



RECYCLING NATURE WITH RICE HUSK

Proposal by TJ Consulting

INTRODUCTION

Rice husk is an organic waste and is produced in large quantities. It is a major by-product of the rice milling and agro-based biomass industry.

Rice husk is light in weight, yellowish in colour and convex in shape, slightly larger than the rice grain. It is separated from the brown rice grain as part of the milling process, after which the rice is polished. Forming one fourth of the volume of paddy, it is bulky and hence difficult to store.



RICE HUSK IN PAKISTAN

Countries like Pakistan are blessed with valuable fertile land and abundant rainfall, two of the most essential prerequisites for enhanced agricultural output. It is also the ideal place to cultivate rice which requires abundant water resources, and justifiably then, rice is the main agricultural crop, exported globally, and its output steadily increasing, to meet both the increasing domestic demand and for earning foreign exchange through international trade.

- In the year 2019, Pakistan produced 7.5 million tonnes of rice
- Pakistan ranked 10th in largest rice producing countries.
- 1 ton of Rice produces 220 kg Rice Husk
- Total Rice Husk Per year in Pakistan is around 1.7 Million tonnes.



CHARACTERISTICS

Some of its distinctive features include:

- Husk makes for good insulation material since it does not burn easily till air is blown through it. It is highly resistant to the penetration of moisture and fungal decomposition.
- Rice husk decomposes slowly due to the rich silica content, and can therefore not be considered for use as fodder.
- When rice husk is burned, its ash content of 17 – 26 % is far higher than that of wood and coal. This explains the need for much larger volumes of husk when utilized for power generation.
- Its high calorific value makes it a good source of renewable energy.



PROPERTIES

Cellulose	50%	Cellulose is a molecule, consisting of hundreds – and sometimes even thousands – of carbon, hydrogen and oxygen atoms. Cellulose is the main substance in the walls of plant cells, helping plants to remain stiff and upright. Humans cannot digest cellulose, but it is important in the diet as fibre.
Lignin	25-30%	Lignin is a class of complex organic polymers that form key structural materials in the support tissues of vascular plants and some algae. Lignins are particularly important in the formation of cell walls, especially in wood and bark, because they lend rigidity and do not rot easily.
Silica	15-20%	Silica is a natural compound, found all around us in nature. Silica makes up over a quarter of the planet's crust and can be found in most rocks, clays and sands. Its forms include emerald, quartz, clay and glass.
Moisture	10-15%	Moisture is the presence of a liquid, especially water, often in trace amounts. Small amounts of water may be found, for example, in the air, in foods, and in some commercial products. Moisture also refers to the amount of water vapor present in the air.



COMPOSITION OF RICE HUSK ASH

When rice husk is burned, its ash content of 17 – 26 % is far higher than that of wood and coal.

S. No	Content	%
1	Silicon Dioxide	86.94%
2	Aluminum Oxide	0.2%
3	Iron Oxide	0.1%
4	Calcium Oxide	0.3-2.25%
5	Magnesium Oxide	0.2-0.6%
6	Sodium Oxide	0.1-0.8%
7	Potassium Oxide	2.15-2.30%

PRECAUTION

The place of rice hulling (separation of fruit shells) is the most dangerous one. The dust content during hulling with the use of wooden mill is 22.44 mg/cu.m., iron – 25 mg/cu.m. Workers usually suffer lung diseases.



USES OF RICE HUSK ASH

This ash is a potential source of amorphous reactive silica, which has a variety of applications in materials science.

- Most of the ash is used in the production of Portland cement. When burnt completely, the ash can have a Blaine number of as much as 3,600 compared to the Blaine number of cement (between 2,800 and 3,000), meaning it is finer than cement.
- Silica is the basic component of sand, which is used with cement for plastering and concreting. This fine silica will provide a very compact concrete.
- The ash also is a very good thermal insulation material. The fineness of the ash also makes it a very good candidate for sealing fine cracks in civil structures, where it can penetrate deeper than the conventional cement sand mixture.



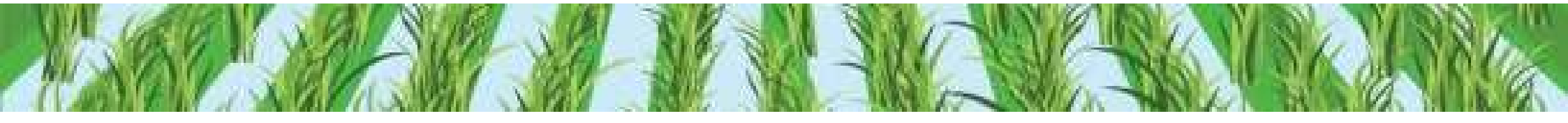
USES OF RICE HUSK ASH

- Ceramic glazes.
- Absorbents for oils and chemicals
- Soil ameliorants
- Source of silicon
- Insulation powder in steel mills
- Repellents in the form of "vinegar-tar" release agent in the ceramics industry, as an insulation material
- More specialized applications include the use of this material as a catalyst support
- Source for tire additive.
- Rice hulls are a low-cost material from which silicon carbide "whiskers" can be manufactured.
- Toothpaste



USES OF RICE HUSK ASH

- Brewing
- Fertilizer and substrate
- Fireworks
- Fuel
- Juice extraction
- Pet food fibre
- Pillow stuffing
- Insulating material
- Particle boards and cardboard
- **Rice Bran Oil Extraction**



RICE BRAN OIL EXTRACTION

Rice bran oil (RBO) is obtained through extraction of rice bran which is a by-product of the rice milling industries. There are several techniques used for the extraction of the RBO, but solvent extraction using hexane is the most popular used conventional method for commercial extraction. The use of hexane in the conventional methods has some drawbacks due to its flammability, toxicity and high temperature involved in the process resulting in some undesirable components in the oil as a result of oxidative deterioration, developments of rancid and off-flavor. Efforts were made by many researchers to explore different other nonconventional techniques for the oil extractions and utilization. Some of these methods such as supercritical carbon dioxide extraction, subcritical water extraction, enzyme-assisted, ultrasonic-assisted and microwave-assisted processes can be use produce an oil that is free from toxic residues, having high concentration of health components and a yield comparable to the conventional techniques.



RICE BRAN OIL EXTRACTION

RBO has gained a wide popularity due to its considerable importance in the last few years for its health benefits. It has gained many applications in food, pharmaceutical, cosmetics and chemical industries because of its unique properties and medicinal value. However, the lack of widespread commercial uses of the RBO is due to the economic factor particularly the high cost of the oil as compared to other vegetable oils.

