# Active Dam Reinforcement with Multistrand Anchors

**PRODUCTS**

*Multistrand Anchors*

**UNIT**

*DSI USA, BU Geotechnics, Toughkenamon, PA, USA*

**LOCATION**

*USA*

**TIMELINE**

*2007-12-31*

**SCOPE**

*Supply*

*Rental of Equipment*

*Installation*

**OWNER**

*Central Hudson Gas & Electric, Poughkeepsie, NY, USA*

The Sturgeon Pool Dam was one of the largest hydroelectric power facilities in the middle Hudson River area, when it was completed in 1922. In order to raise the power output of the dam from 5MW to 15MW by raising the water level behind the dam by 1.2m to 1.5m, some renovations of the dam needed to be done, as well as the construction of an inflatable bladder system.

Sturgeon Pool Lake is fed by the Wallkill River, which has its source in Northern NJ and is one of the few north flowing rivers in North America. Historical records show that the Wallkill River has been harnessed for commercial power use since at least 1628, when it powered commercial flour milling. This was the first commercial use of water power in North America.

The area's topography, the natural basin area of Sturgeon Pool, and the nearby Dashville Waterfalls make the area an excellent location for hydroelectric power generation. Sturgeon Pool has a hydraulic gradient of 34m and a catchment area of 2,000km2. Dashville has a 13m gradient giving a total gradient across both facilities of 47m.

The hydroelectric facility at Sturgeon Pool consists of a concrete gravity dam 33m high and 150m long, and three water turbines producing 5MW of electricity. Water is channeled to the turbines through an intake structure at the southern end of the dam that is connected to 100m long penstocks. Ice and debris are kept from entering the penstocks by a trash rack and rake system.

Central Hudson Gas & Electric (CHG&E), the owner and operator of the facility, determined that it would be feasible to raise the power output of the dam from 5MW to 15MW by raising the water level behind the dam by 1.2m to 1.5m. This would be accomplished by renovations to the dam and the addition of an inflatable bladder system. The increased head required an extensive analysis of the structural capacity of the dam, as well as its ability to withstand 100 year flood events. The result of these analyses showed that the structure needed reinforcing in order to meet State of New York and Federal safety codes.

Structural reinforcing of the dam was accomplished by the installation of 47 epoxy-coated multi-strand anchors. The anchors ranged in size from 12 to 33 strands and lengths from 20m to 60m; anchors were installed along the crest and down stream face of the dam. The crest anchors were vertical while the down stream face anchors were either vertical or battered with batter angles between 10º and 40º.

Installation work was performed by Construction Drilling Inc. (CDI), a long time customer of DYWIDAG-Systems International; all work was performed from barges and temporary decking. The multi-strand anchors were shipped pre- assembled with the anchor head and wedges attached to the epoxy coated strands. Multiple spacers for cable alignment were

appropriately spaced along the length of the cable clusters, and grout tubes were also part of the pre-assembled product. The prefabricated epoxy strand anchors proved easy to install in the field with an appropriately sized crane working off of a barge.

Field verification of the anchor installation was performed by CDI with oversight by DTA, the project engineering firm. The unique creep characteristics of epoxy coated strand had to be taken into account for field testing of the anchors. DSI worked with the contractor CDI and engineering firm DTA to develop a unique PTI based testing procedure specifically for epoxy coated strands. The testing method verified the long term load holding capability of the anchors.