

Name of Project:

Fiber Distributed DAS System For Uranium Enrichment Facility At URENCO USA In Eunice, NM

Date completed in the North American Market:

12/31/20

Project Description:

CommDEX, working as a subcontractor to Motorola Solutions, was selected to perform the design, installation, and configuration of an in-building communications system for the new Uranium Enrichment Facility (UEF) at the URENCO USA Facility located in Eunice, NM. The system consisted of a UHF Distributed Antenna System (DAS) to provide coverage in specified areas of the complex. The DAS is driven by a single head-end system that is directly connected to the nearby donor site and then distributes RF via fiber throughout the complex where RF Remote Optical Units (ROUs) will rebroadcast the RF signals. Implementing the new system into Urenco's facility required a comprehensive engineering approach addressing RF coverage, jurisdictional requirements, and installation. Our team addressed each of these issues and provided comprehensive design documentation submittals to the UEF team for review.

Complete System Design: CommDEX developed a complete engineered solution to cover all four multi-story buildings covering over 1.5 million square feet. The system consisted of an active DAS system with a Fiber Head end fed by direct connection to the UHF repeater site driving 16 ROUs to provide coverage. The fiber headend was co-located with the existing UHF Radio System LMR site which was located approximately 1 mile away from the facility buildings. The headend equipment was connected directly to radio repeaters and then connected via fiber back to the facility and to the individual ROUs located throughout the various buildings.

Installation Management: CommDEX mobilized a DAS Field Engineer to support the installation and commissioning of the system upon delivery of the equipment. Once installation was underway, our DAS Field Engineer monitored the installation progress to ensure that proper best practices are maintained for proper installation such as:

- Maintain proper coax bend radius
- Inspect coaxial cable connectors
- Proper ground kit installation
- Proper cable spacing

Upon completion of the installation process, the RF equipment was powered up and inspected to ensure all components are operating within specification. All remote units were programmed into the fiber head end and all frequencies and filter settings were set properly for the signal source. The CommDEX DAS Field Engineer directed the UEF team through each piece of equipment to verify all these settings.

System Testing: Once the optimization process was complete, the Commdex DAS Field Engineer conducted an RF Coverage Test to validate that the coverage throughout the building met the specifications. This testing validated the predicted coverage from the iBwave design. The Coverage Acceptance Test Procedure (CATP) was based on the evaluation of SSI at the specified reliability level from the technical specifications and predicted design levels. The test process aligns with Telecommunications Industry Association (TIA) Telecommunications Systems Bulletin TSB-88 and corresponding NFPA and IFC testing procedures. The test verified the performance of the RF coverage of the new DAS system by evaluating the signal of test calls placed between a radio user inside of the building under test and a dispatch console. Received Signal Strength Indicators (RSSI) readings were also collected and compared against committed design specifications. A map of the buildings tested was provided showing test locations and RSSI values for all test locations.

Please describe the innovative nature of this project:

A significant amount of the equipment inside the Urenco facility contains classified information and the Department of Energy (DOE) cyber security requirements dictate that copper cabling is not allowed to be in close proximity to these classified secure data lines. This prohibited the implementation of a traditional DAS utilizing a passive network comprised of coax cable. Commdex thus proposed an innovative solution utilizing a fiber distributed system whereby fiber ROUs would be located immediately adjacent to RF antennas throughout the facility for propagation of signal, thereby significantly minimizing the amount of coax in use. Commdex's design solution provided for 36" or less of coax between each ROU and antenna, with all other signal being transmitted throughout the facility via fiber. The solution was reviewed and approved by the DOE representative for implementation.

An additional challenge to implementation of the Urenco solution was the development of the coverage prediction models within the facility. The facility buildings are full to near capacity with the secure data equipment and other heavy machinery, however the floor plans provided by Urenco depicted large empty areas. Commdex typically utilizes supplied building floorplans to create 3D models of each building using iBwave to model indoor coverage. iBwave is an industry-standard tool for DAS design and coverage modelling that utilizes proprietary algorithms to predict the effect of various building materials and internal objects on coverage propagation. Due to the fact that the Urenco plant is a secure classified facility, the customer was prohibited from providing any details on the building interiors on the floor plans, thus preventing Commdex from using this information for the propagation modeling. To overcome this issue, Commdex devised a unique solution and conducted an interior clutter analysis by performing continuous wave (CW) RF testing throughout the facility to record the RF propagation impact of the internal machinery. The information gathered was used successfully to import into iBwave and properly model the RF coverage design to plan the distribution and placement of ROUs and antennas.

Industry impact:

Commdex's innovative approach to implementing a DAS system to meet the data security and integrity requirements has provided a proven model for implementing DAS systems in similar government and/or commercial structures. The increase in cyber attacks has necessitated increasingly stricter information security rules and it is assumed that buildings requiring environments similar to Urenco's will only increase. Commdex's approach will allow DAS implementations to meet these increasing requirements.