KoRo·IBS
MOVING AND BRAKE SYSTEM

Reference project

Industrial Brakes · Thrusters · Pressure Oil Pumps · Couplings · Hydraulic Buffers · Cellular Buffers
Rail Pliers · Sheaves · Hook Blocks · Crane Rail Wheels · Rail Clamps · Reparation · Service

Crane operations above the East River bridge

bridge refurbishment without the need of complete blockage

The Triborough Bridge which was opened in 1936, connects the New York boroughs of Queens, Manhattan and the Bronx and spans the Hell Gate shipping canal on the East River. The bridge's eight carriageways are currently being redeveloped for the first time due to a constantly growing load. This has become necessary as the average number of vehicles crossing the bridge each day has grown from 30,000 in the first year of operation to today's volume of over 200,000.

New type of redevelopment

With the redevelopment of the Triborough Bridge which is set to last twelve years, joint venture contractors American Bridge and Koch Skanska (AB/KS) broke new ground in 1997. The affected traffic routes normally have to be closed before mobile cranes can remove the old sections and replace them with new sections of carriageway. However, this solution was not an option as the contract with the bridge operator, the MTA-Triborough Bridge & Tunnel Authority, states that seven lanes must be kept open for traffic during the project.

A concept was discovered which then premiered in the USA. It was the first time that travelling cranes were used to replace sections of a suspension bridge. Due to the demands of the bridge operator, no other technology could be considered for handling the sections of carriageway. However, it was first difficult to find a tender for the project. The three double-girder travelling cranes whose span of around 30 m matches the width of the Triborough Bridge, were supplied by Demag Cranes & Components. Each of the cranes which all have a load bearing capacity of 30 tonnes, travels between one of the bridge's three spans. The Triborough Bridge's carriageway surface is removed lane by lane, i.e. AB/KS first disposes of the entire surface from one lane. The surface, with an area of more than 25,300 m2, is then replaced with parts made of a new orthotropic, steel-reinforced material which has elastic qualities.

KoRo IBS supplied parts

- Rail clamps

Special crane design

This contract presented Demag Cranes & Components with a very special challenge since the cranes have to operate outdoors in extreme weather conditions. They were also required to overcome inclines and descents of 3.6 % at variable speeds. High wind speeds also had to be taken into consideration, another crane bridge profile had to be developed and specific wheel loads had to be observed. In order to create a dynamic-static design for the crane bridges for torsion-free movement, finite element calculations were used for construction. This produced wider bridges with a reduced profile which reduced the potential influence of strong winds. Eight-wheel carriages with special centre holes run on the

KoRo IBS GmbH
Stockumer Straße 28
58453 Witten (Germany)
Tel. 0049 2302 70 78 7-0
Fax 0049 2302 70 78 7-10
Mail: info@koro-ibs.de
Web: www.koro-ibs.de

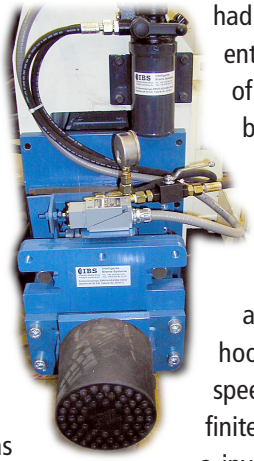
KoRo·IBS
MOVING AND BRAKE SYSTEM

Reference project

Industrial Brakes · Thrusters · Pressure Oil Pumps · Couplings · Hydraulic Buffers · Cellular Buffers
Rail Pliers · Sheaves · Hook Blocks · Crane Rail Wheels · Rail Clamps · Reparation · Service

(cont. from page 1)

crane bridges. They are each driven by eight supporting wheels, all of which have a Demag cylindrical rotor brake motor, so that the cranes can negotiate the inclines. A central frequency converter controls each of the wheels so that acceleration can be performed in a controlled manner without the wheels spinning. The power supply is guaranteed by integrated diesel generators, regardless of the mains supply. Demag has also installed a wind measuring device as an additional safety measure. It is connected to a programmable logic controller (PLC) to the crane's brakes. In the event of constant winds with a speed of more than 40 km/h, the PLC stops the crane and automatically engages locking devices on the rail which hold the crane firm.



Safe use

The cranes have to work in all weather conditions are thus also equipped with encoders which register and report if the wheels slip. The shaft encoders are fitted on both side of the cranes between the carriages on the non-supporting wheels. They compare the speed of the non-driven and the driven wheels. If a difference is detected, the respective crane stops automatically. In order to implement this, the shaft encoders also communicate with the PLC which activates the magnetic brakes as necessary. Manually operated locking devices also help prevent the cranes from making any uncontrolled movements outside of working hours.

The crane trolleys and lifting devices had to be adapted to the different shapes of the new sections of carriageway and the sections being replaced. Each trolley is equipped with two Demag DH lifting devices which each have a load bearing capacity of 15 tonnes and are fitted on a frame with a hook clearance of 5.5 m. The speed of the lifting devices is infinitely variable and controlled by a inverter. Both lifting devices on one crane can therefore be operated simultaneously or independently of each other. Lighter loads are lifted by just one lifting device. For larger sections of carriageway, the operator always uses two lifting devices. The running wheel system in use for the trolleys is the Demag DRS wheel block system which is also controlled by a frequency converter, facilitates sensitive movement control and positioning and provides protection from corrosive media, dust and moisture.

Quick assembly

There are also special requirements as far as the assembly of the cranes is concerned. The double-girder travelling cranes are designed to be installed in one single night shift without having to close lanes on the road as would have been the case with traditional gantry cranes. Demag Cranes & Components therefore constructed the cranes so that they can be assembled in three lifting movements. The carriages, for example, were already fastened to all crane girders. Each lifting movement only took 7 minutes and the bridge only needed to be closed during this phase. Being able to assemble two cranes simultaneously also saved more time.

published in "Hebezeuge und Fördermittel", issue 1/2-2003

KoRo IBS GmbH
Stockumer Straße 28
58453 Witten (Germany)
Tel. 0049 2302 70 78 7-0
Fax 0049 2302 70 78 7-10
Mail: info@koro-ibs.de
Web: www.koro-ibs.de