Conjet Hydrodemolition

Conjet Technology selectively removes concrete without causing micro cracks or damaging the reinforcement bars, resulting in a good bonding surface.

Hydrodemolition removes a layer of concrete by shooting a jet of high pressure water into the material. When the water fills the natural cavities in the concrete, it bursts from within, exploding upwards. The result is a rough surface, free from micro-cracks, ready for a new layer of fresh concrete. It also leaves the reinforcement bars completely intact. Hydrodemolition can also be used for paint removal and surface preparation. A radio controlled robot (supplied with high pressure water from a pump) performs the demolition, keeping the supervising operator at a safe distance.

How does it work?

The robot is equipped with a lance that moves over the concrete surface, shooting a high pressure water jet and removing the damaged material. The operator sets the hydrodemolition parameters (cutting width/depth, speed and jet angle, for example), positions the robot and starts the hydrodemolition process. When this is done, the robot operates autonomously according to the set parameters, working its way in a straight line. All the operator has to do is monitor the progress and inspect the result.

Capacity

The capacity of removal depends on a range of parameters e.g., type and quality of concrete, size and number of reinforcement bars, size and quality of the ballast stones and pump used i.e. water pressure and water fl w. The robots can be used just to scarify the surface removing a few millimeters of concrete or remove concrete to a depth of more than 500 mm (1.7 ft). Depending on the machine used between 0.5 and 1.5 m³ (18-53 ft³) concrete is normally removed per high-pressure hour. However, hydrodemolition is significantly faster than manual methods. One robot removes the same amount of concrete as 20-25 men with jackhammers.

Selective removal

Although hydrodemolition can be used to remove all types of concrete, it is possible to remove only the damaged concrete. This is due to the fact that damaged concrete normally have a lower tensile strength than sound concrete. Hence, with the right setting of the hydrodemolition parameters, selective removal will automatically remove concrete down to a preset quality level.

Advantages

- One man, continuous operation.
- Selective removal of only damaged concrete minimizes waste material.
- Up to 50% better bonding on rough surfaces.
- Causes no vibrations or micro-cracks.
- 25-50 times faster than jackhammers.
- Removes concrete under rebars.
- Removes rust from rebars.

Applications

- Road slabs
- Parking decks
- Bridges
- Quaysides and dams
- Tunnels, pipes and turbines
- Pillars
- Surface preparation / scarificatio
- Ship cleaning

Safety – avoid dangerous jackhammers

Hydrodemolition is one of the safest demolition methods, considering the safety instructions are followed. Only equipment from manufacturers producing equipment complying with quality and safety regulations should be used. Conjet technology. The robot works according to the set parameters, while communicating with the operator’s radio control box and the high pressure pump in the powerpack.

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THE WIDEST RANGE OF HYDRODEMOLITION EQUIPMENT

Conjet Robot 350 performing hydrodemolition on a parking deck in Canada.

Robot 430 performing hydrodemolition on a parking deck in Canada.

Almagrundet lighthouse in the archipelago.

Robot 320 in a tunnel.

Hydrodemolition outside a pier.

Robot 320 at work on the Panama canal.

The Jetframe at work on the Krk bridge, Croatia.

The Panama Canal uses the Conjet Robot 360 to repair the train tracks.

The Panama Canal uses the Conjet Robot 360 to repair the train tracks.

Panama canal, Panama

Zürich, Switzerland

Robot 320 at work on the Golden Gate bridge.

San Francisco, USA

Stockholm, Sweden

Midskog, Sweden

Krk bridge, Croatia.

San Francisco, USA

Almagrundet lighthouse in the archipelago.

Stockholm, Sweden

Tripoli, Libya

Cutting inside a turbine.

Midskog, Sweden
WORKSITE SET-UP

In order to obtain a good return on the investment in hydrodemolition equipment it is essential to maintain a high degree of utilisation. The key to achieving this is good project planning and management that prevents unnecessary interruptions. It is therefore essential to ensure that there are enough supplies, consumables and spare parts, that the waste is removed continuously and that all necessary safety measures are taken.

System

In order to perform hydrodemolition services a hydrodemolition robot and a high-pressure water pump is required. The diesel driven high-pressure pumps, normally rated between 350 kW and 550 kW (470-740 hp), feed from 150 to 300 litres (40-80 US gal) of water per minute through a high-pressure hose to the robot. The robot is equipped with a cradle, which can move back and forth along the feed-beam on which it is mounted. The high-pressure hose from the pump is connected to the tool, which is either a rotor for scarifying surfaces or an oscillating lance for deeper removal. The rotors have two or four nozzles and the lance only one. The water is compressed into a jet stream in the nozzle. The diameter of the nozzle orifice, normally 2-4 mm, determines the water pressure, which for hydrodemolition varies between 800 and 1500 bar (11 600 – 21 800 psi).

Supplies

The water pump requires diesel fuel to operate, which also is the case for some hydrodemolition robots. The majority of hydrodemolition robots on the market run on electricity. Three-phase power can be supplied from either the power net or generators. Finally, yet important, hydrodemolition requires large quantities of clean water. A rule of thumb is to use the same water quality as the one being used to mix the concrete. It is quite common to use water from rivers and lakes but then the water should be filtered and cleaned in order to avoid damages on the water pump. Seawater with high chloride content should not be used since the chloride could penetrate the concrete left behind and start a deterioration process directly after the repair is finished.

Parameters

Concrete is a complex material and it is not possible to make any exact predictions about the results of hydrodemolition in advance. It is therefore strongly recommended to always start with a test run and adjust the parameters until the desired result is obtained. In order to do this correctly it is helpful to understand how the parameters influence the final result.

The main parameters can be summarised as follows:

- water pressure
- water flow
- the time the concrete is exposed to the water jet

In principal, increasing the water pressure and flow will increase the removal capacity within certain limits. However increasing the pressure will reduce the selectivity resulting in a more even surface. The pressure is determined by the nozzle orifice and the water flow. The water flow can be adjusted by alternating the pump engine rpm, but be aware of the fact that the nozzle then will have to be exchanged in order to maintain the same pressure and that the capacity will be reduced.

The water flow and pressure is restricted to the pump unit selected. In some cases more than one pump unit are used to supply the same robot in order to increase the production capacity. The removal capacity is higher for shallow removal depths compared to deep. The time the concrete is exposed of the water jet will determine the depth of the removal. The water-jet exposure time can be altered through a number of parameters e.g. cradle speed, oscillation speed and number of overruns, which are described in detail in the manual.

Waste

As mentioned earlier, hydrodemolition removes a significant amount of concrete per hour. The debris left behind will have to be removed as soon as possible. Otherwise, un-hydrated cement in the debris may adhere to the surface, which in turn reduces the bonding strength.

The most effective method is to suck up the debris with a vacuum truck; however, manual methods are commonly used with good results. After the debris has been removed, the surface should be rinsed thoroughly before pouring new concrete.

Hydrodemolition uses high volumes of water. Before the wastewater can be disposed in the sewage system, river or lake nearby, depending on the worksite and local regulations, the pH value has to be reduced and the solids slurry separated from the water.

CE, EMC certificate

Pictures are illustrative only and do not necessarily show the configuration of the products on the market at the given point in time. These products must be used in conformity with safe practice and applicable statues, regulations, codes and ordinances.

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