



Ship Type: Bulk Trade Area: Worldwide

Bulletin 524 - 05/07 - Wood Pellets - Combustion Hazards/ Carbon Monoxide Emissions - Worldwide

The Association is aware of several recent incidents of stevedores being overcome by fumes associated with the carriage of wood pellets, the following is an article produced for the Association by Dr J H Burgoyne & Partners.

The information given in this article is based on that obtained during the course of two investigations involving wood pellets. An intensive literature search of the product has not been carried out. Nevertheless it is understood that the comments made below apply generally to this commodity.

The manufacture and carriage of wood pellets have increased over the last few years because of their use as a non-fossil heating fuel. It is understood that the main countries of manufacture are North America and Scandinavia.

The following description of the manufacturing process is based on a process used in Canada but it is believed that the method of manufacture used elsewhere is similar. The pellets are produced totally from sawdust and wood shavings and do not contain any additives or binders. The sawdust and shavings are dried, and then milled into particles of up to approximately 2mm particle size. The particles are then compressed approximately 3.5 times into pellets which are typically 10 –20mm long and 3-12 mm in diameter. The compression leads to an increase in temperature. The pellets typically have a moisture content of 4 - 8% and vary in colour from blond to brown depending on the types of wood used.

Due to transport movements and physical handling some breakage of the pellets occurs and this means that the material loaded aboard a ship for transport consists of pellets, pieces of broken pellets and wood dust.

The wood pellets are of course combustible and can be ignited by a range of ignition sources. In addition the dust associated with the pellets, when dispersed and ignited can give rise to a dust explosion under appropriate conditions of containment. Stored bulk piles of wood pellets can self-heat in parts with high moisture contents and it is reported that this process can lead to the spontaneous combustion of the material after a long period of time.

In addition to the combustion hazards, wood pellets also undergo oxidation to produce carbon monoxide and carbon dioxide. In a closed space such as an unventilated ship's hold, this can lead to a dangerous reduction in the oxygen concentration in the hold as well as the development of a dangerous concentration of carbon monoxide which is toxic (and flammable). In a recent case a carbon monoxide concentration of approximately 1% was measured in a sealed cargo hold of a ship containing wood pellets some 18 days after the cargo was loaded. The oxygen concentration at this time was less than 1%. Emission rates for carbon monoxide from wood pellets of 100 – 885 mg/ton/day have been reported in the literature¹.

It is well known that carbon monoxide is produced when wood products are burned in reduced oxygen environments but the low temperature emission of the gas from wood products is rather unexpected. It has been suggested, again by Svedberg¹ that the gas is generated by the autoxidation of fats and fatty acids in the wood but the factors which promote the production have not been fully identified. Svedberg also reports the generation of carbon monoxide from stored rapeseed and stored wheat.

With respect to the marine transport of wood pellets, the commodity has previously sometimes been classed as "Wood pulp pellets" which is entered in Appendix B of the BC Code. However wood pulp is not normally formed into pellets and the wood pellets are not pulp. Furthermore the entry for "wood pulp pellets" while referring to oxygen depletion and the generation of carbon dioxide does not refer to the formation of carbon monoxide. As a result a submission dated 1 July 2004 was made to the IMO Sub-Committee on Dangerous Goods, Solid Cargoes and Containers about the transport of wood

¹ A Thesis entitled "Fourier Transform Infra Red Spectroscopy in Industrial Hygiene Applications" by Urban Svedberg, University of Uppsala, 2004

pellets. The submission recommended a new entry in the BC Code for wood pellets in which reference was made to the hazard associated with the generation of carbon monoxide. This submission was accepted and there is an entry for wood pellets in the 2005 Edition of the BC Code 2004.

The hazard associated with oxygen depletion and the generation of carbon monoxide is now recognised by stevedores who routinely employ “gas doctors” to check spaces which contain or have contained wood pellets. It obviously also needs to be known by ship’s crews and others who may have need to enter a cargo hold which has, or had recently contained wood pellets.

Source of information: Alan Robinson
Dr J H Burgoyne & Partners LLP
Tel : +44 20 7726 4951
Email : alan.robinson@burgoynes.com