Motorola Chemical Warning System – Always Alert

By John Buchalo, Senior Systems Engineer, Motorola

Overview

Chemical weapons are stored in various military depots around the country. Often, these depots are close to residential communities. This proximity puts these communities in constant danger of accidental chemical release. The U.S. Congress recognized this danger and in 1985 created the Chemical Stockpile Emergency Preparedness Program (CSEPP) to provide these communities “maximum protection”.

The program has been adopted by many industrial and military storage depots. A Community Alert and Notification System is an integral part of the CSEPP. In case of emergencies, such as a chemical release, fire or severe weather conditions, the system will alert the storage depot personnel and surrounding communities by an audio siren alarm and digital voice message. Motorola’s Private Data Systems business unit has designed and implemented the monitoring and control portion of the Community Alert and Notification System, based on MOSCAD RTUs.

A typical Community Alert and Notification System is designed to cover two zones: an Immediate Response Zone (IRZ) and a Protective Action Zone (PAZ). The IRZ covers those areas closest to the depot that would be the most affected by a chemical weapons accident. The PAZ consists of those areas that would have one hour warning to react to a chemical accident.

System Description

The Motorola system, installed in Madison County, Kentucky at the Blue Grass Army Depot is one of over 30 systems installed in industrial and military facilities throughout the United States. It consists of five major components:

- MOSCAD RTU’s
- Sirens
- Control Centers
- VHF Simplex Simulcast Communication System
- 800 MHz Trunked Simulcast Communication System

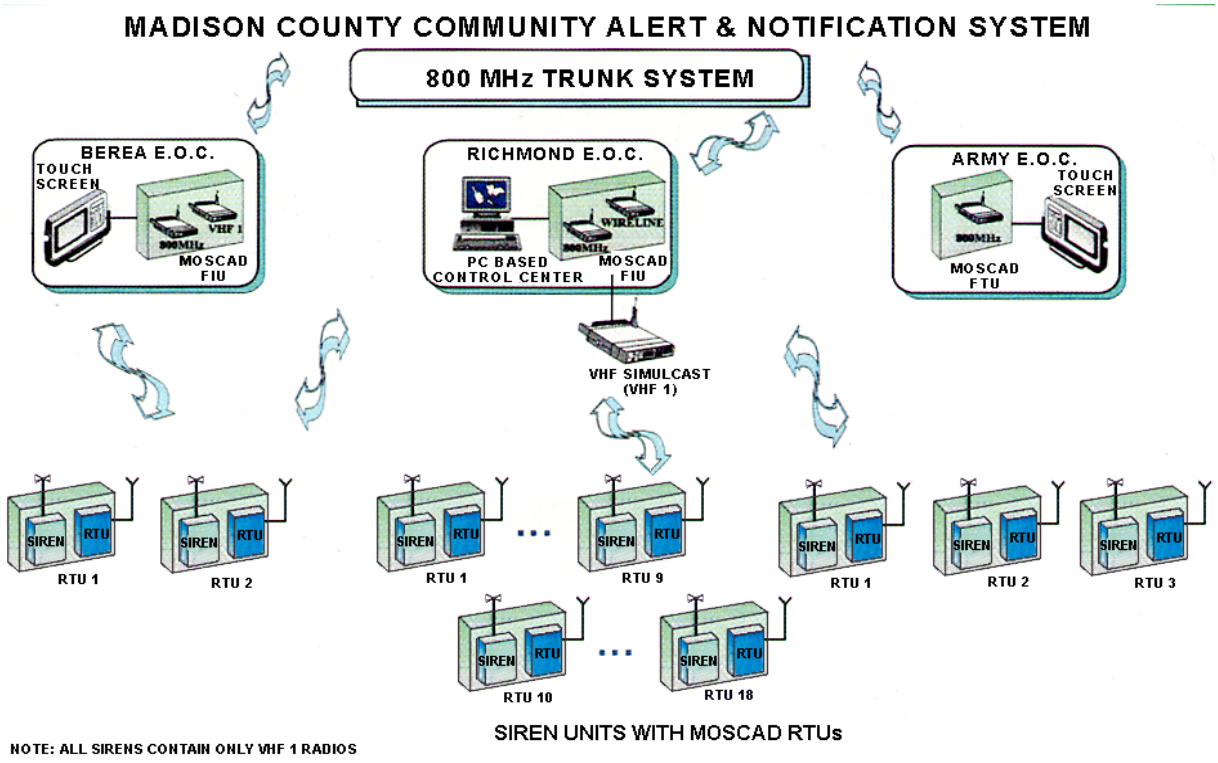
A MOSCAD RTU is integrated into each siren controller and is powered from the siren battery through a DC to DC converter. This provides the customer with a one-box solution to lower equipment and installation costs. Electronic sirens containing pre-recorded digital voice messages are installed throughout the two zones in Madison County. The location of each siren is based upon population and normal wind direction, to ensure the most effective delivery of the warning message. Electronic sirens are preferred because they can be activated via an RS-232 connection, which eliminates excess hardware.

Three Control Centers are provided to activate the sirens. The primary Control Center, located at the Madison County Richmond Emergency Operations Center, is PC-based using Wonderware’s InTouch software. The two secondary Control Centers are based on 9" color touch screens to provide easy activation, operation and low maintenance.

System Operation

Due to RF constraints, a VHF Simplex Simulcast and 800 MHz Trunked Simulcast infrastructure was used to control and maintain the system. The network routing characteristics, inherent within the MOSCAD MDLC protocol, utilize the multiple communication paths to provide automatic redundant activation links.

Each Control Center controls and monitors the sirens differently, according to RF and operating constraints. A different communication method is dynamically chosen, depending upon which siren or sirens are to be activated. By using the VHF Simulcast infrastructure only, all the sirens can be activated from the PC-based Control Center. All the sirens from the Berea or Army Control Center can be activated using the 800 MHz Trunked Simulcast infrastructure. The request for activation is first sent to the PC-based Control Center where it is then relayed, via the VHF Simulcast infrastructure to the siren or sirens. The Simplex VHF frequency is used to activate the sirens near the Berea Control Center. This eliminates the need for the activation message to also travel over the 800 MHz Trunked system, although it is still used to update and log the activation at the PC-based Control Center.



The MOSCAD, an intelligent RTU, is programmed to deliver the activation message to the siren over the RS-232 connection, using an ASCII protocol. The protocol is also used to interrogate the siren every five seconds. If any problem occurs within the siren, it is immediately reported to the PC-based Control Center for alarming, disk logging and printing. Another important feature is the ability to program activation sequences. This allows the operator, at the Control Center, to select a command which causes the siren to generate a predefined series of tones and digital voice messages. While the siren is operating, it is interrogated through the RS-232 link to ensure that the proper command is being executed. If not, the ASCII activation command will be resent.

In addition to the error checking already performed within the MDLC protocol, the MOSCADs are programmed to only activate the sirens if a valid command is received. The security codes used to validate a command are constantly and automatically changed in each Control Center and siren unit to eliminate over-the-air tampering with the system.

Screaming sirens – Motorola's system ensures community safety.