
CASE STUDIES

IMPORTANT INFORMATION FROM CONJET



The Conjet Robot is working on the cooling water feed channel.

Conjet Robot repairs frost damaged water channel

Specialist German hydrodemolition contractor Krüger Wasserhochdrucktechnik, using its Conjet Robot 360 high pressure water jetting machine, has successfully assisted in the very unusual and tricky repair to a steep, new cooling water feed channel at the country's Boxberg coal fired power station.

The Robot, suspended from a winch anchored at the top of the 45% inclined curved channel, systematically removed a layer of reinforced, water resistant concrete from the entire surface which had been badly damaged by an unexpected and very sharp frost during casting.

Krüger Wasserhochdrucktechnik, working for the power station joint venture main contractor Hochtief and Bilfinger & Berger, was able to quickly adapt its Robot 360 and

suspend it to operate on the steep channel. The Robot only took two weeks to selectively remove the frost damaged concrete, allowing the joint venture contractor to return and complete the repair with a fresh concrete overlay. "Hochtief and Bilfinger & Berger had their doubts and didn't believe it was possible for us to remove the damaged concrete from the steep channel with our hydrodemolition Robot," said Krüger Wasserhochdrucktechnik managing director Herr Krüger. "But

it worked very well and did an excellent job. They were very happy with it."

The steep, flat bottomed channel, designed to take water from the base of the power station's cooling water tower back down into the pump house for recycling, is just 21m long. It is 25m wide at the inlet and gradually tapers down in a steep, shallow curve to 18m at the discharge. The 45% sloping channel has a heavily reinforced 1.5m thick base and Hochtief and Bilfinger & Berger intended casting the complete channel base in one continuous pour. But as the contractor was nearing the end of the pour the air temperature suddenly and unexpectedly dropped to -8°C. Hochtief and Bilfinger & Berger had no option but to continue and complete the casting. But the combination of the rapid fall in temperature and very strong biting winds caused extensive frost damage to a depth of 40mm over the channel's entire concrete surface.



The damaged concrete was too weak to cater for the flow of water so Hochtief and Bilfinger & Berger, working for client and power station owner Arge Rohbau Boxberg, had to remove the spoiled layer prior to placing a complete new overlay. The client insisted that concrete had to be removed to a depth of 25mm below the upper layer of reinforce-



ment to achieve a good bond with the existing healthy concrete. To ensure the minimum required gap below the reinforcement was achieved the depth of concrete to be cut out was set at 120mm.

“Hydrodemolition was specified..”

The main contractor subcontracted the specialist concrete removal work to Krüger Wasserhochdrucktechnik. “Hydrodemolition was specified for removing the damaged concrete on this repair contract,” said Krüger. “It takes off only the damaged concrete either above or below the rebar and provides a rough, clean surface to give a good bonding with the new concrete. The hydrodemolition technique doesn’t cause any micro cracks in the sound concrete left behind and leaves all the rebars intact and cleaned. This is unlike pneumatic 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.”

Before Krüger Wasserhochdrucktechnik could set the Robot to work the company had to arrange to secure and support the machine on the damaged inclined surface during concrete removal. For this the company anchored a winch at the

top and in the centre of the channel with a steel rope running down and fixed to the Robot. This simple suspension system enabled the self propelled Robot, pivoting on the anchored rope, to make traversing radial cuts across the concrete channel. After each pass the Robot was lowered on the winch to make the next adjacent cut with the cycle repeated to the channel bottom.

The remotely operated computer controlled Robot 360 was pre-set to selectively remove concrete to be-



low the reinforcement using a jet of high pressure water exiting from a special nozzle at supersonic speed and 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 850bar and flow of 156 litres/min was fed through a flexible hose to the Conjet Robot’s nozzle from a diesel driven, high pressure pump 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 Robot’s standard arm. 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. With this system Krüger Wasserhochdrucktechnik was able to set its Robot 360 to selectively remove concrete at the rate of 0.35m³/hour and expose the top layer of reinforcement. The unusual job took just two weeks before Hochtief and Bilfinger & Berger returned to place the new water resistant concrete overlay and finish the water feed channel.

3312 800x xx Copyright © Conjet AB, 1999

For further information, please contact



CONJET AB
Applied Water
Jet Technology

Postal address
P.O. Box 507
S - 136 25 Haninge
Sweden

Telephone
+46(0) 8 741 39 40
Telefax
+46(0) 8 741 39 60

E-mail
conjet@conjet.se
Internet
www.conjet.com