

Lessons learned case 4 – Misdeclared container caused fire

Please discuss the following key learning points with your group:

- Calcium hypochlorite and other oxidising solids are often used for swimming pool sterilisation and fabric treatment (bleaching or washing). These materials do not oxidise, but they can be relatively unstable chemicals that decompose slowly over time, evolving oxygen. This self-decomposition can evolve heat. A self-heating process can therefore happen in which the material towards the middle of a body of cargo becomes hotter, so the rate of decomposition and heating increases. This can lead to ‘thermal runaway’ with very rapid self-decomposition and evolution of heat and gases, sometimes including further oxygen. The effects of this in a hold can be similar to an explosion. The heat and oxygen produced can lead to fire spreading.
- Potential causes of self-decomposition incidents include:
 - Exposure to heat, e.g. solar radiation (before or after loading), cargo lights and heated fuel tanks.
 - Cargo formulation.
 - Contamination of cargo at manufacture.
 - Spillage and thus reaction between cargo and combustibles, e.g. timber.
 - Excess quantity of cargo in containers giving insufficient dissipation of heat
 - Inadequate separation of packages in containers, also giving insufficient dissipation of heat.
- Calcium hypochlorite is not considered a stable substance as it decomposes under normal circumstances and slowly releases heat and oxygen. If the heat that is released can be dissipated, it is not significant and will not create any problems; however, it is recognised that when stowed in too great a bulk, the heat generated by the slow decomposition cannot escape fast enough. When such a scenario occurs, the internal temperature of the cargo rises, the rate of decomposition increases, and this can lead to a runaway reaction that ultimately results in a fire and/or an explosion. A similar problem can happen if the surrounding temperature is too high. Impurities within calcium hypochlorite can also increase the rate of decomposition. Such impurities can be introduced during the manufacturing process, or due to the nature of the packaging materials, or by the failure of packaging, allowing the escape of cargo.
- Calcium hypochlorite is an IMDG Class 5.1 oxidising agent as described in the IMDG Code. The Code stipulates the following requirements in relation to the stowage and segregation of the common types of high strength calcium hypochlorite:



- 'Category D [on deck only]. Cargo transport units shall be shaded from direct sunlight and stowed away from sources of heat. Packages in cargo transport units shall be stowed so as to allow for adequate air circulation throughout the cargo. Separated from ammonium compounds, acids, cyanides, hydrogen peroxides and liquid organic substances.'
- Additionally, the information below in relation to the properties of calcium hypochlorite is included within the IMDG Code.
- 'May cause fire in contact with organic materials or ammonium compounds. Substances are liable to exothermic decomposition at elevated temperatures. This condition may lead to fire or explosion. Decomposition can be initiated by heat or by impurities (e.g. powdered metals (iron, manganese, cobalt, magnesium) and their compounds). Liable to heat slowly.'