
CASE STUDIES

IMPORTANT INFORMATION FROM CONJET



The Robot 361 working on vertical surfaces in the restoring of the Ponti Del Valico, Italy.

Conjet Robot proves versatility on hydrodemolition contract

The versatility of a Conjet Robot hydrodemolition machine has been successfully demonstrated during the 7 million Swiss Franc repair and strengthening of the major Ponti Del Valico. The dual two lane concrete viaduct, straddles the Swiss Italian boarder at Chiasso, 50km north of Milan.

The Conjet Robot 361, equipped with different water jetting attachments, has prepared and scarified the concrete deck for a new overlay, cut out concrete to install new joints and removed concrete from the edge beams to expose reinforcement in preparation for casting on wider and stronger concrete parapets.

Contractor Wan-Jet, working with fellow Swiss contractor Hydrodemolizione as the specialist hydrodemolition subcontractor for the main contractor Consorzio Viadotto Brogeda. A joint venture of Swiss and Italian contractors Muttoni, CST and Pizzarotti, was able to quickly and easily adapt its Conjet Robot 361 to suit the varied selective concrete removal tasks on its approximate 0,5 million Swiss Franc hydrodemolition contract. A hydraulically driven spinning rotor head,

equipped with four nozzles, was used to scarify the concrete deck, while a standard single oscillating nozzle selectively removed concrete from the bridge joints and beams.

“The Conjet Robot did a very good job” - Hydrodemolition the preferred method

“I was very impressed with Wan-Jet’s hydrodemolition machine,” said Consorzio Viadotto Brogeda site agent Mr Tosato. “The Conjet Robot did a very good job. Hydrodemolition is a very good system and much prefer it to other methods of removing concrete. It takes off concrete to a preset depth either above or below reinforcement and provides a rough surface to give a good bond with new concrete. Hydrodemolition also leaves reinforcement clean and undamaged and doesn’t cause any cracks in the concrete left behind, unlike breakers which can hit and vibrate the rebar and do a lot of extra damage by breaking the bond between the reinforcement and good concrete.”

The 118m long, slightly curving reinforced concrete viaduct, supported on a series of piers, carries the main E35, which is one of the major trunk routes to and from the nearby Gotthard Tunnel. But the heavily trafficked structure was in need of repair and strengthening and bridge owner Dipartimento del Territorio awarded a contract to Consorzio Viadotto Brogeda for the renovation scheme, which was designed by consulting engineers Chiesa Wuest Stucki & Partners, based in Chiasso.



At 150 mm depth, the rebars are totally exposed.

Before Wan-jet could start the hydrodemolition Consorzio Viadotto Brogeda initially cut off the existing parapet with a diamond saw to expose the deck's edge beams. Wan-Jet, using its Conjet Robot 361, with built in automatic quality depth control, then followed on behind selectively removing an approximate 1.5m high vertical swath of concrete to a depth of about 150mm. In addition the Conjet Robot was also used to cut out the viaduct's two old 450mm wide by 300m deep joints, one 80m long and the other 50m, which ran diagonally across the curving viaduct.



Edge beam rebars exposed by hydrodemolition

In both instances the original reinforcement was left exposed and undamaged, but cleaned by the Conjet Robot's high pressure water jet. After Wan-Jet had successfully completed hydrodemolition of the joints and edge beams, Consorzio Viadotto Brogeda returned to link in additional reinforcement prior to insitu casting the new, stronger and

heavily reinforced concrete parapet and replacing the joints.

Plain water at supersonic speed

Wan-Jet's remotely operated, computer controlled Conjet Robot relies on a jet of high pressure water exiting from a special nozzle at supersonic speed, forcing its way into the concrete's porous surface. The water creates an hydraulic over pressure in the concrete which breaks away when this pressure rises above the tensile strength of the concrete. Water at a pressure of 1500bar and flow of 105 litres/min is fed through a flexible hose to the Conjet Robot's nozzle from a high pressure pump driven by a 333kW diesel engine housed in a silenced 20ft long ISO container.

The nozzle, set at a predetermined angle of attack to the concrete, is mounted on an oscillating cassette. This is attached to a traversing cradle running back and forth along a feed beam which is mounted on the Conjet Robot's standard rotating arm. This boom gives the operator considerable flexibility to use the hydrodemolition machine in a wide variety of tasks on horizontal and vertical surfaces, ceilings and soffits. Wan-Jet, with over 10 years specialist experience of hydrodemolition, also has an optional bridge boom arm which can reach under a bridge deck soffit while the Conjet Robot stays on the deck above. When the cradle reaches the end of its travel the nozzle swivels over to maintain the same angle which enables the jet to operate with a sweeping action to cut away concrete behind reinforcement. At the same time the machine moves back a predetermined dis-

tance ready to make the next adjacent cut. The entire nozzle assembly is covered by a protective shroud.

Change of high pressure tool

After removing the concrete from the edge beams and joints, Wan-jet simply replaced the Conjet Robot's cassette mounted single nozzle assembly with the optional rotor cutting head to scarify the concrete abutment and the bridge deck.



Robot 361 working supplied by the power pack.

The hydraulically operated spinning rotor, complete with four nozzles, was set a small distance above the concrete surface before removing a nominal 20mm of concrete from the viaduct's deck at about 23m²/hour. Consorzio Viadotto Brogeda followed on behind bonding a new thin concrete overlay to the scarified deck. The concrete screed was covered with a 5mm thick layer of polymer insulation prior to asphalt sub-base and base course overlay and final asphalt wearing course topping.

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