



Photos courtesy Kenwood Communications

Vietnam Secures Port with **Digital System**

A new digital network ensures adequate coverage across the port's challenging propagation environment.

By Jerry Ling

Every year, more of the world's goods are transported by container on cargo ships. Ports in Asian countries have been rapidly modernizing during the past 10 years to accommodate increased traffic. Singapore-based PSA International is the second-largest port operator in the world with 28 ports in 16 countries. One of the latest additions to its list of ports is the SP-PSA International Port (SP-PSA) in Vietnam.

The SP-PSA is Vietnam's first deep water container terminal, inaugurated 29 May, 2009. Located south of Ho Chi Minh City in Ba

Ria-Vung Tau Province, this new terminal allows Vietnam to have direct shipping access to the west coast of the United States. At the inauguration, marked by the arrival of Singapore's 288-meter long APL Alexandrite — the largest container vessel to call at any Vietnamese port — Deputy Minister of Transport Tran Doan Tho said, "This is of great significance to the Southern Key Economic Zone and Ba Ria-Vung Tau Province in particular."

The SP-PSA is ideally positioned to serve the fast-growing intermodal container traffic in the region. The

industrial heartland of Vietnam is directly linked by road and inland waterway networks to the port, assuring future expansion of the port facilities. Highway 51 and the inland waterway to Ho Chi Minh City, Dong Nai and surrounding provinces further expand the port's access to southern Vietnam. When work is completed on the port, the terminal will have a projected annual capacity of 2.2 million twenty-foot equivalent units (TEUs). Four container berths will support this capacity, a total quay (dock) length of 1,200 meters and 12 quay cranes.

NXDN Technical Details

NXDN is the name of the digital air interface protocol and trademark of Kenwood and Icom. In analog systems, as the signal strength decreases in low-coverage areas, noise and dropouts increase, severely degrading intelligibility. However, with the NXDN digital system, which features enhanced forward error correction (FEC), the digitized audio stream is less susceptible to noise, resulting in superior clarity at varying signal strengths. System operators converting from analog to NEXEDGE comment that users now receive calls in areas that were out of range before. NXDN reduces lost or misinterpreted calls and the need for repeat calls, enhancing workforce productivity.

A key element of the NXDN air interface is the AMBE+2 vocoder that digitizes speech while retaining natural voice nuances, performs noise reduction, introduces FEC and compresses this voice data to accommodate land mobile radio data rates. Next, the radio's digital signal processor (DSP) protocol packages the vocoder, signaling, control, and more

FEC data and converts this to a uniquely filtered four-level frequency shift keying (FSK) digital waveform that modulates the transmitter. This results in an unusually low bit-error-rate digital air interface, delivering robust communications even in weak signal strength areas. The NXDN air interface is capable of fitting into both narrow 12.5- and 6.25-kilohertz bandwidth channels, meeting the tightest spectrum efficiency requirements — 9.6 kilobits per second (kbps) at 8.3 kilohertz and 4.8 kbps at 4 kilohertz occupied bandwidth respectively.

NXDN is an FDMA methodology whereby one user accesses a channel frequency at any one point in time — accesses via the frequency domain. Other digital methods such as TDMA permit more than one user to access the channel frequency via timeslots — accesses via the time domain — but there has to be a tradeoff between coverage and effective transmission rate, because increasing the former means decreasing the latter.



Port Requirements

SP-PSA needed a radio system that would accommodate its staff and facility size, as well as offer further expansion without additional license expenses. After assessing other technologies, port officials decided to deploy a Kenwood NEXEDGE digital two-way radio system throughout the SPA-PSA International Port, marking the first Asian NEXEDGE system.

The terminal has more than 100 employees, requiring 24 x 7 communications for service, safety and security to port users. Specifically, port maintenance, crane operation staff and supervisory control use the NEXEDGE radios. Supervisors use both broadcast and group call features for daily operations.

The budget was tight for the sys-

tem, and the RF coverage demands were challenging. Stacked containers, enormous metal structures and a large footprint were among the challenges for radio signal propagation. After installation, SP-PSA officials reported that the expected coverage of a 2-kilometer radius was exceeded by more than double with 5-

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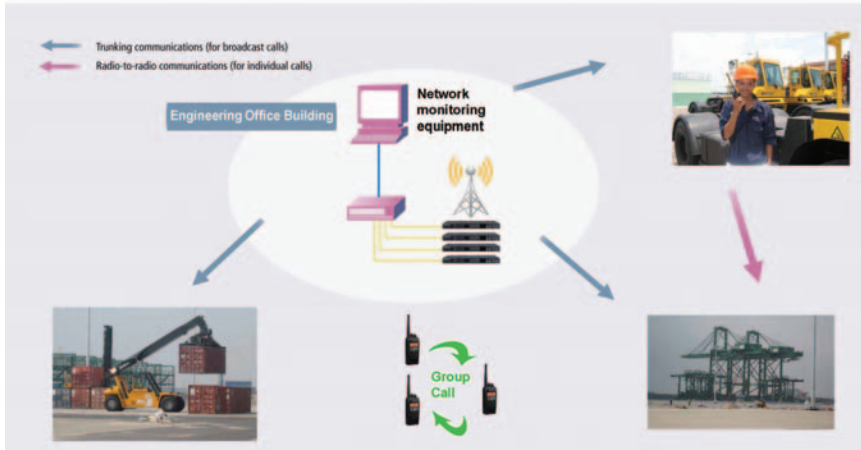
kilometer radius coverage. The port performed a coverage test with the portables and reported that direct communications was possible up to 3 kilometers, and with 5-watt trunking, up to 5 kilometers.

The coverage was achieved without antenna towers and with a 5-watt repeater. The entire SP-PSA system includes 111 radios, both portables and mobiles for vehicles; four antennas; rack-mounted repeaters; duplexers; and a virtual private network (VPN) router. The port determined that 15 talk groups would provide adequate coverage — 15 group IDs and 120 unique IDs.

The port specifically selected FDMA technology, which allows for 6.25-kilohertz narrowband operation and higher spectrum efficiency. The narrowband technology requirement was partially driven by costs; the port did not have to seek additional frequencies to double its voice traffic as the port operations expanded. Using mixed-mode operation, the port can convey analog-to-analog or digital-to-digital voice and data automatically for a smooth migration path from analog to digital. The direct mode provides two 6.25-kilohertz channels with 12.5-kilohertz channel spacing, compared with the TDMA protocol.

It was important for the port to maintain constant voice integrity throughout the facility, without coverage problems or dropouts, so the shift to digital led to greater clarity even in high noise areas. NEXEDGE employs enhanced forward error correction (FEC), resulting in an audio stream that is less susceptible to noise at every level of signal strength. This results in fewer lost or misinterpreted calls, which allows the port to maintain high productivity and efficiency.

The port uses 12.5-kilohertz channel spacing and plans an upgrade to 6.25 kilohertz to double the number of available channels as necessary for personnel and activity expansion. Because NEXEDGE is a software-driven system, there will be incremental technology improvements



System operation diagram. Top left to right: terminal entrance, main office, container yard

and enhancements that will parallel SP-PSA's increased requirements. As the economy improves

throughout the world, the SP-PSA port is positioned to take advantage of increased intermodal traffic,

More Information

- For more on NEXEDGE, visit <http://nexedge.kenwood.com>
- For NXDN information, visit <http://www.nxdn-forum.com/>

especially with the establishment of the Vietnam-U.S. route created with this new facility. ■

Editor's note: The use of NEXEDGE technology specifically as it relates to splitting channels in this article isn't permissible under regulatory guidelines in North America.

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