

The Explosive That Isn't...



Remove the redundant, reinforced concrete base of a derelict dolphin without explosives – that was the job, **MICK GREENHOUGH** looks at the answer



▲ *Tilbury Douglas' Mick King and John Dobrucki illustrate the working conditions in Limehouse Basin*

During the 18th century, Britain experienced a boom in canal building that provided the essential means of heavy transport required to power the industrial revolution.

And despite the arrival of both road and rail transport systems in the 19th and 20th centuries, plus the increasing use of

deep-water ports to move cargo, the basic integrity of most of the canal infrastructure remains reasonably sound.

Today, and as one of the UK's many millennium projects, the canal network is enjoying a renaissance. Considerable reinvestment is taking place – the *Great Wheel of Falkirk* (DPC March 2002) is a spectacular example – and increasingly the canals are enjoying more and more recreational and commercial usage, particularly the old docks and basins.

TRANSFORMATION

The UK's most significant canal was and remains the Grand Union, which runs through the industrial heartland of Britain from Birmingham to London's docklands, terminating at Limehouse Basin. When built, this dock had access to the tidal River Thames via a lock system and took part in the export & import of cargoes from around the world before becoming commercially redundant.

Time moves on and Limehouse Basin is now a very fashionable – and expensive – part of London to live in, convenient for both the City's banks and offices and the cultural centre. Owners *British Waterways* capitalised on that...

The old bonded warehouses and wharfs have now been renovated as offices, apartments and cafes while the basin itself houses a marina and leisure amenities. All these facilities have been refurbished to

◀ *You can just see the dolphin base (centre) exposed at low water ... and the expensive apartments right above*



▲ *Cardox at work, the rebar is separated from the fractured concrete...*

extremely high standards and fetch vast sums. But there was a problem...

JOB SPEC

Part of the development programme called for the replacement of a derelict wooden jetty in the River Thames at the entrance to the Basin's lock – a contract won by *Tilbury Douglas*.

"It wasn't a particularly big job," said area manager Dave Hansford, "and basically it was quite straightforward. But there were a number of conditions that made it rather more complicated and interesting..."

Those conditions were down to the high value of the homes and offices that had already been built in close proximity to the worksite. And there was also an access problem.

"Considerable concern was expressed over the expected noise and vibration likely to be generated during construction," Dave continued, "especially as we had to drive a number of replacement 'H' piles."

But it was the requirement to remove the reinforced concrete base of a derelict dolphin alongside the old jetty that vexed the most.

CARDOX

The dolphin base jutted up from the riverbed and at low water was considered an unacceptable risk to the shipping using the lock – predicted to increase considerably.

"Traditionally, you'd use explosives or a heavy hydraulic breaker to remove such a mass of concrete," Dave continued,





▲ ...and the Cardox tubes can be re-used

“but the soft bed and small tidal window – not to mention the risk to both the general public and the surrounding properties – made these options undesirable.”

So Dave used *Cardox*.

“It’s a system that uses liquid CO₂ to fracture concrete in a non-explosive manner – and one that works equally well above ground or underwater,” he said. “It proved to be very successful and non-disruptive, with nearly all the problems –

Piling the entrance into the new marina... ▼



How Cardox Works

You start by drilling holes into the concrete or rock using standard rock drills

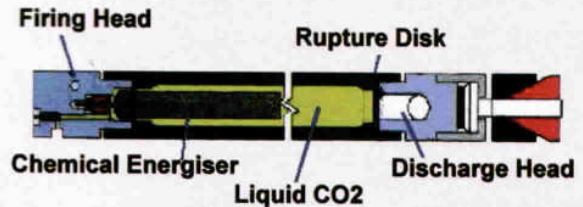
Next, special Cardox tubes, made of thick steel containing a chemical energizer and a measured quantity of liquid CO₂, are inserted.

The energizers are then ignited via an electrical fuse and the heat thus generated converts the liquid CO₂ to gas in less than a second – the volume increasing by a factor of 600. The pressure build-up inside the tubes ruptures special ‘burst discs’ of a selected thickness that regulate the final pressure.

The result is that high pressure CO₂ gas is suddenly released into the surrounding rock or concrete where it seeks out any weak points, including joints and fissures, and heaves the material apart.

The magic is that there’s little noise, no

shock wave, no ‘explosive missile’ effect and no shattering of the concrete or rock substrate. It’s even possible for a workman to be in close proximity – or a diver to be in the water – during ignition in complete safety.



▲ **Basics of the Cardox tube**

Finally, the Cardox tubes can be recovered, reloaded and used again and again – and the system’s approved by the UK’s *Health & Safety Executive*.

More info from author Mick Greenhough via email: j.greenhough@ntlworld.com

noise, the risk of collateral damage and the safety factors associated with using explosives – avoided. It was also, fortunately, far less expensive with no special permits or secure storage required.”

FINALLY...

“As can be seen in the photographs,” Dave concluded, “the reinforced concrete was suitably fractured and completely loosened from the rebar, enabling the debris to be removed from the riverbed with ease. We had no complaints or

adverse comments from the residents, most of whom remained completely unaware of the operation.”

And to properly finish the job, in keeping with both the Limehouse Basin’s original function and appearance, greenheart fenders were fitted to the jetty’s steel frame and topped with a new concrete platform and safety railings. ▲



▲ ...finished off with greenheart fenders for that period touch

About The Author

Eur.Eng. Mick Greenhough is a chartered engineer and an HSE part 1 diver with over 40 years experience. A consultant for diving and underwater works – and a UK Expert Witness – he specializes in design stage consultancy, onsite monitoring and troubleshooting distressed projects. Reach him for further information on +44-(0)-1-689-856-438 or email j.greenhough@ntlworld.com