



## **Conjet Robot restores the Skanstull Bridge in Stockholm**



Conjet Robot 362 tight protection enables close live traffic with a minimum risk of hazardous incidents.

**A Conjet Robot high pressure water jetting hydrodemolition machine was playing a key role in the SEK 22 M repair and strengthening to the deck of the major Skanstull Bridge in Stockholm, Sweden.**

Contractor NCC Waterjet, working as the specialist hydrodemolition sub-contractor for the bridge renovation main contractor PEAB 0st AB, is successfully using one of its seven Conjet Robots on its approximate SEK 3.5 M hydrodemolition contract to selectively remove only the damaged concrete from the deck prior to strengthening with a much thicker reinforced concrete overlay.

**"I much prefer the Conjet hydrodemolition technique to other methods,"**

A comment from PEAB fist project manager Robert Lundstrom. "Nothing compares to the Conjet system. 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. It doesn't cause any micro cracks in the sound concrete left behind and leaves

all the rebars intact and cleaned, 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."

The 565 m long reinforced concrete bridge, with its 120 m central span over the Hammarby Lock, carries rail, road and pedestrian traffic between the Stockholm districts of Sodermalm and Johanneshov. The original road bridge was opened in 1947 and was later widened to carry the adjacent railway track. But a combination of age, frost and ingress of de-icing salt has penetrated the waterproofing and damaged the 50 year old structure's concrete deck. Some initial repairs, also using Conjet Robots, were carried out in 1991 to the railway bridge deck and its edge beam. To complete the renovation bridge owner Gatuch och Fastighets-Kontoret subsequently awarded what is believed to be Sweden's largest hydrodemolition repair contract to PEAB fist.

**500 m<sup>3</sup> of damaged concrete at a rate of 100 m<sup>2</sup> and 400 m<sup>2</sup>/day**

PEAB fist, based in Sollentuna, north of Stockholm, is initially removing the deck's

# Case Stories



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## **APPLIED WATERJET TECHNOLOGY**

asphalt wearing course to expose the damaged concrete underneath. NCC Waterjet, using its remotely operated, computer controlled Conjet Robot with built in automatic quality control, follows on behind removing a nominal 20 mm of damaged concrete from the road deck and 40 mm from the pedestrian walkways. NCC Waterjet has to take off about 500 m<sup>3</sup> of damaged concrete from the deck and is completing an area of between 100 m<sup>2</sup> and 400 m<sup>2</sup>/day.

PEAB is replacing the damaged material from walkway with the same thickness of new concrete. But on the main road deck the contractor is strengthening the original 300 mm slab by adding a new layer of reinforced concrete tapering from 400 mm thick at the centre down to 200 mm at the edge. Once the Conjet Robot has been pre-set by the operator the machine only removes weak and damaged areas of concrete to a pre-determined quality depth above or below any steel reinforcement, which, if exposed, is also cleaned of rust.

NCC Waterjet's Conjet Robot relies on a jet of high pressure water exiting from a special nozzle at supersonic speed and forcing its way into the damaged concrete's porous and coked surface. The water creates an hydraulic over-pressure in the concrete which breaks when this pressure rises above the tensile strength of the concrete. Water at pressures of 900 bar to 1100 bar and flows ranging from 150 litres/min to 250 litres/min is fed through a flexible hose to the Conjet Robot's nozzle from a high pressure pump driven by a 350 kW to 550 kW diesel engine housed in a silenced 20 ft long ISO container.

The nozzle, set at a predetermined angle of attack to the concrete, is mounted on an oscillating cassette, which is attached to a traversing cradle running back and forth along a feed beam. 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 distance ready to make the next adjacent cut.

### Safety is paramount

Safety is paramount and the entire nozzle assembly is attached to the end of the Conjet Robot's arm and covered by a protective shroud. The boom gives the operator considerable flexibility to use the

Conjet Robot in a wide variety of hydrodemolition tasks on horizontal and vertical surfaces, ceilings and soffits. An optional multi-positioning boom can also reach under a bridge deck soffit while the machine stays on the deck above.

PEAB started on site in April 1996 and the project was completed two years later, including breaks during the winter months.



Conjet Robot 362, powered by the Conjet Powerpack 540 at work on the Skanstull bridge in Stockholm.

#### Equipment used

- 1 Conjet Robot 362
- 1 Conjet Robot 230
- 1 Conjet Powerpack 540

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