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Case study: Sheriff seeks solution to life-or-death problem with portable two-way radios

Background

Sheriff Frank Bates studied the giant headline splashed across the front page of the newspaper, his brow furrowed with worry.

"Deputy In Critical Condition After Shooting. Radio Fails To Summon Help."

Frank Bates knew the man personally. He was a fine officer, with a loving family. Bates now felt he owed a debt to his deputy—and to the entire county—to solve this radio problem *now*.... once and for all.

The sheriff is the number one public safety officer in Greenville County, Wisconsin. He's responsible for public safety countywide.

Bates operated the ForceCom two-way radio system for the entire county. The sheriff deployed a thousand handheld radios for a dozen departments. They all depend on the system: Sheriff's Office, Fire-Rescue, Code Enforcement, Traffic, Snow Removal, Public Works. And a handful more.

The Problem

ForceCom—the manufacturer—installed the system two years ago. Sheriff Bates knew the Model 2000 portable two-way radios were dependable, steady performers. Evidently, the issue was the rechargeable batteries.

The problem surfaced 12 months back, when the sheriff's duty officer began to receive complaints.

A portable radio is issued to each deputy at the beginning of each eight-hour shift. Some batteries were dying around hour seven. Soon, other departments—Fire-Rescue and Public Works—were reporting the same problem.

Sheriff Bates ordered his Technical Support Unit (TSU) to study the situation. They consulted the radio manufacturer.

The ForceCom solution? The manufacturer recommended issuing two freshly charged batteries for each radio at the beginning of the shift. At the four-hour mark, the user would swap in the second battery, the fresh one.

The sheriff saw no end to the problems with the dual-battery "solution." The proposal was wrong from every angle: operations, training, finance, human resources, tech support.

Not only would the county buy twice the batteries, they'd have to increase the number of chargers.

Each battery cost \$100. Each six-battery "gang" charger cost \$400. Where would Finance find the money for this unbudgeted expense? Between \$130K and \$160K.

The service life of the batteries is about two years. So every two years the county replaces an extra thousand batteries. To the tune of another half-million dollars, over ten years.

Now Tech Support has to inventory, deploy and track twice the number of batteries and perhaps 30 more multi-chargers.

TSU also has to change the standard operating procedure (SOP) for fleet charging. Who pays for the training? Who pays for the increase in man-hours to operate the charging stations?

How, where do deputies carry the extra battery? Their utility belts are already heavier, more crowded than Batman's. And what happens if the deputies are too busy chasing bad guys to change the battery, due to "task loading?" What if they forget?

How do we cover the added expense? Roughly half a million dollars over ten years.

These batteries and chargers are deployed in a dozen departments throughout the county. The costs ripple down the line, throughout the entire radio system and beyond.... countywide.

The real problem, as Sheriff Bates saw it: the two-battery solution is no solution at all. It creates more problems than it solves. The cure is worse than the disease.

The math was simple: Twice the batteries, twice the risk of problems—throughout the entire system.

When we increase the number of batteries and chargers, we increase both the complexity of the operation and the potential for mistakes. The price of a mistake is too high—maybe the life of a deputy or firefighter.

To top it off, this was an election year. The press would have a *field day* with this issue. And no one—especially the sheriff—could blame the union for demanding quick action.

With lives on the line 24 / 7, Sheriff Bates could not risk another minute of battery problems. He needed a solution—fast.

His gaze fell on his copy of *Law Enforcement Week*. The magazine was open to page ten, which featured an ad for a "new technology" charger. In the photo, an exasperated police officer is ready to drop his walkie-talkie into a garbage can. The cutline: "Got battery problems?"

It took Sheriff Bates all of 15 seconds to grab his phone and dial Charge-Tec's toll-free number.

The Solution

Linda Crestwood picked up the call at Charge-Tec. The senior account executive was an expert on battery problems.

Crestwood knew just what to say: "You're not alone, Sheriff Bates. We've seen hundreds of customers in the same boat across the world. "

"The problem is not the batteries." She paused for effect.... "It's your chargers. Or I should say, the chargers supplied with your system."

"Bear in mind, this situation is not unique to ForceCom radios. We see it with all chargers, because all the manufacturers use the same outdated charging technology.... except us. That's why Charge-Tec developed Condition2Charge technology."

Linda continued, "What's the problem with 'other,' original equipment chargers?' They're *strictly* chargers—all they do is charge."

"What's unique about Charge-Tec? Our chargers charge *and* condition. We *condition* your batteries *while they charge*."

"During charging, we condition batteries to restore their maximum capacity. So they accept a deeper, longer lasting charge, which delivers more power to operate the radio.... beyond the end of the shift."

"At Charge-Tec we use a special, non-standard charging algorithm. It's patented and proprietary—we invented it, we own it. Our Condition2Charge technology is deployed on a custom microprocessor. And it's built into every product that bears the Charge-Tec name."

Linda paused again. "Let's review our basic knowledge of batteries and chargers. To provide a framework for our discussion...."

"A battery can power a handheld radio—day in, day out—for maybe two or three years. Every day a little bit of the battery dies, with every shift. The capacity—the amount of charge the battery holds—drops slowly over time. Over the years, the capacity slowly declines until it reaches the tipping point—the point at which the battery no longer powers the radio through an entire shift."

"So here's the all-important question, sheriff: Will *your* batteries power *your* radios throughout an entire shift?"

"Before we can answer that, we need to understand a crucial specification: the 'duty cycle.' The manufacturer provides this rating for each radio-battery combination in their product line-up. It's measured in hours."

"For example, when you we're formulating the specs for the Greenville County radio system—before purchase and installation—the consulting engineer probably said, 'The duty cycle on this radio-battery combination is 9.0 hours.' What did he mean? Under average conditions, the radio operates for nine hours, before the battery is exhausted."

"So, sheriff, you're probably now in a situation where a significant number of your radios are dying at the 7.5-hour mark, a half-hour shy of the end of the shift. One deputy paid dearly for this problem.... it almost cost him his life."

Crestwood homed in on her big point: "I propose we run a scientific test at Greenville County Sheriff's Office. After we've seen positive results, Charge-Tec can provide a quick, simple and cost-effective solution to your problem—systemwide."

Testing The Solution

Technical Services uses a computerized diagnostic to track the performance of every radio deployed in the Sheriff's Office. So TSU could track complaints for each portable, by serial number.

TSU and the Charge-Tec engineers put their heads together. They designed a scientific double-blind test.

First, the tech team culled out 50 radios with "the problem"—which they whimsically dubbed BPOP.

"Bee Pop." As in, Battery Poop-Out Problem.... (The sheriff was not amused with the acronym, but he decided to let Tech Support have their fun.)

Second, the 50 radios "afflicted" with BPOP were divided into two groups of 25.

With the first group—the control—they charged the batteries according to the current ForceCom SOP.

With the second batch—the test group—they charged the batteries with the Charge-Tec technology.

Third, TSU administered the test. The performance of each radio was charted daily.

The techs obtained statistically significant results in seven days. But they continued the test for another three weeks. In the end, one month of data confirmed the results observed at the end week one:

Control group: no significant change. 100% of the batteries charged with ForceCom continued to exhibit BPOP.

Test group: Condition2Charge eliminated 99.5 percent of incidences of poop-out.

Final Outcome

The sheriff bought 167 six-battery multi-chargers from Charge-Tec. He purchased from the Wisconsin state contract, so no bids were required.

Two weeks after installation of Condition2Charge, Greenville County's battery problems were history.

The county sold the old ForceCom chargers at auction for \$22K. Those funds were applied to the \$67K Charge-Tec solution. So, in about a month, Sheriff Bates solved his battery problems once and for all, for a net investment of \$45K.

The sheriff figured he had dodged a bullet—the two-battery solution. A solution that was never a solution in the first place. An expensive bullet that would have cost the county half a million dollars and untold pain over a decade.

"So now," Frank Bates mused, "everybody is happy: county commissioners and department heads, deputies, radio users, voters, the press, the union, tech support, finance and accounting, me—even Charge-Tec. Got to remember to send Linda Crestwood a thank you card...."

Note to the reader

This case study is fiction. The author, Rob Curran, produced this case study to showcase his technical abilities as a freelance writer in the electronics sector.