

Highlights:

- Five sludge streams revealed treatment-stage-specific conversion constraints.
- Moisture exceeded 97% in four streams and remained 77.2% in dewatered cake.
- Primary sludge had the highest dry-basis HHV at 19.9 MJ/kg.
- Digested sludge and cake contained 40-42% ash and about 54% volatile matter.
- Residues heated to 950 °C contained heterogeneous aluminosilicate and Ca-P domains.
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