

We are very pleased to have been given access to the main output of the EU-funded Biomass Trade Centres project, the Wood Fuels Handbook, which has been an invaluable guide for many in the industry for the past decade. Over the next few newsletters, we'll be reproducing the key chapters of this comprehensive resource. The first section is on Units of Measurement used in the wood energy sector.

Thanks are due to the principal authors, Valter Fancescato and Eliseo Antonini of the Italian Agroforestry Energy Association, and Luca Zuccola Bergomi of the University of Padua.

1. UNITS OF MEASUREMENT

1.1 Volume

The **solid cubic meter** (m^3) is used with reference to the volume that is entirely occupied by wood. This unit of measurement is commonly used for timber.

The stere, which refers to the volume occupied by wood as well as by air space, void space being considered as filled space, is instead typically used for wood fuels.

The **stacked cubic meter** (stacked m^3) is the unit of measurement used for neatly-stacked log woods.

The **bulk cubic meter** (bulk m^3) is the unit of measurement used for log woods and, more typically, wood chips.

The volume of wood fuels, whether densified or not, varies according to the shape, size and arrangement of the single pieces of wood. The steric volume, i.e. the ratio between filled and void volume, depends on these factors.

1.2 Weight

The units of weight used for wood fuels are the kilogram and the metric ton.

Listed below are the units of measurement for volume and weight that are commonly used in the marketing of wood fuels.

Units of measurement			
Ton	Kilogram	Stacked cubic meter	Bulk cubic meter
t	kg	stacked m^3	bulk m^3
log woods chips pellets and briquettes		log woods	chips log woods

1.3 Weight/Volume Ratios

Three different units of measurement can be used to express the weight/volume ratio of wood fuels :

Specific gravity : it is an adimensional value resulting from the ratio between the weight and volume of water (at 4°C) and of woody substance. It refers to the weight of the woody substance in the oven-dry state – mainly cellulose, hemicellulose and lignin – which make up the cell walls. The specific gravity of such substance is 1.5 and this same value applies to all the different species.

Mass density : It refers to the ratio between the weight and volume of the wood body (porous body) made up of a set of substances and voids (vascular cavities) variously filled with air and/or water. It is expressed in units of g/cm³ or kg/m³.

Mass density is frequently referred to as apparent specific gravity or even, and erroneously, merely as specific gravity.

As for wood pellets, mass density relates to the weight of one single piece of wood, which must be over 1.15 g/cm³; in the case in point, when released in a container full of water, the piece of wood sinks rapidly.

Bulk density: It is used for piles of wood fuels (log woods and wood chips) that create voids among the wood pieces which may be bigger or smaller depending on the size and shape of the latter.

It is expressed in either kg/stacked m³ or kg/bulk m³, depending on whether the pile is stacked or bulk.



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