MONSTER INDUSTRIAL®

CASE STUDY

Preconditioning of Feedstock for Waste-to-Energy

Opportunity

Grind biomass to the necessary particle size to help convert biomass to biofuel.

Solution

A customized solution with JWC's Monster Industrial 3-SHRED-2 grinder, multiple safety features and a viewing window that allows scientists to observe the grinding process.

Converting Biomass to Biofuel

For decades, scientists at the Department of Energy's Pacific Northwest National Laboratory (PNNL) in Richland, Washington, have been experimenting with technologies that convert organic matter into biofuel. One such technology is hydrothermal liquefaction (HTL). At a basic level, HTL involves the injection of a biomass slurry into a reactor where it is heated under high pressure, similar to pressure cooking. The process is environmentally friendly, and the energy efficiency is very high.

Unlike technologies that require dry feedstock to convert biomass to biofuel (which can be prohibitively expensive), HTL can utilize a large variety of feedstock, including those with high moisture content such as organic residues and sludges. One of the key steps in the HTL process is grinding/shredding the biomass to the necessary particle size for injection into a reactor. This is where grinders from JWC Monster Industrial play a critical role.

Customized Preconditioning Solution

In 2019, PNNL ran into issues with their attrition mill that was having difficulty grinding/shredding a mixture of straw and manure. Looking for a solution, they turned to JWC. JWC performed numerous grind tests on a variety of tough materials in their grind test facility that was built to identify optimal configurations for each customer. After successfully grinding dry and wet or soaked hay, sticks, twigs, tumbleweeds, manure with straw, switchgrass, alfalfa, and animal fur, among others, they chose a 3-SHRED-2 unit with a 10 hp motor and an 18-inch split cutter stack that allows for coarse and fine grinding. The customized cutter stack features a Rockwell hardness of HRC 45-52 and uses 13-tooth .215" thick cutters for a coarse/prebreak grind and 23-tooth .08" thick cutters to produce the desired fine grind of .25" or smaller. Unlike inferior grinders that use cutters with a monolithic design, the forged and surface grinding of JWC's individual cutters allows for very tight manufacturing tolerances that result in a precise scissoring action.

The low-speed, high-torque, dual-shafted grinder has been able to successfully and safely grind the variety of organic materials that PNNL has tested. JWC worked closely with PNNL to design a unit that best suited their materials and operating environment. One of the unique features is a polycarbonate viewing window with water-tight seals that allows the scientists to observe the grinding process and ensure everything is grinding as expected. And because the stand is bolted instead of welded, it can be easily taken apart for cleaning in between grinds.

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The customized configuration incorporates multiple safety features, including a dead man switch on the effluent, e-stop cord, remote e-stop and controller stop. There is also 36-inch ANSI standard machine guarding.

The Future of Food Waste

PNNL is also using HTL to convert food waste to biofuel. The idea of converting food waste into fuel is a promising development in the waste-to-fuel space because food waste is plentiful, is easily made into a slurry, doesn't require arable land, and has the environmental benefit of keeping trash out of landfills, thereby reducing greenhouse gasses. PNNL is converting food waste from colleges, military bases and other large institutions. Some of the waste has had paper and plastics removed; some has not. Either way, JWC's Monster Industrial grinders easily handle all of it.

About Pacific Northwest National Laboratory

Pacific Northwest National Laboratory draws on its distinguishing strengths in chemistry, Earth sciences, biology and data science to advance scientific knowledge and address challenges in sustainable energy and national security. Founded in 1965, PNNL is operated by Battelle for the U.S. Department of Energy's Office of Science, which is the single largest supporter of basic research in the physical sciences in the United States. DOE's Office of Science is working to address some of the most pressing challenges of our time.

About JWC Environmental

JWC Environmental (JWC), a Sulzer Brand, is a world leader in solids reduction, removal systems and product destruction for municipal and industrial applications. JWC Muffin Monster® sewage grinders are the first choice to protect vital sewage pumping stations and sludge system equipment, and JWC headworks screens are proven performers to protect essential treatment plant equipment from debris in wastewater. Plants globally turn to JWC systems like Auger Monsters® and Screening Washer Monsters for unique all-in-one packaged solutions for solids separation and dewatering. JWC provides industrial wastewater treatment equipment through its IPEC screens and separation equipment. JWC industrial screening equipment is used in a variety of food and beverage, oil and gas, general manufacturing and industrial wastewater applications. JWC Monster Industrial shredders and grinders are uniquely designed to cut through the toughest solids and bring them down to size. Monster Industrial products are working every day, protecting equipment and destroying debris. They are found in applications like recycling, waste-to-energy, commercial facility sewage, food processing, agriculture, and oil and gas. Founded in 1973, the company has built and shipped more than 40,000 Monster grinders, shredders and screens to customers worldwide.

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