

# CASE STUDY

## Maintaining Piped Medical Gas Systems

### Cleveland Clinic Develops Computerized Tracking Program

Imagine manually tracking 13,500 medical gas outlets, 2,650 zone valves, 1,190 alarm panels, and 52 pieces of source equipment. How would you monitor requirements for thousands of pieces of equipment? How would you know what needed to be tested and when? How would you track preventive and priority maintenance issues? How would you minimize risks to patients? Those were the challenges facing Cleveland Clinic—challenges that many other organizations are also facing.

“Prior to 2006, we used a paper-based system,” says Tom Shepard,

director of facilities engineering, Cleveland Clinic. “All maintenance and testing of outlets, valves, alarms, and source equipment was tracked manually using periodically distributed paper reports.”

In 2006, Cleveland Clinic found a partner to help create a computerized tracking program for its piped medical gas system. The program was implemented at Cleveland Clinic’s main campus that same year and in its ambulatory surgical centers in 2008, and it is being implemented throughout all its facilities in 2010.\*

### Why a Computer-Based Tracking System?

Cleveland Clinic transitioned to a computer-based system primarily to improve patient safety and standards compliance. “In order to get our hands around the process itself, we really had to go to an electronic tracking system,” comments Shepard. Cleveland Clinic’s program now identifies exactly where potential deficiencies are on a daily basis, not only improving patient safety but also improving standards compliance. “The program allows the organization to know what is going on with its system every minute of every day,” according to J. Basil Damukaitis, a medical gas consultant based in Chicago.

Numerous requirements for piped medical gas systems are set by The Joint Commission, the National Fire Protection Association, and the American Society of Sanitary Engineering. “We used to have data clerks copy all compliance requirements and put them into paper files,” says Shepard. “The computerized system eliminates all that paper and file space.” It is much more efficient and user friendly because standards and best practices for equipment, like those defined in Joint Commission Standard EC.02.05.09, Elements of Performance (EPs) 1–3, regarding inspections, tests, maintenance, identifying equipment

Figure 1. An Asset Tracking Tree

The screenshot displays a software interface for asset tracking. On the left, there is a tree view of assets, including categories like 'Maint Master Alarm', 'PBX Master Alarm', 'Local Master Alarm', and 'MEDAIR S1 SRC: 06753MG'. The main area shows detailed information for a selected asset: 'MEDICAL AIR' in Building 'E', Floor 'BASEMENT', Room 'EB 41', Zone 'B3'. It lists the manufacturer as 'BEACON', model number '4107003696', and serial number '191768-2'. There are also sections for 'Manuals' (listing 'Beacon Scroll Compressor Manual') and 'Attachments' (listing various test history files like 'CCF 06753MG BEACON FM 4TH Q').

All outlets, valves, alarms, and source equipment are included in the program and can be tracked using the asset tracking tree to retrieve current and historical data.

**Source:** Used with permission from Cleveland Clinic.

\* The program has been commercialized and entitles Cleveland Clinic and Tom Shepard to royalties.

## About Cleveland Clinic

Cleveland Clinic includes a main campus plus 9 community hospitals, 15 regional health centers in north-east Ohio, and other buildings, totaling approximately 23 million square feet. Based in Cleveland, Ohio, the main campus alone consists of 50 buildings and spans 13 million square feet.

locations, and having respective documentation, are embedded directly into the program, enabling Cleveland Clinic to stay organized and meet compliance requirements.

Cleveland Clinic's computer-based system also addresses its need to easily access inventory status information, easily track equipment and have that information in one place, and easily enter new information when equipment is added. Having this information is critical for the operating budget, recapitalization budget, and staff development planning.

## Designing a Computerized Tracking Program

"Cleveland Clinic offers world-class care and services. We also wanted to be the best from a maintenance standpoint," says Shepard. "At the time we began, the only existing computer-based maintenance programs were meant for asset management. We believed medical gas needed special attention because it is directly tied to the patient's safety and therefore is more critical."

To initiate a new program, Shepard and his team first went to Cleveland Clinic's Innovations Department, which promotes the use of existing technology as well as invention of new technology for clinical initiatives. Next, they sought a partner to create a customized program. Shepard says, "We wanted a part-

ner who shared our vision of putting patients first, understood the scope of the project and that we needed something much bigger than just a spreadsheet, and was willing to create a training program for staff." They found such a partner in Scott Lisec, piped medical gas expert, Raleigh, NC, and his team.

Shepard and Lisec's teams looked at what made sense to include in the program from the perspectives of the engineering department, the field, and regulatory requirements. "We made the program adaptable, and we are always improving it," says Lisec. They wanted to create a program that was user friendly and efficient, with built-in checks and balances to ensure patient safety.

As the program developed, educating staff and others was important. "This program is not just software but a culture created by people and the pro-

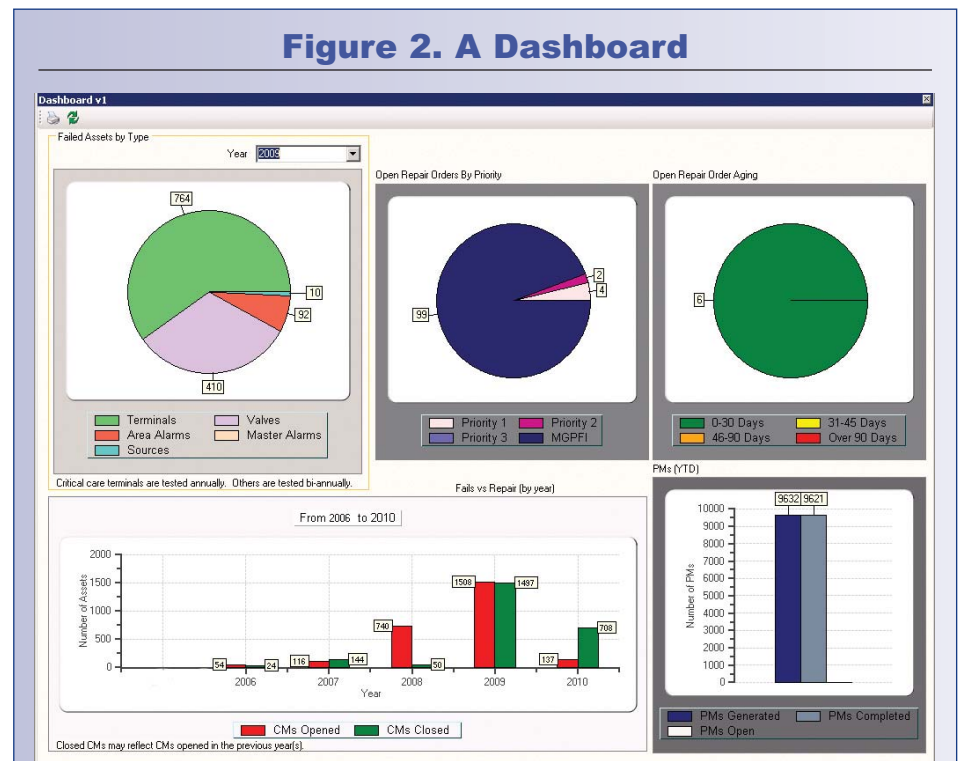
gram," says Lisec. In addition to holding training sessions for staff, Cleveland Clinic also held training sessions for architects, engineers, and contractors working on construction projects. "At all times, we reminded staff that this was for the safety of patients," says Shepard.

## How the Program Works

Here's how the program works. When a new piece of equipment or outlet is installed, someone bar-codes and enters it into the program, specifying the type of equipment and location. The manufacturer's information is also entered, including brand, type, and recommendations. Best practices and requirements for equipment are also entered, including standards and regulatory maintenance, testing, and inspection requirements. Any breakdowns or

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**Figure 2. A Dashboard**



Critical documentation of the program can be viewed in a concise dashboard. Users can click on elements of the dashboard to retrieve more detailed information.

**Source:** Used with permission from Cleveland Clinic.

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repairs, including issues with contamination, low or no flow, or equipment failures, are then tracked. Third-party verifications are electronically attached to the asset as well. Figure 1, page 4, shows an asset tracking tree, which allows equipment to be tracked beginning either from the source equipment or the outlet and shows every outlet test, valve test, alarm test, and so on, all the way to the source equipment. Preventive maintenance tasks and priority work orders are electronically sent to appropriate staff members and are accessible using desktop or laptop computers, smart phones, and other portable electronic devices. Follow-up reminders are also sent when a task is not fulfilled. For tracking and documentation purposes, the program captures and retains this history and can print out “dashboards” (see Figure 2, page 5) or full-length reports.

### Benefits and Challenges

The numerous benefits of using a computer-based program to track piped medical gas systems include the following:

- Improved patient safety. Cleveland Clinic’s computer-based program helps reduce or eliminate risks associated with piped medical gas because it enables facilities engineers to know the status of all equipment and outlets at all times and to take necessary action when a failure occurs.
- An accurate inventory of assets in one place.
- The ability to track, maintain, and compile data on equipment and outlets in real time instead of monthly, quarterly, or annually.
- Detailed and easily accessible documentation, which supports compliance requirements and allows for better continuity.



*Cleveland Clinic has reaped many benefits from its computerized medical gas tracking program.*

- An improved bottom line. When organizations are proactive and schedule preventive maintenance, they are able to prioritize their needs and budget accordingly. When organizations are only reactive to equipment failures, they must tap into unplanned resources.

- Checks and balances to ensure patient safety and compliance.

Although implementing a computer-based program reaped many benefits at Cleveland Clinic, the transition generated certain challenges as well. “When you move from a paper-based system to a computer-based program, there is a culture change,” Shepard comments. During this transition, Cleveland Clinic experienced and addressed the following challenges:

- Staff members with different technology training needs. Although all staff receive training, some are less proficient than others on computers and require more guidance.
- Regulatory organizations with different requirements for how they receive information. Some prefer to review paper documents and files rather than computer-based records; for these organizations, hard-copy reports are printed from the program.
- Technology running slowly at times, particularly when it is Web based.

Anticipating efficiency issues, Cleveland Clinic downloads the updated program to laptops weekly so that when a surveyor or an inspector is on site, he or she is not reliant on going through Cleveland Clinic’s intranet.

If your organization is considering adopting or creating a computerized program for tracking a piped medical gas system, Shepard offers the following tips:

- Make sure the patient remains the primary focus. Although implementing a computerized program will help an organization comply with regulatory requirements, improving patient safety is the most important reason to use a computerized program.
- When beginning any tracking program, gather a complete inventory of all of the organization’s assets.
- Design or adopt a program that can continuously be improved. There are always ways to make improvements, and a tracking program should be flexible enough to support updates.
- Find a way to embed regulatory requirements into the program. This will help with organizing and meeting compliance requirements.
- Educate and train clinical and non-clinical staff, as well as contractors, architects, and engineers, on the program. 