



Solutions in Milling & Sieving

Ideal for sample preparation of solid biofuels according to EN 14780

Sample Preparation of Biofuels/Biomass

When plant samples are to be tested for calorific value, moisture content, ash content, bulk density, durability, particle size distribution, ash melting behavior, chemical composition and impurities, RETSCH offers innovative size reduction tools and sieve shakers for the neutral-to-analysis preparation and characterization of these samples. If you require professional solutions that combine high performance, ease of use, a maximum of operational safety and a long lifetime, then RETSCH's equipment is your only choice!



Cutting Mill SM 300



Ultra Centrifugal Mill ZM 200



Knife Mill GRINDOMIX GM 200



Knife Mill GRINDOMIX GM 300



Sample Dividers



Sieve Shakers / Particle Analyzers





Solutions in Milling & Sieving

For optimum sample preparation

There are basically 3 different methods of generating energy from biomass

Direct Combustion

This method involves direct combustion of the raw material to produce energy and it is applied, for example, to wood chips. These are produced from wood residues (crowns, branches, parts of the trunk) which are not suitable for other purposes. The wood chips are shredded and burnt in an oven. The quality of wood chips is mainly determined by their calorific value and ash content. The size range is also important as smaller heating systems only accept chips of a defined size. The methods and requirements of sample preparation and analysis are stipulated in standards such as EN 14961. Before analyzing the calorific value, for example, the chips have to be ground in an **ultra centrifugal mill (RETSCH ZM 200)**. For particle size analysis a **horizontal sieve shaker (RETSCH AS 400 control)** is recommended. Larger pieces of wood can be submitted to primary size reduction in a **cutting mill (RETSCH SM 300)**.

Extraction

Another common method to produce biofuels is the refinement of combustible components from plant raw materials. In Europe, this is mainly done by extracting oil from rape seed, in the US it is soy beans whose oil is then esterified to biodiesel. Quality control of the seeds comprises size reduction with an **ultra centrifugal mill (RETSCH ZM 200)** and subsequent extraction of the raw materials as well as quantification of seed and other plant components by **horizontal sieving (RETSCH AS 400 control)** or **vibratory sieving (RETSCH AS 200 control)**.

Fermentation

Biogas plants have become important energy providers. Basically, biomass of any kind (mostly algae or plant waste) can be used as raw material. The plants are "digested" by microorganisms under exclusion of oxygen. The methane produced in the process is then combusted in a cogeneration plant. Important factors for a high yield of methane are the types of plants and microorganisms used. To accelerate the decomposition process in the laboratory test, the plant waste is ground in a **RETSCH Knife Mill GRINDOMIX** which can easily process moist materials such as algae or silage.

The term biomass comprises those plant raw materials which are used for the production of energy. Due to their rather complex profile of characteristics sample preparation to subsequent analysis can be quite a challenge. Primary and fine size reduction of plants requires some know-how and experience to obtain reliable and reproducible analysis results.

Powerful preliminary and fine size reduction

CUTTING MILL SM 300

- Powerful size reduction thanks to 3 kW drive with high torque and RES technology
- Thermal load can be reduced thanks to variable speed from 700 to 3,000 rpm
- Sample can be pre-cooled with dry ice or LN₂
- Optimum cutting effects thanks to double acting cutting bars
- Quick and easy cleaning due to fold-back hopper, smooth surfaces and push-fit rotor
- Defined final fineness due to bottom sieves with aperture sizes from 0.25 - 20 mm
- Wide range of accessories including various hoppers, collection systems, rotors and sieves

www.retsch.com/sm300



SM 100
the budget-priced basic model for routine applications

SM 200
the versatile standard model which covers a wide range of applications

SM 300
the high performance model with variable speed which processes even the most difficult materials



Parallel section rotor or 6-disc rotor selectable

APPLICATION EXAMPLES

Dried red algae (gracilaria)

Task



Feed size: Fibers < 5 cm
Feed quantity: 30 g
Material properties: dry, fibrous
Requirement: <63 µm
Analysis: Determination of calorific value

Solution



Ultra Centrifugal Mill ZM 200
 (12-teeth push-fit rotor, stainless steel; ring sieves, trapezoid holes 2 mm and 0.12 mm, stainless steel; speed: 18,000 min⁻¹)

Remarks: The sample is first ground with a 2 mm ring sieve and then pulverized with a 0.12 mm sieve. The use of a cyclone is recommended for improved discharge of heat and material.

Obtained fineness: 77% < 63 µm



Soy Beans

Task



Feed size: 5 – 10 mm
Feed quantity: 50 g
Material properties: medium-hard, oily
Requirement: < 500 – 600 µm
Analysis: Determination of oil content

Solution



Knife Mill GRINDOMIX GM 200
 (Stainless steel knife; 1 l grinding container, autoclavable plastic; standard lid, polypropylene; speed: 8,000 min⁻¹; grinding time: 30 sec.)

Remarks: none

Obtained fineness: < 500 µm

Fine grinding of larger sample volumes

ULTRA CENTRIFUGAL MILL ZM 200

- High-throughput processing of samples
- Temperature-sensitive samples can be ground with dry ice or pre-cooled with LN₂
- Large ring sieve allows for quick sample processing
- Option for load-controlled automatic feeder
- Cyclone separator for 230 ml to 4.5 l sample material
- Optional dust extraction for optimum material discharge
- Heavy-duty "Powerdrive"
- Speed range 6,000 rpm to 18,000 rpm

www.retsch.com/zm200



Ultra Centrifugal Mill
ZM 200

Ideal for samples with a high water or fat content

KNIFE MILL GRINDOMIX GM 300

- Homogenization of up to 4.5 liters sample material
- Variable speed from 500 – 4,000 rpm
- Autoclavable grinding tools
- Patented gravity lids ensure homogenization of the ENTIRE sample
- Mode for preliminary and fine grinding
- Sturdy industrial motor
- Comprehensive range of accessories

www.retsch.com/gm300

KNIFE MILL GRINDOMIX GM 200

- For up to 700 ml of sample material
- Variable speed from 2,000 to 10,000 rpm

www.retsch.com/gm200



Knife Mill
GRINDOMIX GM 300

Wood Delivers Energy

Wood residues from forestry work and wood processing are usually processed to wood chips. These can be used in different ways, depending on the type of wood, bark and residual moisture, for example as raw material for chipboards or as substrate for the cultivation of mushrooms. The major part, however, is used for energy generation. The quality of the wood chips can vary significantly, depending on their origin and condition. Trade and industry are interested in the percentage of dry matter and in the calorific value of the chips as the price calculation depends on the water contents of the product. With the analysis result representing an important economic factor, the representative and reproducible sample preparation gains importance, too.

In order to reproducibly determine the **calorific value** and moisture content of the wood chips it is necessary to obtain a small but **representative analysis sample** which is ground to a size of 2 – 3 mm. Care must be taken that the grinding process does not alter the original moisture and energy content of the material. The RETSCH **cutting mill SM 300** with parallel section rotor is ideally suited for the size reduction of wood thanks to its high torque motor and variable speed. The sample is

hardly warmed during the grinding process and the **original moisture content is preserved**. If the sample contains larger wood pieces (> 20 mm), it is recommendable to pre-grind the material using a sieve with larger apertures (e. g. 10 mm). In a next step the sample is ground to a fineness of 2 to 3 mm. Now a small sample amount can be extracted to determine the required parameters representatively.



before



after

Wood chips before and after grinding in a cutting mill SM 300.

Particle Size Analysis



RETSCH offers the widest range of particle sizing equipment worldwide covering a size range from 1 µm to 125 mm

- Maintenance-free, low-noise, precise electromagnetic sieve shakers in various sizes, for sieves 100 – 450 mm diameter
- Tap Sieve Shaker for standard applications
- Air Jet Sieving Machine for sieve cuts of powdered substances
- High quality analytical test sieves according to ISO standards
- Evaluation software EasySieve®
- Particle size and particle shape analysis with Dynamic Image Analysis

www.retsch.com/sieving

Sample Division and Reduction

RETSCH offers solutions for representative part samples

- Sample Splitters
- Rotating Sample Dividers
- Rotating Tube Dividers

www.retsch.com/assisting

FREE TEST GRINDING

As part of RETSCH's professional customer support we offer our customers the individual advice required to find the optimum solution for their sample preparation task. To achieve this our application laboratories process and measure samples free-of-charge and provide a recommendation for the most suitable method and instrument.

For more information please visit our website www.retsch.com/testgrinding

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Solutions in Milling & Sieving

part of **VERDER**
scientific

Retsch GmbH
Retsch-Allee 1-5
42781 Haan, Germany

Phone +49 (0)2104/2333-100
Fax +49 (0)2104/2333-199
E-Mail info@retsch.com
Web www.retsch.com



www.retsch.com