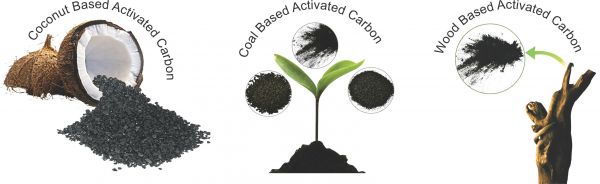


**Per-feasibility (P.F.S)**

**Produce Activeate Charcoal of Coal Plan**

[](http://www.abpsoil.com/cache/f/0fdad4ae3e7dcab3780a9ddf3479615d.png)

**executor of plan:**

**Pars Robin Consulting Engineers Co**

**Project supervisor:**

**Dr. Ali Saidi**

**Project employer:**

**South Khorasan Industry, Mining and Trade Organization**

**The Center of Investment Services, South Khorasan Province**

# Project summary:

Because of activated carbon's structural and absorbing properties, it is used to separate gases and liquids (e.g., in a cleaning environment). Activate carbon, sometimes called "Active charcoal, " is a kind of processed carbon with tiny pores with lower values. This kind of carbon is used on the surfaces to increase surface absorption.

Because of its pores, one gram of activated carbon has a surface nearly 3000 square meters. To reach an acceptable level, we need a high activation process here. The chemical processing causes an increase in the absorbance of our materials.

Activated carbon obtained from wood. When it is obtained from coal, it is called "activated charcoal"; when it is produced from coke, it is called "activated coke."

This plan will use coal as the best material for activated carbon production.

Categorize activated carbon is done based on these physical properties:

1. Powdery activated carbon: Its size is 100 nanometers, and its diameter is 15 to 25 micrometers.
2. Granular activated carbon: its site is greater than powdery activated carbon.
3. Spherical activated carbon
4. Injected activated carbon
5. Activated carbon with polymer coat

Activated carbon has more prose for chemical gas and liquids absorbing than usual carbon. These materials are very popular in industries because of their properties in unwanted gas or liquid absorption and are used in many applications.

The infrastructure of this plane needs 647300 Kilowatts of electrical power (per hour) and 1383 cubic meter water. This plan needs 163500 cubic meters of water. It is anticipated 30 people will be employed in this plan directly.

# Project define:

Because of activated carbon's structural and absorbing properties, it is used to separate gases and liquids (e.g., in a cleaning environment). Activate carbon, sometimes called "Active charcoal, " is a kind of processed carbon with tiny pores with lower values. This kind of carbon is used on the surfaces to increase surface absorption. The structure, function, and properties of activated carbon are dependent on its raw materials and production process. In the activated carbon production process used of many materials such as cock, charcoal, Petroleum coke, bitumen, Coal tar, plant waste, and agricultural waste such as fruit skins and seed (e.g. Olive seed), wood, erc. The final products include plant-based activated carbon, activated carbon from activated coconut skin (Coconut activated carbon), wooden activated carbon, plant-based activated carbon such as almond and walnut skins, mineral activated carbon, etc.

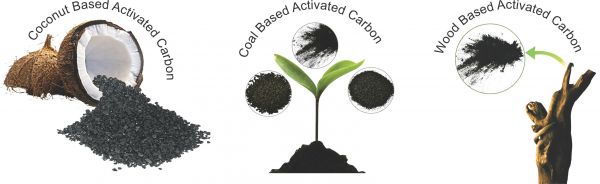
# Usages:

Some of the more applications of activated carbon are:

* Gas and water purification and sewage treatment.
* Purification of domestic and industrial waters to remove pollutants, color, unpleasant taste and smell, and withdraw additional materials.
* Air Purification and various gases to clear pollution and vapors and enhance the smell and color of gas streams
* Refining, purifying, and improving the color of liquids in pharmaceutical, food, beverage, cosmetic industries, etc.
* Operate in air purifiers and fresheners, also in industrial air cleaners
* Air filters in breathing masks and air compressors
* Food industry and edible oils for enhancing the color and taste of drinks and juices
* Sugar industry for sugar decolorization
* Decaffeination
* Pharmaceutical industries for drugs sanctification
* To purification of gas and liquid streams in the petrochemical industries as an absorbent and catalyst and the purification of wastewater
* As a pre-treatment in the reverse osmosis systems
* Gas sweetening
* Recycling of solvents and chemicals materials
* Lessening of chlorinated compounds
* Gold purification, extraction of metals and recycling
* The granular active carbon is used in the dehumidification systems in home and industrial refrigerators
* Activated charcoal is used to withdraw color and turbidity from herbal and traditional drinks and clarify them
* Activated carbon powder is used in charcoal facial mask and skin whitening
* Create carbon plates for air cleansing in houses, hospitals, and manufacturers
* Create N95 filters with active carbons FFP2 and FFP3 and high iodine carbon layers
* Air cleaners with absorbent plates with active carbon to remove smells and other organic and material pollutants
* Enhancing color and taste in drinks and juices
* Use in appliances like air cleaners, air fresheners, and industrial air purifiers

# Requirement Technologies and producing method review:

The structure, function, and properties of activated carbon are dependent on its raw materials and production process. In the activated carbon production process used of many materials such as cock, charcoal, Petroleum coke, bitumen, Coal tar, plant waste, and agricultural waste such as fruit skins and seed (e.g. Olive seed), wood, etc. The final products include plant-based activated carbon, activated carbon from activated coconut skin (Coconut activated carbon), wooden activated carbon, plant-based activated carbon such as almond and walnut skins, mineral activated carbon, etc.

[](http://www.abpsoil.com/cache/f/0fdad4ae3e7dcab3780a9ddf3479615d.png)

Activated carbon production methods are divided into four broad parts: pyrolysis, physical activation, chemical activation, and carbonization with steam or thermal.

## 1-Pyrolysis process

The pyrolysis process is also called the "thermochemical transformation" of organic biomass into gaseous or liquid fuels at very high temperatures without halogen and oxygen. Pyrolysis is a process that simultaneously changes the material's chemical arrangement and physical phases. In the pyrolysis method, materials are placed at very high temperatures. In pyrolysis, the structure and characteristics of active carbon products are changed by parameters such as temperature, heating intensity, retention time, and nitrogen gas flow intensity.

## 2- Physical activation

Physical activation synthesizes activated carbon in a two-step process that contains carbonization and activation. In the first step, the carbonization is done, and then the activation of the final coal is done at high temperatures with oxidizing gases such as carbon dioxide, water vapor, air, or a mixture of all three. In the carbonization step, use a temperature between 400 to 850 (sometimes 1000) degrees Celsius. The activation occurred at temperatures between 600 and 900 degrees Celsius. This process used raw materials like agricultural or rice waste and wood.

## 3- Chemical activation

In chemical activation, two steps, activation, and carbonization, are performed. Doing these processes (activation and carbonization) at low temperatures simultaneously leads to better activation and makes a more porous structure. Throughout this process, chemical materials such as zinc chloride, potassium hydroxide (KOH), phosphoric acid, and potassium carbonate are used as activation agents. Here, agricultural waste raw materials such as olive and apricot seeds, walnut and peanut skins, and rice wastes are used.

## 4- Pyrolysis with water steam

Here, raw materials (including agricultural waste) are heated between 500 and 800 degrees Celsius under steam flow. This process has been widely used to produce active carbon from agricultural waste.

**Checking and determining the minimum economic capacity**

**1- Fixed project costs**

|  |  |  |
| --- | --- | --- |
| row | **Description** | **Total cost (thousand riyals)** |
| 1 | Earth | 8000000 |
| 2 | Landscaping | 4059000 |
| 3 | Production and administrative building | 71300000 |
| 4 | General facilities and equipment | 11610000 |
| 5 | equipment and machinery | 49854000 |
| 6 | Office furniture and equipment | 2982200 |
| 7 | vehicles | 2900000 |
| 8 | Pre-operation costs | 1190000 |
| 9 | Unforeseen costs of 3% | 4316856 |
| **total sum** | | **156212056** |

**1-1- land**

|  |  |  |  |
| --- | --- | --- | --- |
| **land location** | **land area** | **Unit price** | **Total price (thousand riyals)** |
| Birjand | 5000 | 1600000 | 8000000 |

**1-2- Landscaping**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **row** | **Description** | **Meterage** | **unit** | **unit cost** | **total sum** |
| **(thousand riyals)** | **thousand riyals)** |
| 1 | Leveling and excavation and embankment | 5,000 | Square meters | 40 | 200000 |
| 2 | Fencing | 300 | meter long | 5000 | 1500000 |
| 3 | Street drawing, table drawing, channel drawing and parking lot | 500 | Square meters | 3900 | 1950000 |
| 4 | Area lighting | 31 | original | 9000 | 279000 |
| 5 | entrance door | 1 | number | 130000 | 130000 |
| **total sum** | | | | | **4059000** |

**1-3- construction**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **row** | **Description** | **area (square meter)** | **Unit cost (thousand riyals)** | **Total cost (thousand riyals)** |
| 1 | Production Hall | 1,200 | 30000 | 36000000 |
| 2 | Roofed warehouse | 1,000 | 27000 | 27000000 |
| 3 | office building | 150 | 42000 | 6300000 |
| 4 | Caretaker and security and welfare | 50 | 40000 | 2000000 |
| **total sum** | | **2400** |  | **71300000** |

**1-4- Facilities and equipment**

|  |  |  |
| --- | --- | --- |
| **row** | **Description** | **Total cost (thousand riyals)** |
| 1 | Electricity | 8900000 |
| 2 | Water | 170000 |
| 3 | Cooling and heating | 1300000 |
| 4 | fuel | 290000 |
| 5 | Scale and truck unloading station | 940000 |
| 6 | Telephone lines | 10000 |
| **Total** | | **11610000** |

**1-5- equipment and machinery**

|  |  |  |  |
| --- | --- | --- | --- |
| **row** | **Description** | **Unit cost (thousand riyals)** | **Total cost (thousand riyals)** |
|
| 1 | Storage containers | 1520000 | 4560000 |
| 2 | Mill | 3400000 | 3400000 |
| 3 | Carbonation | 2960000 | 2960000 |
| 4 | cold | 960000 | 960000 |
| 5 | Activation furnace | 14800000 | 14800000 |
| 6 | Cooling system | 3600000 | 3600000 |
| 7 | Dryer | 6600000 | 6600000 |
| 8 | Gas purification system | 4400000 | 4400000 |
| 9 | Feeder and conveyor | 5200000 | 5200000 |
| 10 | Packaging system | 1000000 | 1000000 |
| 11 | Installation of machinery and commissioning and supervision of executive works | | 2374000 |
| **Total** | | | **49854000** |

**1-6- Office furniture and equipmen**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **row** | **Description** | **Number** | **Unit cost (thousand riyals)** | **Total cost (thousand riyals)** |
| 1 | Table | 8 | 28000 | 224000 |
| 2 | the chair | 8 | 14000 | 112000 |
| 3 | Computer | 8 | 134000 | 1072000 |
| 4 | Earphone | 8 | 3000 | 24000 |
| 5 | stationery | 8 | 1600 | 12800 |
| 6 | Uniforms and safety equipment | 30 | 8000 | 240000 |
| 7 | office furniture | 2 | 130000 | 260000 |
| 8 | the chair | 12 | 8000 | 96000 |
| 9 | Laser printer | 2 | 110000 | 220000 |
| 10 | fax | 1 | 80000 | 80000 |
| 11 | Kitchen equipment, dining hall and self-service | 1 | 300000 | 300000 |
| 12 | Work wardrobe | 2 | 42000 | 84000 |
| 13 | dressing room | 2 | 50000 | 100000 |
| 14 | office closet | 4 | 25600 | 102400 |
| 15 | Zunken shelf | 1 | 55000 | 55000 |
| **Total** | | | | **2982200** |

**2- Current project costs**

|  |  |  |
| --- | --- | --- |
| **row** | **Description** | **Total cost in the base year**  **(including practical capacity) (thousand Rials)** |
| 1 | raw materials | 471144000 |
| 2 | Salaries and wages of direct production personnel | 29802320 |
| 3 | Consumer facilities | 2077028 |
| 4 | Maintenance and repairs | 5540560 |
| 5 | depreciation | 8170690 |
| 6 | Spare parts (0.5% of investment costs without land) | 736132 |
| 7 | Unpredicted excluding 1% depreciation | 5093000 |
| Total production costs | | 522563728 |
| 9 | Advertising and administrative distribution and sales costs (percentage of sales) 2% | 13500000 |
| Total operating costs | | 13500000 |
| 11 | Amortization cost of pre-operational costs | 160606 |
| 12 | Costs of renewal of standards | 80000 |
| 13 | Insurance costs | 285410 |
| Sum of non-operational expenses | | 526016 |
| Total annual operating costs | | 536589746 |

**2-1- raw materials**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **row** | **Description** | **unit** | **Production rate at 100% capacity (tons)** | **Riyal cost per product unit (Ryal)** | **The annual cost of providing materials**  **(thousand riyals)** | |
| 1 | coal (anthracite) | Ton | 1500 | 89600000 | 470400000 | |
| 2 | Chemical substance (sodium hydroxide and potassium hydroxide) | kg | 1500 | 620000 | 744000 | |
| **total sum** | | | | | | **471144000** |

**2-2- Personnel salaries and wages**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **row** | **Description** | **Number** | **Monthly salary (thousand riyals)** | **Total annual salary**  **including bonus (14 months)** |
| **(thousand riyals)** |
| 1 | the manager | 1 | 120000 | 1680000 |
| 2 | production manager | 1 | 140000 | 1960000 |
| 3 | warehouse keeper | 1 | 72000 | 1008000 |
| 4 | Quality control and laboratory | 1 | 90000 | 1260000 |
| 5 | Technician | 4 | 80000 | 4480000 |
| 6 | skilled worker | 4 | 52000 | 2912000 |
| 7 | Simple production worker | 12 | 44000 | 7392000 |
| 8 | Administrative and financial staff | 3 | 64000 | 384000 |
| 9 | Driver | 1 | 52000 | 728000 |
| 10 | Specialist production personnel | 2 | 110000 | 3080000 |
| **Total** | | 30 | -- | 24884000 |
| 23% social security insurance of the employer's share | | | | 4918320 |
| **Sum of salaries and wages** | | | | 29802320 |
| **Total** | | | | **29802320** |

**2-3- The amount of energy**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **row** | **Description** | **unit** | **Amount of consumption per year** | **Unit cost** | **Total cost** |
| **(riyals)** | **(thousand riyals** |
| 1 | Water | cubic meter | 1,383 | 11000 | 15208 |
| 2 | Electricity | kilowatt hours | 647,300 | 2400 | 1553520 |
| 3 | Petrol | Liter | 4,800 | 30000 | 144000 |
| 4 | gas | cubic meter | 163,500 | 1800 | 294300 |
| 5 | Phone and internet | --- | | | 70000 |
| **Total** | | | | | **2077028** |

**3- Estimating the amount of working capital of the plan**

|  |  |  |  |
| --- | --- | --- | --- |
| **row** | **Description** | **Month** | **Total cost (thousand riyals)** |
| 1 | salary | 1 | 2483526 |
| 2 | raw materials | 2 | 94228800 |
| 3 | slanderer | 1 | 3691044 |
| **Total** | |  | **100403370** |

**4- investment**

|  |  |  |
| --- | --- | --- |
| **row** | **Description** | **Total cost (thousand riyals)** |
| 1 | Fixed investment | 156212056 |
| 2 | capital in circulation | 100403370 |
| **Total** | | **256615426** |

**5- Financial indicators of the plan**

|  |  |  |
| --- | --- | --- |
| **row** | **Indicator** | **year of operation** |
| 1 | Percentage of sales at breakeven point | 33% |
| 2 | The amount of sales at the breakeven point | 78,904,054 |
| 3 | The amount of production at the breakeven point | 702 |
| 4 | Internal rate of return on investment | 54.6% |
| 5 | The investor's internal rate of return | 54.6% |
| 6 | Return of capital | 2.29 |
| 7 | The return period of the investor's investment | 2.29 |
| 8 | Net present value of the investment | 161980480 |
| 9 | Net present value of the investment share | 161980480 |
| 10 | The cost price of each production unit | 178,863,248 |
| 11 | The selling price of each production unit | 225,000,000 |

**Summary of pre-feasibility plan**

|  |
| --- |
| general information |
| Project Title: Production of activated carbon from coal |
| Project capacity: 1500 ton |
| Employment rate: 30 people |
| Working days: 300 days |
| Technical study |
| Land area: 5000 square meters |
| Building area:2400square meters |
| Electricity required: 647300 kilowatt hours per year |
| Required water: 1383 cubic meters per year |
| Required fuel: 163500 cubic meters |
| Financial and economic study |
| Fixed investment amount: 156212 million Rials |
| Working capital: 100402 million Rials |
| Total investment: 256614 million Rials |
| net present value**:** 161980 million Rials |
| Internal rate of return (IRR): 44.61 percent |
| Investment return period: 2.5 years |