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Featured Excerpt:

Lost Creek Dam Hydrodemolition Project was a Blast from the Past

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Lost Creek Dam Hydrodemolition Project was a Blast from the Past

By David Pedersen for Midwest Mobile Waterjet

It was like going back from the future when Midwest Mobile Waterjet in St. Paul traveled to Northern California to help repair the 100-year-old Lost Creek Dam this summer.

Because this historic Wild West-like work setting was so remote and extremely constrained, the plan of attack required creative solutions. One involved the new age robotic hydrodemolition equipment that can be remote controlled.

"I have been in the industry for 20 years and this is by far the most challenging project we have done," says Brian Gleeson, vice president at Midwest Mobile Waterjet about this hydrodemolition work.

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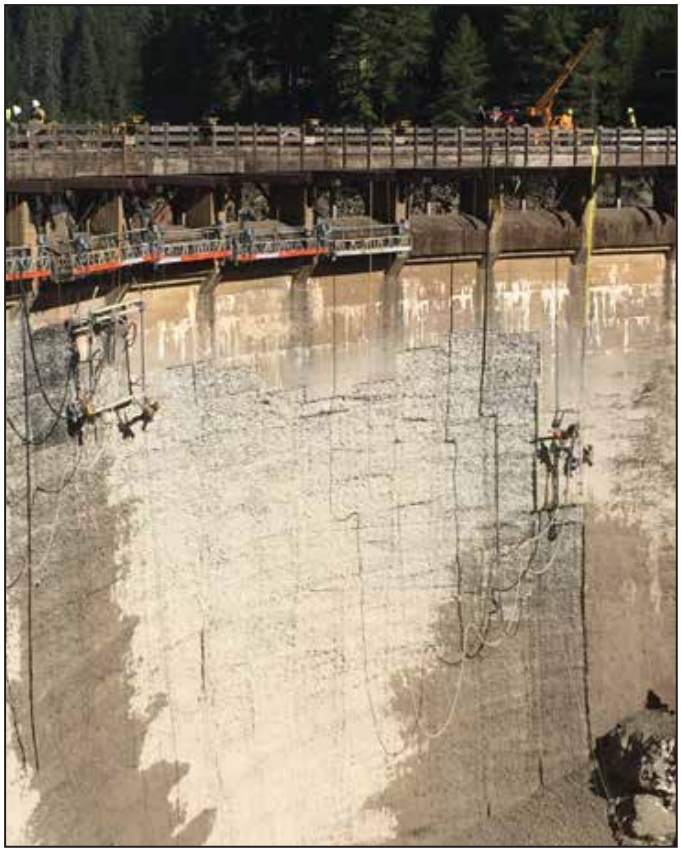
Equipment laydown areas. Three 20,000 psi pumps and water system (not shown) were set up in a very confined space.

Climbers positioning and bolting robotic hydrodemolition tool to the dam face.



Rope climbers proved to be the most efficient method to mount the robotic frames in place for each blasting segment.

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Project managers soon realized there was no "how to" manual written for these rare circumstances. It would be a "learn as you go" venture when resolving unpredictable issues. The word mobile would be the key operative word.

Robotic equipment running its sequence while the operator monitors function using wireless remote.

Hydrodemolition tool during water blasting sequence.

Unsound concrete removal

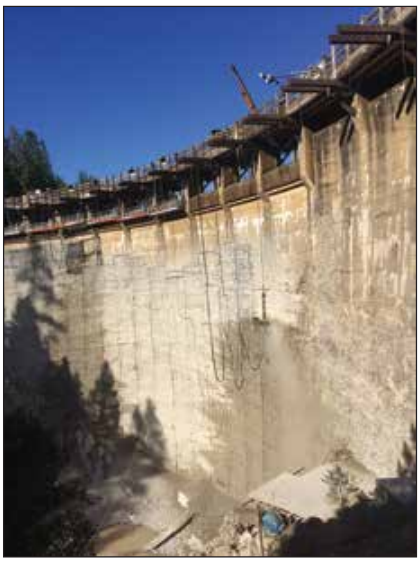
Last spring, modification work began on the Lost Creek Dam north of Sacramento. This dam that is 500 feet wide and 120 feet tall at the center was experiencing some spalling/crumbling concrete resulting from freeze/thaw conditions.

"The dam is more than 20 feet thick at its base and it performs very well structurally," says Shawn Hayse, special projects manager for the South Feather Water & Power Agency. "The primary potential failure mode had more to do with the potential for unprecedented large scale seismic activity that could not have been fully appreciated when the dam was originally designed."

The design specifications required the contractor to remove all unsound concrete from the dam face and attempt to leave only concrete that was a minimum of 1,500 psi compressive strength. Several factors complicated the project that turned out to be far from ordinary in many ways. The reservoir created by the dam would not be drained. The only access into the work site was by old logging dirt roads miles from the nearest paved highway.

Plus, the site had no power, water, phone service and the bridge structure over the top of the dam was a very old timber design with 10,000-pound maximum weight capacity.

There is no access into the creek area below other than by foot and rope. The reservoir behind the dam holds drinking and irrigation water for many areas around Sacramento.



Side view showing both robotic tools - one rotary head and one oscillating head. The choice of tool was dependent on depth required and location of blasting area (crane cable interference).

Hydrodemolition ordered

The engineering firm AECOM was contracted to come up with a method and specification of repairing and modifying the fragile old dam without disrupting the water flow or causing additional structural damage.

After much research and testing to the structure, the AECOM engineers decided that hydrodemolition would be the best method for removal of concrete from the dam face. Robotic hydrodemolition was chosen because it has the unique capability of removing bad concrete while leaving good concrete. It also does not induce vibration that could cause the dam to fail. Hydrodemolition can also be utilized to remove only concrete in a given compressive strength range, which in this case was anything under 1,500 psi.

Robotic tools to the rescue

Midwest Mobile Waterjet was hired to perform this work using custom made robotic hydrodemolition equipment uniquely designed for vertical surfaces. These robotic tools could be set to perform in areas as small as four square feet or as large as 160 square feet in one demolition cycle.

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All functions of the equipment were controlled remotely from operators on the bridge deck or from the ground. Rope climbers proved to be the most efficient method to mount the robotic frames in place for each blasting segment. Removal depths varied from one to 18 inches.

"To get equipment into the site we had to off-load many items off-site and transport using a smaller truck," says Gleeson. "For the large semi-trailer-mounted equipment, we had to use a large front end loader to lift the rear of the trailer and move it sideways in order to make the hairpin turns with steep drops and to avoid large trees."

A need to downsize

One early challenge faced was presented by the weight limit on the bridge structure. The original crane provided was far too large to meet the 10,000-pound weight limit, so Gleeson was able to rent a very unique small Broderson crane that met lift requirements and also the weight limits of the structure.

The next task was to move and position the equipment. The initial concept was to position the demolition tools with the crane and bolt them to the dam face using the available swing stage.

"It became immediately apparent that the swing stage did not have the maneuverability required to reach all areas of the tool needed to secure it to the dam face," notes Gleeson. "After trying several different methods we were able to locate a Reno-based industrial climbing company to assist in mounting the hydro demo tools."

The small crane was used to lower the tool to the area on the dam with the climbers guiding it in and giving direction via radio and hand signals. Once in the correct location, they would drill and anchor the tool to the wall. The crane cable was left attached at all times as a backup in case the tool came loose from the crumbling concrete. The operators would run the tool from the ground using a wireless control system for both the pumps and robot.

"We installed a relay tower on the dam to boost the signal to the robot and pump as the operator often could not see anything on the bridge or the pump lay-down area," adds Gleeson. "All electric equipment was run off an 85 kw generator with multiple voltages and both single and three-phase transformers utilized."

Getting into the flow

Water supply was taken directly from the reservoir using a large submersible pump and pre-filtering prior to sending to the clean water holding tanks. From the holding tanks it was fed to one of three hydrodemolition pumps that were used on the project.

The waste water from the hydrodemolition process was collected in a holding area about 100 feet downstream from the dam. It was pumped back up 120 feet to a water treatment area. The dirty water was filtered and treated to meet the strict California discharge requirements and sent back to the reservoir.

Water test samples were taken on a regular basis and documented to assure the treatment process met all requirements. The dam also had many ground water leaks that created a constant flow of water into the waste water holding area that also had to be collected and treated.

Jumping through hoops

"Working in California is like another planet," Gleeson exclaims. "We had to get licenses, bonded, insured, incorporated and registered to numerous government agencies to meet the state requirements."

The location itself made communication very difficult with the outside world. Midwest Mobile Waterjet rented satellite phones as part of the emergency plan and also for the employees to make calls.

There was no "how to" manual for the challenging and difficult conditions involved in this project. This is nothing new for Gleeson and the company.

"We typically come up with a plan A, B and C and modify plans based on unknown or changing circumstances," notes Gleeson. "Many of our projects are very unique in nature and require custom solutions. We bring every club in the bag, but almost always need to modify as we go."

The three-month long project was finished July 21. The final concrete removal total was 13,000 cubic feet. Most of the time, the project involved four Midwest Mobile Waterjet employees and four climbers.

Midwest Mobile Waterjet is a Minnesota-based contractor specializing in applications from hydrodemolition, hydro-milling, hydro-scarification and waterjet cutting services, as well as cleaning and water blasting utilizing ultra-high pressure waterjetting.

For more information about Midwest Mobile Waterjet, visit: www.midwestmobilewaterjet.com.