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### DIGITAL RADIOS IN FIREGROUND LIMBO

Aug 1, 2008 12:00 PM, By Donny Jackson

Faced with vocoder intelligibility issues, departments choose to stick with analog a little longer

Amid concerns surrounding digital-radio performance, several public-safety agencies are considering alternatives, including analog radios.

Focus on digital-radio performance in fireground scenarios heightened last month after the release of an International Association of Fire Chiefs (IAFC) report on the issue. Tests conducted by the National Telecommunications and Information Administration (NTIA) indicated that analog systems provided greater audio intelligibility than digital systems in four of nine environments, including when self-contained breathing apparatus (SCBA) masks and personal alert safety systems (PASS) were in use.

These results and anecdotal experiences have caused firefighters in Phoenix, Orlando and Marion County, Ind., to question the wisdom of moving from analog radio to multimillion-dollar digital systems.

"Some fire departments are saying they are not experiencing the issue to the degree that others are," said John Powell, senior consulting engineer for the National Public Safety Telecommunications Council (NPSTC). "Other fire departments, like Phoenix, are saying they're going to stay on analog until this is resolved. It's a problem any digital radio is going to have — anything that has a vocoder in it is going to have this problem; it's just the nature of the beast."

In Marion County, some media reports indicating shortcomings in the Metropolitan Emergency Communications Agency's new \$37 million P25 system have been inaccurate, but the county plans to take steps to address the problem for firefighters, said David Schwartz, deputy director of technology for MECA.

"We're aware that there's a potential issue with the vocoder — it's a national issue, not something unique to the Motorola system," Schwartz said. "Right now, they're using the system and using the best practices that the IAFC has released, and they're constantly training to find those times when digital noise can be an issue. We'll be working with them to see if there are any alternative solutions that need to be looked at, and we'll be looking at the pros and cons of those."

Dale Henson, chief of the Decatur Township (Ind.) Fire Department and president of the Marion County Fire Chiefs Association, said it was apparent from the MECA system's launch in June that a problem existed.

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"For the one-engine/ambulance runs, the digital system works fine," Henson said. But that is not the case in the 10% of incidents that require engines to pump and firefighters to use chain saws, exhaust fans and breathing masks. For instance, when a mask's PASS device goes off — triggering a loud alarm when a firefighter is motionless for 30 seconds — "you almost can't hear anything, because that noise overrides the voice," Henson said.

Henson and several of his fellow chiefs in the county sent a letter to MECA, asking it to look into the situation. One of the solutions suggested is to convert the county's talk-around channels back to analog operation. Additionally, some channels in each subscriber unit also would be converted from digital operation to analog.

Henson believes the conversion of the talk-around channels would be a relatively easy and inexpensive fix. However, the conversion of digital channels in 6000 handsets across the county could be an entirely different matter, he said. "We're not stupid. If it turns out that this is going to cost another \$25 million ... I don't think that's something we're going to be able to support," Henson said.

Digital-radio vocoders are designed to compress a digital signal by picking out the user's voice from background noise and transmitting it. However, when background noises are stronger than a firefighter's voice, the vocoder can transmit the noise instead of the voice. With an analog system, it also can be difficult to hear a firefighter's voice in such a scenario, but enough information gets through that the message often can be deciphered — something that is not the case in digital systems.

"I think what's allowing them to work is that the human ear is a very adaptive device, and the human mind is a very adaptive device. So with analog, you get enough information to figure out what was going on," said Glen Nash, supervising telecommunications engineer for the California Department of Government Services. "With the digital environment ... we have computers trying to decide whether this is a one or a zero. If it makes the wrong decision, you don't have communication. Very simply, that's what the problem is."

A solution to the issue does not appear easy to identify — a disturbing outcome for public safety because many federal grant programs require the use of digital P25 radios to secure funding. In addition, the FCC is counting on digital efficiencies to reduce channel widths for public-safety communications below 512 MHz, from 25 KHz to 12.5 KHz by 2013. The FCC also has indicated it plans to reduce widths further to 6.25 KHz channels, which could prove more challenging to developers of vocoder solutions.

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With this in mind, the IAFC recommends that it approach the FCC about the timing of an eventual migration to 6.25 KHz channels. "We want to make sure that, before we move forward, we don't make things worse than they already are," said Charles Werner, chairman of IAFC's digital project working group.

Werner added it is important for the industry to develop audio-intelligibility standards so products can be tested objectively. In addition, more testing is needed to better determine the environments in which digital radio systems are reliable, he said.

NTIA's test results are even affecting the design of radio systems that have not been built yet. Tom Sorley, deputy director of radio communications services for the city of Houston, said he hopes the digital-radio issues will be resolved before his city is scheduled to begin operating on a new P25 system, but the city is pursuing a backup plan, as well.

"What we've done is ask the vendors to provide us an option to build out ... a small analog system that will cover the whole area," Sorley said. "In the event that the digital-vocoder issue doesn't get fixed by the time we implement our new system, then we can use this analog option. The issue isn't normal operations for the fire department, it's fireground safety issues."

Nash believes the digital-radio fireground issue could slow acceptance of digital radios by fire departments. But the issue could prove to be a blessing in disguise, he said.

"The solutions may actually provide better communications, if we're willing to adopt them — throat microphones, bone-conducting microphones and microphones inside the air mask," Nash said. "Technology is not the limit; it's getting people to accept a different way of doing things."

Meanwhile, government and fire officials will have to wrestle with which network for firefighters to use. While an analog network may provide better intelligibility, the newer digital systems typically provide greater coverage.

*additional reporting by Glenn Bischoff*

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