



Conjet Robot restores flyover at Staples Corner, UK



Conjet Robot 360 equipped with boom extension arm.

First Conjet Robot 360 hydro-demolition machine in the UK proved a major success on its debut contract assisting in repairing North London's A5 Edgware Road flyover, which was severely damaged by a terrorist bomb in April 1992.

The specialist high pressure water jetting equipment, purchased specifically for the major trunk road repair by UK hydro-demolition contractor Costain Industrial Services, was successfully used to accurately and speedily remove the bomb damaged areas of 45 MPa compressive strength concrete in the box girder structure's soffit prior to replacement with fresh 50 MPa concrete.

The 305 m long, seven span, continuous prestressed concrete box girder deck flyover, supported on reinforced concrete piers, carries the A5 Edgware Road over the Staples Corner roundabout. This prin-

cipal roundabout junction provides a vital interchange linking the major A5 trunk road with the main A406 North Circular Road, which is carried across the A5 and the Staples Corner roundabout on another higher level flyover.

120 m³ of damaged concrete had to be removed

The blast from the bomb, which was left in an abandoned vehicle on one of the A406 sliproads, directly underneath the A5 Edgware Road flyover, punched holes through the bridge deck's bottom slab and damaged much of the remaining soffit and part of the top slab. The force of the explosion apparently lifted the 18.5 m wide deck off its supporting concrete piers and the high dynamic compressive forces generated as it dropped back down damaged the tops of the piers.

Consulting engineer W S Atkins, responsible for supervising the flyover's original construction, were appointed by the Department of Transport to assess the damage and design and supervise the repair technique. About 120 m³ of damaged

Case Stories



CONJET AB

P.O. Box 507
SE-136 25 HANINGE
SWEDEN

PHONE:
+46 (0)8 55 65 22 40

FAX:
+46 (0)8 55 65 22 60

E-MAIL:
conjet@conjet.com

WEBSITE:
www.conjet.com

APPLIED WATERJET TECHNOLOGY

concrete had to be removed in a very tight reconstruction programme.

W S Atkins specified that high pressure water jetting had to be used for the concrete removal as the consulting engineer identified that the hydrodemolition method selectively removes damaged concrete while leaving reinforcement clean, intact and undamaged. The system also has the major advantage over conventional hydraulic impact breakers of considerably reducing the risk of propagating cracks into the adjacent sound, healthy concrete.

The Conjet proved to be excellent in removing concrete from the soffit

W S Atkins awarded the main A5 flyover rehabilitation contract to contractor Tilbury Douglas Construction. "We were not allowed to use hand held breakers or similar equipment," says Tilbury Douglas Construction site agent Ian Austin. "And awarded an approximate £180,000 hydrodemolition subcontract to Costain Industrial Services to remove the damaged concrete. The Conjet proved to be excellent in removing concrete from the soffit. It is a very very good system and was the only equipment capable of doing the work at Staples Corner in the tight programme."

However Austin believes the damaged concrete in the soffit could have been cut out with hand lances, which were used to remove a relatively small amount of concrete on the less damaged deck. "But hand lances are about 10 times slower and would the job would have taken considerably longer than the Conjet," says Austin.

Costain Industrial Services opted to use hand held water jetting lances, working at pressures up to 14,500 psi (987 bar, 100N/mm²), to remove the approximate 20 m³ of damaged concrete on the deck slab. But for the majority of the more difficult and controlled removal of the damaged concrete in the soffit, the specialist contractor chose to use the Conjet Robot 360 hydrodemolisher.

Costain Industrial Services orders the first Conjet Robot 360 in the UK

"We ordered the Conjet Robot 360, the first one in the UK, after Tilbury Douglas Construction awarded us the hydrodemolition contract," says Costain Industrial Services hydrodemolition manager Hugh Gilhespie. "The approximate £250,000 package from Conjet included providing an engineer on site to initially train our operators. Conjet have been extremely helpful and provided excellent support and back up," says Gilhespie.

The versatile Conjet equipment, which is remotely controlled by a single operator, is powered by a separate powerpack housing a 450 hp Caterpillar diesel engine driving a Hammelmann high pressure water pump. The powerful pump produces a flow

of 140 litres/min at pressures up to 16,000 psi (1100 bar) and is fed through a 20 mm diameter hose to a specially mounted single nozzle, where it exits at supersonic velocity.

The articulating boom enables the equipment to be used in a wide variety of hydrodemolition tasks

The nozzle is mounted on an oscillating cassette, which, attached to a traversing cradle running back and forth along a feed beam, enables the jet to operate with a sweeping action to cut away concrete behind reinforcement. The entire nozzle assembly is attached to the end of the Conjet Robot 360's multi-positioning arm and covered by a protective shroud.

This articulating boom enables the equipment to be used in a wide variety of hydrodemolition tasks on horizontal and vertical surfaces, ceilings and soffits. The boom can also reach under a bridge deck soffit while the machine stays on the deck above.

The Conjet Robot 360 worked extremely well ahead of programme

Costain Industrial Services were able to use the Robot's flexibility to sight the machine at ground level at Staples Corner and work on the damaged deck soffit directly above in a series of programmed and sequential repairs. "The Robot worked extremely well and by keeping ahead of programme we were able to temporarily move the equipment to another hydrodemolition job in Liverpool without interrupting our progress at Staples Corner," says Gilhespie.

The areas of the A5 flyover soffit for repair, each covering approximately 8 m², were partitioned with a protective screen and included inserting a shield inside the box to prevent any concrete being jetted out of the soffit damaging the deck's upper membrane.

"As a general rule of thumb jetting pressure needs to be about two to three times the compressive strength of concrete to be cut," says Gilhespie. "We were using pressures between 1050 bar to 1100 bar and cutting right through the 150 mm to 350 mm thick soffit slab and removing an average of 3 m³ of damaged concrete in a typical 10 hour shift. Conjet's predictions of machine performance proved to be accurate and the reliable equipment performed as expected. There were no problems and W S Atkins and Tilbury Douglas Construction were pleased with our hydrodemolition job, which went very smoothly."

Equipment Used

- 1 Conjet Robot 360
- 2 Conjet Power pack 340



Conjet

CONJET AB

P.O. Box 507
SE-136 25 Haninge
SWEDEN

Phone:
+46 (0)8 55 65 22 40

Fax:
+46 (0)8 55 65 22 60

E-mail:
conjet@conjet.com

Website:
www.conjet.com