SCHWAGER DAVIS INC

PROJECT PORTFOLIO - POST-TENSIONING SYSTEMS

Sakhalin II Offshore Oil & Gas Platform CGBS

Built in the Far East Russian Federation/Installed in the Sea of Japan

IN 2004-2005, SCHWAGER DAVIS, INC. PERFORMED THE LARGEST AMERICAN-SUPPLIED POST-TENSIONING CONTRACT IN ASIA AS PART OF THE LARGEST OFFSHORE DRILLING PROJECT IN RUSSIAN HISTORY. SDI FURNISHED THE QUALITY - CONTROLLED POST-TENSIONING MATERIALS, INSTALLATION LABOR AND ON-SITE PT PROJECT MANAGEMENT, ALL OF WHICH WON AWARDS OF EXCELLENCE FROM THE OWNER AND RESULTED IN THE EARLY DELIVERY OF THE TWO CAST-IN-PLACE CONCRETE GRAVITY BASE STRUCTURES.

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SAKHALIN OFFSHORE OIL & GAS PLATFORM POST-TENSIONING

Challenging the experts' position that mammoth oil and gas projects cannot be fast-tracked, an international construction team has completed the $1 billion Sakhalin II concrete gravity base structures (CGBS) near the port city of Vladivostok, Russia, in a period of only 13 months. This is among the fastest time frames for completion of any offshore oil CGBS ever achieved.

Led by veterans of the Norwegian contractors who built nearly all of the North Sea platforms throughout the 1970s through 1990s, the project taps subset reserves of approx. 1.2 billion barrels of oil and 20 trillion cu ft of natural gas. Yet despite the experience of the project team, location, available workforce and climactic conditions presented a variety of challenges to all involved. The base structures must withstand the heavy seismic conditions of the Asian east coast, large waves and floating icepack that averages ten feet thick for six months of the year. Accordingly, the base towers are thicker, more heavily reinforced and more angular than most CGB structures built to date. This dictated the most complex tower geometries of any slipformed CGBS every built. Moreover, the cultural and language barriers presented other problems to address and overcome.

SDI's post-tensioning of the Sakhalin structures required a total of 2,100 tons of steel, using tendons made up of bundles of 0.6-inch diameter high-strength steel strand and SDI's new bearing plate and anchor head. The slabs of the caissons were post-tensioned in both directions using a total of 376 19-strand tendons with an average length of 330 feet. The tendons were assembled by pushing individual strands through galvanized duct that was placed inside the slabs prior to concreting. Due to their long lengths, the tendons were stressed from live anchorages at both ends using 600-ton capacity hydraulic jacks. The maximum stressing load is 3,775 kN. All tendons were installed, stressed and grouted in a period of only one month for each structure, finishing in December of 2004.

The towers were vertically post-tensioned by a total of 800 site-fabricated tendons, each made up of bundles of twenty-two 0.6-inch strands. The pre-assembled tendons were hoisted by tower cranes and then fed down into the galvanized steel duct embedded in the concrete tower walls. The vertical tendons, averaging 193 feet in length, were configured like rock anchors. The strand tails were first bonded inside the duct for a length of ten feet at the lower end to create a dead-end anchorage, and, after the lower grouted zone achieved strength of 60 MPa, the tendons were stressed from the top anchor head to a maximum load of 4,466 kN. Operations for installation, stressing and final grouting of the vertical tendons began in February and were completed in late May of 2005. SDI's performance and safety records on the project were perfect -- all tendons were installed, stressed and grouted without a single broken strand or lost time incident.