

# Self-ignition of animal meal

29 August, 1999

Cleguer – [Morbihan]

France

Self-ignition  
Bulk storage  
Animal meal  
Controls -  
Temperature

## THE INSTALLATIONS IN QUESTION

The ministerial order of June 28, 1996 made mandatory the destruction of meat-and-bone-meal produced prior to this date. Upon application of the order, only animal meal at risk was destroyed. The French government was in charge of finding suitable storage locations pending its destruction. The meal stored at Cleguer (Morbihan), considered to be of 'high risk', were earmarked for incineration.

While animal meal had been stored in Cléguer since 1997, no new stock had been added since March 1997. The storage facility consisted of two hangars. The first hangar contained 8,000 tons of meal, piled up to a maximum height of 10 meters while the second contained 6,000 tons at a maximum height of 4 metres.

## THE ACCIDENT, ITS BEHAVIOUR AND CONSEQUENCES

On August 29th, a local resident alerted the firemen and administrative services concerned after having noted suspicious smoke coming from the 2,000 m<sup>2</sup> hangar containing 8,000 tons of animal meal. The firemen were able to smother the zone of spontaneous ignition by covering it with cold meal and tarps. An expert evaluation was conducted on the site. Firemen, wearing PBA took temperature measurements, detecting temperatures upwards of 118°C in some locations. Destocking began September 6th, and hot spots measuring above 80°C remained for two weeks. From October 4th to 8th, smoke was released accompanied by a strong ammonia smell, particularly bothersome for the surrounding area. Between October 4th and 16th, 317 tons of hot animal meal were removed to another site for cooling. Three hot spots in excess of 60°C remained until October 25th, when the fairly deep zone of spontaneous combustion near a pole was finally reached. The temperature dropped off progressively. Requisition authority was implemented in the active search for incineration sites in order to accelerate the removal of the animal meal.

### European scale of industrial accidents:

The Cleguer accident did not result in the release of dangerous materials governed by the SEVESO 2 directive and resulted in no known human, social or environmental consequences. On the other hand, as an estimate of the damage and measures implemented was not made, the financial impact could not be characterised by the scale officialised in February 1994 by the Committee of Competent Authorities of the member States which oversees the application of the 'SEVESO' directive.

Dangerous materials released		<input type="checkbox"/>					
Human and social consequences		<input type="checkbox"/>					
Environmental consequences		<input type="checkbox"/>					
Economic consequences		<input type="checkbox"/>					

The parameters that comprise these indices and the corresponding rating method are available at the following address:  
<http://www.aria.ecologie.gouv.fr>.

## ORIGIN, CAUSES AND CIRCUMSTANCES OF THE ACCIDENT

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Since 1996, the French government has been in charge of finding storage locations for stocks of animal meal pending their incineration. In 1998, 85,000 tons of animal meal were incinerated in cement plants, thereby regularly eliminating the flow of meal and begin cutting back the stocks. As of December 31, 1998, 100,000 tons of animal meal remained that was essentially accumulated in 1997. These often over-filled bulk storage facilities are progressively destroyed. These facilities must thus be monitored owing to the potential danger of self-ignition risk of the piles. Furthermore, certain confined storage facilities represent a dust explosion danger.

Storage heights reached 10 meters in locations within the hangar involved. Calculations show that the flammability of animal meal is directly linked to the volume, and thus the height of the pile. An expert evaluation concluded that the critical self-ignition temperature for a cubical storage mass of 4 cm per side is 160 °C. For 2 m per side, this temperature is only 75 °C. This perfectly explains why self-ignition took place in hangar No. 1 and not hangar No. 2 where the more reasonable storage height did not exceed 4 meters. It should be noted that the incident occurred during the summer, with high outdoor temperatures.

In addition, an insecticide treatment was done in the hangars a few days before the accident. Tests done to determine the whether the insecticide impacts on the self-ignition of animal meal revealed negative results.

The combustion and the handling operations generated odours, gases and dust which worried the local residents. Measurement of the gaseous emanations were done and gave low results.

## ACTION TAKEN

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Various emergency measures were undertaken:

- ✓ The warehouse remains under surveillance;
- ✓ Precise temperature mapping was carried out in the storage facility in order to carefully determine the location of the heart of the fire;
- ✓ The pile was spread out;
- ✓ The installation of tarps to limit the influx of air.

This incident contributed to enhanced monitoring of this type of storage facility and, particularly, constant follow-up of the temperatures even after the meal has been cooled.

## LESSONS LEARNT

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Incidents of this type confirm that bulk animal meal storage facilities can promote self-ignition phenomena and thus need to be monitored on a permanent basis. Several measures must be taken to limit this risk:

- ✓ The meal should preferably be stored in bales;
- ✓ Meal should be stored on a flat floor;
- ✓ The warehouse must be hermetic (air and humidity);
- ✓ The ends of the storage facility should be closed off with tarps;
- ✓ The storage of humid meal on dry meal and conical storage configurations should be avoided;
- ✓ Storage heights must not exceed 7 to 8 meters;
- ✓ Temperature readings should be taken and must not exceed 30 °C; hot meal should be spread out;
- ✓ Combustible substances or fuel must not be stored in the same facility;
- ✓ Handling equipment must be protected from fire.

In addition, preventive measures against the risk of explosion may be necessary for certain types of meal that may create dust when handled.

It should be noted that this type of storage facility no longer exists as the production and "transit" storage of animal meal is currently prohibited.

The accident at the Plousy animal meal storage facility (ARIA document No. 16108) presents a similar problem.