

**John Hodson,  
Cardox  
International  
Limited,  
emphasises  
the importance  
of safe silo  
cleaning.**

#### **Introduction**

As many cement plants will testify, cleaning cement and raw meal silos can be a dangerous, time consuming and costly job. Nowadays, most cement plants try to emphasise and enforce stringent safety policies. A demand for safe silo cleaning has long been overdue.

Despite a growing awareness that safety is a major factor when performing a silo cleaning task, there are still cases where cement plants have chosen to ignore the huge risks involved in undertaking such activities. In some instances, the danger posed to workers is so serious that lives have been lost. With that in mind, cement plants must recognise that silo cleaning is a highly professional job that requires qualified specialists that are able to minimise the exposure to risks by incorporating skill, experience and technology.

*Time to Recognise the Risks*





Figure 1. Cardox Angled Sockets allow access to the heart of the buildups and blockages.

## Hitting the heart of the blockage

In many cases, the discharge area of the silo provides one of the biggest challenges in silo cleaning. Loose material has to be removed from the silo first and huge lumps of hardened cement are commonly found blocking the passageway during the extraction of material from the silo. In the past, the only available solution was to either pump compressed air through an improvised opening at the discharge gate, or to completely remove the discharge chute itself. However, neither method proved

to be particularly effective or efficient until Cardox International proposed applying the Cardox System right at the heart of where most buildups and blockages occur - at the discharge areas of the silo.

By installing small, sealed fixtures (sockets and plugs) around the discharge area, the new type of Cardox Tube specifically designed for silo applications can be quickly inserted, secured and activated safely and efficiently to clear blockages that prevent the extraction of material from the silo.

The new Cardox Tube contains over double the amount of liquid CO<sub>2</sub> charge to deal with the large lumps located inside the silo and instantly produces a large 'heaving' force that not only breaks down the buildup and/or blockage, but actually aerates the product within a 2 - 3 m radius around the area of discharge, allowing the free flow of material.

## Case study: the Lafarge Langkawi plant

Lafarge Cement in Malaysia is just one of a growing number of cement plants that have taken advantage of the improved silo clearing system and it has contracted Cardox International for a second time to solve its blockage problems.

The plant's cement silo 2 was last cleaned in 2002. Due to moisture entering the silo, some of the material had formed massive lumps around the discharge areas, preventing flow of cement during discharge operations.

Firstly, newly designed Cardox Angled Sockets were

## How Cardox works

Holes are made in the buildup through the sockets by either an air lance or rotary auger rods (extendable auger rods enable substantially longer holes to be made).

The charged Cardox Tube(s), made from a special alloy steel, are then inserted through the sockets and secured by turning the tube holder through 90° in the socket.

A simple connection is made from the Tube to a hand-held activating machine and on passing an impulse to the Tube, a low-tension electric fuse initiates a rapid reaction in the safety heater, causing the liquid carbon dioxide to pressurise (the safety heater can only react in a pressurised environment).

This instantaneous buildup in pressure reaches a yield

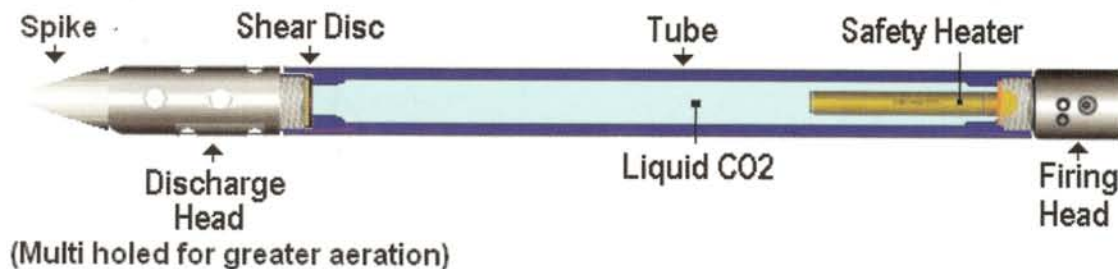
pressure of the shear disc, which bursts, releasing a cold heaving mass of CO<sub>2</sub>, expanding to 600 times its original volume, which aerates and clears the surrounding material.

The whole process takes less than a second.

The pressure generated can be regulated between 2800 bar (40 000 psi) and 1200 bar (18 000 psi) by selecting the thickness of the shear disc.

The high pressure discharge is far in excess of what air-blasters can produce and the Tubes are used over and over again, the safety heater and rupture disc being replaced after each use.

It is conceived that the new Cardox Silo Tube will have a service life of approximately 15 years.



Cardox Silo Tube (in section).

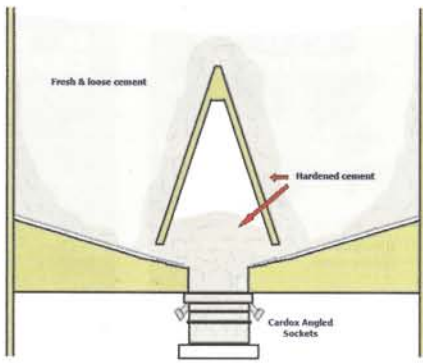


Figure 2. Installing Cardox Sockets at critical areas near discharge areas of a silo.



Figure 3. Cardox operative inserts and locks the specially designed silo tube into an Angled Socket.

installed around the discharge valves, which allowed Cardox Tubes to be inserted up into the heart of the buildup.

Cardox International's engineer in-charge of the project explains, "the new improved Cardox Tubes have certain accessories, like a 'spike' attachment that allows easier penetration into the hardened material around the discharge areas of the silos and 'connector tubes' if it is necessary to insert the Cardox Tubes further up into the product".

This is not the first time Cardox has been used at the Lafarge Langkawi plant; last year the company cleared cement silo 4, which had been out of operation for two years and was 98% full of high-grade cement.

The engineer went on to explain: "From installing the sockets at the discharge points, it took just five days to totally clear the silo. The process usually involves activating two Cardox Tubes, which break down the large lumps and aerate the material around the discharge area, then discharging all the free flowing material until the flow becomes restricted once again. The company activated just 21 Cardox Tubes, around four per day."

"The company is usually called in to clear silos that have been blocked for, sometimes, years, but if plants were to activate a few Cardox Tubes every week, then the severe blockage problems encountered in silos would go away for good."

Many plants are now installing sockets around the silo and Cardox International supplies sockets for concrete or steel silos. 🌐