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# Engineering the DOE's Largest-Ever Ventilation System at WIPP

“Curtiss-Wright built, integrated, and tested an advanced digital control system that supports non-safety and safety-significant operations. The new system has expanded capacity at the nation’s premier underground nuclear waste facility.”

# A Critical Mission to Restore Airflow and Safety

The U.S. Department of Energy (DOE), in partnership with Curtiss-Wright and other key contractors, launched one of its most ambitious infrastructure efforts at the Waste Isolation Pilot Plant (WIPP) in New Mexico—home to the nation’s only deep geologic repository for defense-related transuranic waste. With the stated goal to increase underground airflow more than threefold, the DOE initiated two major capital projects: the construction of a new utility shaft and the implementation of the Safety Significant Confinement Ventilation System (SSCVS).

The goal of this \$500 million effort was to restore operations levels that had been reduced in the wake of a 2014 underground fire. The new SSCVS, now the largest ventilation system in the DOE complex, was designed to boost airflow from 170,000 to 540,000 cubic feet per minute (CFM). The new SSCVS required not only advanced mechanical systems but also a highly integrated and safety-compliant instrumentation and control (I&C) system.

This monumental DOE initiative marks a cornerstone in the long-term strategy for transuranic waste disposal in the U.S. The waste consists of items contaminated with small amounts of plutonium and other human made radioactive elements. It has been accumulating since the 1940s as part of the U.S. nuclear defense program. So far, the Department of Energy has completed cleanup at 22 sites nationwide. The SSCVS not only restores but enhances WIPP’s capacity to safely carry out its mission for decades, reinforcing the site’s role as a national asset in nuclear waste management.

## Project Snapshot

### Challenge:

Restore full underground airflow at WIPP to support safe waste emplacement after ventilation capacity had been reduced due to fire damage.

### Solution:

Curtiss-Wright delivered a fully integrated instrumentation and controls system, including HMI, sensors, logic programming, and turnkey dampers.

### Results:

The Safety Significant Confinement Ventilation System (SSCVS) now enables 540,000 cubic feet per minute (CFM) of airflow and safe repository operation, with DOE-compliant, fully traceable controls commissioned and in operation.



Interior of the New Filter Building at WIPP, showing completed HEPA filter arrays and airflow control systems powering the Safety Significant Confinement Ventilation System (SSCVS) [Public domain, U.S. DOE]

## Engineering an Intelligent, Integrated Control System

Curtiss-Wright's Plant Information Monitoring and Controls (PIMC) team, based in Idaho Falls, partnered with Salado Isolation Mining Contractors, LLC (SIMCO)<sup>1</sup> and other DOE contractors to deliver a complete I&C solution for the SSCVS. PIMC scope included design and implementation of the primary I&C system that operators use to control major subsystems and equipment across the Salt Reduction Building and New Filter Building.

"Curtiss-Wright designed and delivered the main I&C system that plant operators use to control all of the major subsystems and equipment in the plant," says Robert Ammon, Curtiss-Wright's lead engineer for the project. "This is all brand new. It replaced WIPP's existing plant ventilation system with new buildings, new ventilation equipment, and new control systems for all the industrial components, including 1,000 horsepower fans and 22 immense filters that are each 12 feet wide, 16 feet long, and eight feet tall."

The Curtiss-Wright team developed the I/O interfaces, programmed all the control logic, and created the human-machine interface (HMI) displays that operators use to monitor and manage the system. These displays provided intuitive, real-time control capabilities across the facility, enabling operators to configure systems, monitor performance, and respond swiftly to changing conditions. Curtiss-Wright also supplied most of the instrumentation, including flow meters, temperature sensors, and pressure sensors, primarily sourced from Rosemount and Endress+Hauser.

"Curtiss-Wright helped us identify gaps in the specification and came up with solutions to those gaps," says a contracted supply chain manager, who requested anonymity due to a corporate policy. "It was evident during proposal reviews that their team had a solid understanding of how this was going to play out and what troubleshooting was required."

The system includes both safety-significant components—that met all DOE nuclear safety requirements—as well as non-safety Balance of Plant (BOP) elements. Curtiss-Wright completed commercial-grade dedication of critical components, performed two Factory Acceptance Tests (FATs) for the BOP system and Safety Significant system to include safety hardware and software functions, and supported commissioning and Site Acceptance Testing (SAT) at the WIPP facility.



A control panel undergoes testing at the newly constructed Safety Significant Confinement Ventilation System [public domain, U.S. DOE]

*"Curtiss-Wright completed the scope including end-to-end traceability from a quality perspective," adds the supply chain manager. "They developed a completely integrated system that operates and functions as it was intended."*

As part of the broader modernization effort, the Curtiss-Wright team also evaluated and replaced aging local processing units (LPUs) and Programmable Logic Controllers (PLCs) within WIPP's Central Monitoring System (CMS). These legacy systems were prone to single-point failures and costly repairs, making them unsustainable for long-term facility management. The upgraded control infrastructure provides a robust, future-ready foundation for safe and efficient operations, supporting WIPP operations for many years to come.

Curtiss-Wright delivered turnkey functionality for critical components, including the dampers. "When we sent out the RFPs for this project, Curtiss-Wright proposed a solution not only to integrate those systems, but also to supply the dampers as a full turnkey integrator," the supply chain manager confirms.

1: Salado Isolation Mining Contractors, LLC (SIMCO) was formed to support the mission of the U.S. Department of Energy's Waste Isolation Pilot Plant. SIMCO's member is Bechtel National Inc. and its WIPP team includes Los Alamos Technical Associates as a New Mexico based teaming subcontractor.

# Enabling Full-Capacity Operations for Decades to Come

Construction of the SSCVS was completed in June 2024, and Curtiss-Wright's systems were instrumental in its commissioning. The team overcame significant challenges during the COVID period. From navigating supply chain constraints to adapting commissioning timelines under pandemic-related restrictions, Curtiss-Wright maintained steady progress and upheld quality standards throughout.

Through the collaborative work of Curtiss-Wright, SIMCO, and other contractors, the project achieved a new benchmark for integrated safety, engineering precision, and operational readiness. Today, the new ventilation system operates in tandem with the utility shaft to support full-capacity, safe operations at WIPP.

*"The Curtiss-Wright team demonstrated their expertise with instrumentation and control systems, distributed control systems, display systems, and data acquisition systems," concludes the supply chain manager. "We look forward to future collaborations."*

## SSCVS Project Scope Summary

The SSCVS is a cornerstone modernization effort at WIPP, designed to:

- Increase airflow to 540,000 cubic feet per minute—tripling the site's previous capacity
- Restore full mining, maintenance, and waste emplacement operations following ventilation loss
- Integrate two new aboveground structures—the Salt Reduction Building and New Filter Building—with a new utility shaft
- Meet DOE nuclear safety requirements with advanced instrumentation, filtration, and control systems



New infrastructure on the surface supports airflow underground  
[public domain, U.S. DOE.]



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