



With a \$1.2 million price tag, Idaho National Laboratory (INL) spared no expense modifying three Gradall XL-5200 excavators to handle the demands of removing radioactive material for the Idaho Cleanup Project.

## GOING NUCLEAR

Modified excavators used to remove nuclear waste;  
oil change intervals extended to several years; radioactive protection

**BY DAWN M. GESKE**

In an effort to clean up 40 acres of radioactive material as part of the Idaho Cleanup Project, Idaho National Laboratory (INL) has constructed what may be considered an excavator on steroids. These heavily modified Gradall XL-5200s are decked out with a series of ventilation, filtration and fire suppression systems to protect the operator from radioactive exposure and extend the maintenance intervals on the machines as long as possible over the full length of the seven-year project.

With the first phase of the nuclear waste removal project expected to wrap up in 2012, INL will remove a total of four acres of scattered transuranic waste from the 40 acre Idaho Falls, Idaho, location through funding from the Department of Energy (DOE). The radioactive material was buried more than 40 years ago as part of World War II-era conventional

weapon R&D and commercial nuclear power plant research that occurred at the site.

The project will include demolishing several nuclear reactors and removing spent nuclear fuel, radioactive storage bins and radioactive experimentation labs as well as digging up plutonium process waste, which was brought from the Rocky Flats plant, a weapons production facility in Denver, Colo.

"They built the very first nuclear reactor ever here," said Dr. Thor Zollinger, senior consulting engineer at INL. "That's what the site started as, so it naturally had some nuclear waste which led to waste storage. Tailings ended up in 55 gal. drums and buried along with barrels of radioactive clothing, tools, motors and junk like that."

To remove the radioactive material from the site, INL must dig down 30 ft. to the bedrock, which is covered by 10 ft. of earth and backfilled with 10 to

15 ft. of gravel. The waste layer to be removed is about 15 ft. thick and was quarantined under two steel-beam arched dome structures. Once removed, the radioactive waste will be sorted, sealed in drums and shipped to the Waste Isolation Pilot Plant in New Mexico.

Three XL-5200 Gradall excavators, which have been modified by INL and Caterpillar dealer Western States Cat to withstand the radioactive effects of the site, will do all the digging.

"When we're all through modifying them they're almost 70,000 lb.," said Zollinger. "We put a lot of weight on there. They start at around 50,000 lb. Each of the excavators ends up being \$1.2 million by the time we get done with it. They're about \$350,000 brand new and then we put another two times that into it before we drive it into the building."

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standard XL-5200 models powered by a 5.9 L six-cylinder Cummins 6BTA5.9 turbocharged, aftercooled diesel engine rated 175 hp at 2100 rpm. INL extends the oil change intervals on the engines by installing a puraDYN PFTI bypass filtration system and using Amsoil synthetic oil. The puraDYN system is also installed on the excavators' hydraulic system, which together, INL anticipates, will extend the engine and hydraulic oil change intervals to several years.

"We want to be able to put the excavators in these buildings and cut the maintenance to the absolute minimum," said Zollinger. "We want to minimize the amount of work we have to do on them, so having an excavator that has high filtration on the oil for us makes sense.

"The reason we can get away with that is because the puraDYN systems filter to below a micron and remove all of the abrasive waste out of the oil. With the filtration and synthetic oil, we don't anticipate having to change the oil very often while we're running the machines."

INL selected the puraDYN filtration systems for the excavators following an evaluation by the DOE. In the study, 11 diesel-powered buses and six gasoline-powered Chevy Tahoes, used to transport employees to the

cleanup site, were equipped with puraDYN filters. More than 1.3 million accumulated test miles found extended oil change intervals with payback between 72,000 and 144,000 miles on the buses and 66,000 to 69,000 miles on the Tahoes.

By using the puraDYN filtration systems on the excavators, INL said it is not only able to extend the maintenance intervals of the machines, it is able to reduce the costs associated with frequent oil changes and the amount of waste created by these

changes. The puraDYN systems are also designed to reduce wear and tear by eliminating particles in the oil, which is ideal for the demands and environment of the clean-up project, said INL.

The excavators are also equipped with an Extengine Maxtrap soot filter on the exhaust and an Auragen 8 kW hydraulic generator to power all the extras INL has installed. Filters are also incorporated on all the breather lines and the crankcase to keep radioactive particles out of the oil.

While one of the excavators is controlled by a Hardline remote transmitter and operators are heavily suited and masked in plastic and cloth suits, the cab environment of the excavators has undergone a serious redesign to provide extra protection for the operators. The cab is thoroughly sealed and ventilated with a custom ventilation fan, HEPA filters and a Red Dot HVAC controller. Eight hours of bottled oxygen is stored on the excavators along with a radioactive particle sampler and a cab differential pressure alarm as a precaution.

The cab also has additional work lights, nine CCTV cameras, a Kenco quick coupler, custom joystick controllers and a depth monitor for physical positioning of the bucket relative to the cab. Windows were also



**Engine and hydraulic oil change intervals were extended on the excavators by installing puraDYN's PFTI bypass filtration systems. INL anticipates the puraDYN system will extend the engine and hydraulic oil change intervals on the machines to several years.**



The bucket on the excavators was also specialized to incorporate a knuckle boom, narrow ditching bucket with a thumb and splaying tool.

replaced with 0.5 in. thick Lexan glass to prevent breakage.

Because of the potential for fire, INL has installed an Ansul fire suppression system in the engine compartment, and

a customized dust suppression system is mounted to the back end of the excavators. An EMCCO Wheaton automatic fueling system also provides refueling.

Even the bucket on the excavator is

specialized, incorporating a knuckle boom, narrow ditching bucket with a thumb and splaying tool. "The boom rotates so I can flip it upside down," said Zollinger. "We ram the tips of the splay tool into a drum. Then, it separates the tips and rips the drum in half. You can also use the tongs to pick through items."

By the time the Idaho Cleanup Project is completed in 2012, more than 4,828,998 cu.ft. of waste is expected to be removed from the Idaho Falls site. It will then be decided if further removal is needed. The location is undergoing cleanup at five major geographic areas: the Idaho Nuclear Technology and Engineering Center, the Power Burst facility, the Reactor Technology Complex, the Radioactive Waste Management Complex and the Test Area North.