

Wood fibres and wood powder for biofuels and particle boards

Instrument: CAMSIZER X2

Application

Wood fibres are a 100% renewable organic material which is used for many different applications, including for example construction materials, animal bedding pellets, and biomass for energy generation. For all these applications, wood is shredded into fine chips or flakes, or finely ground (sawdust).

The size and shape of the particles is not only important for the homogeneity and strength of chipboards, as well as their production process parameters, but for example also for the gasification of wood as biofuel in engines. For the latter process, the surface area of the pulverised material, for example, will strongly influence the pyrolysis process.



Fig. 1: The raw material for wood fibres and wood powder

Requirements for quality control

The size distribution of woods chips is commonly measured by sieve analysis. This method has severe disadvantages as it is time consuming, requires extensive cleaning of the sieves after each analysis due to the sticky nature of the particles, and yields only an insufficient information. In many cases it is desirable to measure not only a one dimensional "size distribution", but to characterise the wood chips regarding their length and diameter independently.

Sieving allows to gain only a limited amount of information in this respect, as the information about the particle length is not determined by this method, and equally important, the particle length may influence the sieve measurement in an unpredictable way and falsify the results. Long particles will pass not as easy through a sieve mesh as short particles with the same diameter.

CAMSIZER X2 size analysis of wood fibres

Two samples of wood fibres have been analysed with the CAMSIZER X2 using the dry dispersion module X-Jet (Fig. 2, right). The dispersion pressure was set to 30 kPa. Since the largest fibres in the samples are up to 10 mm, a XL dispersion nozzle was used for the measurement. There are several nozzles available for the X-Jet. 4 mm aperture is the standard size (Fig. 2, left). Additionally, nozzles with 2 mm, 9 mm (XL) and 14 mm (XXL) aperture are available.

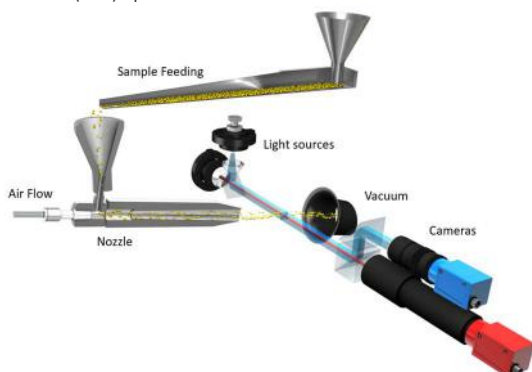


Fig. 2: CAMSIZER X2 measurement principle (left). Particles are dispersed in an air flow and more than 300 images / second of the moving particles are acquired by two cameras. The default nozzle has 4mm aperture (right image, middle nozzle). Large nozzles are available for bigger particles.

The results display the independent measurement of “particle width” (Fig. 3b) and “particle length” (Fig. 3a) with the X-Jet module at a gentle dispersion pressure of 20kPa (0.2bar). Length and width are analysed simultaneously, during the same measurement. Example images are presented in Fig. 4. Each graph shows the measurements of 2 different samples (red/green versus blue/ purple). The difference in length and width is clearly visible (about 10% of volume at 1 mm length and at 200 μ m diameter). The measurement of each sample was repeated, to demonstrate the excellent reproducibility of the results. The red and green curves as well as the blue and purple curves overlap perfectly. The result of the shape analysis (aspect ratio) is shown in Fig. 5.

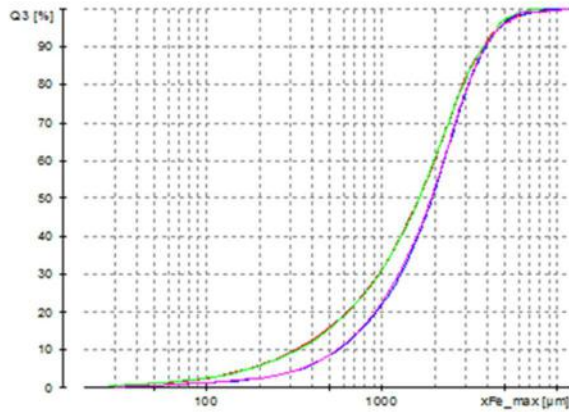


Fig. 3a (left): Measurement of particle length

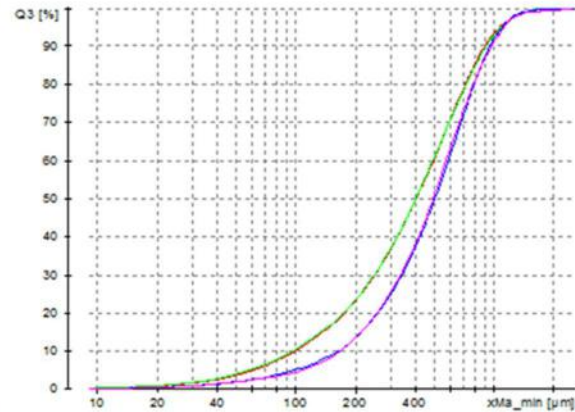


Fig. 3b (right): measurement of particle width



Fig. 4: Typical images recorded by the BASIC camera of the CAMSIZER X2. The scale is 1 mm. Even the largest fibres of the sample, which are up to 10 mm long, can be analysed precisely with the X-Jet module.

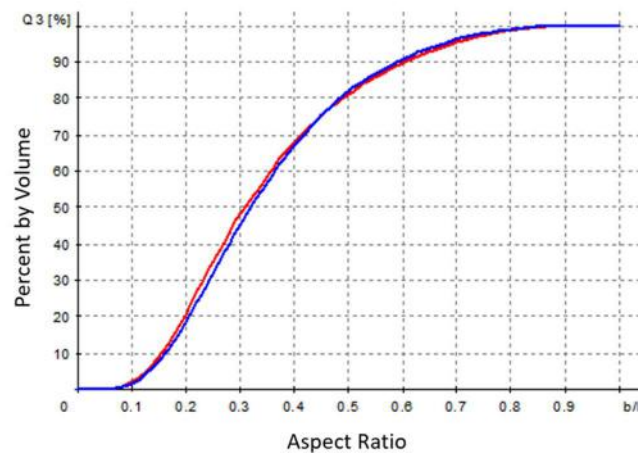


Fig. 5: Shape measurement result obtained with the CAMSIZER X2. The graph shows the results of 2 samples with nearly identical aspect ratio (width divide by length).

Example: Saw Dust

One great advantage of the CAMSIZER X2 is the wide measurement range. Analysis of large wood fibres of several mm length and fine saw dust (median size = 355 μm) is possible without hardware modifications. The result in Fig. 6 shows two consecutive measurements of a saw dust sample (size definition: particle width xc_min). The black asterisks represent the corresponding sieve analysis, which is in perfect agreement with the CAMSIZER X2 results.

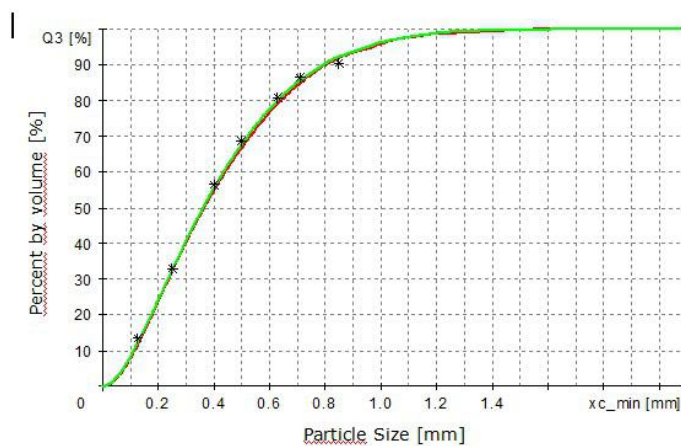
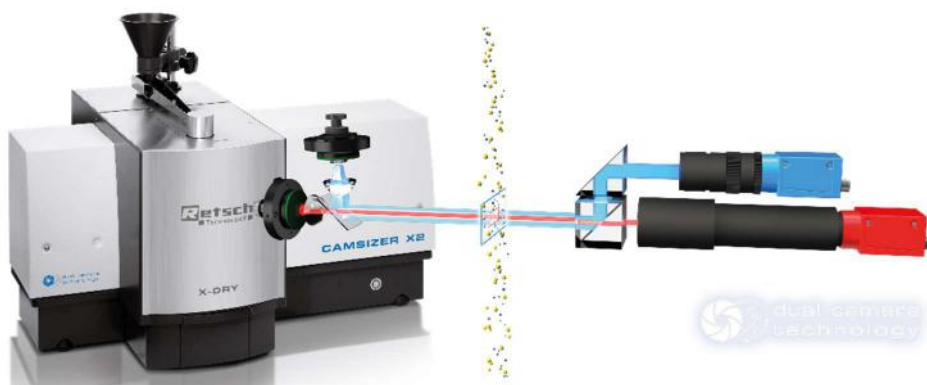


Fig. 6: Size analysis of finely ground wood powder (sawdust) measured with the X-Jet module at 30kPa. The reproducibility of the measurements is very good (red and green curves). Furthermore, the CAMSIZER X2 results agree perfectly with the results of a sieve analysis (black *).

CAMSIZER X2: Benefits at a glance

- Wide dynamic measurement range from dust to chips
- Reproducible and repeatable
- Particle shape analysis
- Analysis of length and diameter
- Compatibility of results with other techniques, like sieving
- Reliable detection of oversized grains
- Fast (typically 1-3 minutes per measurement, 20 measurements per h)
- Almost maintenance free



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