

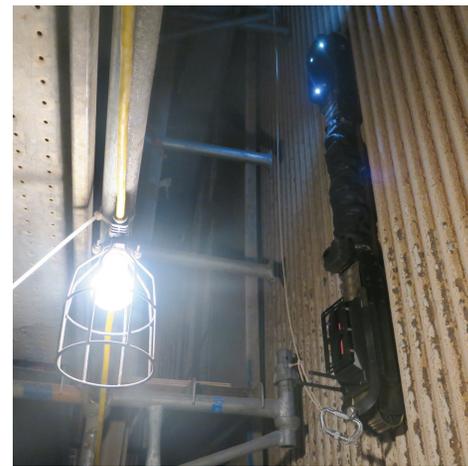
Boiler Leak, Debris & Hazard



Situation

Ameren Missouri, a large utility and power generation company in the Midwest wished to augment the inspection process for its power plants and assets by using crawlers for remote visual inspection (RVI). The company, having explored other solutions in the past, hoped to improve its maintenance planning and inspection efficacy by capturing high-quality visual data that would give an accurate assessment of the boiler's condition. This data could then be used to streamline the scope of the maintenance and reduce projected asset downtime.

During a boiler outage, the inspection crew must conduct a full inspection before maintenance and repair processes can begin. After the boiler has been shut down, cooled and cleaned, the team must rigorously inspect the components for high-pressure steam leaks and gauge the extent of slag and hazardous material buildup.



Guardian S robot climbing boiler walls

“With safety in the front of our minds at all times, one of the best ways to mitigate a hazard is preventing a coworker from dealing with it in the first place. The Guardian S robot does that by going into confined spaces in place of a person. That’s a plus in my eyes.”

– David Strubberg, Director of Innovation, Programs & IT Projects

Ameren chose the Guardian™ S mobile inspection platform

for its ability to maneuver in tight spaces, twists and turns, and complex terrain – all while collecting high-quality data. The robot completed a successful first look visual inspection of the boiler’s superheaters and waterwall tubes to determine the amount of slag, the location of leaks, and the extent of repairs needed.

To date, Ameren had conducted manual visual asset inspections. Using tools such as borescopes or cameras attached to sticks, inspectors crawled through the drums and headers capturing images of the assets to ensure screens and tube orifices remain free of debris or structural issues. To assess slag build-up in the furnace, inspectors entered the furnace suspended 200 feet in the air in a skylifter. Getting an accurate picture of the asset’s condition, especially its components at high elevations and in confined spaces, has been difficult.

Using the Guardian S robot to visually inspect the confined spaces and challenging terrain inside of the boiler, Ameren could address their inspection needs for both planned and forced asset outages throughout its facilities.

The Guardian S robot was inserted through a manway

in the upper third portion of the boiler and attached to the radiant boiler walls. The operator guided the robot up slag-encrusted walls and surfaces to visually inspect and capture footage of the pendant superheaters hanging from the boiler roof.

“ I think there are all kinds of possibilities for this technology in our company. – David Strubberg ”



Water wall header entrance

The lower water wall headers were similarly inspected. The robot was inserted into the mud drum to access the tube penetrations. The operator guided the robot inside the header to visually inspect the asset while watching its progress on the control unit screen.

The Guardian S first-look visual inspection robot successfully climbed vertical furnace walls, traversed across the waterwall tubes and the difficult, unstructured boiler terrain. The robot was able to access the necessary areas in the top of the boiler to assess the slag build-up on the pendant super heaters, and to enter the hard-to-reach headers below to inspect for leaks and material build-up.

Results

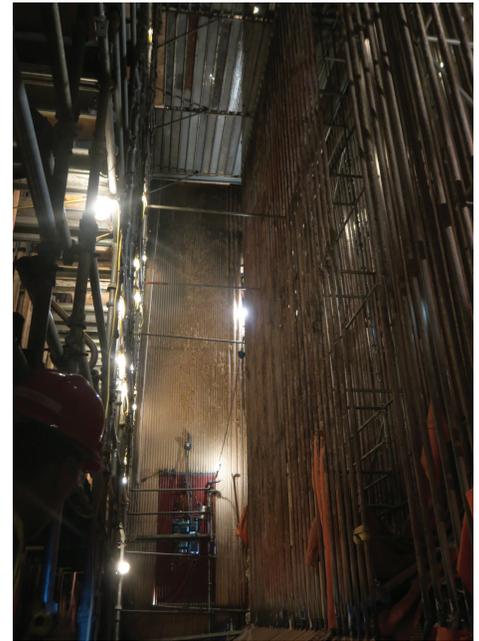
Ameren confirmed that the Guardian S inspection platform would augment and positively contribute to both planned and forced outage missions through increased employee safety and significant financial savings.

- Using the Guardian S robot eliminated the need for employees to enter the mud drums, significantly reducing safety risks associated with an inspection. Ameren calculates a reduction of 16-32 man-hours to complete the mud drum inspections with the Guardian S robot.
- For forced outages due to boiler tube leaks, the robot completed a first-look inspection in one day, versus the typical 3-5 days. Early visibility into potential damages gave Ameren more time to prepare a better maintenance plan— understanding how long the unit would be down and purchasing replacement power sooner. With such informed decisions, Ameren can shorten the time boiler units are out of service and help minimize O&M expenses.
- With real-time and post-mission visual data, Ameren was able to visually gauge the extent of damage and repair needed, enabling the O&M team to optimize inspection resource planning with more accurate cost and downtime estimates.

Ameren believes that the ROI for the Guardian S inspection robot is especially compelling, considering that the robot's multi-purpose platform can be leveraged for many other inspection scenarios to further increase worker safety.

Ameren plans to use the high-definition video and imagery collected over time to move towards a more condition-based maintenance planning practice, scheduling asset repairs by their actual condition rather than on a time-based formula. Such preventative maintenance protocols will help streamline overall downtime opportunity costs, including people resources, parts, tools, infrastructure, and the need to procure replacement alternative energy for its energy customers.

After a successful pilot, Ameren purchased the Guardian S and plans to deploy it throughout its locations for remote visual inspections.



Hazardous heights over 200 feet

Worker Safety

Reduced time spent in hazardous or confined spaces

Faster Inspection

Waterwall: reduced by 16-32 hrs.
Boiler leak: reduced by 2-4 days

Optimized Planning

Real-time & post-mission visual data optimized inspection and maintenance resource planning