

ECONOMIC EVALUATION FOR A BLOCK COMPANY WITH ADDITION OF PET POWDERED.

Zapata Tec Gabriela del Rosario¹, Moreno Rivera José Luis²,
Montiel Huerta Ma. Elizabeth³.

¹ Department of Administrative Engineering, National Technological Institute of Mexico, Institute, Technological University of Apizaco, Tlaxcala, 90300, Mexico.

Abstrac

Based on the increase in PET waste in Quintana Roo³, it is decided to incorporate plastics into the construction industry and thereby reduce the exploitation of quarries to obtain fine aggregate as this is a non-renewable resource, reduce the excess of PET and give an economic option of various finishes to the homes of low-income people.

The evaluation of the project analyzes the feasibility to install a company that produces blocks with the addition of PET spray, the analysis is descriptive, with the use of quantitative data, and transversal research.

The results of the study showed that \$ 3,726,009.00 pesos are needed as initial investment, the sale price compared to the competition is \$ 9.50 pesos, considering that according to the projections made at five years the company would have economic feasibility, having a NPV (Current value net) of \$ 3,499,711.47 pesos, and IRR (internal rate of return) at 3 years of 39% and at 5 years of 57% which shows that the project has a credit capacity.

Key words: PET (polyethylene terephthalate), IRR (internal rate of return), NPV (Net present value), EP (equilibrium point).

1. Introduction.

The economic situation in the town is going through a decline, that is, within the economy, the industry had a decline of 2.3% per year, representing the largest drop in recent years (graphs I, II), likewise The Gross Domestic Product⁴ (GDP) per hour worked recorded the largest decrease in more than seven years, since the first quarter of 2009, according to the figures adjusted by seasonality of the INEGI (graph IV).

This indicator has steadily declined over the last six quarters; that is, it has been in negative territory for a year and a half; Families can build their home at low cost, with a durable and quality product. The local construction companies can be sure to offer their customers a new block that meets the characteristics, requirements and quality that other products have, the community can have the ecological product because it will be low cost.

The creation of a company dedicated to the production of blocks composed of PET approximately 50% while being pulverized and the rest of the compound will be cement and dust, grows as an innovative project that will aim to reduce the pollution index, since PET is one of the main pollutants, because their degradation takes more than 500 years approximately²; Through this proposal, we want to contribute to the reduction of pollution, and offer the Municipality of Othon P. Blanco a durable and resistant product.

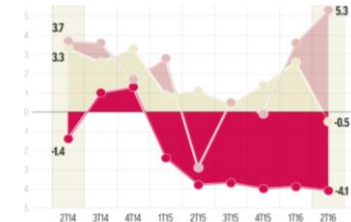
The company will realize the manufacture of a hollow standard block with measures of 15 * 20 * 40 and having an approximate weight of 8 kg, being the measure more used by

constructors and the families.

The blocks are used for the creation of walls of houses, fences,

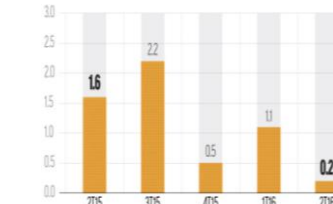
infrastructures it is of great importance to establish a trust with society, providing the security of offering a product made with high

Variation % anual.



Graph I. Productivity in the industry, economic Source: "El Financiero". 2016.

Variation % anual



Graph II. Productivity in the industry, construction sector. Source: "El Financiero", 2016.

quality indexes, manufactured with the appropriate raw material and with an accessible price, it is one of the goals of the company, which is essential to determine the sources of supply of the main materials, without having to extend to areas beyond reach.

The block will have as components:

- Cement
- Sand
- Granzon
- Water
- Powdered PET (in a percentage)

The block is made with a concrete called poor, composed of portland cement, sand, granzon, PET and water; These four components are mixed and put into molds to compact them and give them the desired shape, achieving a combination of the materials obtaining an innovative result.

The advantages that the elaboration of this product can offer are the following:

- It helps the environment with the recycling of bottles, since annually in the Mexican Republic, approximately more than 800 thousand tons of PET² are used.
- Period of degradation of PET 500 years³.
- Weight: Light weight, due to the low specific weight of PET.
- Absorption of water: Similar to other traditional enclosures.
- Multiple options finished.

2. Materials and methods.

The economic analysis was carried out based on all the operating conditions previously determined in the technical study. This includes the initial investment, total operating costs, working capital, raising different financing schemes to accept one of them, the calculation of the initial balance sheet, the projected income statement, the equilibrium point and the rate of profit that the investors would like to obtain by risking their money installing this productive plant. Trying to obtain the necessary figures to carry out the economic evaluation. Once the information on the market, the technology and all the costs involved in the installation and operation of the plant have been obtained, the point where the economic return of the entire investment is determined under clearly defined criteria, such as NPV (net present value), and IRR (internal rate of return). The study is descriptive, quantitative, taking into account that the data resulting from the technical study carried out beforehand will be taken. For the development of the study, the following methodology was implemented (figure 1).

To carry out the installation of the project, it is necessary to have an investment of \$ 2,309,593.00 pesos.

It is broken down in table 1, the necessary equipment to start work, among them is considered the raw material, which is

essential to start up the work, producing and receiving customers in their facilities.

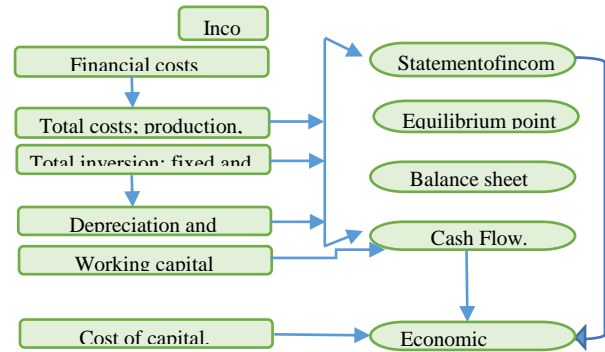


Figure 1. Structuring of the economic analysis.

Source: Prepared from: "Project Evaluation", Baca, (2013)¹.

Table 1. Total investment.

| Civil work | | | | |
|--------------------------------------|---|--------------|--------|----------------|
| Concept | Description | Unit cost | Pieces | Total |
| 1. Acquisition of the land | Considering the location of the land in the town of Huay-Pix, with a dimension of 625 m2 | \$175,000.00 | 1 | \$175,000.00 |
| | Land use and social impact | \$7,000.00 | 1 | \$7,000.00 |
| 2. Permits and licenses | Lisenses | \$6,300.00 | 1 | \$6,300.00 |
| | Work permits | \$28,500.00 | 1 | \$28,500.00 |
| | Assignment of no. Officers | \$320.00 | 10 | \$3,200.00 |
| 3. Construction of the ship | Industrial building construction attached to all services and offices of attention to the public. * Rustic style * Area 520 m2 | \$750,000.00 | 1 | \$750,000.00 |
| Conditioning of departaments | | | | |
| 1. Wages | | | | \$94,000.00 |
| 2. Suitability of the parking | Earth movement, divisions and signaling | \$5,000.00 | 1 | \$5,000.00 |
| 3. Painting | Painting of the offices | \$7,500.00 | 1 | \$7,500.00 |
| 4. Computer and printer | Lenovo Computer and Printer - All in One 330-20 PEN 19.5 "- Pentium - Intel HD - 8GB Memory - 1TB Hard Drive - White | \$10,400.00 | 6 | \$62,400.00 |
| 5. Desktop | Black desk, simple | \$750.00 | 7 | \$5,250.00 |
| 6. Chair | Chair for desk | \$256.00 | 8 | \$2,048.00 |
| 7. Landline | Landline | \$400.00 | 8 | \$3,200.00 |
| 8. Wells | Development of 7mtr deep well. | \$15,000.00 | 1 | \$15,000.00 |
| 9. Stationery, office equipment | | | | \$8,500.00 |
| 10. Advertising | | | | \$10,000.00 |
| Conditioning of the Production área. | | | | |
| 1. Scale | Plate scale with capacity of 10kg | \$5,000.00 | 1 | \$5,000.00 |
| 2. Full block machine. | It has a capacity of 450 kg, horizontally with a 10 hp motor. • Conveyor belt, model B845. The conveyor belt has a length of 8 meters, with a width of 45 centimeters and a 3hp engine. | \$630,000.00 | 1 | \$630,000.00 |
| 3. Transportation | Truck with a capacity of six tons | \$98,000.00 | 1 | \$98,000.00 |
| 4. Personal protection equipment | | | | \$10,775.00 |
| 5. Raw material | | | | \$398,920.00 |
| Total investment | | | | \$2,325,593.00 |

Source: Prepared by the authors, 2019

Based on the data in a previous study, the unit costs of each block piece are detailed, which are presented in table 2, the results of the sale are shown.

Table 2. Unit variable costs.

| Unit variable costs. | | |
|-----------------------|--------|--------|
| Pet | .5 kg | \$2 |
| Arena | 2.5 kg | \$0.45 |
| Cemento | 1 kg | \$1.92 |
| Agua | 1 Lt | 0.003 |
| Granzón | 3 kg | \$0.33 |
| Costo unitario | | \$4.70 |
| Precio venta | | \$9.50 |

Source: Prepared by the authors, 2018

To obtain the sale price is applied to the following formula, the cost already includes the cost involved in selling the product.

$$SP = \frac{\text{Cost of sale}}{1 - \% \text{ useful}} \quad SP = \frac{6.077}{1 - 40\%} = \$9.30 \approx \$9.5$$

Once the unit production cost and the sale price were obtained, the EP forecast was made (tables 3 and 4).

Table 3. Equilibrium point.

| Equilibrium point. | | | | |
|--------------------|---|-----------|---|-------|
| CF | = | \$103,000 | = | 21472 |
| PV -- CV | | \$4.80 | | |

Source: Prepared by the authors, 2018

Table 4. Costs and utility with PET.

| Ganancia | Anual |
|------------|----------------|
| \$203,982 | \$2,447,779.86 |
| Production | Anual |
| \$100,982 | \$1,211,779.86 |

Source: Prepared by the authors, 2018

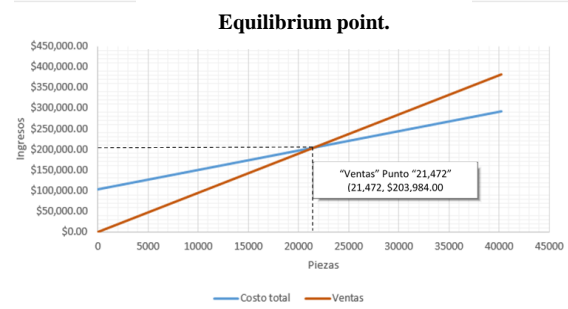
Contemplating the costs that the organization will have, a fixed cost of \$ 103,000.00 pesos per month is estimated, with variable costs of \$ 191,460.00 pesos, having total costs of \$ 294,460.00, which may be covered upon reaching the equilibrium point in sales, for which They should have sales of 21,472 pieces per month.

Based on the equilibrium point forecast, a projection of production capacity was established, allowing the determination of the raw material and sales forecasts for the corresponding periods (table 5, 6 and 7).

To determine sales, we proceeded to calculate the total population in the municipality of Othon P. Blanco, having 297,516 inhabitants, of which our market is the economically active population, which has the ability to acquire the product.

To start the project, the company plans to supply only 10% of that population, bearing in mind that their purchases will not be one unit per person.

With the application of the forecasts it was possible to obtain relevant data for the projection of the PROFORMA states, which allow to establish a clear idea of the situation in which the project would be at a certain time.



Graph 2. Equilibrium point.

Source: Prepared by the authors, 2019

Table 5. Production capacity at 5 years.

| Production capacity | | | | | |
|---------------------|-------------------------|------------------|--------------------|--------------------|-------------------|
| Año | Capacidad de producción | Producción anual | Producción mensual | Producción semanal | Producción diaria |
| 2019 | 90% | 762048 | 63504 | 15876 | 2646 |
| 2020 | 94% | 795917 | 66326 | 16582 | 2764 |
| 2021 | 96% | 1105920 | 92160 | 23040 | 3840 |
| 2022 | 99% | 1140480 | 95040 | 23760 | 3960 |
| 2023 | 100% | 1152000 | 96000 | 24000 | 4000 |

Source: Prepared by the authors, 2019.

Table 6. Production costs at 5 years.

| Production costs | | | | | |
|------------------|-------------------------|---------------------------|-----------------------------|-----------------------------|----------------------------|
| Año | Costo variable unitario | Costo de producción anual | Costo de Producción mensual | Costo de producción semanal | Costo de producción diaria |
| 2019 | \$4.70 | \$3,583,912 | \$298,659 | \$74,665 | \$12,444 |
| 2020 | \$5.60 | \$4,457,134 | \$371,428 | \$92,857 | \$15,476 |
| 2021 | \$5.61 | \$6,204,211 | \$517,018 | \$129,254 | \$21,542 |
| 2022 | \$5.62 | \$6,409,497.60 | \$534,124.80 | \$133,531.20 | \$22,255.20 |
| 2023 | \$5.65 | \$6,508,800.00 | \$542,400.00 | \$135,600.00 | \$22,600.00 |
| 2024 | \$6.00 | \$6,912,000.00 | \$576,000.00 | \$144,000.00 | \$24,000.00 |

Source: Prepared by the authors, 2019.

Table 7. Sales revenue to 5 years.

| Ingreso de ventas | | | | | |
|-------------------|-----------------|-----------------|----------------|---------------|--------------|
| Año | Precio de venta | Venta anual | Venta mensual | Venta semanal | Venta diaria |
| 2019 | \$9.50 | \$7,239,456 | \$603,288 | \$150,822 | \$25,137 |
| 2020 | \$9.50 | \$7,561,210 | \$630,101 | \$157,525 | \$26,254 |
| 2021 | \$10.00 | \$11,059,200 | \$921,600 | \$230,400 | \$38,400 |
| 2022 | \$10.50 | \$11,975,040.00 | \$997,920.00 | \$249,480.00 | \$41,580.00 |
| 2023 | \$11.00 | \$12,672,000.00 | \$1,056,000.00 | \$264,000.00 | \$44,000.00 |
| 2024 | \$11.00 | \$12,672,000.00 | \$1,056,000.00 | \$264,000.00 | \$44,000.00 |

Source: Prepared by the authors, 2019.

After the application of the states, the NPV calculation was

carried out, which allows to determine the position in which the project is located, in a certain period, for the forecast the initial investment was established, considered with a negative sign from the period zero, in such a way that the positive result will mean yields higher than the discount rate used, given that the project has economic feasibility or not to be carried out.

Where:

| | |
|--------------------|------------------|
| Inflation | 0.049 |
| Cost effectiveness | 0.155 |
| Tasa i | 20% |
| Inv. Inicial | \$ -3,726,009.00 |
| n | 5 |

$$VPN = -II\text{ inicial} + \sum \frac{FE}{(1+i)^n}$$

The calculation of the internal rate of return, that is, the effective profitability of the project, using results of the cash flows estimated previously.

The IRR was determined three years and five years ago.

| | | | |
|--------------------------------------|--|----------------|------------|
| Data | | IRR at | |
| Initial investment - \$ 3,726,009.00 | | 3 years | 39% |
| 1st year income \$ 2,429,016.00 | | | |
| 2nd year income \$ 1,802,141.68 | | | |
| 3rd year income \$ 2,865,905 | | IRR at | |
| 4th year income \$ 2,547,443 | | 5 years | 57% |
| 5th year income \$ 2,645,161 | | | |

The IRR was determined, which shows that the project has a capacity of 57% (of credit), allowing loans, of course, without exceeding the permitted percentage.

3. Conclusions.

Based on the results obtained in the study, it was determined that the initial investment must be \$ 3,726,009.00 pesos, which include the acquisition of land, the organization's buildings, transportation, machinery, staff salaries, and acquisition of material premium for the first two months of production.

In accordance with the projected revenues, it is concluded that the project has the solvency to cover the operating and investment expenses, due to the fact that the income exceeds the expenses by 70%, reflecting in the cash flow to the fifth year a balance from \$ 2,645,161.00

The net present value (NPV) was calculated, which indicates with the amount of \$ 3,499,711.47 pesos, that the project has economic feasibility to be carried out.

Of equal the internal rate of return was determined, having like result that to the 3 years the company will have the capacity to respond before possible creditors with a 39% and after 5 years of being working, it will have a capacity of 57%.

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