MECHANICAL DEGRADATION OF WOODY BIOMASS PELLETS DURING STORAGE IN STOCKPILES

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Abstract:
The latest EU climate and energy policy was issued in January 2014 with the 2030 emissions target set at 40% below 1990 levels, with a further target for renewables then providing at least 27% of EU’s energy. Biomass combustion is a reliable step towards improving fuel flexibility and reducing greenhouse emissions. Densified pelletized forms of biomass fuel are preferred because they have higher energy density and hence provide better economic viability in the areas of transport, storage and handling. Compared to coal, wood pellets bring a number of challenges in areas of storage and transport, conveying and milling and combustion.

This paper focuses on the changes in mechanical properties of woody biomass pellets during indoor and outdoor storage scenarios and the resulting impacts on handling and conveying. One 2.4x2.4x1.5m indoor white wood pellet stockpile and three equally sized thermally treated wood pellet piles (indoor and outdoor) were investigated over a period of at least seven months and covering both the summer and winter months. At regular intervals pellet sampling was carried out at multiple positions within the piles, followed by sample analysis including pellet durability, compression and shear tests.

The white wood pellets from the indoor stockpile suffered significant mechanical degradation with the pellet durability dropping from 65 to 20% after six months in storage. The pellet compression and shear tests results also reflected the severe pellet degradation. The weakened pellets readily crumbled to dust even during sampling.

The thermally treated wood pellets from the indoor pile showed very little signs of mechanical degradation with the durability of the pellets on the surface of the pile only dropping by 3% after twenty months in storage. However the outdoor thermally treated wood pellets demonstrated much higher levels of mechanical degradation, especially to the pellets on the surface of the stockpiles. In the summer months when humidity and temperature were both high the pellet durability dropped from 92 to 22% after three months in storage. The degradation of the pellets from the middle of the pile was slower and more gradual.

Keywords: Wood pellets, storage, degradation, dust

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