EVALUATION OF SCREENIG AND DRYING TO IMPROVE FUEL PROPERTIES OF LOW QUALITY WOOD CHIPS FOR THE USE IN SMALL WOOD GASIFIER CHP-PLANTS

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Introduction and current situation

- Wood chips with lower quality (circulatory and cascade use) are not suitable for small scale CHP-plants due to critical fuel properties
- Drying and screening as process steps are necessary to make such fuels useable
- Upgrading was done in three different supply chains
- 30 to 60 m^3 per supply chain and raw material
- upgraded material was gasified in three different gasification units from Spanner Re^2
- During the processing and the gasification of the wood chips energy balances, changes in fuel quality and mass rates were recorded

Experimental procedure: Wood chips assortments

Stemwood | Calamity wood | Roadside maintenance wood

Experimental procedure: Supply chains

I. Continuous drying in a walking floor dryer (Spanner Re²) with a subsequent continuous screening in a self-constructed, small-scale drum screen with round holes (48 mm) followed by rectangular holes (3 mm × 20 mm)

Photo: Hoffmann (LWF)

Experimental procedure: Supply chains

II. Continuous drying in a walking floor dryer (by Spanner Re²) which represents at the same time the bunker of the gasification plant (see below) with a continuous sieving in the screw conveyer of the plant (round holes: 4.5 mm, followed by rectangular holes: 50 mm × 85 mm)

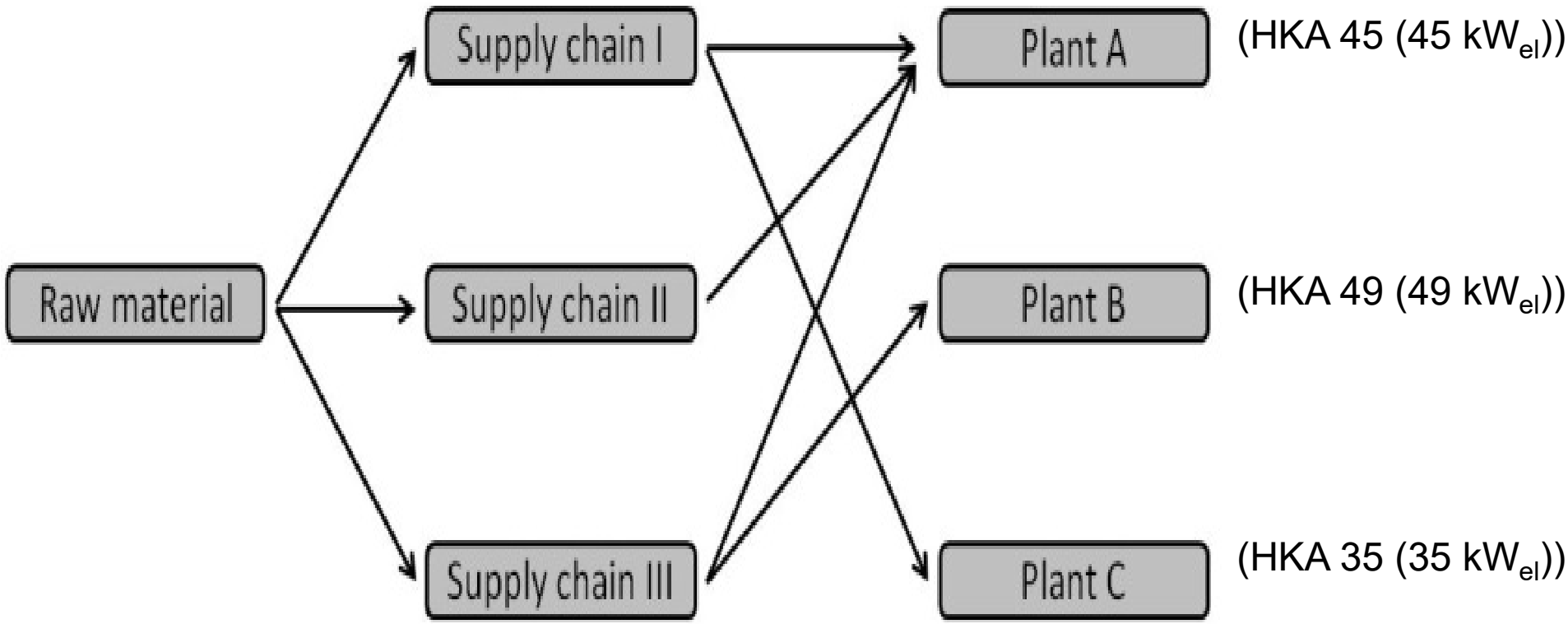
Experimental procedure: Supply chains

III. Screening in a self-constructed drum screen (rectangular holes, 10 mm × 40 mm) and Batch drying in a self-constructed container dryer (15 m^3)

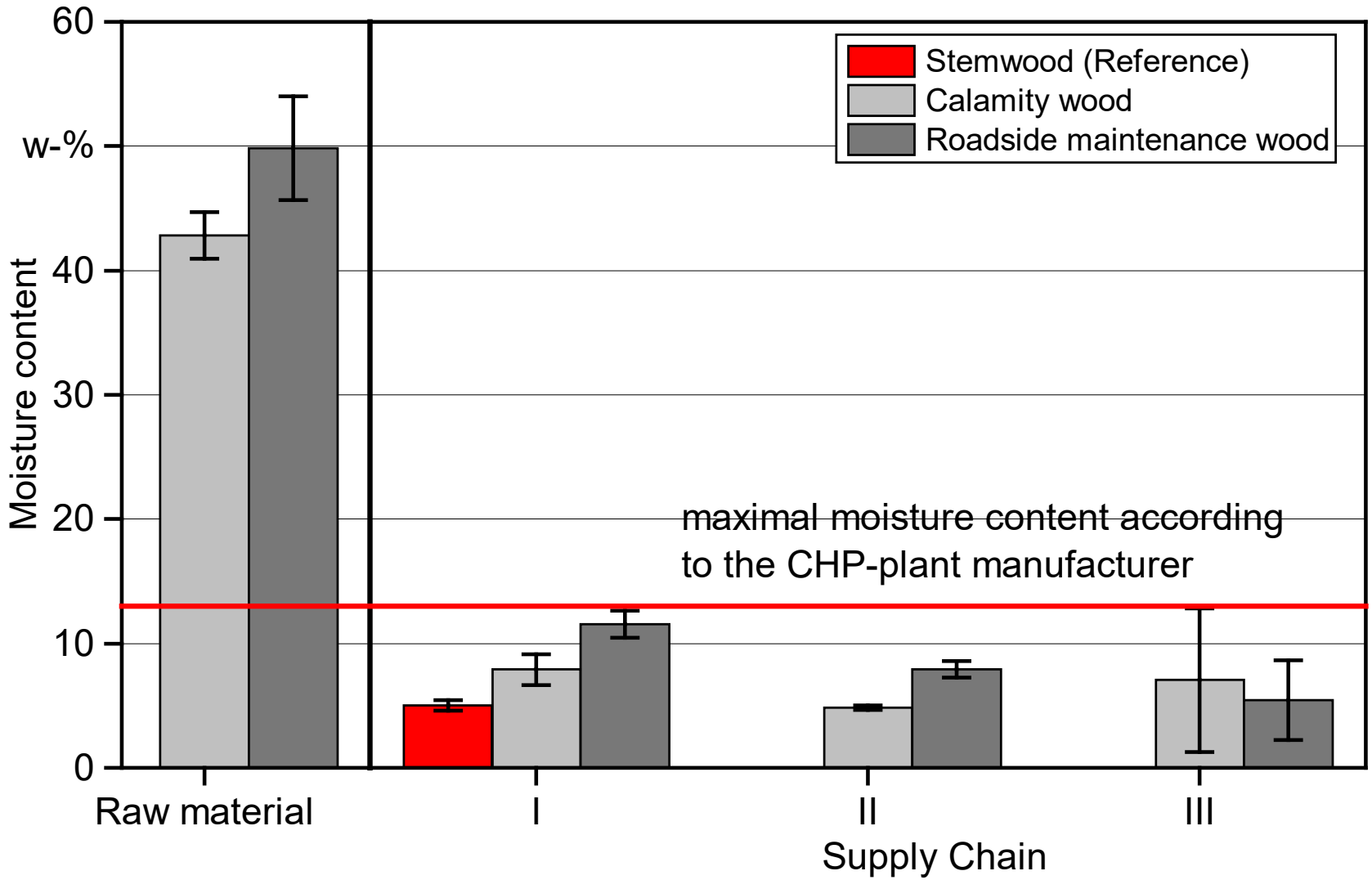
Experimental procedure: Gasifier units

Upgraded fuels were successfully applied in three HKA 35/45/49 CHP plants (35 to 49 kW_{el}) of Spanner Re^2.

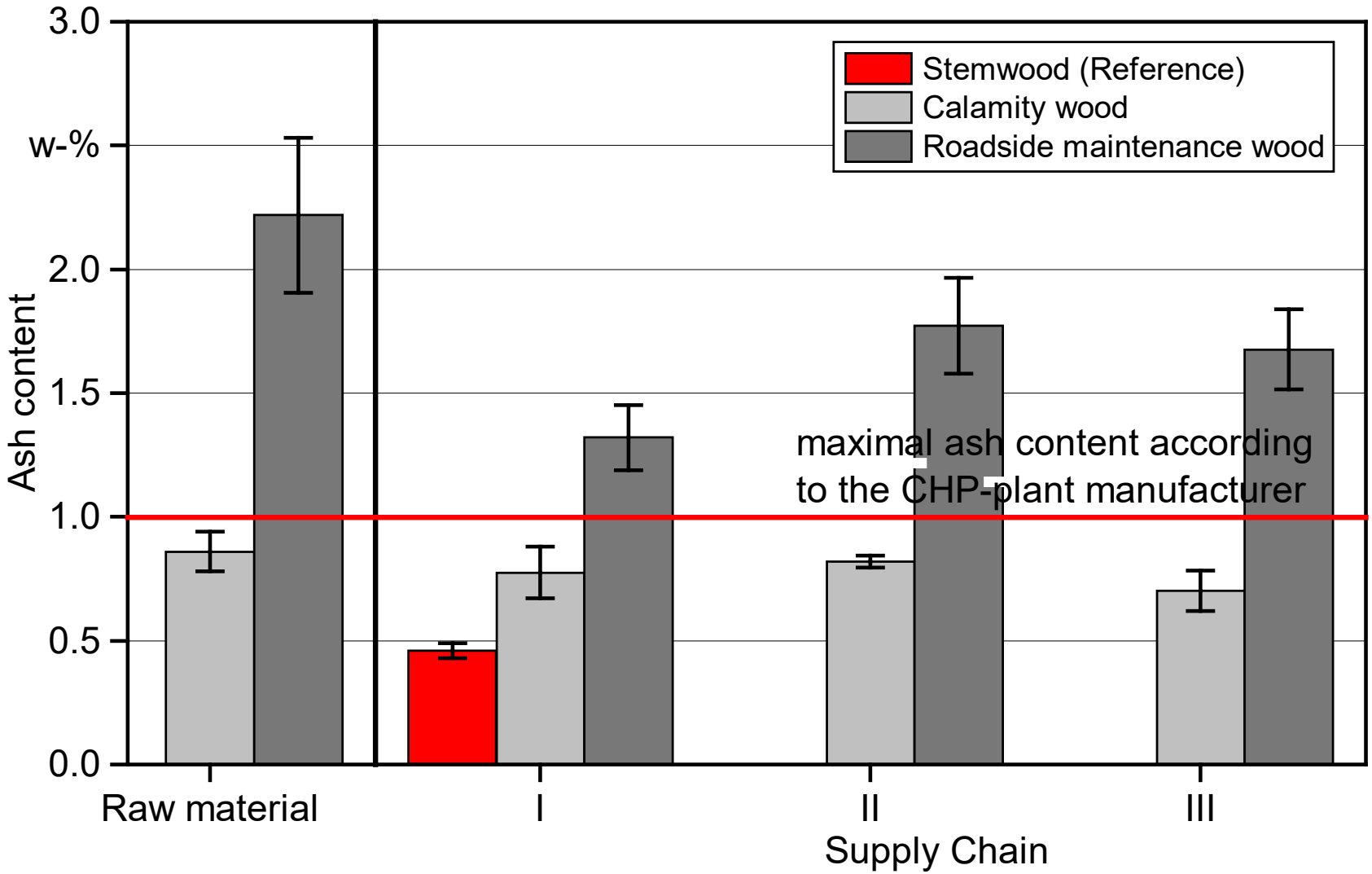
Experimental procedure: Supply chains



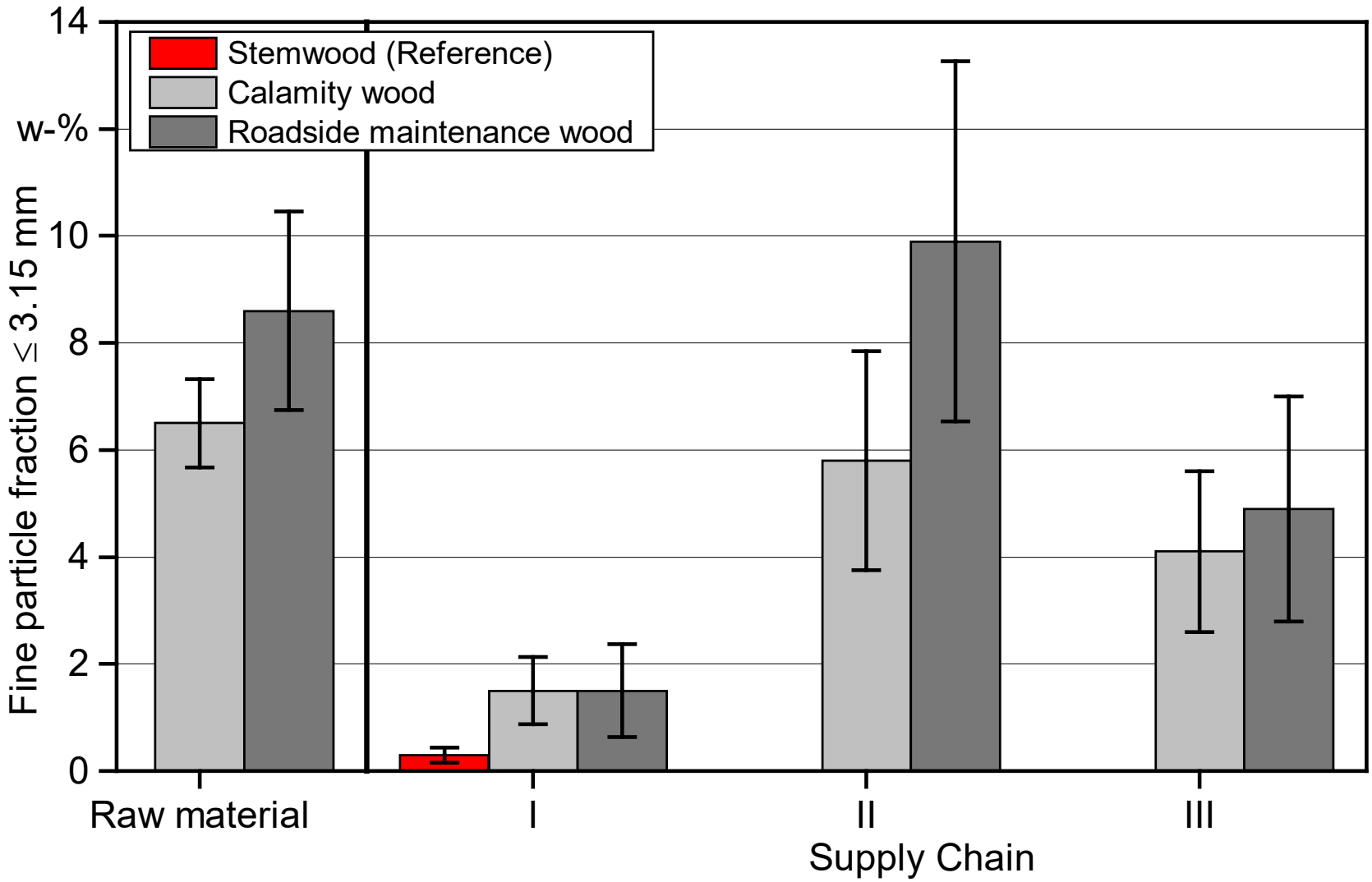
Results: Moisture content



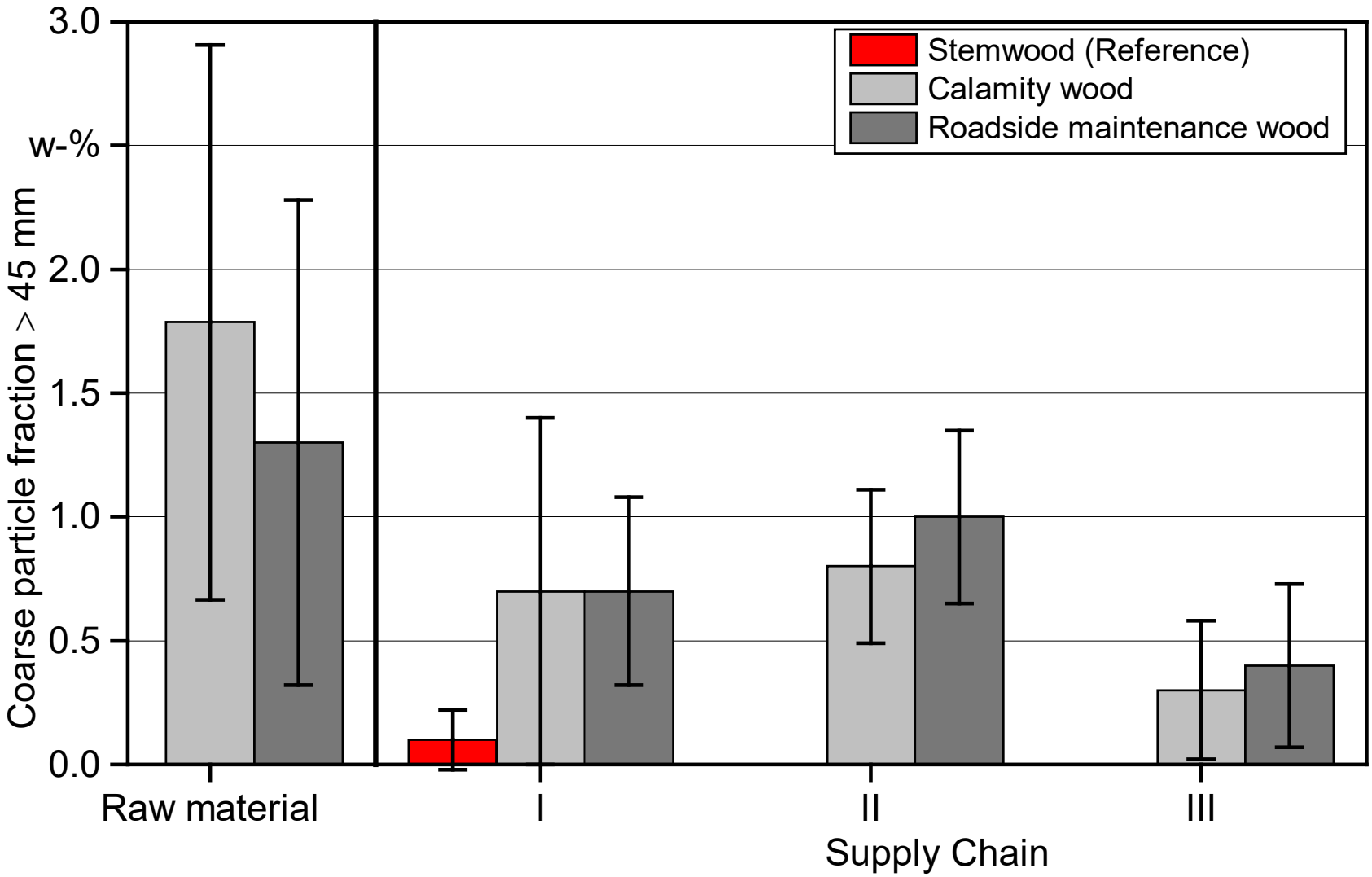
Results: Ash content



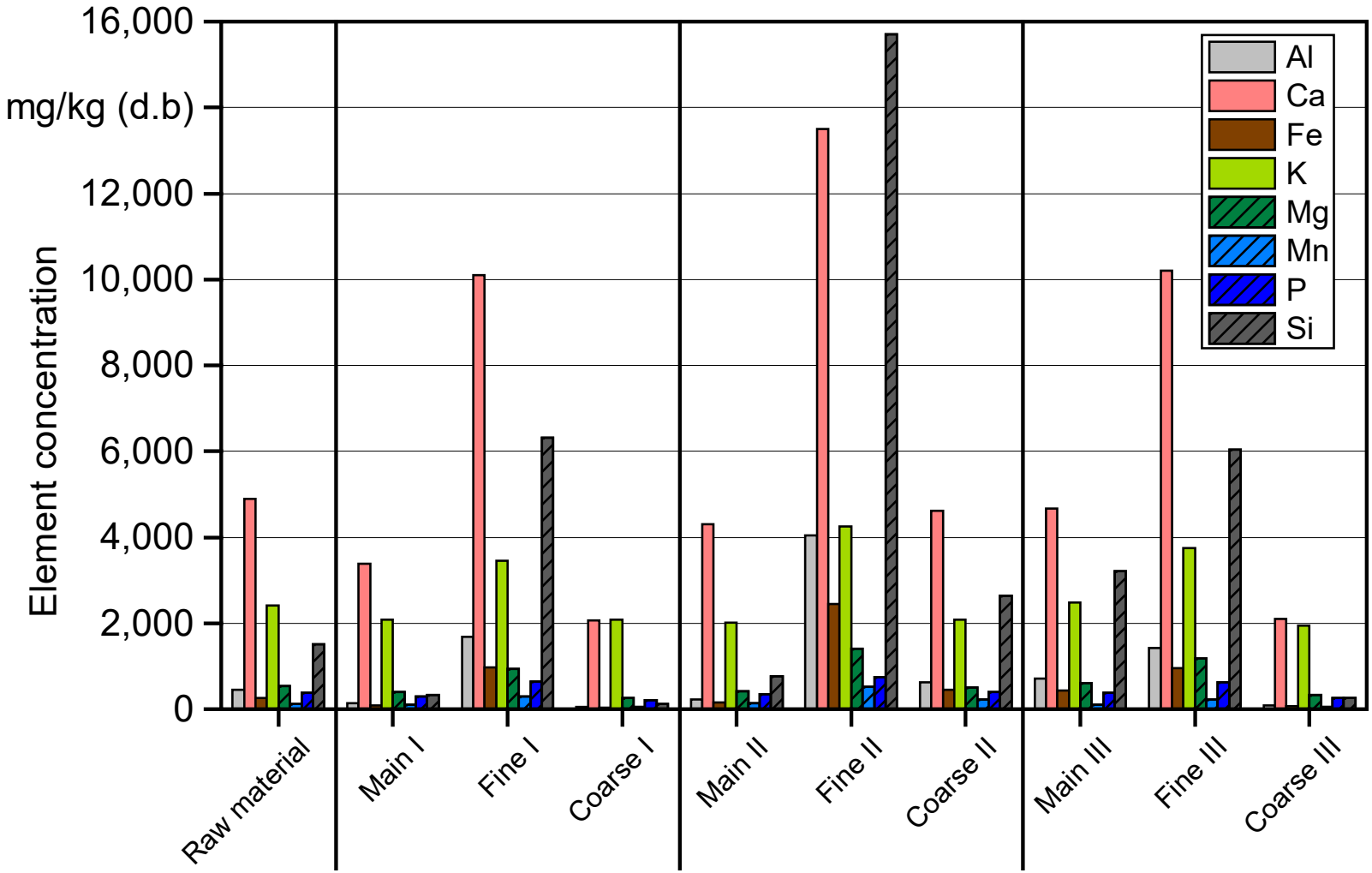
Results: Particle size distribution



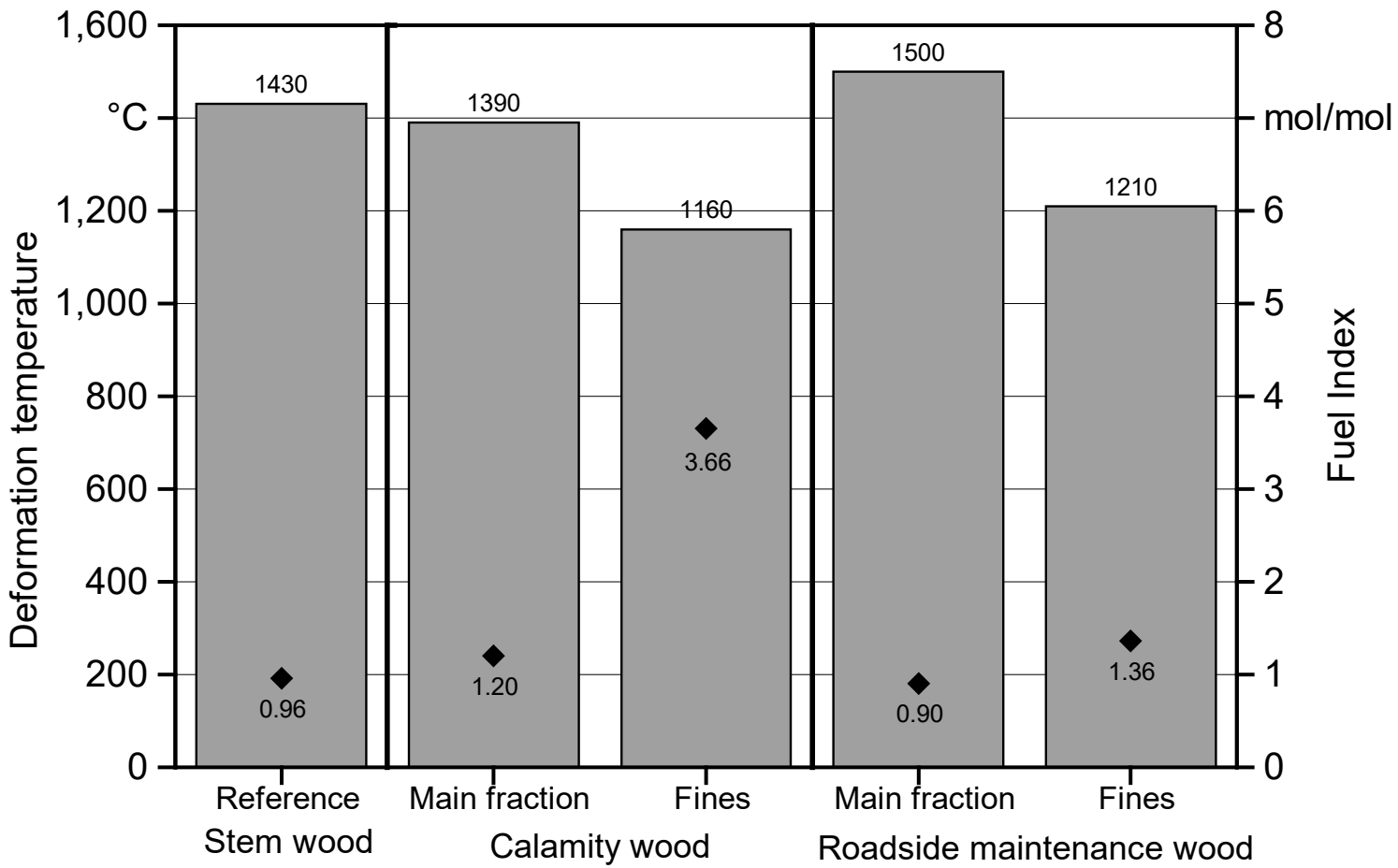
Results: Particle size distribution



Results: Chemical Analyses of Road Side maintenance wood

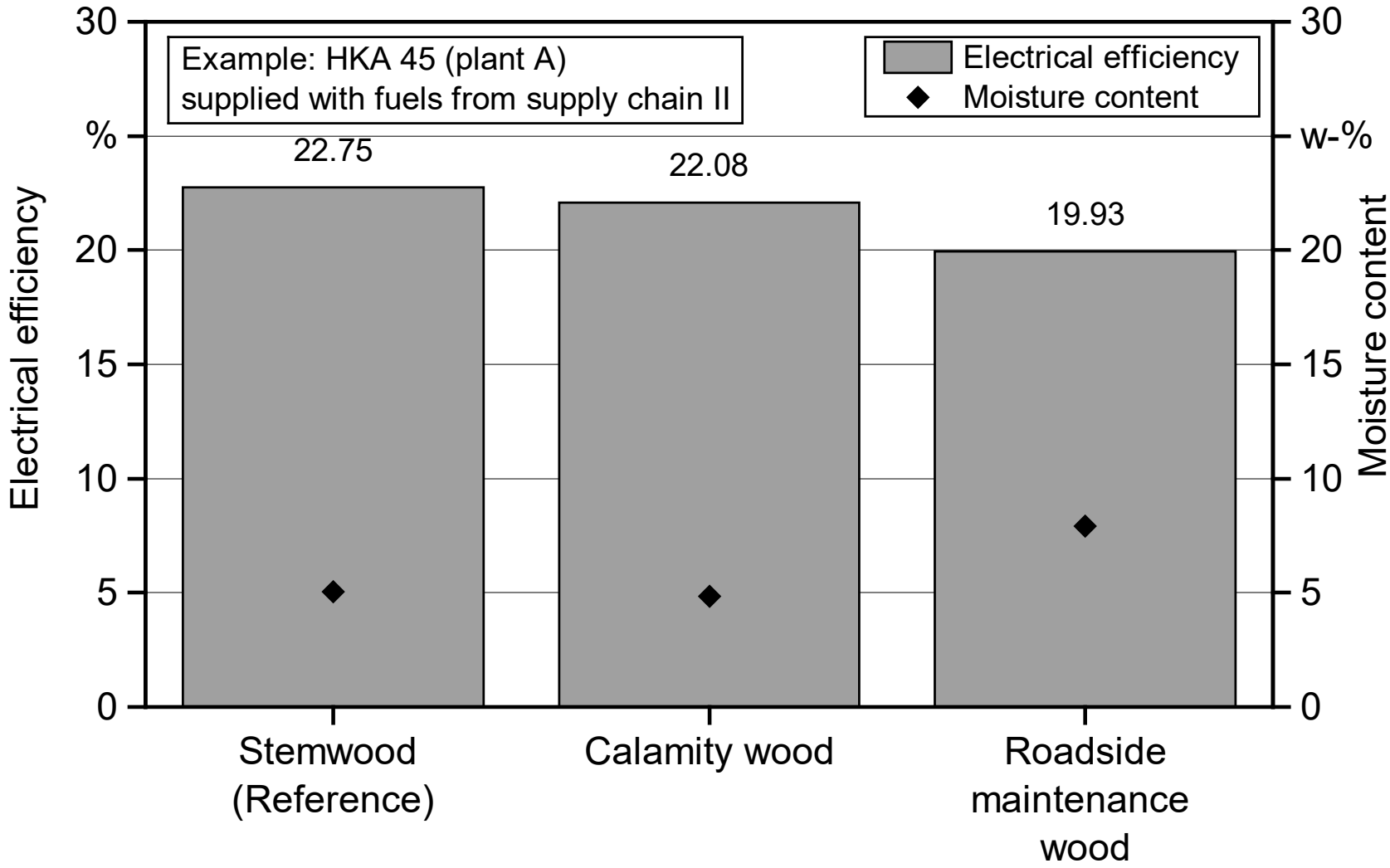


Results: Ash melting behavior and Fuel Index

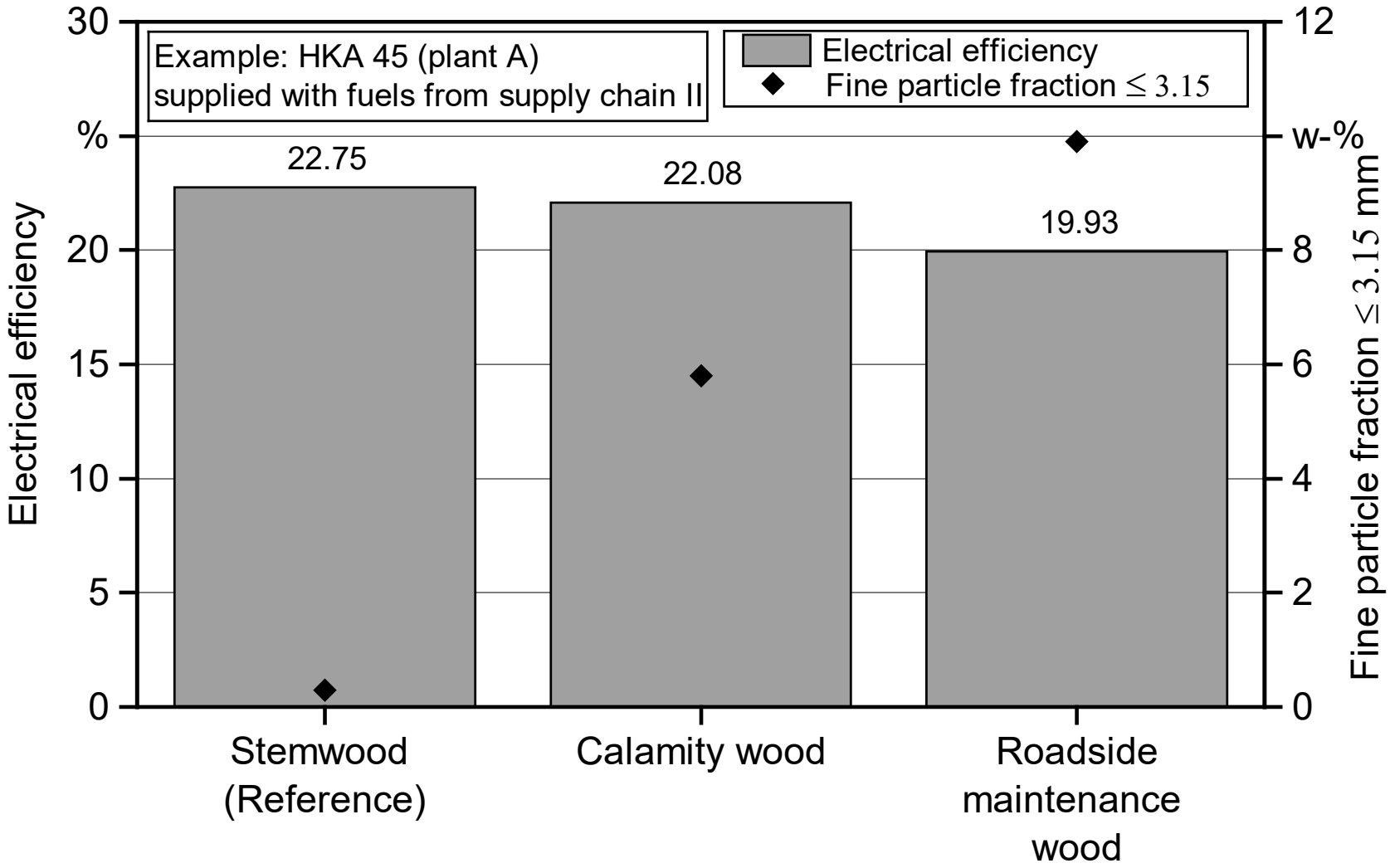


Fuel-Index: Slagging-Tendencie $\frac{(Si+P+K)}{(Ca+Mg)}$ $(in\ \frac{mol}{mol})$ (Sommersacher 2011)

Results: Gasification performance



Results: Gasification performance



Excursion

Excursion on further wood fuels: Scrap wood

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- Needs to be upgraded
  - High amount of coarse particles (> 45 mm) of 10.5 w-%
  - Typical moisture content of 21 w-%
  - Due to the raw material (chemically untreated wooden pallets) no problematic chemical fuel parameters should occur
- The shredded scrap wood wasn’t upgraded due to foreseeable major problems with the screw conveyer of the screening system as a result of the excess length

Summary and Conclusion

- None of the unprocessed raw materials was suitable for gasification (MC, AC, Particle size)
- After upgrading in the supply chains, all low quality wood chips became suitable for gasification
- Combustion critical elements were reduced due to upgrading
- Even with the upgraded fuels more disturbances were recorded compared to the reference material (stemwood)
- Thus, using these fuels requires trained plant operators and more maintenance
- CHP units should be adjusted to the new fuels

Thank you for your attention!

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