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Wood Pellet Milling Performance in a Suspension-Fired Power Plant

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What were our motivation and research objectives?
• There are limited experimental data on 100% wood pellet comminution in full-scale coal vertical roller mills.
• To study if the grindability in roller mills and particle separation in dynamic classifiers were affected by the particle size distribution (PSD) of material within pellets.
• Understanding pellet quality properties that affect the milling performance will ensure efficient pellet milling and hence optimize the combustion process.

How was the milling performance assessed?
1) Grinding I₁ pellets (comprise finer particles) and I₂ pellets (comprise coarser particles) in roller mills
2) Mill data collection
   • Specific grinding energy consumption, SGEC (kWh/t)
   • Mill pressure drop, \( \Delta p \) (kPa)
3) Isokinetic extraction of fine particles from burner pipes
   • Size/shape analysis using a dynamic image analyzer

Main findings

Conclusions
• The PSD of material within pellets affects the full-scale milling behavior and particle classification (i.e., cut size).
• I₁ pellets yielded a smaller classifier cut size, required less grinding energy, and a lower mill pressure drop.
• The original elongated wood particle shape was not altered by vertical roller mills.
• Operating the mills at higher loads had unfavorable effects on mill pressure drop and classifier cut size. However, SGEC was reduced at higher loads.