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From Wood Chips to Pellets to Milled Pellets: the Mechanical Processing Pathway of Wood

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Motivation and research objectives
We present a study focusing on the mechanical processing pathway of wood, including pellet feedstock size reduction, pelleting, and milled pellet comminution, because:
• Operators of wood suspension-fired power plants need information about the physical properties (i.e., size, shape, density) of milled pellet particles for optimizing particle burnout.
• An understanding of how pelleting and comminution alter the physical properties of wood is valuable for pellet producers, who want to produce pellets of desirable quality for power plants.
• Pellets after milling in coal mills are believed to show the original particle size distribution (PSD) before pelleting.
• The effect of the size and shape of milled wood particles on the pelleting process and pellet quality has hardly been studied.

How was the wood processing study performed?

Austrian pine stemwood
European beech stemwood

Wood chips
Wood hammer-milling
Coarse hammer-milling (15 mm screen)

Coarse grinds
Fine hammer-milling (4 mm screen)

Beech pellets
Pine pellets
Pellet hammer-milling (4 mm screen)
Pelletizing (ring die pellet mill)

Milled wood pellets

Pine pellet milling
Beech pellet milling

Specific grinding energy consumption (kWh/t)

Characteristic product particle size, d (mm)

Particle size range, d (mm)

Average circularity (C)

Average elongation ratio

Specific grinding energy 
consumption (kWh/t)

Characteristic product particle size, d (mm)

Average burnout rate

Milled beech pellets
Milled pine pellets
Disintegrated beech pellets
Disintegrated pine pellets
Coarse pine milling
Fine pine milling
Coarse beech milling
Fine beech milling

Conclusions
• Milling beech requires less energy for milling, leads to higher size reduction, and produces finer particles.
• Milling pellets reduces the internal pellet particle size.
• Pelletizing beech requires more energy than pine due to lower amount of extractives.
• Pelletizing modifies the longest particle dimension and particle shape of wood.
• Pelletizing improves the grindability of wood compared to the pellet raw material.