Making Way for Increased Production of Hydroelectric Power in Southern Vermont

Project Summary

PROVIDE FOR MORE PRODUCTION OF ELECTRICITY WHILE KEEPING IMPORTANT LOCAL RECREATION ALIVE

DynoConsult, Dyno Nobel's specialty consulting division, helped this hydroelectric power station in southern Vermont solve unique construction challenges to increase electric production and efficiency for the town.

Background

INEFFICIENT POWER GENERATION WAS THE STATUS QUO FOR THIS HYDROELECTRIC STATION

Originally built to power a marble producing plant, the site was purchased by regional power company who decided to continue generating electrical power for their manufacturing and support the surrounding town.

The project required rehabilitation of the water intake, including the removal of approximately 250 cubic yards of rock, allowing enough water flow to operate an additional two turbines.

Because the dam and intake was built in the early 1900's, there were additional challenges of working around an electrical substation (built within 40 feet of where rock excavation is required) and the original concrete dam (within 20 feet of the excavation point).

Project Goals

EXCAVATE ROCK WITHOUT EXCESSIVE VIBRATION DAMAGE OR MECHANICAL ROCK BREAKING

The team set out to drill and blast as much rock as possible to avoid the use of time consuming and costly

mechanical rock breaking techniques. In addition, the rock needed to be excavated without excessive vibration damage to the existing electrical substation or the 100-year-old concrete dam.

Technology Applied

DigiShot® ELECTRONIC INITIATION SYSTEM ALLOWS FOR ACCURATE DECK TIMING TO CONTROL VIBRATIONS

The initial blasting required a cut of 15 feet of rock to be blasted. The decision was made to use three explosive decks per hole. 2ms delay timing was used between decks with 18ms used between holes, providing 1 deck per 8ms delay.

A seismograph reading recorded at the substation 40 feet from the blast site were 0.21 inches per second. Blast event ground vibration readings on the dam, which was located 20 feet from the blast site, were less than the allowable 2 inches per second as recorded by a third party seismograph monitoring company. Well within the vibration specifications established for this project

DYNO
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Groundbreaking Performance

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Seismograph geophone secured to the concrete foundation on the 100-year old concrete dam

Value Added

COST SAVINGS AND MINIMIZING BLAST RISK

The customer was able to meet excavation schedules in a cost effective manner by using electronic detonators verses more costly mechanical means. A new dam gate assembly was put in place to regulate water flow into the turbines. A 15 foot rock cut was blasted and excavated to allow water flow to the new gate system.

Rock excavation was within 15 feet of the new excavation and construction. Rock was removed in 5 foot lifts using two explosive decks per hole. The pattern was laid out 3ft x 3ft x 5ft deep. Primer was a 0.75 pound cast booster charge was used in each deck yielding 0.9 pounds per cubic yards powder factor. Two rows of 4 holes were used with 1ms between decks, 4ms between holes and 6ms between rows.

The initial blast generated a reading of 0.5 ppv on the dam gate. Subsequent closer blasts developed readings between 1.4 ppv and 5.2 ppv which were deemed acceptable by project engineer. By properly engineering and executing blast designs, using precise and accurate initiation technology, and properly covering the blasts, the material could be safely excavated, making way for the extra water to increase hydroelectrically production.