

Hydroelectric Generator Cleaning

POWER GENERATION CASE STUDY

SDI SELECT™ 60 PROVIDES DELICATE CLEANING AND HIGH LEVEL AGGRESSION ALL IN ONE UNIT

COMPANY

Coldsweep, Inc.

APPLICATION

Hydroelectric Generator
Cleaning

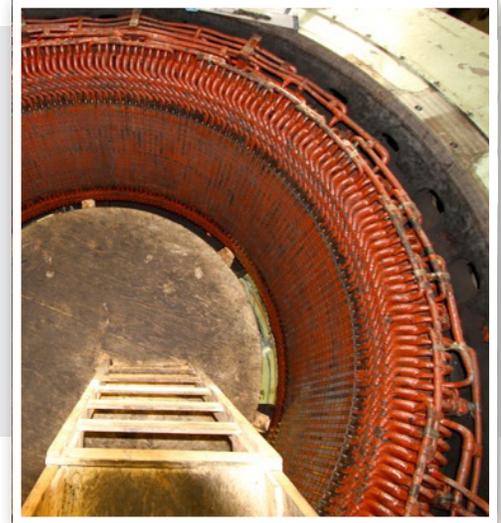
COLD JET SYSTEM

SDI Select 60
SDI-5

BENEFITS

Dry ice cleaning provides a clean-in-place solution, is non-abrasive, non-conductive and non-corrosive.

The SDI Select 60 is a revolutionary dry ice cleaning system that offers the value of delicate cleaning and high-level aggression all in one frame. It successfully cleaned the delicate windings at pressures that varied between 30 and 50 PSI and was also used to clean the cast iron portions of the generator housing at higher pressures up to 125 PSI.



"THE SDI SELECT 60 PROVIDES THE FULL SPECTRUM OF CLEANING CAPABILITY IN ONE EASY TO USE PACKAGE..."

THE SITUATION

A Pacific Gas & Electric (PG&E) hydroelectric generator in California that was originally built in 1920 had been out of service for several years. In order to place the unit back in service, the fragile insulation on the stator needed to be delicately cleaned without causing additional damage to the windings. Coldsweep, Inc. – a company that provides industrial cleaning services to the industry – was contacted for the job.

Coldsweep, Inc. had performed several other industrial cleaning projects for PG&E in Central and Northern California before this project was proposed and has been providing services to some of the most respected names in power generation (GE, PacifiCorp, Tri-State Generation, Army Corps of Engineers, Bureau of Reclamation, Montana PPL, Nevada Power and many others) since 2001.

THE PROBLEM

The unit was in very poor shape and the main concern was to provide a gentle cleaning action that would not damage

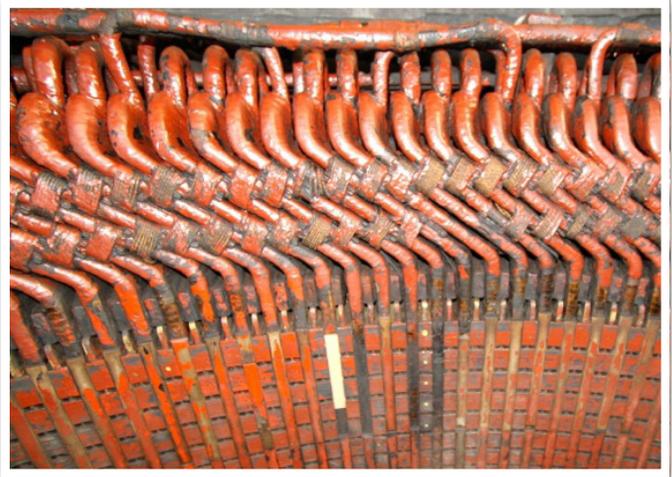
the delicate windings. Generator cleaning projects such as this one require some very delicate cleaning for some areas, but more aggressive cleaning in others. A cleaning solution with the flexibility to do both was needed. In the past, corn cob blasting and brushing or wiping with solvents have been used to attempt generator cleaning. Corn cob blasting has proved to be too messy and hand cleaning with solvents too time and labor-intensive.

Randell Heath, founder and owner of Coldsweep, Inc. suggested dry ice cleaning for this project. Dry ice cleaning provides a clean-in-place solution and is non-abrasive, non-conductive and non-corrosive. It is a completely dry and clean process as it does not use water. The cleaning media, dry ice, sublimates – or converts from a solid to a gas – upon impact, disappearing without adding secondary waste. Dry ice cleaning is environmentally responsible and can safely be used on and around hydroelectric generators. Dry ice cleaning is also able to get into the nooks and crannies that other methods – such as corn cob – cannot.

BEFORE



AFTER



"WITH THE ABILITY TO SHAVE WITH ANY DRY ICE MEDIA, IT ELIMINATES WORRIES ABOUT DRY ICE AVAILABILITY, OPENS UP OPPORTUNITIES FOR NEW TERRITORIES AND APPLICATIONS AND EXPANDS OUR CAPABILITIES. MANY PEOPLE WITHIN THE COMPANY ORIGINALLY FELT THAT THIS GENERATOR MIGHT BE BEYOND SALVAGE, BUT ONCE AGAIN, COLD JET SEEMS TO MAKE THE IMPOSSIBLE A LITTLE EASIER TO ACHIEVE."

THE SOLUTION

"We evaluated a number of cleaning methods, and our analysis found that sand and other forms of media blasting were quite destructive in the restoration of historical property," said Paul Waugh, Collaborative Design Group Lead AP and project manager for the Split Rock Lighthouse Restoration Project. "Finding a solution that would meet all of our restoration needs was going to be quite a challenge for the project." CDG conducted research on dry ice blast cleaning process and found Cold Jet on the Internet. CDG specifically liked the fact that dry ice blasting promoted itself as a method that can clean electric components and will not harm them. Another major factor was that dry ice blasting produces zero residue, unlike soda blasting, and does not generate any secondary waste.

Veit & Company, a Rogers, Minn.- based cleaning contractor, was invited to demonstrate Cold Jet's Aero Series of dry ice blast cleaning systems for CDG and MHS. Dan Gotz, project manager for Veit & Company said, "We were able to demonstrate that Cold Jet's systems were the most effective solutions for the project. The goal was only to remove the loose and flaking paint, mold and surface containments, and putty, and we wanted to do so without damaging the interior or exterior of the lantern room. During our demonstration, what ultimately sold MHS on the process was the fact that we were also able to show that dry ice blast cleaning does not produce secondary waste. Any

paint chips and debris that we removed during the blasting process could be cleaned up using a shop vac."

THE RESULTS

Coldsweep, Inc. had already performed many dry ice cleaning projects for PG&E using Cold Jet's SDI-5 machines but for this job, Heath tested Cold Jet's new SDI Select™ 60 to clean the windings. The SDI Select 60 is a revolutionary dry ice cleaning system that offers the value of delicate cleaning and high-level aggression all in one frame. By accommodating dry ice of any form (pellets, nuggets, block and even leftover scrap ice), the SDI Select 60 offers maximum flexibility for the end user. It can shave ice or direct feed pellets for unlimited control, accommodates all Cold Jet standard Aero accessories and delivers proven cleaning effectiveness on the full spectrum of contract cleaning applications.

"We shaved both block ice and 3 mm rice pellets with ease and experienced no issues," said Heath. "The SDI Select 60 performed wonderfully to clean the delicate windings at pressures that varied between 30 and 50 PSI. The unit was also used to clean the cast iron portions of the generator housing at higher pressures up to 125 PSI. I did not have access to high-pressure air at this worksite, but the possibility of performing three different types of dry ice cleaning (dry ice dusting, traditional and high-pressure) with one machine is very compelling for us. It was especially convenient to be able to place the SDI Select 60 outside of

our containment because it simplified loading the dry ice into the machine. The ability to run 40 feet or more of hose into the work area made this job go twice as fast because there was not enough room for two machines inside the stator bore."

The stator diameter was 10-foot with a 6-foot bore. This project used about 8,000 pounds of dry ice and took about 6 days to complete. This included time to erect containment, perform the dry ice cleaning, wipe down the generator and dismantle the containment.

Several nozzle configurations were used for this project and varied in width/blast swath from .8 inches up to 2 inches. Narrower nozzles were used to clean the fragile portions of the windings and wider nozzles were used to speed up the cleaning in areas that could tolerate more aggressive cleaning. Where there was easy access, longer nozzles were utilized. For the end turns on the top and bottom of this vertical unit, 8-inch long nozzles were used because of the tight working quarters. It was important that the cleaning action could be precisely controlled with various nozzle types and sizes.

Coldsweep, Inc. carefully cleaned the unit, taking care not to over-clean areas that could not tolerate it. The customer was very pleased with the results and brought other hydro users on site to see how they were successfully cleaning the unit. The generator is now fully back in service.

"The SDI Select 60 provides the full spectrum of cleaning capability in one easy to use package," said Heath. "With the ability to shave with any dry ice media, it eliminates worries about dry ice availability, opens up opportunities for new territories and applications and expands our capabilities. Many people within the company originally felt that this generator might be beyond salvage but, once again, Cold Jet seems to make the impossible a little easier to achieve."



CS:2016.06.20