



## Tanks

## Reference Details:

## Owner JV

Regasagunto, Madrid, Spain +++ Main

Contractor SAGGAS, Madrid, Spain +++

## Contractor JV

Regasagunto, Madrid, Spain +++

## Consulting Engineers

DYWIDAG International GmbH, Munich, Germany / SENER, Bilbao, Spain

**DSI Unit** DYWIDAG Sistemas Constructivos (DSC), Fuenlabrada, Spain / DYWIDAG International GmbH, Munich, Germany**DSC Services** Supply and installation of 1,300 t of 9- and 19-0.62"

DYWIDAG Multistrand Tendons; Supply of

9,312 m GEWI®

Threadbars Ø 28 mm with accessories; Rental of technical equipment.

**DYWIDAG Post-Tensioning and Reinforcement Systems secure Liquid Natural Gas Tanks in Sagunto****Construction of two LNG tanks (LNG=Liquid Natural Gas) in Sagunto, Valencia, Spain**

DYWIDAG Sistemas Constructivos (DSC) installed the post-tensioning material for two new 150,000 m<sup>3</sup> LNG tanks. The tanks in the harbor of Sagunto were constructed by JV Regasagunto (ACS, Sener, DYWIDAG International GmbH, TKK and Osaka) under the leadership of SAGGAS (Unión FENOSA, Iberdrola and Endesa). The two LNG tanks were built in the midst of the region with the second largest natural gas consumption. Due to their geographical position they are well suited for the accommodation of liquid gas supplies from North Africa and the Persian Gulf.

The tanks reach a height of 52 m with an inner diameter of 74.0 m and a wall thickness varying between 0.6 and 1.20 m. DSC Services included the supply of DYWIDAG Multistrand Tendons and their complete installation with placing, stressing and grouting. Furthermore, DSC supplied also

GEWI® Threadbars with accessories for splices in construction joints and in subsequently concreted access openings.

The client turned particular attention to the cryogenic suitability of the PT-system and the strand. DSC with support of DSI Technical Service in Munich furnished the proof, that the applied DYWIDAG PT-system with strands meets all criteria of the most demanding standards for construction of LNG tanks. In each LNG tank 12 horizontal DYWIDAG Multistrand Tendons were installed in the bottom slab, 178 in the outside wall and 18 in the ring beam.

The horizontal multistrand tendons consist of 19 strands Ø 0.62" and MA-Anchorage at both ends. The bottom slab was circumferentially post-tensioned with tendons anchored in sections in 6 buttresses shifted by 60 degrees. The Multistrand Tendons were anchored in 4 buttresses placed at 90° centers in the outside wall and in the ring beam of the LNG tanks. The vertical post-tensioning was accomplished by 80 U-shaped DYWIDAG Multistrand Tendons 9x0.62" per tank. This PT-system is also known as loop tendon and consists of two vertical tendons, which are connected at their bottom ends by an 180° arc and anchored at their top ends by MA-Anchorage in the ring beam.

For this project DSC supplied a total of 320 anchorages for DYWIDAG Multistrand Tendons consisting of 9 strands, 832 anchorages for 19 strands, 14,250 m galvanized sheathings with an inner diameter of 80 mm, 51,166 m galvanized sheathings with an inner diameter of 100 mm, 320 pocket formers for Multistrand Tendons consisting of 9 strands and 152 pocket formers for tendons with 19 strands. In addition, 9,312 m GEWI® Threadbars Ø 28 mm as well as 5,300 couplers and nuts for standard and cryogen applications were supplied.

Post-tensioning began with the placing, stressing and grouting of all vertical DYWIDAG Multistrand Tendons. Subsequently the horizontal tendons in the wall - with the exception of the tendons in the area of the access openings of the tanks - as well as 50% of the tendons in the ring beam were post-tensioned. Then the remaining tendons were stressed in the walls, in the bottom slab and in the ring beam to complete the work.

A total of 1,300 t 0.62" DYWIDAG Multistrand Tendons were placed, stressed and grouted from October through December 2004. To complete the required work on schedule DSC employed up to 8 work teams with appropriate equipment.



