

Animal Feed and Spontaneous Combustion Risk Management Note

There have been recent incidents involving the spontaneous combustion of animal feed products including palm kernel meal (PKM), palm kernel expeller (PKE) and Broll.

Increasingly being used as cattle feed, PKM/PKE (a residual product of palm kernel oil extraction) is being imported into New Zealand in bulk as a supplement for cattle feed, particularly in drought-affected areas. Broll (wheat bran) and PKE/PKM are two of a number of free-flowing grain related products that are susceptible to spontaneous combustion. While the recent incidents of spontaneous combustion took place in warehouse situations, the same outcome can occur when the product is being transported if the product is destabilised.

The stability of these products is maintained by low moisture and oil content. It is easier to maintain homogeneity in terms of moisture and oil content in small volumes, however it is difficult to do this when the volumes are large. The moisture content can vary considerably due to such factors as original processing, pre-shipment storage, transport and subsequent storage.

This can lead to pockets of higher moisture content within a larger pile, and this is where self-heating will tend to occur. If a single moisture content level figure is taken it doesn't provide meaningful information on how the moisture content ranges within the stockpile. Once the moisture content is greater than nine and a half per cent (9.5%) spontaneous combustion is more likely to occur.

Self-heating can come about in two ways; mould growth and oxidation of oil.

Mould growth is capable of increasing the temperature to about sixty degrees Celsius (60°C). Microbiological heating is limited to sixty degrees Celsius (60°C) because above forty degrees (40°) the moulds producing the heat start to die.

Oxidation of oil occurs spontaneously at any temperature but more slowly at lower temperatures and does not require any biological assistance. Above fifty degrees Celsius (50°C) it can cause quite a rapid exothermic reaction which results in a spiralling increase in temperature that can easily result in combustion.

Given the factors that are at play here there are a number of risk management requirements that need to be followed in order to reduce the risk in bulk storage warehouses.

(Additional considerations apply during shipment).

- Moisture and temperature readings should be recorded prior to stowing any new shipment of the product (ie before ship unloading).
- Use of thermal scanners or temperature probes every second day at a minimum of five hundred millimetres (500mm) below the surface. These readings must be recorded on a graph. If any of the following temperature increases are detected, urgent remedial action is required:
 - the temperature reading a minimum of five hundred millimetres (500mm) below the surface of the stack is ten degrees Celsius (10°C) or more above the surface temperature of the stack; or
 - the surface temperature of the stack is ten degrees Celsius (10°C) or more above the ambient temperature of the warehouse floor; or
 - the temperature readings of the stack's surface or five hundred millimetres (500mm) below the stack's surface are more than ten

degrees Celsius (10°C) above the recorded readings from two (2) days previous.

If any of these situations occur, the centre of the stack is to be exposed, checked, and re-stowed with the central section stowed last. (As the introduction of oxygen will accelerate combustion, care needs to be taken when disturbing the stack. With this in mind a high volume fire hose reel is to be on hand prior to disturbing the stack).

- Storage buildings must be appropriate for the product, preferably purpose-built, with no internal spouting and protection from surface water intrusion.
- Roof valleys and guttering, and internal downpipes must be inspected regularly for leakage and blockage - at least prior to each shipment.
- Security fences to be provided and nightly security patrols to be completed.
- CCTV to cover access points with external monitoring (advisable).
- Turn piles a minimum of every four months.
- Safety signage to be displayed next to all entry points into the building - Hazchem Panel and Class 4.2 Spontaneously Combustible sign.
- Electrical switchboards should be sealed to prevent the intrusion of dust, and be inspected and cleaned out as necessary between each shipment.
- Switchboards should be tested using a thermal imaging camera by a competent person at least annually, and any faults be rectified as soon as possible.
- Fire extinguishers (CO₂ or Dry Powder) should be mounted adjacent to specific hazard areas eg electrical switchboards, conveyor motors, fan motors etc.

Fire extinguishers should be mounted on all loaders and trucks.

All equipment should be serviced at least annually in accordance with NZS 4503:2005 and staff should be competent in their use.
- Fire hose reels to be provided in sufficient number to reach all corners of the building (refer NZS 4503:2005).

Disclaimer

The purpose of this Risk Management Note is to assist you to minimise potential loss from exposures which need prompt consideration. The Note does not imply that all other exposures were under control at the time of inspection.

The options contained in this Note are not intended to be a substitute for appropriate professional advice in relation to any matter. In achieving compliance with these items, fire protection equipment and systems should be installed to comply with the requirements of the relevant local, and/or Government authority. Any equipment installed should also comply with the requirements of the relevant New Zealand Standards and Codes.

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