CHEMICAL

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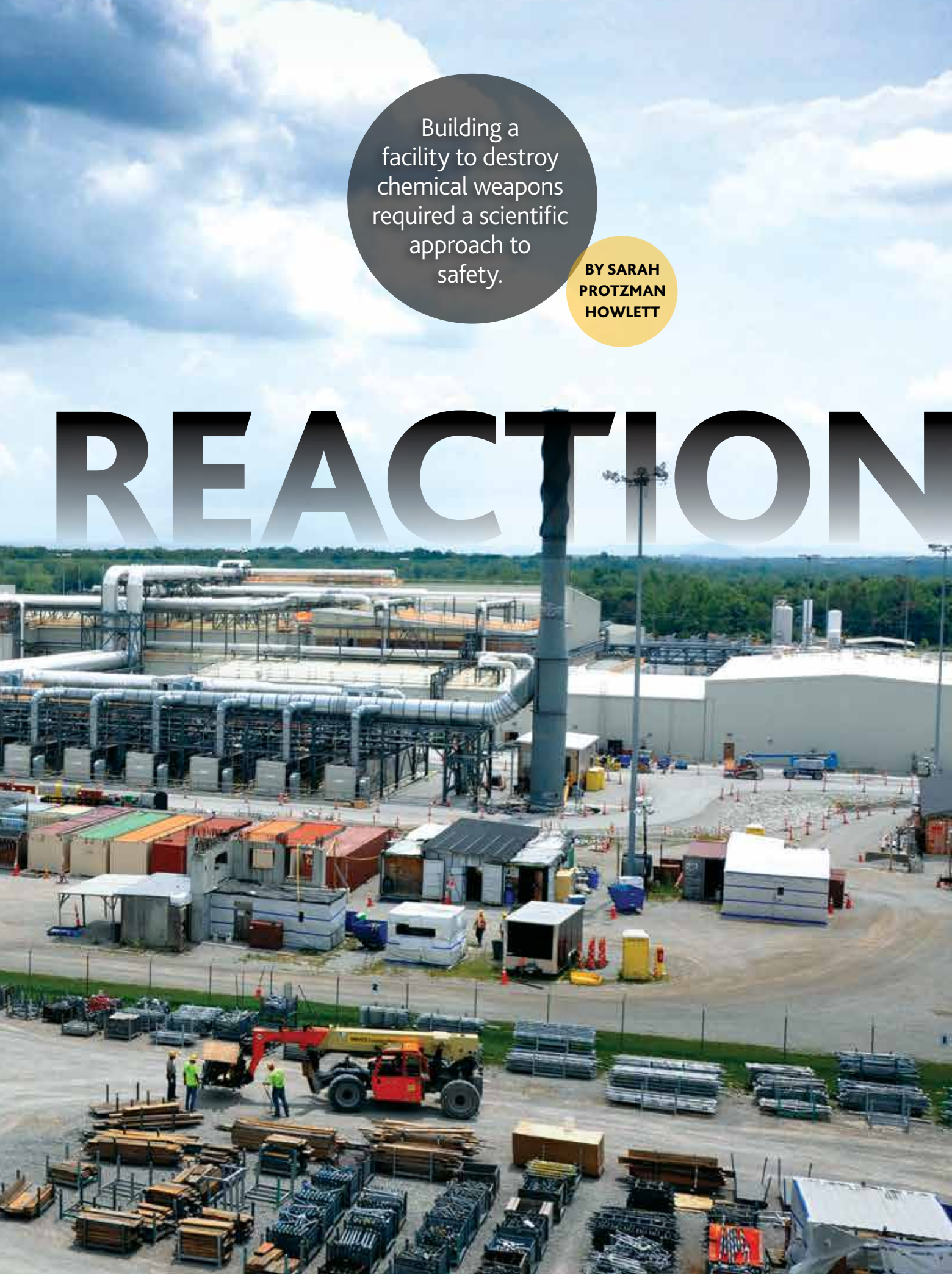
REACTION

Building a facility to destroy chemical weapons required a scientific approach to safety.

BY SARAH PROTZMAN HOWLETT



Workers inspect chemical weapons at the Blue Grass Army Depot, Richmond, Kentucky, USA.

THE WAR ON CHEMICAL WARFARE ISN'T OVER YET—BUT THE END IS GETTING CLOSER.

In 1997, 192 countries and territories signed the Chemical Weapons Convention treaty, which banned chemical warfare. The result of decades of diplomacy, this agreement has sparked a long succession of projects to eliminate chemical weapons, such as nerve and mustard agent and chlorine gas, from military stockpiles around the world.

Wiping these weapons from the face of the earth has been an arduous process. The 13-year, US$5.3 billion chemical agent destruction plant project in Richmond, Kentucky, USA, is a case in point.

A joint venture by engineering firms Bechtel and

PHOTO COURTESY BLUE GRASS ARMY DEPOT

Parsons and the U.S. Department of Defense, the project aims to design, construct and test a facility that will allow the U.S. government to destroy 523 tons of nerve and mustard agent in rockets and artillery projectiles stored at the Blue Grass Army Depot. But before the facility can begin chemical remediation in 2020, the team must develop and test destruction equipment to make sure it works safely—and complies with relevant regulations, says Douglas Omichinski, PMP, corporate manager of construction and principal vice president, Bechtel, Houston, Texas, USA.

"All this has to be demonstrated," he says. "We are using 10,000 dummy rounds to test, but also to demonstrate that the operations team knows what to do in [crisis] conditions. You simulate everything—even an operator having a heart attack in a bubble suit."

LITMUS TESTS

When the project's primary construction phase was completed in October 2015, the Blue Grass plant became the ninth chemical weapons destruction facility in the United States—seven of which already have finished destroying their stockpiles. So Blue Grass project managers had a wealth of experience and lessons learned from which to pull.

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—Douglas Omichinski, PMP, Bechtel, Houston, Texas, USA

Jeff Brubaker, the site project manager, has worked for the government-sponsored chemical destruction program for 27 years. He says the construction material selection, layout design and weapons-handling protocol for Blue Grass all relied on lessons learned. For instance, the team knew it was necessary to install backup generators so the sophisticated ventilation system that prevents deadly agent vapor from seeping into work areas never shuts down.

"There was a robust exchange of lessons," says Mr. Omichinski, who served as life-cycle project manager for Bechtel on the Blue Grass project and worked on similar chemical weapons destruction facility projects in the U.S. in Aberdeen, Maryland; Anniston, Alabama; and Pueblo, Colorado.

CHANGING STATES

Yet, the Blue Grass team couldn't simply copy and paste previous project plans. In fact, some of the

REACTION TIME

2003: The U.S. Department of Defense awards the Bechtel Parsons Blue Grass team the contract to design, build, systemize, operate and close the facility.

2004: Initial design for facility is completed.

2005: Department of Defense orders redesign of facility to meet budget and timeline.

2006: Construction begins.

2008: Placement of concrete foundation begins for the building where chemical agents will be neutralized. A 138kV electrical substation is installed to provide power to the pilot plant.

2010: Department of Defense accepts final designs for facility.

2012: Construction is 60 percent completed. Facility receives Voluntary Protection Program certification from the Occupational Safety and Health Administration.

2013: Construction is 75 percent complete, including structural steel on main facility.

2014: Testing of equipment begins, including destruction of dummy weapons.

October 2015: Construction of primary facility completed.

November 2016: Construction of separate static-detonation chamber scheduled to be complete.

TALENT SPOTLIGHT

Douglas Omichinski, PMP, corporate manager of construction and principal vice president, Bechtel

Location:
Houston, Texas, USA

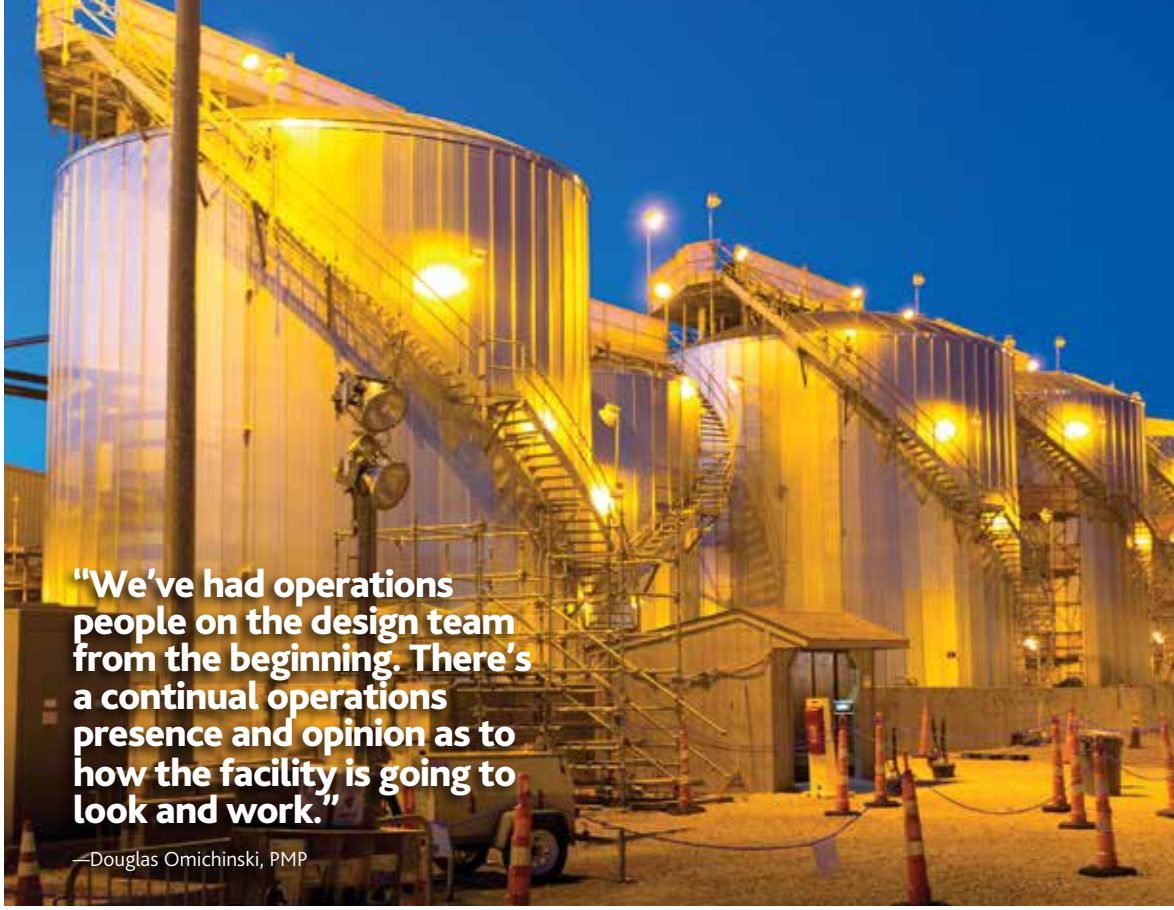
Experience: 35 years

Other notable projects:

1. Mosjoen Carbon Anode Facility, Mosjøen, Norway, a commercial mining project near the Arctic Circle that was completed in 2007. Mr. Omichinski was site construction manager.

2. Diablo Canyon Nuclear Power Plant in Avila Beach, California, USA. Mr. Omichinski served as field engineer for the project that completed in 1984.

Career lesson learned:
"Establishing a culture of accountability on a project is paramount for success. The project team must collectively agree to the key results they want to accomplish on the project, and then empower themselves to overcome the difficult obstacles to get the results they want, with full management support."



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project's most distinct requirements came as a surprise. In 2011, Mr. Brubaker's team discovered the projectiles that contained mustard agents—liquid at the time of production some 70 years ago—had solidified. That meant the plant would not be able to destroy these weapons by draining the mustard and neutralizing it.

The new destruction method and its accompanying equipment required a static-detonation chamber that couldn't be incorporated into the main plant. So the team had to adjust the scope to include a separate facility next door—which required the Army Corps of Engineers to approve a new design. Construction of that facility is scheduled to be completed in November 2016. "It was a significant change," Mr. Brubaker says. "The static-detonation chamber is basically a three-level apparatus. With the first facility's layout, we just couldn't have accommodated that."

The change raised concerns for local safety advocates, including the Kentucky Chemical Demilitarization Citizens Advisory Commission (CAC), a stakeholder group made up of local leaders from various industries. "Their eyes got wide," Mr. Brubaker says. But his team gave CAC members a tour of a similar static detonation chamber at the Anniston plant and shared an environmental assessment report stating that the new technique would be safe and effective.

PRINCIPLE OF CONTINUITY

Although the construction project team never had to handle chemical weapons, every move it made impacted those who ultimately will. So, project managers worked hand in hand with the operations team to ensure the design and construction met all its requirements and safety preferences, Mr. Omichinski says.

For instance, when the team was building the small explosion-containment rooms to destroy nerve-agent rockets—rooms that have floors that are 4 feet (1.2 meters) thick, and walls and ceilings that are 2 feet (61 centimeters) thick—the operations team used 3-D models to replicate operators' tasks and ensure they would have the ability to move around without damaging equipment or puncturing safety suits.

"The one thing about this project that's very unique is that we've had operations people on the design team from the beginning," Mr. Omichinski says. "There's a continual operations presence and opinion as to how the facility is going to look and work."

COMPOUND ELEMENTS

Managing safety and compliance risks also required creating a cohesive and well-trained team. The team established a goal of having 800 craft laborers on-site most days, Mr. Omichinski says. But to find enough qualified team members, he had to expand

Project manager Jeff Brubaker briefs visitors on progress.

"Eliminating chemical weapons means a safer community and world."

—Jeff Brubaker, Blue Grass Chemical Agent-Destruction Pilot Plant, Richmond, Kentucky, USA

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—Douglas Omichinski, PMP

his search beyond Kentucky—a risk the team anticipated, because of its early labor and talent studies. "The risk with traveling workers is that they might find work closer to home [and leave the project]—something you have to plan for," he says.

Creating a strong work safety culture also required unifying a team of people from five different companies—including subcontractors who had been competitors—around a shared vision, Mr. Omichinski says.

"When I came on-site, it was more of a take-a-risk type culture than one of compliance and being your brother's keeper," he says. "We had to work pretty hard for the buy-in from our craft to our professionals."

Getting everyone to agree that safety was a priority required senior leaders to increase their visibility on-site. And he personally attended training sessions with new members to ensure the importance of safety was being clearly communicated.

"I wanted a culture where people could stop the work if they suspected something was about to go wrong, where they had a questioning attitude in order to avoid those incidents," he says. "There was no reason we shouldn't be at zero accidents."

Mr. Omichinski also brought in a third-party company that specialized in mergers, which he says encouraged accountability and helped teams set and share common goals, such as creating a seamless transition from the construction team to the startup and systemization teams. From senior leadership all the way down to junior associates, he says, it was important everyone felt they were part of a mission to control chemical weapons.

The hands-on approach produced real results. By the end of 2015, during peak construction and systemization, there had been only four recorded work accidents—an 82 percent decrease from the single-year project high of 29 in 2012. And as of February 2016, all construction except for the static-detonation chamber was complete and systems testing was 45 percent complete. That means facility operations should begin on time, and the United States will be one step closer to full compliance with the international treaty—and destroying its last stockpile of chemical weapons, Mr. Brubaker says.

"Eliminating chemical weapons means a safer community and world." **PM**