache, 2004). The pollutant discovery in the EIA plan falls into public involvements of the project.

The studies of the author pointed out to the existence of 141 various types of chemical industries in Iran in individual confirmation in the in-charge organization at least. But this study focused on five different industrial projects based on data reported by the Iranian evaluator team (Hassanpour, 2020). The objective of the present research sought to scrutinize the EVA made by five Iranian chemical industries. To conduct the present research was first tabulated annual requirements of industrial projects based on data released by the Iranian evaluator team. Then, the tabulated data were shifted and reported in currency. Finally, the empirical equations were assigned to figure out the EVA. The EVA was calculated based on depreciation outlay, and unforeseen costs via considering the percentage of outlays of required land, landscaping, buildings, pavement, and asphalt, investment in facilities, investment in equipment and the installation costs, and investment in transportation cars (vehicles, car, and fork). The novelty of the current research refers to the use of the latest prices in the market of Tehran to estimate the EVA. Concerning this fact that prices are varied during the period of sanction.

The author studied economic indices of many industries before such as plastic waste recycling industries, used motor oil reprocessing industries, acidic sludge recycling of used motor oil reprocessing industries, blown bitumen industries, and etc. But the objectives followed by current research sought the classification of 5 industries based on EVA. The indices of EVA have been taken into account in the comparison of chemical industries of both countries of Poland and Hungary from 1995-2011, and 2000-2014. The low level of the values of EVA obtained in industries of both countries. The findings emphasized to rise of the EVA in both nations by assigning relevant regulations and policies (Folfas and Udvarib, 2019). 59 various kinds of Karachian industries underwent an evaluation by EVA from 2006 to 2010. The results tabulated the percentages and presented the priority among 59 alternatives assessed (Awan et al., 2014). The EVA is used to classify 18 different types of Iranian chemical industries in the financial statement. The input and output variables encompassed capital, labor force, raw materials, energy consumed, depreciation, debt ratio, waste costs, and product income. So, the industries classified from the lowest EVA to the highest one (Mohamadi et al., 2015). To assess the performance of the supply chain used the EVA among sugarcane farmers, sugar mills, and distributors. The findings allocated to classify the first, second, and third rank to sugarcane farmers, sugar mills, and distributors respectively (Asrol et al., 2020; Liang et al., 2020; Ebadi and Hisoriev, 2018).

The research examined the performance of EVA in comparison with market value. So, the data allocated in the financial statement for 325 Indian firms. After estimating the values of both indices the findings had shown EVA is a little weak index in comparison with market value but it is in a positive relationship with that. Also, classification completed based on both indices (Altaf, 2016). Jordanian public industrial firms consist of 51 firms have investigated via EVA to compare with other indices of financial statement. The comparison provided a common procedure in the classification of firms by EVA supported with statistical analysis and supplementary indices (Alsoboa, 2017). A study explained the circumstances of the performance of EVA in promoting business excellence and its main role in better discerning the potential advantages of employing that in the retail industry (Madhani, 2011). Asgari (2020) investigated the energy consumption, outlays; EVA in industries to find a relationship among the 3 mentioned variables during a few years (Asgari, 2020). The results revealed a weak connection among them. The EVA and other financial analyses have been taken into consideration in the evaluation of 87 various kinds of Iranian industries from 2007-2011. The results proved that the fluctuation in values of EVA has no significant relationship with operating cash flow (Khoshkhoo et al., 2013). A report investigated shifting the country's gross exports into the EVA to configure a valid database for trade purposes all over the world (Koopman et al., 2010). The EVA requested to rank and classify the Iranian industrial groups by the statistical center of Iran. Also, it paved the way towards the technical classification of industrial groups (Soofi and Ghazinoory, 2011).

2. Materials and Methods

According to Fig. 1 the 5 industries underwent the project identification step in the EIA plan assessed by the Iranian evaluator team. The initial data of assessment were processed to find the EVA of industries individually. The EVA estimation was calculated by taking into account the following assumptions. In one year, 270 working days and 8 hours of work shift were considered every day. All required equipment and facilities for this project were provided from within the country. The costs of water consumption for the green space water needs, staff; the total daily water demand for the industry were calculated depend on firewater demand according to the report of the evaluator team. To calculate the monthly salary of the employees, the monthly salary in 14 months was estimated and 23% of the total salary of the employees was assumed for social security and pension insurance and finally, $100 per person was added to the traveling expenses. The electricity consumption was calculated in 300 days per year due to electricity consumption on non-working days. In this study, the conditions for obtaining a loan and the fee for the facilities were ignored. It was used Equations 1 to 3 to finalize the calculations (Hassanpour, 2018). Fig. 1 presents the evaluation steps of EIA in EVA estimation and project assessment levels in Iran.

$W = 0.75(\sum e) \times A$ W (electrical energy demand), e (total electrical energy employed in lines), A (area, m2) (1)

$V = p - \left((\sum e) + A' + F + Cf\right)$ V (value-added), p (the price of products) A'(outlay of feedstock), F (outlay of maintenance), Cf (unforeseen outlays) (2)

$\%V = V \times 100/p$ (3)

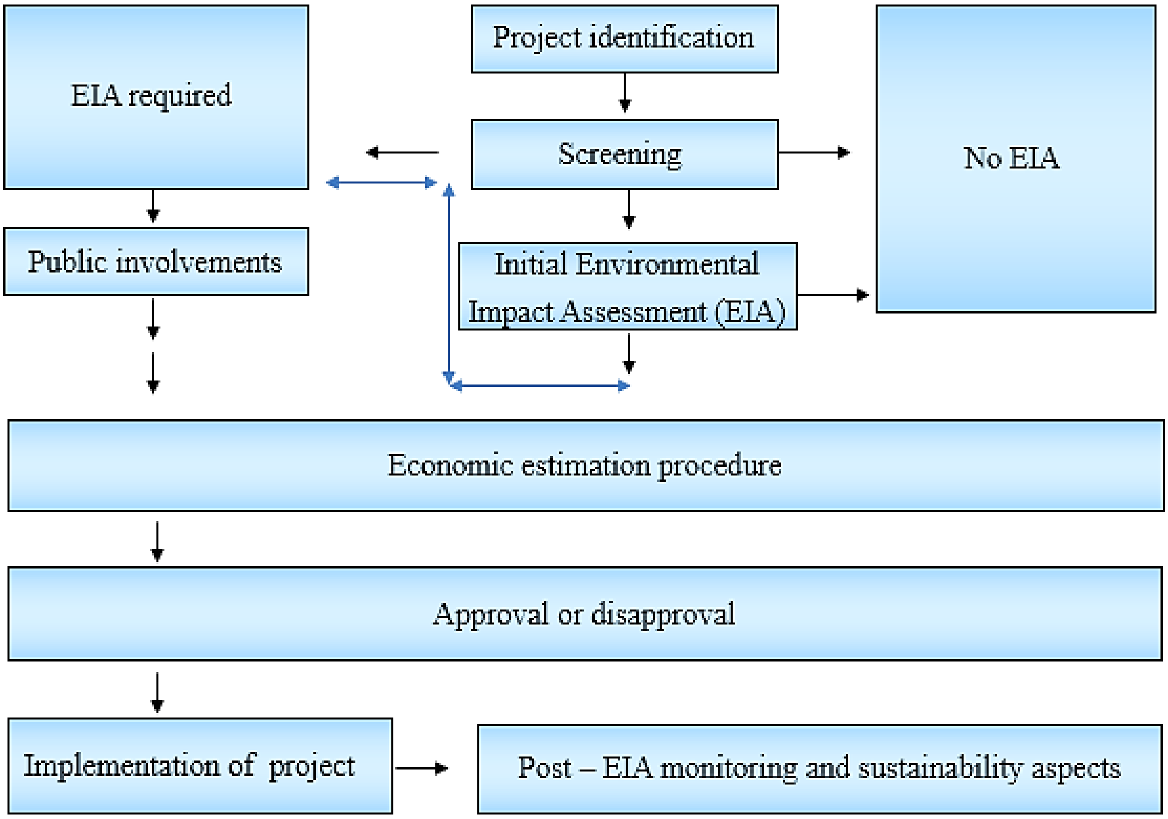

Fig. 1. The evaluation steps of EIA and followed work for the present research.

3. Results and Discussion

3.1. Household insecticide coil

The different stages of production are as follows: First, all the raw materials which are used as the main elements of the coil are weighed. The raw materials in the mill are powdered. The resulting powder is thoroughly mixed in a blender. These ingredients include wood bark powder, refined sawdust, and starch. These ingredients are transferred to a kneader and are mixed with a suitable quantity of dyes, insecticide essential oils, and water. Then, it is completely kneaded. Allicin, malachite green, and dinitrophenol are kneaded back into the mixture. Before the mixture is poured into the extrusion press, it is first thoroughly ground with the extruded waste. The milled mixture is transferred to an extrusion press of 3 mm thick strips which are produced by extrusion press and then are cut into single plates. It is then directed to rotary drilling machines. This machine consists of single holes which produces 21 coils each time. Each formed coil can be divided into two spiral coils. The formed coils are dried to a moisture content of approximately 10%. After drying, the coils are packed in boxes or cans. The waste materials produced in this process are crushed and used again. Fig. 2 represents the layout of units of household insecticide coil manufacturing industries. Table 1 includes the annual requirements of industries of household insecticide coil.

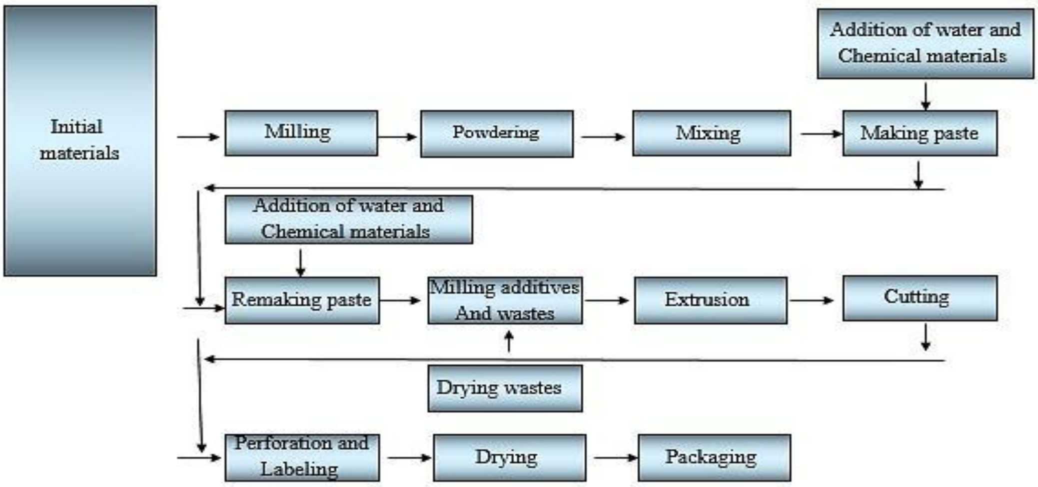

Fig. 2. The layout of units of household insecticide coil manufacturing industries.

Table 1. The annual requirements of industries of household insecticide coil (NC = 50000 No).

The materials and equipment	Total annual rates	Costs ($)
Equipment and devices		
Mixing tank, steel, 3 m³	1 No	230770 +11538.5 (installation cost)
Pasting machine 1 m³	1No	
Extrusion, 10 tons	1 No	
Stamping machine with 21 molds	1 No	
Crushing machine, 1 ton	1 No	
Cutting machine, 35 colis/minutes	1 No	
Conveyor, L= 2 and 3 m	3 No	
Caping and pressing machines, 200 coils/h	1 No	
Packaging machine, 200 coils/h	1 No	
Materials demands		
Sawdust (t)	750	63461.55
Formaldehyde glue (kg)	7500	721
Wood powder (kg)	375000	31730.77
Soluble starch (kg)	15000	15000
Freshener (kg)	1500	1500
Green malachite (kg)	7500	112500
Dinitrophenol (kg)	7500	112500
Allicin (kg)	75000	1125000
Total cost (kg)		1349913.32
Facilities		
Fire extinguishers + Stoves + Cooler +Ventilation system + Office equipment, furniture and etc. + Lab equipment		11538
Transportation		
A vehicle, car and etc.		40000
Products		
Household insecticide coil	50000 No	100000
Employees		
Staff	9 persons	20790
Energy consumption		
Required water (m³/day)	5	8686
Power (kW/day)	130	
Required fuel (Stoves) (Giga Joule/day)	5	
Required land and landscaping		
Required land (m²)	3900	39000
Construction of infrastructure (Buildings) (m²)	1115	85855
Landscaping and asphalt (m²)	850	850

3.2. Household insecticide spray

The production steps of insecticide spray are as follows: a certain volume of insecticide; Synergists, fragrances, and solvents are directed into the mixing tank and are mixed and prepared the insecticide propellant formulation. Impurities and foreign substances in the insecticide solution are then removed by a filtration system. The solution is temporarily transported through a tube into a storage tank. It is poured from the storage tank to the filling machine. The solution is filled in a certain volume inside the cans that come out of the pneumatic cleaning part. Filled cans are randomly sampled at regular intervals to control the filling of the insecticide solution. The valve (spraying mechanism) is inspected as a random sample upon delivery. This valve is mounted on top of the filled cans. After this step, the stimulant material enters the filling material under high pressure and with a certain volume. The cans on which the valve is mounted are filled. Here, the cans filled with gas are randomly inspected. The cans filled with the stimulant material then enter the hot water bath, the water temperature of which is about 50 °C. In this way, the cans are checked for improper and defective crashes and the cans which have leaked (leakage occurs in the form of air bubbles) are removed from the production line. The cans are then cleaned to remove water, oil, and other materials. After this stage, the cans are checked to ensure filling. They are weighed. The weighed cans are sealed. The serial number of the cans is printed to control the volume of the gas and solution. The pressure inside the gas is checked. The filled cans, after inspection and control of the gas volume, are used only in packaging and ready to be transported to the market. Empty spray cans are delivered by the can manufacturers are carefully inspected and temporarily stored in the warehouse. The cans are then transferred from the feeder warehouse to the cans in the filling line. The inside of the cans is cleaned by the suction device of the cans pneumatically. At this stage, the stimulant is introduced into the cans filled with insecticides. The valve mounts on top of the cans and fills the cans with high pressure. Fig. 3 describes the layout of units of manufacturing the household insecticide spray industries. Table 2 besets the annual requirements of industries of household insecticide spray.

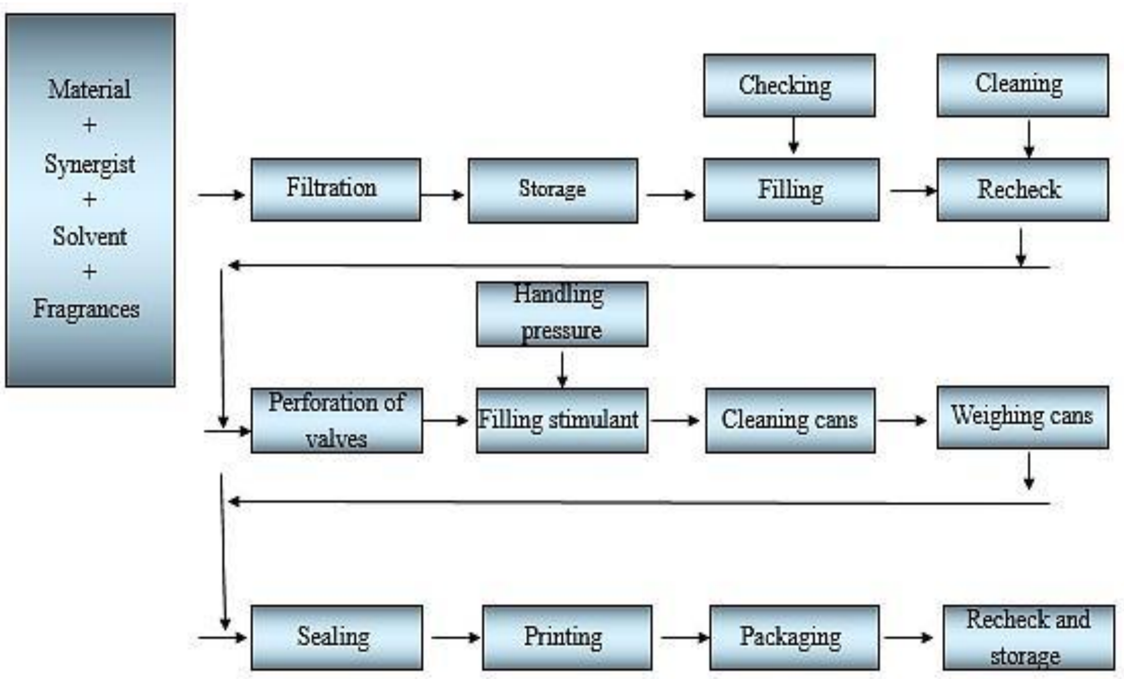

Fig. 3. The layout of units of manufacturing the household insecticide spray industries.

3.3. Bleach powder

Both methods of TOAGOSEL and BACHMANN are used to produce bleaching powder. But in Iranian industries, the nature of the applied method is a semi-continuous reactor in bleach powder generation. In this method, chlorination is performed in a series of steel or cast iron cylinders in which lime and chlorine enter and are mixed together. These cylinders are placed horizontally on top of each other and rotating blades are installed inside them, which are both mixing and proceeding the materials. Lime and chlorine gas are introduced on opposite sides of the system. By rotating the blades, a complete mixing operation is performed between lime and chlorine gas. Then chlorinated lime is discharged from the bottom and unreacted chlorine is also re-injected into the system. Determining the absorbed quantity as well as controlling and granulating the product are one of the quality control steps in this process. The following is a brief sequence of the production process. Fig. 4 displays the layout of units of bleach powder manufacturing industries. Table 3 encompasses the annual requirements of industries of bleach powder.

Table 2. The annual requirements of industries of household insecticide spray (NC = 2700000 No).

The materials and equipment	Total annual rates	Cost ($)
Equipment and devices		
Spray cans filling line, automatic 7 No/min	1 No	115384 + 11538 (installation cost)
Gas filling machine, 3 m^3/h	1 No	
Pumps of 3 m^3/h	2 No	
Compressor, 200 L/min	1 No	
Hot water bath, 300 m^3	1 No	
Ventilation system, 1 KW	1 No	
Filtration, 2 kg/cm^2	1 No	
Mixing tank, 150 L	1 No	
Storage tank, 200 L	1 No	
Conveyor for spray test, 3 m	1 No	
Packaging conveyor, 4 m	1 No	
Elevator machine, 3 m	1 No	
Inspection equipment	1 No	
Handling devices	1 Series	
Materials demands		
Effective materials of Insecticide (kg)	1500	576.92
Synergist as main toxicant (kg)	3000	1153.85
Various perfumes (kg)	1500	865.5
Petroleum (L)	360000	2517.5
Stimulant materials like LPG (L)	540000	41538.5
Cans with plastic caps (No)	2700000	103846
Cartons (No)	27000	3115
Total cost		153613.65
Facilities		
Fire extinguishers + Stoves + Cooler +Ventilation system + Office equipment, furniture and etc. + Lab equipment		11338
Transportation		
A vehicle, car and etc.		40000
Products		
Household insecticide spray	2700000 No	2700000
Employees		
Staff	20 persons	46200
Energy consumption		
Required water (m^3/day)	5	7070
Power (kW/day)	128	
Required fuel (Stoves) (Giga Joule/day)	5	
Required land and landscaping		
Required land (m^2)	3300	33000
Construction of infrastructure (Buildings) (m^2)	935	71995
Landscaping and asphalt (m^2)	700	700

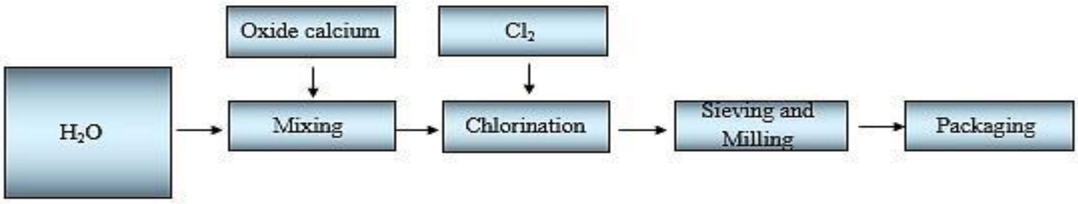

Fig. 4. The layout of units of bleach powder manufacturing industries.

Table 3. The annual requirements of industries of bleach powder (NC = 2700t).

The materials and equipment	Total annual rates	Cost ($)
Equipment and devices		
Lime tank equipped to amixer, h and d= 1.5 and 1.5 m, 3 tons, 30 kW	1 No	192307 + 11538 (installation cost)
Horizontal cylindrical chlorinated lime, d and L= 0.8 and 3 m, steel, 15 kW	3 No	
Ballmill and sieve, 15 kW	2 No	
Conveyor, 3 kw, w and L=70 cm and 6 m	2 No	
PE tank, 4.5 m^3	2 No	
Filling machine, capacity of 40 sacks of 50 kg, 2.5 kW	1 No	
Bag sewing machine, 0.5 kW	1 No	
CL_2 gas tanks, d and h = 0.86 and 1.75 m	390 No	
Fitted lab and repair workshop	1 No	
Materials demands		
CaO (t)	1100	11000
Pure Cl_2 (t)	1200	8193
PE bags of 50 kg	55000 No	2115
		21308
Facilities		
Fire extinguishers + Stoves + Cooler +Ventilation system + Office equipment, furniture and etc. + Lab equipment		12700
Transportation		
A vehicle, car and etc.		40000
Products		
Bleach powder (t)	2700	764307.7
Employees		
Staff	26 persons	60060
Energy consumption		
Required water (m^3/day)	10	13836
Power (kW/day)	137	
Required fuel (Stoves) (Giga Joule/day)	3	
Required land and landscaping		
Required land (m^2)	2200	22000
Construction of infrastructure (Buildings) (m^2)	620	47740
Landscaping and asphalt (m^2)	370	370

3.4. Matchstick producing industries

In the chip (pieces of wood) manufacturing stage, the timber is cut with a circular saw to the desired length and size. The obtained chips are then cut and divided into smaller sizes and the final size of the matchstick is optimized by the shredder. The matchsticks are saturated by the impregnating machine and then are dried until they reach a moisture content of 7%. After drying, the separating machine splits healthy chips from unhealthy chips. In the match-making stage, first, the healthy chips which have separated are poured into the splitting machine to place them on plates and are impregnated with paraffin and other chemicals needed for the matchstick. During the matchbox-making process, the printed sheets are received from the printing house and are cut. Cut and folded cardboard are also received from the paper warehouse. Then the can-making machine shapes the cans and the outer cans are made. Then the matchboxes are packed in packages of 12 empty spaces and the packages are packed in cartons of 120 empty spaces and ready to be shipped. Fig. 5 shows the layout of units of matchstick manufacturing industries. Table 4 comprised the annual requirements of industries of a matchstick.

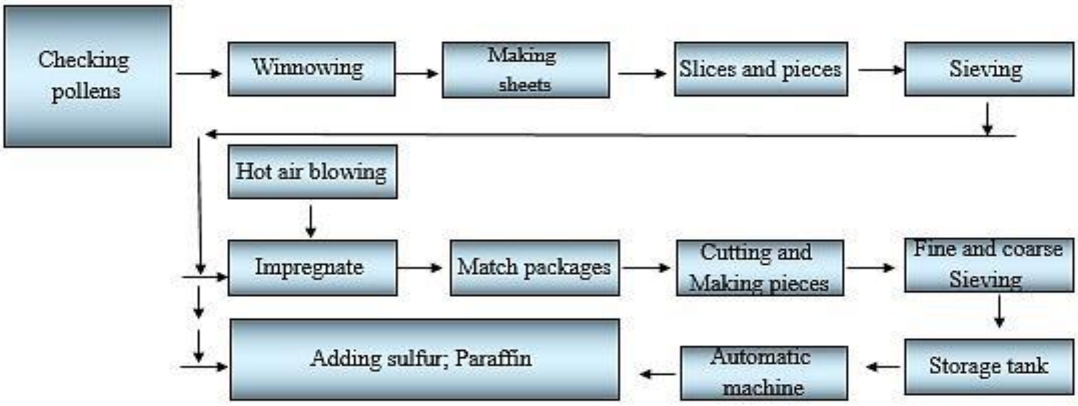

Fig. 5. The layout of units of matchstick manufacturing industries.

3.5. Iranian Soap manufacturing industries

After entering the unit, the raw materials are stored in the warehouse and then are weighed separately and enter into the relevant melting tanks (fat, soda, saltwater). The melting operation is done by steam and the materials are directed by transferring pumps to the soap cooking pot. It is heated at 80-100 °C (depending on the soap and the formulation) for 4 to 5 hours until the baking of the soap is relatively completed. After the fat conversion stage to the soap, due to the fact that the bulk density of the cooked soap is less than (800 kg/m^3) and for glycerin (1276 kg/m^3) the lower phase, which contains glycerin, is drained and the upper phase enters the dryer. The recovered phase, which is a mixture of salt and glycerin, etc are utilized to extract glycerin but it is costly in operation and is usually sold in its original form to chemical fertilizer manufacturers. The phase entering the dryer is hardened by the loss of moisture, which after passing through the grater it is then crushed and stored in a silo. Then, it is mixed with oil, dye, titanium dioxide, and sodium silicate. Then, for more mixing, which increases the quality of the soap, a three-roll machine is used. It has three horizontal rollers moving in opposite directions. After passing through the three rolls, the soap enters the soap-making machine in the form of thin sheets, in which it becomes thin strands. Then, the ingot machine is stuff in which the baked soap is cut into the desired parts by passing through the cutting molds, and then the relevant mark is engraved on it in the press machine. They go to the packaging section and are ready to be presented to the market. Fig. 6 denotes the layout of units of soap manufacturing industries. Table 5 engulfed the annual requirements of industries of soap manufacturing.

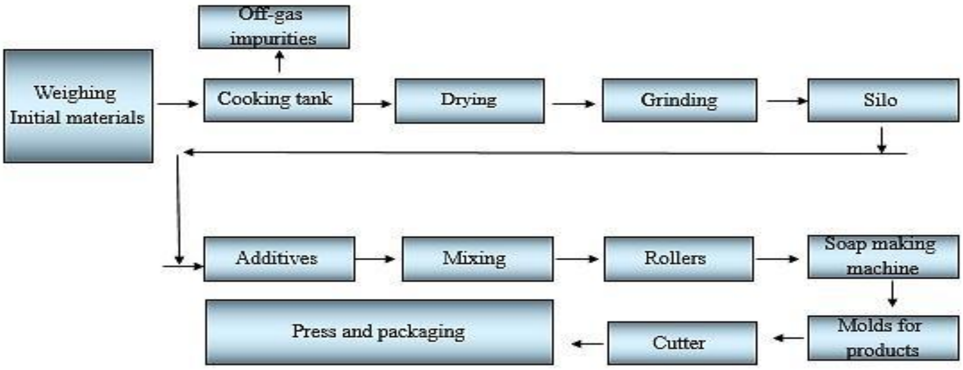

Fig. 6. The layout of units of soap manufacturing industries.

Table 4. The annual requirements of industries of a matchstick (NC = 7776 packages).

The materials and equipment	Total annual rates	Cost ($)
Equipment and devices		
Circular saw, 2 kW	1 No	384615 + 26923 (installation cost)
Peeling machine, Capacity of 18 million	1 No	
A wood grinding machine, 2.5 kW, 18 million wood/h	1 No	
Saturation and dyeing machine, 0.2 kW, 18 million woods	1 No	
Drying chamber, 8 kw, capacity 18 million wood/h (1 No)	1 No	
Casting and polishing machine, 0.6 kW, 18 million woods/h	1 No	
Small chip separate, 0.2 kW, 18 million wood/h	1 No	
Disassembly chips, 0.3 kW, 18 million wood/h	1 No	
Buffing machine, 0.75 kW, 18 million woods/h	1 No	
Chip collection device, 1.5 kW, 18 million woods/h	1 No	
Match producing machine, 20 kW, 20000 matches box/h	1 No	
Furnace, 20 kW	1 No	
Air dryer, 10 kW	1 No	
Disintegrating mixing device, 0.5 kW, 18 million woods/h	1 No	
Gelatin melting machine, 200 L	1 No	
Cutting machine, 2 kW, 18 million wood/h	1 No	
Cutting machine, 2 kW, 18 million wood/h	1 No	
Box machine, 1 kW, 20000 boxes/h	1 No	
Matching sticker machine, 2 kW, 18 million wood/h	1 No	
Box filling machine, 2 kW, 18 million wood/h	1 No	
Milling chemical materials, 2 kW, 18 million wood/h	1 No	
Chemical material coverage, 1.5 kW, 18 million wood/h	1 No	
Brush making machine, 1.5 kW, 18 million wood/h	1 No	
Packaging machine, 1.5 kW, 18 million woods/h	1 No	
Materials demands		
Timber (m^3)	970	74615.4
Potassium chlorate 92% (t)	34	9622
Red phosphorous (t)	14	546000
Paraffin wax (t)	25.8	3288.5
Gum (t)	9.7	1119.2
Sulfor 60% (t)	8.1	2187
Resin powder (kg)	4.9	20
MnO_2 85% (t)	3.6	1385
Antimony sulfide 60% (t)	3.6	28800
Chemical additives (t)	0.5	700
Paper cans, 310 g/m² (million rolls)	2.2	7692.30
Paper cans, 240 g/m² (million rolls)	86.4	
Packaging paper (rolls)	880	
Total cost		836967.87
Facilities		
Fire extinguishers + Stoves + Cooler +Ventilation system + Office equipment, furniture and etc. + Lab equipment		15500
Transportation		
A vehicle, car and etc.		40000
Products		
Matchsticks	7776 packages	1495384.5
Employees		
Staff	41 persons	94710
Energy consumption		
Required water (m^3/day)	9	13071
Power (kW/day)	330	
Required fuel (Stoves) (Giga Joule/day)	48	
Required land and landscaping		
Required land (m^2)	5100	51000
Construction of infrastructure (Buildings) (m^2)	1460	112420
Landscaping and asphalt (m^2)	1100	1100

Table 5. The annual requirements of industries of soap manufacturing (NC = 1000t soap + 89.92 t glycerin).

The materials and equipment	**Total annual rates**	**Cost ($)**
Equipment and devices		
Fat and NaOH melting pots, 5.5 and 3 m³	1 and 1 No	230970 +11558.5 (installation cost)
Pot for salt water and baking soap 10 and 40 tons	1 and 1 No	
Salt fat tank, 20 tons	2 No	
Dryer, 5*4 m	2 No	
Grinder, L= 1 m	1 No	
Conveyor, L= 4 m	4 No	
Silo, 5 tons	1 No	
Mixer equipped to gearbox	2 No	
Roller, L= 1.5 m	3 No	
Soap maker machine	1 No	
Cutter	2 No	
6 frames press	4 No	
Packaging machine	4 No	
Molds or frames	10 No	
Materials demands		
Natural oil (t)	652.96	1958880
Cocnut oil (t)	594.063	3198800.8
Palm oil (t)	47.7	256846.15
Estearic acid (t)	20.956	7254
NaOH (t)	83.982	38760.92
Emulsifier (t)	2.525	1456.74
Freshener (t)	8.83	8830
Dye (t)	1.01	192
TiO_2 (t)	10.1	4846.15
Salt (t)	47218	363215.4
Sodium silicate (t)	14.746	5671.5
Paper cover (No)	56111111	7692
Boxes (No)	336667	
Packaging carton (No)	120015	
Total cost		5852445.66
Facilities		
Fire extinguishers + Stoves + Cooler +Ventilation system + Office equipment, furniture and etc. + Lab equipment		16000
Transportation		
A vehicle, car and etc.		40000
Products		
Soap + glycerin (t)	1000 + 89.92	1090000
Employees		
Staff	20 persons	46200
Energy consumption		
Required water (m^3/day)	18	24973
Power (kW/day)	221	
Required fuel (Stoves) (Giga Joule/day)	53	
Required land and landscaping		
Required land (m^2)	5300	53000
Construction of infrastructure (Buildings) (m^2)	1505	115885
Landscaping and asphalt (m^2)	1260	1260

3.6. Classification of industries based on EVA

To classify the industries based on EVA was used the outlays of fixed capital and depreciation according to below. Table 6 displays the fixed capital and depreciation costs.

Table 6. Fixed capital and depreciation costs.

Industry 1; Fixed capital ($)			
Required land, landscaping, buildings, pavement, and asphalt			125705
Investment in facilities			11538
Investment in equipment and the installation costs			242308.5
Investment in transportation cars (A vehicle weighing 4 tons, car and fork)			40000
Unforeseen costs	3% investment		112586.54
Depreciation costs, maintenance, operational and non-operational fixed annual capital			
Description	**Rate (%)**	**Capital value ($)**	**Costs of maintenance ($)**
Landscaping, buildings, pavement, and asphalt	2	86705	1734.1
Facilities and equipment	10	11538	1153.8
Equipment without installation costs	5	230770	11538.5
Office equipment, furniture, etc	10	1923	192.3
Transportation cars (A vehicle weighing 4 tons, car and fork)	10	40000	4000
Unforeseen cost	5	112586.54	5629.327
Total cost			24428.1
Industry 2; Fixed capital ($)			
Required land, landscaping, buildings, pavement, and asphalt			105695
Investment in facilities			11338
Investment in equipment and the installation costs			126922
Investment in transportation cars (A vehicle weighing 4 tons, car and fork)			40000
Unforeseen costs	3% investment		8518.65
Depreciation costs, maintenance, operational and non-operational fixed annual capital			
Description	**Rate (%)**	**Capital value ($)**	**Costs of maintenance ($)**
Landscaping, buildings, pavement, and asphalt	2	72695	1453.9
Facilities and equipment	10	11338	1133.8
Equipment without installation costs	5	115384	5769.2
Office equipment, furniture, etc	10	1923	192.3
Transportation cars (A vehicle weighing 4 tons, car and fork)	10	40000	4000
Unforeseen cost	5	8518.65	425.94
Total cost			12975.13
Industry 3; Fixed capital ($)			
Required land, landscaping, buildings, pavement, and asphalt			70110
Investment in facilities			12700
Investment in equipment and the installation costs			203845
Investment in transportation cars (A vehicle weighing 4 tons, car and fork)			40000
Unforeseen costs	3% investment		9799.65
Depreciation costs, maintenance, operational and non-operational fixed annual capital			
Description	**Rate (%)**	**Capital value ($)**	**Costs of maintenance ($)**
Landscaping, buildings, pavement, and asphalt	2	48110	962.2
Facilities and equipment	10	12700	1270
Equipment without installation costs	5	192307	9615.35
Office equipment, furniture, etc	10	1923	192.3
Transportation cars (A vehicle weighing 4 tons, car and fork)	10	40000	4000
Unforeseen cost	5	9799.65	490
Total cost			16529.85

Table 6. **Continue**

Industry 4; Fixed capital ($)			
Required land, landscaping, buildings, pavement, and asphalt			164520
Investment in facilities			15500
Investment in equipment and the installation costs			411538
Investment in transportation cars (A vehicle weighing 4 tons, car and fork)			40000
Unforeseen costs	3% investment		18946.75
Depreciation costs, maintenance, operational and non-operational fixed annual capital			
Description	**Rate (%)**	**Capital value ($)**	**Costs of maintenance ($)**
Landscaping, buildings, pavement, and asphalt	2	113520	2270.4
Facilities and equipment	10	15500	1550
Equipment without installation costs	5	384615	19230.75
Office equipment, furniture, etc	10	1923	192.3
Transportation cars (A vehicle weighing 4 tons, car and fork)	10	40000	4000
Unforeseen cost	5	18946.75	947.33
Total cost			28190.78
Industry 5; Fixed capital ($)			
Required land, landscaping, buildings, pavement, and asphalt			170145
Investment in facilities			16000
Investment in equipment and the installation costs			242528.5
Investment in transportation cars (A vehicle weighing 4 tons, car and fork)			40000
Unforeseen costs	3% investment		14060.20
Depreciation costs, maintenance, operational and non-operational fixed annual capital			
Description	**Rate (%)**	**Capital value ($)**	**Costs of maintenance ($)**
Landscaping, buildings, pavement, and asphalt	2	117145	2342.9
Facilities and equipment	10	16000	1600
Equipment without installation costs	5	230970	11548.5
Office equipment, furniture, etc	10	1923	192.3
Transportation cars (A vehicle weighing 4 tons, car and fork)	10	40000	4000
Unforeseen cost	5	14060.20	703
Total cost			20386.7

According to methodology the equations 2 and 3 were employed to estimate the EVA and its percentage. The classification of industries has been presented based on EVA in Table 7.

Household insecticide coil manufacturing industries
V = 100000-(8686+1349913.32+24428.1+112586.54) = (4)
V = -1395613.96
V% =-1298073.02*100/100000= 0 <

Household insecticide spray
V = 2700000-(7070+153613.65+12975.13+8518.65) = 2517822.6 (5)
V = 2517822.6
V% = 2517822.6*100/2700000= 93.25%

Bleach powder
V = 764307.7-(13836+ 21308+ 16529.85+9799.65) = (6)
V = 702834.2
V% = 702834*100/764307.7= 91.95%

Matchstick producing industries
V = 1495384.5-(13071+836967.87+18946.75+28190.78) (7)
V = 598208.08
V% = 598208.08*100/1495384.5= 40%

Iranian Soap manufacturing industries
V = 1090000-(24973+5852445.66+20386.7+14060.20) = (8)
V= -4821865.56
V% = -4821865.56*100/1090000= 0 <

Table 7. Classification of industries based on EVA.

Industries	Value-added	Rank
Household insecticide coil manufacturing industries	0 <	-
Household insecticide spray	93.25%	1
Bleach powder	91.95%	2
Matchstick producing industries	40%	3
Iranian Soap manufacturing industries	0 <	-

Due to a rise in the price of chemical materials introduced into manufacturing lines the EVA of industries has tended to zero.

Conclusion

The main factors involved in the quantity of EVA are the selling price of the product, the cost of energy consumption, unforeseen costs, the cost of raw materials required for the production line, and the cost of depreciation. Therefore, in the current situation in Iran, many industrial projects have no economic justification in a short time, even considering a price ceiling (maximum possible selling price of goods) per unit of goods. In future studies is suggested that the breakeven point be considered in the estimates. Industries with various nominal capacities can be classified based on the estimated EVA. It is suggested to reduce costs, changes are made in the input materials injected into the industrial production lines to raise the EVA and ensure the proper efficiency of the product. Automation in the industry can also be a lever to culminate the percentage of EVA. The data in the tables can be used to provide any financial & economic modeling and simulation. It is also possible to use different models of data envelopment analysis based on existing information in tables. The use of the criteria applied in this study paves the way for the classification of industries using decision theory. The tables also provide a price list from the inventory list without any further processing.

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