

Manufacture of Value Added Products from Rice Husk (Hull) and Rice Husk Ash (RHA) (3rd Edition)

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Rice husk hull and rice husk ash are byproducts that are derived from the processing of rice grains. Rice husk hull is the outer layer of the rice grain, while rice husk ash is the residue that remains after the husk is burned. These byproducts may seem insignificant at first, but they have numerous applications and offer immense potential for various industries. Rice husk hull is composed mainly of cellulose, lignin, and silica. Its high silica content makes it a suitable raw material for manufacturing eco-friendly building materials such as boards, bricks, and panels. On the other hand, rice husk ash is rich in silica, potassium, and carbon. It can be processed into silica powder, which finds applications in the production of silicon carbide, silicon nitride, and other ceramic materials.

The market outlook for value-added products derived from rice husks and hulls is incredibly promising. As industries and consumers become more environmentally conscious, the demand for sustainable alternatives continues to rise. This presents a great opportunity for manufacturers who are looking to capitalize on the versatility and eco-friendly properties of rice husks and hulls.

The global rice husk ash market size was USD 1.39 billion and is expected to register a revenue CAGR of 6.3%. The market revenue growth is also driven by the increasing use of rice husk ash in the production of various industrial chemicals such as sodium silicate and activated carbon. The unique chemical composition of rice husk ash makes it an ideal raw material for the production of these chemicals, which find application in various industries such as water treatment, pharmaceuticals, and food and beverage. The increasing demand for rice husk ash from various end-use industries, is expected to drive the market growth.

This book provides comprehensive details regarding Precipitated Silica Manufacturing, Cement Production from Rice Husk Ash, Activated Carbon Production, Electricity Generation, Ethanol Production, Hardboard Manufacturing, Oxalic Acid Manufacturing, Paper Production, Particle Board Manufacturing, Rice Husk Briquettes, Rice Husk Pellet (RHP) Production, Silicon Production, Hollow Blocks Production, Sodium Silicate Manufacturing, Charcoal Production, Disposable Cutlery and Tableware Production, Red Clay Bricks Production from Rice Husk, Packaging, Manufacturing Process, Machinery, Equipment Details, and Photographs with Suppliers Contact Details are also given.

This book serves as an exhaustive guide to the manufacturing and start-ups aspects of the Rice

Husk (Hull) and Rice Husk Ash (RHA) Value Added Products industry. It presents itself as a singular resource for all information related to this sector, highlighting its vast potential for manufacturers, traders, and business innovators. This guide stands alone in its coverage of commercial Rice Husk (Hull) and Rice Husk Ash (RHA) Value Added Products manufacturing, offering a comprehensive journey from the initial idea to the acquisition of equipment. It is a treasure trove of practical insights and step-by-step guidance in this field.

1. Rice Husk (Hull)

Composition of Rice Husk

Properties of Rice Hull

Use & Applications of Rice Husk

- (a) As an Industrial Fuel
- (b) Preparation of Activated Carbon
- (c) Rice Husk as a Fertilizer and Substrate
- (d) As Pet Food Fiber
- (e) Substrate for Silica and Silicon Compound
- (f) Used for Making Bricks
- (g) Rice Husk as Fireworks
- (h) Used as Pillow Stuffing
- (i) Other Uses

Rice Husk as an Adsorbent for Heavy Metals

2. Rice Husk Ash (RHA)

Physical Properties of Rice Husk Ash

Chemical Composition of Rice Husk Ash

Applications

Use of RHA in Several Industrial Applications

- 1. As a Replacement to Silica Fume
- 2. As an Admixture in Low Cost Concrete Block Manufacturing
- 3. As a Tundish Powder in Steel Casting Industries
- 4. Manufacturing Refractory Bricks
- 5. Control of Insect Pests in Stored Food Stuffs
- 6. In the Vulcanizing Rubber
- 7. In the Water Purification
- 8. As a Flue Gas Desulphurization Absorbent

3. Precipitated Silica from Rice Husk Ash

Typical Properties

Physico - Chemical Characteristics of Precipitated Silica

- 1. pH Value
- 2. Drying Loss
- 3. Ignition Loss
- 4. DBP Absorption
- 5. SiO₂ Content
- 6. SIEVE Residue
- 7. Tamped Density

Uses & Applications

Rubber Grade Precipitated Silica

Non Rubber Grade Precipitated Silica

Manufacturing Process

Digestion

Precipitation

Regeneration

Process Flow Diagram

4. Activated Carbon from Rice Husk

Forms of Activated Carbon

Physical Characteristics

Uses and Applications of Activated Carbon

Manufacturing Process

5. Cement from Rice Husk Ash

Varieties of Cement

Uses of Cement

Manufacturing Process

1. Manufacture of Lime

Calcination

Hydration

2. Manufacture of Burnt Rice Husk

3. Mixing & Grinding

4. Packing & Forwarding

6. Electricity from Rice Husk

Procedure of Electricity Generation from Rice Husk

Downdraft Gasification

Purification Unit

Turbine and Generation Unit

7. Ethanol from Rice Husk

Ethanol is Used

Chemical Properties of Ethanol

Grades of Ethanol

Denatured Alcohol

Absolute Alcohol

Rectified Spirits

Manufacturing Process

Cellulosic Ethanol

Purification Distillation

Process Flow Diagram

8. Hardboard from Rice Husk

Properties

Uses of Hardboard

Furniture

Construction

Auto Industry

Packaging and Other

Manufacturing Processes

Blending

Adhesive Preparation

Adhesive Mixing

Mat Formation

Cole Pressing

Hot Pressing

Sanding and Finishing

Process Flow Diagram

9. Oxalic Acid from Rice Husk

Physical and Chemical Properties of Oxalic Acids

Uses of Oxalic Acid

1. Bleaching
2. Removing Stains
3. Removing Rusts
4. Other Uses

Manufacturing Process

Process Flow Sheet

10. Paper from Rice Husk

Uses & Applications

Process of Manufacture for Rice Husk

Raw Material Storage & Preparation

Husk Pulping

Waste Paper Pulping

Screening of the Pulp

Pulp Beating & Refining

Sizing & Loading

Refining

Paper Making and Finishing

11. Particle Board from Rice Husk

Advantages of Particleboard

Uses & Applications

Manufacturing Process of Pre Laminated Board

Flow Sheet for Manufacturing of Pre-Laminated Particle Board

Traditional Approach for Manufacturing Rice Husk Particleboards

Adhesives in Particleboards

1. Synthetic Adhesives

Phenol-formaldehyde (PF)

Urea-formaldehyde (UF)

2. Natural adhesives

Soybean Adhesive

Starch Adhesive

12. Rice Husk Briquettes

Various Types of Briquettes

Biomass Briquettes

Sawdust Briquettes

Agro waste Briquettes

Wood Briquettes

White Coal Briquettes

Uses of Briquettes

Applications of Briquettes in Various Industries

13. Rice Husk Pellet (RHP)

Why Make Rice Husk Pellets?

Property of Rice Husk Pellet

Advantages of Pelletizing Rice Husk into Pellet

- a. Good to Environment
- b. Convenient

- c. High Effectiveness
- d. Wide Application

Manufacturing Process

- a. Drying
- b. Pelletizing
- c. Cooling and Packing

Process Flow Diagram

14. Silicon from Rice Husk

Properties

Physical Properties

Chemical Properties

Electrical Properties

Uses

Uses of Silicon Based Products in Different Sectors

Computers and Electronics

Automobiles

Textiles

Household

Personal Care

Healthcare

Paper

Manufacturing

Food and Related Industries

Manufacturing Process

- 1. Digestion
- 2. Precipitation
- 3. Regeneration

Production of Silicon

Process Flow Diagram

15. Sodium Silicate from Rice Husk

Sodium Silicate Physical and Chemical Properties...

Uses of Sodium Silicate

Properties of Sodium Silicate

Manufacturing Process

Safety Procedures in Handling Sodium Silicates

Process Flow Diagram

16. How to Make Hollow Blocks from Rice Hull

Procedure

17. Packaging

Types of Packaging Materials

Plastic

Metal

Brick Carton

Cardboard

Glass

Functions of Packaging

Containment

Protection

Convenience

Communication

Package Environments

1. Physical Environment

2. Ambient Environment

3. Human Environment

Levels of Packaging

Selection of Proper Packaging for Industrial Product

Flexible Industrial Packaging - Paper and Plastic

Rigid Industrial Packaging - Wooden, Metal, Plastic

Labelling

Labels for Chemical Products

18. BIS Specifications

Cement

Activated Carbon

Particle Board

Silicon

Silica

Sodium Silicate

Oxalic Acid

19. Photographs of Plant & Machinery with Supplier's Contact Details

20. Sample Plant Layout & Process Flow Sheets

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