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DETERMINATION OF BIOFUEL CALORIFIC VALUE WITH MEASUREMENT UNCERTAINTY ESTIMATION

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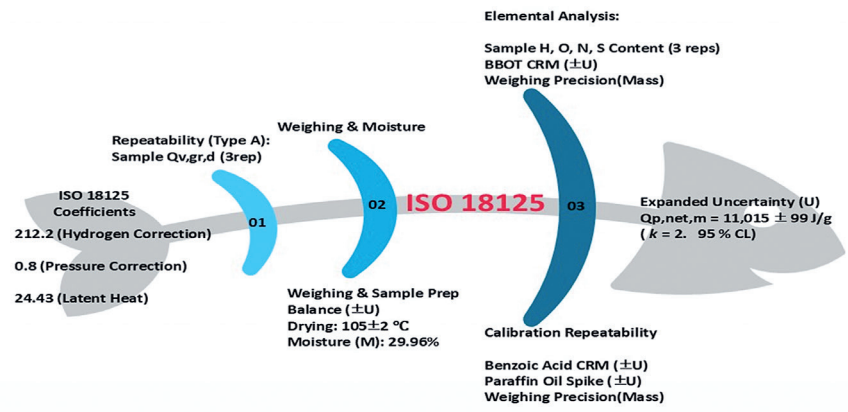
Abstract – This work was conducted as part of the official quality inspection of wood based BioSRF in accordance with the Resources Recycling Act of the Republic of Korea. The primary objective was to verify the precision of calorific value measurements, which is a critical parameter for solid recovery fuels. The gross calorific value was measured using an automatic bomb calorimeter following ISO 18125. Subsequently, the measurement uncertainty was estimated in accordance with the ISO/IEC Guide 98-3, also known as GUM, to provide a quantitative assessment of the analytical precision. For the analysis, the Bio-SRF wood pellets were pulverized into a sawdust form. This preparation step was conducted to ensure the sample was suitable for the combustion crucible and to facilitate precise calorific value measurements. The net calorific value at constant pressure was determined to be 11 015.26 Joules per gram. To achieve complete combustion, a paraffin oil spike was applied to thoroughly wet the porous structure of the sawdust samples. Due to the high surface area and volumetric characteristics of the sawdust, the mass of the paraffin oil spike exceeded that of the sample to ensure sufficient wetting. Despite this high spike to sample ratio, it was an essential procedure to achieve total energy release and complete combustion. According to ISO 18125, the repeatability limit for wood sawdust is specified as 120 Joules per gram. In this work, the difference between the individual determinations remained well below this standard. Furthermore, the estimated expanded uncertainty was plus or minus 98.76 Joules per gram with a coverage factor k equal to 2, which also falls within the 120 Joules per gram threshold. These results confirm that the analysis maintains a high level of precision consistent with international standards.

Keywords – Combustion aid (Benzoic acid); ISO 18125; quality inspection; repeatability limit



Ishikawa(fishbone) diagrams: A Measurement Uncertainty Estimation

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