

# TECHNOLOGY CROSSOVER

Solutions traditionally used for heavy lifting and lowering can also be used to simplify removal of falsework, explains

Pete Ashton



Above left: Strand-jacks were used to lift linkspan deck sections on San Francisco's new Bay Bridge across Oakland Bay. Bigge proposes the same system for removing falsework.

Above right: Spindle jacks in use.

**R**emoving falsework from beneath completed bridge decks can be one of the most awkward tasks facing specialist lifting contractors. Site access is invariably difficult, with numerous obstacles making it difficult to manoeuvre a mobile crane into the desired location. But specialist Bigge has come up with two different solutions for removing falsework that are likely to reduce the cost and time of construction.

The first method is designed specifically for bridge construction projects. Working with Dutch strand-jack manufacturer Hydrospex, whom it represents in America, Bigge has designed a strand-jack specifically for lowering falsework systems in a fast, safe and efficient way.

Strand-jacks are regularly used for lifting heavy deck sections during bridge construction, one most notable recent example being the new Bay Bridge between San Francisco and Oakland. On that job, Bigge used Hydrospex strand-jacks to precision-lift a pair of 1,800t steel spans off a barge to a height of approximately 70m within tolerances of less than a millimetre.

However this versatile technology, which has its roots in concrete prestressing, can also be used for removing temporary works.

The strand-jack methodology for falsework removal is particularly useful for bridge decks that are very high, where the material has to be lowered significant distances to the ground – perhaps even out of reach of the very longest-reaching mobile crane.

Typically, falsework systems are designed to support the temporary formwork necessary for concrete deck

construction. Before pouring the concrete, tubes as small as 16mm, the diameter of a bundle of strands, are placed at positions along the deck, directly above the main falsework support beams. Once the concrete is poured and cured, strand-jacks are placed over the tubes and the strands are threaded through the tubes. On the underside of the new concrete deck, a specially-designed falsework anchor is connected to the strand; this anchor is designed to connect to the I-beam at any location using a simple pin connection. Once they have all been connected to the falsework support beams, the jacks are tensioned and the falsework columns are removed.

All jacks work together to lower the falsework decking to the ground in a single operation. When it is on the ground, the decking system can be safely and efficiently dismantled, which is far safer than working at height.

When the strand-jacks have been removed, the remaining holes in the concrete deck can be filled. Likewise, strand-jacks can also be used in this way for removing formwork.

The second solution that Bigge has devised is to use spindle-jacks in place of custom-sized falsework towers. Typical falsework towers are a combination of pipe columns, timber cribbing, bracing and I-beams. They are usually engineering-intensive and require custom fit-up for each and every support location. Construction of these towers can require large amounts of labour and equipment and hence represent significant expense. What's more, on completion of the project these materials have minimal resale value and if the contractor intends to retain them for

future jobs, a sizeable storage area is required.

Together, Bigge and Hydrospex have developed a replacement technology for these cumbersome falsework towers, using multiple electrically-powered spindle-jacks to support the temporary formwork.

A spindle-jack is essentially an electric-powered adjustable tower which can raise loads of up to 100t to a height of 9m. A positive-threaded collar eliminates the risk of unplanned retraction. Any number of spindle-jacks can be used in series, increasing their lifting capacity, and by use of a single computer they can be synchronised to within 1mm. They have many useful applications in rigging jobs but this enormous potential is yet to be exploited for this type of application.

Small forklifts or cranes can be used to construct the temporary decking at the fully-retracted elevation and it can then be lifted to precisely the right height. Another benefit of the spindle-jack technique is that it requires minimal at-grade civil improvements.

After the concrete has cured, the jacks can be fully retracted, the temporary formwork removed and the equipment relocated to the next location.

Spindle-jacks have the benefit of low capital cost, reduced engineering and site labour costs, and accelerated construction schedules. Additionally, they are light and compact, which minimises transport and storage costs, and they have a high resale value ■

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