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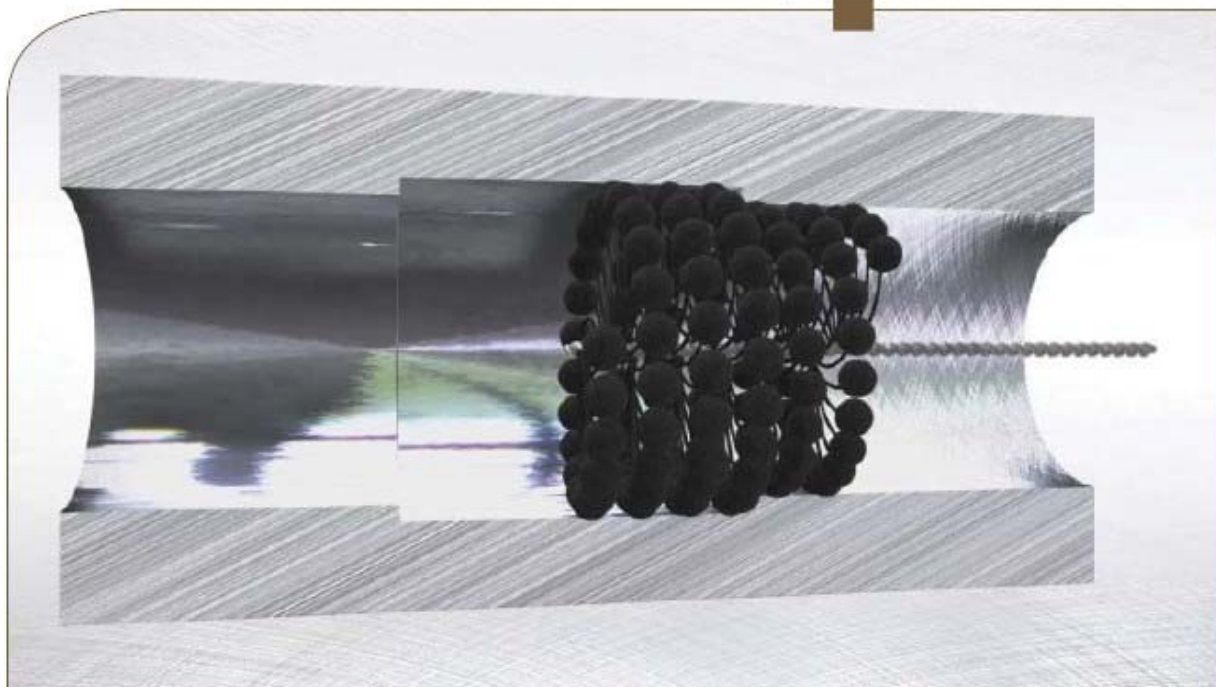
Diablo Canyon Steam Generator Replacement PHOTO STORY

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Pulverizing Oxide Layers

Small, Modular Reactors:
Alternative Path to the
Nuclear Renaissance?





The ball-style hone, developed by Brush Research. Small, abrasive globules are permanently mounted to flexible filaments. Photo, Brush Research.

Pulverizing Oxide Layers

Making short work of nuclear water pipe decontamination can reduce radioactive exposure and waste.

By Ed Sullivan, freelance writer

The decontamination of large-bore water pipes at nuclear power plants is a maintenance challenge, largely due to the production of secondary waste materials and exposure risks to plant employees. For any decontamination system to be considered viable it must minimize secondary waste and be cost-effective to operate and maintain minimal occupational radiation exposure.

Traditional mechanical decontamination includes various grit-blasting techniques using either wet or dry abrasives, but the costs of operating time plus handling and disposal of contaminated blasting media add to the time and expense associated with these methods.

Chemical decontamination techniques provide adequate shielding to minimize occupational risks, but radioactive chemical solutions must be produced in high volumes, making disposal burdensome and expensive.

Whether chemical or mechanical cleanup methods are employed, the cost of service

time plus worker exposure to radioactivity can present economic challenges to nuclear power facilities.

"We normally use mechanical decontamination, which can be very effective but is also expensive," said Dan Stoltz, a radiation protection supervisor at a commercial nuclear plant in the central United States. Stoltz said that it is quite possible for a nuclear power plant to spend many thousands of dollars on blasting oxide layers while not necessarily achieving the lowest radiation levels.

Dose rates are a significant consideration because of Nuclear Regulatory Commission (NRC) limits on annual

millirems (units of radioactivity environmental monitoring) per worker. When dose rates are high in nuclear plant water pipes, more time and manpower may be required to perform pipe decontamination operations.

"We had used grit blasting for this type of operation, but were looking for a more efficient and possibly more effective mechanical method of doing the work," Stoltz said. "One of the ideas we discussed was honing."

Stoltz had seen flexible, ball-type hones used to resurface the cylinder walls of automotive engines and thought such a hone could be made large enough for use in working on a 14-inch (11-1/2 in. I.D.) pipe.

regulations for the minimum pipe wall thickness. Any significant reduction in material could require pipe replacement.

The ideal tool would have to be controllable and flexible enough to operate effectively in pipes that, like most metal pipes, are somewhat elliptical rather than round. Stoltz found Brush Research Manufacturing in Los Angeles, a supplier that offers Flex Hones, flexible, ball-style hones.

Developed by Brush Research, the ball-style hone is characterized by the small, abrasive globules that are permanently mounted to flexible filaments. The product is utilized in the manufacturing marketplace for specialized surfacing, including de-burring, edge-blending, pla-

and type of pipe and conditions, although it wasn't actually radioactive."

Once the hones had shown they would work, Brush made some suggestions about the style and grit of the hone as well as the operating speed (RPMs) to maintain a specific finish on the pipes. Specific applications often require preliminary testing, which is routinely performed by Brush's engineering department and surface-finishing laboratory.

SAVING ON RAD WASTE

Because one of the secondary costs of nuclear plant water pipe decontamination is the disposal of Radioactive Absorbed Dose (RAD) waste, Stoltz was interested in seeing how much expense could be eliminated by using the flexible hone. Sandblasting and other mechanical methods of pipe decontamination produce a considerable amount of RAD waste above and beyond the oxide layer because the blast media becomes part of the waste. There is a need to decontaminate the blast tool itself because it, too, becomes contaminated while doing the decon work.

Sometimes referred to as a "dingleberry hone," the flexible hone uses some grit, which requires cleanup along with the pulverized oxide layer but since the Flex-Hone uses no media other than the balls of grit on its filaments, the RAD waste and associated disposal costs are reduced. The cleanup process is less rigorous, too, and the Flex-Hone is considered a disposable so it requires no decontamination after use in a radioactive pipe.

EXPEDITING DECON

Aquilex WSI Nuclear Services, a welding solutions provider for major industries including the energy, petrochemical, steel and pulp and paper sectors, was one of the first contractors to use the flexible hone for removal of radioactive oxides from water pipes in nuclear power plants. Aquilex has used the flexible hone to decontaminate water pipes in nuclear



The Flex-Hone, used for decontamination of large-bore water pipes at a nuclear power plant. The tool is considered disposable so it requires no decontamination after use in a radioactive pipe. Photo, Brush Research.

"Also, the hone would have to be aggressive enough to remove the tough radioactive oxide layer from the pipe, but controllable so that it would remove very little of the pipe metal," he said.

Limiting the amount of pipe metal removed is important because of NRC

teau honing and deglazing.

"I contacted Brush Research and discussed our potential application," Stoltz said. "The engineering department made some recommendations and sent some different hone models. We installed a test facility, equipping it with the same size

plants located in Spain and the U.S.

"What initially led to our interest in the flexible hone was surface preparation of pipes we were going to repair by welding," said Mark Stoutamire, Aquilex engineering manager. "This tool could be lowered and controlled in such a way that it would remove material inside pipes workers could not reach. In some situations that may involve removing a layer of radioactive oxide, so we decided that would also be an excellent application for the tool."

Aquilex worked with Brush Research to determine the proper abrasives for their Flex-Hone, as well as the appropriate speeds for tool operation.

"Because it is a contour-following tool

rather than the typical rigid hone, you can control the amount of pipe metal removed, rather than reaming it round and possibly violating NRC pipe thickness requirements," said Stoutamire.


LOWERING MREM AND COST

Excessive dose exposure can limit workers' availability. Using the Flex-Hone can reduce mrem (man-hours of radioactivity environmental monitoring).

"This flexible honing method reduced dose rates from about 700 mrem per hour to approximately 100 mrem," Stoltz said. "Contamination levels were also reduced significantly."

In the decontamination of nuclear water piping, much of the cost comes down to

the time consumed to do the work.

For the recent decontamination project, there was originally a 14-hour window requested by the decon service contractor to perform the work, four hours of which were for prep work and cleanup. Use of the flexible hone cut the remaining eight hours budgeted to only one hour of honing through the oxide layer. In the nuclear power plant industry such decontamination can cost up to \$40,000 per hour, so the savings in just the honing operation were quite significant. 

Author: Ed Sullivan is a Hermosa Beach, Calif.-based writer. He has researched and written about high technologies, health care, finance and real estate for more than 25 years.



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