

Contributing to Safe Evacuation Guidance through Early Detection of a CBRN Terrorism Threat

Visualizing a potential threat in a certain area with the CBRN Early-Warning System

The CBRN Early-Warning System, which was developed mainly for counterterrorism, detects toxic chemicals, biological agents, and radiation within its monitoring area in an accurate and real-time manner, and monitors them in a centralized fashion. This system serves as an information source for prevention of terrorism and provision of evacuation guidance in order to ensure the safety and security of large-scale events, large facilities, and communities.



Introduction

The global issues of terrorism reported by the media in recent years are no longer the problems for other people occurring in distant countries. Counterterrorism is an urgent issue in Japan as well. The materials for which due caution is required with respect to terrorism are referred to as CBRN (C: Chemical, B: Biological, R: Radiological, N: Nuclear). The term CBRNE is also used, which includes Explosive (E) materials. It is necessary to construct a warning system in areas where danger is predicted, such as large event sites and other large facilities, in order to quickly understand the situation in an emergency, and ensure safety and security through safe evacuation guidance. This article describes the features and availability of the warning system that we have developed in response to this societal demand.

What is the CBRN Early-Warning System ?

When a hazardous material is scattered, the CBRN Early-Warning System detects the C, B, R, or N material with multiple sensors located in the monitoring area and issues an alarm, simultaneously sending information to the control room through wired or wireless communication to assist the process of examining evacuation routes. The success or failure of this system depends on its communication capabilities. In an emergency, it is likely that conventional communication infrastructure will be attacked first and lose its function. Therefore, in addition to conventional communication infrastructure, it is necessary to construct a different temporary system in the monitoring area. Definitely such a system is necessary if there is no adequate communication infrastructure in place. The CBRN Early-

Warning System, which IHI Corporation and IHI Inspection & Instrumentation Co., Ltd. jointly developed, is extremely effective because its communication infrastructure can be constructed more quickly than conventional ones and can be made to function only for a specific period from the time the threat is detected until the time it is resolved.

Automatic networking

The CBRN Early-Warning System consists of a control unit and multiple sensor units. The functions of the control unit are: ① to connect multiple sensor units to form a network, and ② to integrate the information sent from the sensor units and show the diffusion of the hazardous material on a map displayed on screen. Networking is an extremely important process, as information cannot be received from the sensor units without a network being formed. A major advantage with regard to networking formation is that the sensor units have an “ad hoc communication” function. This means that individual sensor units automatically form a network. This eliminates the need for the user to establish communication connections between the control unit and all sensor units, thereby enabling networking to be quickly performed by personnel who are not experts in communication technology.

In addition, with existing systems, the network is formed through either wired or wireless communication, but with IHI’s system, it can be formed through a combination of the two. This makes it possible to construct a flexible network by using wired communication to connect sensor units installed in locations where radio waves cannot reach.

Visualization of the network

The control unit screen displays not only sensor measurement information but also the routes of information transmission and connections of the sensor units to the network. By obtaining this information during the network construction process, it is possible to determine whether to select wireless or wired communication, thereby enabling quick construction of an optimal system for gathering data at the control unit in the shortest amount of time. If sensor information cannot be sent directly to the control unit due to the presence of an

obstacle, then the information can be sent via another sensor unit. If there is no suitable sensor for this purpose, then a relay device can be installed.

Functions of the sensor units

Each sensor unit has the ability to detect the presence of radiological, biological, and toxic chemical materials with high sensitivity in a real-time manner, and also performs the functions of issuing a warning and sending information to the control unit. It can detect gamma radiation in a few seconds, a toxic chemical in a few tens of seconds, and a biological threat agent in approximately one minute. The number of sensor units can be adjusted according to the size of the area covered. The default is 10 sensor units, but can be increased to up to 50. The system is designed to have the sensors to be installed at intervals of a few hundred meters but they may be installed at intervals of a thousand meters or more in areas with good visibility, such as airport runways. The system uses a power supply of 100 VAC or 24 VDC, or a battery pack as its power source. The battery pack lasts 12 hours or more and is of a mobile type, since emphasis is placed on flexibility in an emergency. The control unit allows examination of the evacuation route taking diffusion of the material into consideration, based on the position information of the sensor units located on the map, and wind direction and speed information.

Future development

The CBRN Early-Warning System was exhibited at “DSEI JAPAN 2019,” “Risk Control in Tokyo (RISCON 2019),” and “Special Equipment Exhibition & Conference for Anti-Terrorism (SEECAT 2019)” and received a favorable reception from customers from the Police Department, Fire Department, Self-Defense Forces, and security companies. In addition to counterterrorism, we aim to expand its scope of application with sensors specially designed for ① measurement of local environmental conditions (e.g., air pollution), ② restricted area observation (e.g., observation of radiation leakage during a natural disaster, and observation of noxious volcanic gas), and ③ protection of important facilities (e.g., guarding against intruders).



Display example of CBRN Early-Warning System
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CBRN Early-Warning System (exhibited
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Inquiries:
Defense/Security Equipment
Engineering Department,
Defense System Division,
Aero Engine, Space &
Defense Business Area,
IHI Corporation
Phone: +81-42-568-7177
<https://www.ihicorp.jp/en>