New Rice Husk Processing Technology

All over the world the discharge of the husk accruing in the numerous rice mills causes a serious environmental problem. This agricultural waste however has a significant calorific value and a high percentage of amorphous silica.

With an innovative technology these favourable characteristics of rice husk will be used for solving the environmental problems and at the same time producing electricity and high value industrial products.

„Green“ Technology

Pörner Ingenieurgesellschaft mbH, Grimma, Germany is offering a new processing technology for production of silica using as feedstock rice husk from rice milling process developed and patented by our exclusive licensor AgriTec Incorporated, Houston, Texas.

Processing technology consists of a rice husk fired power plant and a chemical plant, producing from the rice husk ash high value industrial substances, namely liquid sodium silicate, precipitated silica and activated carbon.

Feedstock

Rice husks makes up about 20% of the rice (paddy) weight. The rice millers world wide therefore should generate more than 100 million tons of rice husks. Nowadays almost 70% of the rice husks are not commercially used.

Using one of the world’s major agriculture products - rice - as primary feedstock and avoiding disposal of either

- rice husks which are difficultly biodegradable or
- ash from combustion of rice husks

makes the Technology “Green” and is able to solve a huge environmental problem all over the world.

According international estimates the rice demand by 2020 will growth to 780 million tons. Because the rice growing areas can not be dramatically extended the rice harvest from one hectare shall increase from actual 5 tons to 12 tons by means of new improved rice seeds.
Preparation of Feedstock

- During rice milling approximately 70% of the raw rice is processed to "white" rice.
- Rice husks which are about 20% of raw rice are shelled, separated and stored in storage silos.
- The bran from rice polishing, which is about 10% of the raw rice is separated and most commonly used for animal feed.

All these processing steps are executed in classic rice mills all over the world.

Rice Husk Processing Plant:
Now the rice husks from various rice mills are collected and will be transported to the Rice husk processing plant.
Unloading will be done pneumatically or with gravity flow and excavators to intermediate silos. Before entering the silos impurities are separated by means of a riddle screen. Afterwards the husks are ground and fed to storage silos.
The caloric value of about 14 MJ/kg of the rice husks represents about 35% of the caloric value of diesel or bunker oil with a caloric value of 40.5 MJ/kg.

Combustion and Power Generation Unit
A special rice husk combustion unit generates steam and the rice husk ash is separated in hoppers. The main part of the steam is feed into a steam turbine-generator set which generates electric energy.

Electric energy is either partly used for the rice mill if it is located nearby and for the rice husk processing plant. The main part of electric energy is sold to the public grid and is a valuable product of the plant.

Depending on the combustion technology and process parameter rice husk ash with more or less carbon content (5% - 40 %) can be produced. The other components of the ash are amorphous silica and a small amount of crystalline silica as well as some Inerts.

The ash is collected from the several hoppers and the flue gas filters of the combustion unit and is stored in storage silos.
Liquid Sodium Silicate and Activated Carbon Production

Rice husk ash is first digested with caustic soda and then filtered. In the filter diluted liquid sodium silicate is separated from unwashed carbon filter cake. The diluted liquid sodium silicate is fed to storage tanks while the carbon cake in the filter is washed and chemically cleaned before dried in the drying section. The special serial dryers allow the production of powdered activated carbon with a residual water content of about 8%. The powdered activated carbon is screened and stored in storage silos. For distribution of activated carbon packaging in bags of various sizes is executed in the packing unit. The liquid sodium silicate (~24% silicate) can be sold as commodity chemical in tank-tainers or trucks.

Precipitated Silica Production

Liquid sodium silicate is processed with acid and filtered. The filter separates a diluted sodium sulfate (Glauber’s salt solution) and the wet silica product. The salt solution can be evaporated or fed to a reverse osmosis and solid salt is produced as valuable by-product. The wet filter cake is finally washed and fed to the drying unit. With special dryers a precipitated silica product with about 8% water content is produced. The precipitated amorphous silica powder is screened and stored in storage silos. For distribution of silica products packaging in bags of various sizes is executed in the packing unit.

Main Applications of the Products

Precipitated Silica:
Typical properties of our products:
- BET surface area 205-290 m²/g (gas adsorption), DBP oil absorption 170-240 ml/100g
- Rubber reinforcement
- Solar panels
- Plastic reinforcement
- Agriculture (animal food)
- Food, healthcare, cosmetics
- Catalyst; Coatings
- Pulp and Paper processing
- Detergents and soaps
- Adsorbents
- Anticaking agent for packing

Activated carbon:
- Food and beverages (decolouring)
- Pharmaceuticals
- Water purification
- Sweetener
- Solvent recovery
- Air purification

Liquid Sodium Silicates:
Weight ratios of SiO₂ to Na₂O from 1.6 to 3.3
- Detergents and cleaning compounds
- Adhesives & cements
- Paints& coatings
- Pulp & Paper processing
- Ceramics & binders
- Water treatment
- Textile processing
- Mining & mineral processing
- Petrochemical processing
AgriTec and Producers Rice Mill, Inc. (“Producers”), Arkansas have formed a JV Company, AgriTec-Sorbents, LLC (“ATS”) in December 2002. ATS has constructed and is operating a plant in Arkansas which manufactures liquid sodium silicate LSS and activated carbon AC products derived from RHA, utilizing the patented technology licensed by AgriTec. The plant is designed to process 12,000 tpa of RHA, resulting in an output of 25,000 tons of liquid sodium silicate and 5,000 tons of powder activated carbon. Construction of the plant began in 2003 and was concluded in 2006.

AgriTec/AgriSil Holding and Pörner Group have signed in 2007 an exclusive cooperation and project development agreement for the exploitation of the patented technology. Pörner Group is offering the Rice Husk Processing Technology as EPC Contractor including license for the AgriTec patented technology.

By providing all engineering services out of one hand: from conceptual design, to basic and detail engineering, procurement and project management up to commissioning and start-up, Pörner Group realizes all projects tailored to the customer’s requirements.

We look forward to present our capabilities in a personal meeting.