

**Pre-Feasibility Study for**

**Tire recycling plan**



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**1. Abstract:**

The produced rubber powder in the world has diverse numerous applications. This product is generally an intermediate good and is employed in tire industries as raw material. It can be used as an alternative for new materials. The rubber powder has numerous applications, including the production and supplying rubber carpets, producing various rubber parts,

The required land area is 5,000 square meters. The required electricity power is 840000 kWh annually, the water required is 1500 cubic meters annually and The project is expected to employ 17 people.

**2. Product Introduction:**

Rubber powder is made by grinding worn tires. The particle size is usually between 4-140 mesh which will be different depending on the use cases. Iran produces about 150 tons of worn tires. We can't dispose of them in the environment because tires decompose at a very slow rate and create too much pollution. Hence, optimal usage of these waste materials has turned into a necessity.

Accumulated polymer waste in the environment has become a threat to the life and well-being of humans and other creatures of the planet Earth. Polymers make up about 8% of the total waste in the environment and they can cause serious issues for nature. In order to prevent damage, we can reuse this waste. In the past few years, recycling industries have gathered a lot of attention because of their importance and the economic profit that's associated with them. In our country, recycling industries are considered to be one of the young and new industries of the country as they haven't been active for a long amount of time. Among different types of recycling, the rubber recycling industry and rubber powder production are especially important.

The rubber recycling industry is important because of the valuable products that it can produce and a lot of big companies are active in this scene. But even with that, this industry is only a few years old in our country and there’s a vast amount of opportunities for new industrialists in Iran. Around the world, rubber powder has countless uses and these use cases are also starting to get developed in Iran.

**3. Usage and Application of the Product in Local and Global Markets:**

This product has been noticed by everyone in recent years of the recycling industry because of it’s importance and economic profits. In our country, recycling industries are considered to be one of the young and new industries of the country as they haven’t been active for a long time yet. Among different types of recycling, the rubber recycling industry and rubber powder production are especially important.

The rubber recycling industry is important because of the valuable products that it can produce and a lot of big companies are active in this scene. But even with that, this industry is only a few years old in our country and there’s a vast amount of opportunities for new industrialists in Iran. Around the world, rubber powder has countless uses and these use cases are also starting to get developed in Iran.

This product is classified as an intermediate good and it can be used in the production of various rubber products as it can be a suitable replacement for raw material that’s usually used to produce these goods.

**Introducing the Use Cases of Rubber Powder:**

Rubber powder can be used for the following:

* Producing and maintaining rubber flooring and tiles
* Making various rubber components
* Reused when making rubber tires
* Improving and reinforcing asphalt and concrete
* As a fuel in furnaces
* Making rubber lagging and insulators

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One of the most important purposes for rubber powder is using them in the production of various flooring. Flooring is one of the rarest produced goods which is used everywhere including houses, offices, factories, cars, machines, etc. Considering that energy sources are unrecyclable and it takes a long time for them to renew, we can use rubber powder to produce energy in some cases such as using them as fuel in furnaces.

**Product usage in various fields**

By comparing the current rubber powder and rubber recycling industry with previous years, we can clearly see that the market for them is being developed and expanded day by day. Raw materials for producing rubber are expensive, so we can use rubber powder to reproduce items and lower production costs. This can be used for 20% of the tires industry and 60% of rubber component production.

**4. Technology, Production and Supply Methods**

In order to produce recycled rubber, first collected waste tires are moved to cutting machines using lift trucks or conveyor belts and are cutting by the machine. This machine cuts every tire with ease and prepares it for future processes. After being washed and dried, cut tires are moved to a secondary cutting machine and are chopped into smaller pieces. Finally, the pieces will be taken to the sieve and are ground into a powder. In the next step, a machine separates the fiber from the mixture and in the end, pure rubber powder is ready to be packaged and shipped.

The packaging of the final product, which is granulated rubber powder, consists of polypropylene bags that are put in rows on a pallet for easier transportation.

**5. Market State**

China, Germany, and USA have the highest amount of global exports. USA, Germany, and France have the highest amount of global imports. According to the custom house of the Islamic Republic of Iran, from the years 1390 to 1398, the highest export value of tires was 22.1 million dollars in 1396 and the lowest was 12.5 million dollars in 1391. Additionally, the highest import value was 562 million dollars in 1393, with 283.3 million dollars being the lowest value in 1397. The majority of the exports are to Afghanistan and the majority of imports are from China.

28.7% of the offered capacity of active units in this industry are for Barez industrial group and after that, Kavir Tire with 15%, Dena Tire and Rubber with 12.1%, and Yazd Tire with 9.7%.

Kavir Tire is the largest industrial unit in the Southern Khorasan province which as of right now, produces more than 15% of the entire tire of the country by weight and more than 22% of tire by quantity.

The tire industry plays a key role in the day-to-day life of people and is important for the global economy, considering how it’s one of the necessary components in vehicle production and how it’s being produced all around the world. Predictions show that considering the high number of vehicles on the global scale, the need for tires will have a 4.1% growth by 2024. Also in this period, the economic value added (EVA) of this industry will see a 7.1% increase, which is approximately equal to 258 milliard dollars.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Predicting the need for the product (ton)** | | | | | |
| 2025 | 2024 | 2023 | 2022 | 2021 | Description |
| 85,911 | 78,563 | 67,571 | 53,657 | 39,387 | Domestic supply |
| 0 | 0 | 0 | 0 | 0 | importation |
| 56,874 | 51,259 | 46,340 | 42,115 | 38,584 | Domestic demand |
| 8,591 | 7,856 | 6,757 | 5,366 | 3,939 | export |
| -20,446 | -19,447 | -14,474 | -6,177 | 3,136 | Need a product |

As you can see, considering the accounted methods and lack of attention to exporting and establishing new markets to consume the product, the need for it will be negative in the future years. Hence, having that in mind is very important when establishing new industrial units.

**6. Importance of Production**

Considering the everyday growth in the global population which also increases human-produced waste, recycling and returning material to the production cycle can lead to lower costs and lower amounts of environmental pollution. The raise in the number of worn tires and rubber in the past years have caused many issues. Recently, using new and powerful machines, these old tires can be ground and melted, after which they can become new tires and products.

**Analysis and determination of the minimum economic capacity**

## **1- project's fixed costs**

|  |  |  |
| --- | --- | --- |
| # | Description | Amount in Million Rials |
| 1 | Land | 5500 |
| 2 | Landscaping and Buildings | 32810 |
| 3 | Facilities | 4666 |
| 4 | Vehicles | 7130 |
| 5 | Equipment and machinery | 154476 |
| 6 | Office and workshop equipment | 890 |
| 7 | Miscellaneous and unforeseen costs (2% above total) | 6174 |
| 8 | Pre-operation costs | 1396 |
| **Total** | | **213042** |

## **Equipment and Machinery**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Machinery | Unit cost in Euro | Acceleration rate  (Million Rials) | Total Costs (Million Rials) |
| 1 | The entire rubber recycling line consists of:  A tire cutting machine  Tire grinder  magnet for removing iron  rubber grinder  sieve  abrasion machine  packaging | 613000 | 147120 | 147120 |
| Customs, shipping and installation cost (equivalent to 5% above) | | | | 7356 |
| **Total** | | | | **154476** |

## **2- Estimation of project's working expenses**

|  |  |  |
| --- | --- | --- |
| # | Description | Costs in Million Rial |
| 1 | Raw materials | 37500 |
| 2 | Salary | 10676 |
| 3 | Fuel and energy | 2608 |
| 4 | Repair and maintenance | 2722 |
| 5 | depreciation | 6128 |
| 6 | Advertising cost ( 1% Sales( | 1200 |
| 6 | Unforeseen (2% of rows 1 to 4) | 1070 |
|  | Total | 61904 |

## 1-2- Raw materials

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # | Main Raw Materials | Annual Consumption | Unit | Unit Cost  (Million Rials) | Total Costs in Million Rials |
| 1 | Worn tires | 12500000 | Kg | 3000 | 37500 |
|  | Total | | | | 37500 |

2-2- Salary Estimate

Salaries are estimated for two categories; production and non-production personnel. Benefits, bonuses and employer premiums for non-production and production personnel are 70% and 90% of the annual salary, respectively. The following tables depict the estimated salaries.

## **Non-production personnel**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Description | Quantity | Monthly Salary (Rial) | Annual Salary (Million Rial) |
| 1 | Project Manager | 1 | 60000000 | 720 |
| 2 | Administrative and financial manager | 1 | 40000000 | 480 |
| 3 | Administrative and financial employee | 1 | 28000000 | 336 |
| 4 | Procurement and sales staff | 1 | 28,000,000 | 336 |
| 5 | warehouse keeper | 1 | 25,000,000 | 300 |
| 6 | Driver | 2 | 23,000,000 | 552 |
| 7 | Cleaning Chi and Abdar Chi | 1 | 23,000,000 | 276 |
| 8 | Guardian and attendan | 1 | 23,000,000 | 276 |
| Total | | 9 |  | 3276 |
| Benefits, bonuses and premiums | | | | 2294 |
| Total | | | | 5570 |

## **Production personnel**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Description | Quantity | Monthly Salary (Rial) | Annual Salary (Million Rial) |
| 1 | production manager | 1 | 32000000 | 384 |
| 2 | Site worker | 4 | 27000000 | 1296 |
|  | Technical and repair technician | 3 | 28000000 | 1008 |
| 3 | Total | 8 |  | 2688 |
| 4 | Benefits, bonuses and premiums | | | 2420 |
| 5 | Total | | | 5108 |

2-3- Estimating the amount of required energy and water

In a production unit, in addition to the raw materials needed to produce a product, facilities are needed to operate the equipment and machinery. These requirements, also known as utilities, include: electricity, process water, cooling water, and diesel. In this section, the amount of consumption of each of these components is determined in two categories; the process components (required for manufacturing equipment) and the non-process components (utility and general use).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # | Description | Unit | Annual Consumption | Unit Cost (Rial) | Total cost (Million Rials) |
| 1 | Gasoline | M3 | 135 | 7600000 | 1026 |
| 2 | Petrol | Lit | 4,500 | 20000 | 90 |
| 3 | Electricity | Kw/h | 840,000 | 1600 | 1344 |
| 4 | Water | M3 | 1,500 | 5000 | 8 |
| 5 | Viscosine oil | Lit | 2,000 | 20000 | 40 |
| 6 | Communications | --- | --- | --- | 100 |
|  | Total | | |  | 2608 |

**3- Estimating project's circulating capital**

|  |  |  |
| --- | --- | --- |
| # | Description | Total Costs (Million Rials) |
| 1 | Raw material storing costs | 6164 |
| 2 | Petty cash | 4012 |
| Total | | 10176 |

**4- Investment Table**

|  |  |  |
| --- | --- | --- |
| # | Description | Total Costs  (Million Rial) |
| 1 | Fixed investment | 213042 |
| 3 | Circulating capital | 10176 |
|  | Total | 223218 |

**5- Annual Production Costs**

The total annual production costs are estimated from the sum of fixed and variable costs.

|  |  |
| --- | --- |
| Description | Total cost |
| Raw material | 37500 |
| Energy and fuel | 2608 |
| Personnel expenses | 10676 |
| Annual wear and tear, repair and maintenance costs | 8850 |
| **Total** | **59634** |

**6- Sales Forecast**

It is calculated based on the finished product price, taking into account the market price and deduction of overhead expenses. So the selling price of the product is estimated as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Description | Amount (Kg) | Unit Value  (Rial) | Total costs (Million Rial) |
| 1 | Recycled rubber powder | 10000000 | 12000 | 12000 |
| **Total cast** | | | | **12000** |

**7- Plan’s Financial Indicators**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Special profit and loss | The rate of return on investment | The period of return on investment | Per capita fixed investment | Per capita total investment |
| 44540 | 0.34 | 2.94 | 7100 | 7700 |

**8- Profit and Loss Calculation Table**

\* All figures are in million rials

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Profit and Loss Forecast Table | | | | | |
| Description | 1st year | 2nd year | 3rd year | 4th year | 5th year |
| Production Amount | 14000000 | 16000000 | 18000000 | 20000000 | 20000000 |
| net sales | 84000 | 96000 | 108000 | 120000 | 120000 |
| Production Costs | | | | | |
| Raw material | 26250 | 30000 | 33750 | 37500 | 37500 |
| Production staff salaries | 3576 | 4086 | 4596 | 5108 | 5108 |
| Energy Consumption | 1826 | 2086 | 2346 | 2608 | 2608 |
| Maintenance | 1906 | 2178 | 2450 | 2722 | 2722 |
| Unexpected | 750 | 856 | 964 | 1070 | 1070 |
| Wear and Tear | 4290 | 4902 | 5516 | 6128 | 6128 |
| Total production costs | 38594 | 44108 | 49622 | 55134 | 55134 |
| The finished price of the sold product | 38554 | 44068 | 49582 | 55094 | 55094 |
| Gross profit | 45446 | 51932 | 58418 | 64906 | 64906 |
| Operation Costs | | | | | |
| Office staff salaries | 5570 | 5570 | 5570 | 5570 | 5570 |
| Administrative and sales costs | 1680 | 1920 | 2160 | 2400 | 2400 |
| Total operating costs | 7250 | 7490 | 7730 | 7970 | 7970 |
| Operating Profit | 38196 | 44444 | 50690 | 56936 | 56936 |
| Non-operation Costs | | | | | |
| Depreciation before operation | 280 | 280 | 280 | 280 | 280 |
| Fixed asset insurance | 242 | 242 | 242 | 242 | 242 |
| Total non-operating costs | 12396 | 12396 | 12396 | 12396 | 12396 |
| Pre-tax profits | 25800 | 32046 | 38294 | 44540 | 44540 |
| Special Profit | 25800 | 32046 | 38294 | 44540 | 44540 |
| Yearly profit | 0 | 25800 | 57848 | 96140 | 140680 |
| Unprofitable to sell | 0.38 | 0.54 | 0.54 | 0.54 | 0.54 |
| Special Profit to Sell | 0.22 | 0.33 | 0.35 | 0.37 | 0.37 |

**Pre-Feasibility Summary**

|  |
| --- |
| **General Specification** |
| Project Name: Tire recycling |
| Project Capacity: 10,000 tons |
| Number of Personnel: 17 |
| Working Days: 300 |
| **Technical Study** |
| Land Area: 50,000 square meters |
| Building Area: 2050 square meters |
| Main Raw Materials: Worn tires |
| Supplying Method of Raw Materials: internal resources |
| Power Requirement: 840,000 kwh annually |
| Water Requirement: 1,500 cubic meters annually |
| Fuel Requirement: 4,500 liters of diesel per year |
| **Economical & Financial Study** |
| Fixed Investment Cos: 213042 million rials |
| Working Capital: 10176 million rials |
| Total Investment: 223218 million rials |
| Annual Sale: 12000 million rials |
| Net Present Value(NPV): 37608 million rials |
| Break Even Point(BEP): 38% |
| Internal Rate of Return(IRR): 34% |
| Investment Return Period: 3 years |