Air Cars
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On-site medical oxygen generators
Disaster preparedness boosts sales of medical oxygen generators in U.S.
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On-site generation for hospital central distribution also sees gains as bulk oxygen prices soar.

The market for on-site generators that produce medical grade oxygen began to open up dramatically following 9/11. Hurricanes in the Gulf of Mexico and other natural disasters expanded the markets further.

Disaster preparedness has accelerated growth in the U.S. for on-site generation, not only in hospitals, but in many other disciplines as well, including fire departments and nursing homes. A leading indicator is California, where Governor Schwarzenegger has set aside $15 million for mobile hospitals, while 25 percent of fully equipped hospitals in that state already have on-site generator back-up systems.

Natural disasters have prompted a flurry of inquiries and emergency calls regarding on-site generation. As one hurricane was bearing down on Baton Rouge, the public affairs manager of Exxon Mobile called OGSi (Oxygen Generating Systems Intl.) to check on the availability of an oxygen generating system. A stream of similar calls continues to deluge OGSi in its North Tonawanda, N.Y.-based U.S. headquarters.

Although PSA medical oxygen generators have been slow to catch on in U.S. hospitals for their central supply systems, they have been firmly established for many years in overseas hospitals, as well as in other industries. OGSi alone has medical oxygen generators in more than 70 hospitals overseas, as well as in U.S. Military installations, including Iraq, where most of the hospitals in Baghdad have these systems installed. In military field operations, generators are employed to fill cylinders on-site.

However, bulk gas deliveries in that country were unreliable, and that opened the door to on-site generation. OGSi also gained a firm foothold in that market when it signed up a knowledgeable Chinese distributor who customizes installations for hospitals as part of its service. He also is diligent in maintaining his relationships after the systems are installed.

In addition to hospitals, OGSi has sales in 70 countries worldwide, in all markets that include fish farms, mining, ozone water treatment, waste treatment, and metal cutting. Typical oxygen purities from the company’s generators range from 93 percent purity to 99 percent purity. Many sales are generated through the company’s website. Generator systems fit onto metal skids for placement in 30 or 40-foot containers for ocean shipping or on trucks.

“The largest markets for medical-grade oxygen overseas are China, India, and Taiwan.”

Hospital On-Site Generation Grows in U.S.
Hospitals in the U.S. are becoming more aware of the need to upgrade their disaster preparedness programs, which requires that they be self-sufficient for a 72-hour period. As part of their preparedness evaluation they look at what can they live without and what is absolutely necessary to back up.

In the area of homecare, individuals with their own breathing air cylinders may run out of oxygen during an emergency, and their first reaction is to have someone rush to the fire department to get a re-fill. That need has created a niche for small, on-site generators in fire departments — referred to as the “prehospital or emergency medical” market. But that is morphing into demand for much larger systems in hospitals.

The installation of medical oxygen generators in U.S. hospitals for their central supply systems or for cylinder filling has been an economic plus with bulk oxygen supplies. Until recently,
generators could not compete effectively with major gas companies in that market. Historically, the majors have sold bulk medical oxygen to U.S. hospitals at a very competitive price, and they do an excellent job of filling bottles. After January 2006, however, the economic picture changed as the price of oxygen increased significantly, and coupled with the increase in transportation costs, oxygen generators have become more competitive. In addition, the trend to more disaster preparedness is pushing hospitals to take a closer look at this source for either a back-up or as the major supply for their medical oxygen - both for feeding directly into a central supply system and for filling cylinders. It should be noted that fire fighting companies that fill into cylinders using on-site generators are considered to be manufacturers and as such must comply with all relevant FDA and USP requirements. Also, cylinders must be labeled with the concentration of the oxygen contained.

The US Pharmacopeia Standards list two medical oxygen gas standards:

- At least 99 percent purity
- Purity of 93 percent purity, plus or minus three percent

This standard also states that the medical grade oxygen must be stored in cylinders or in a low-pressure tank. These must not be treated with any toxic, sleep-inducing, or narcosis-producing compounds, or with any compound that can irritate the respiratory tract. Medical oxygen produced by a generator must contain not less than 90.0 percent and not more than 96.0 percent by volume of oxygen. The balance shall be composed of argon and nitrogen, and less than 0.003 percent carbon dioxide and less than 0.001 percent carbon monoxide. Also, these requirements state that medical oxygen produced by on-site generators must be tested additionally for CO and CO₂ content, as stated in the previous sentence.

The question of how pure medical oxygen needs to be to enhance the survival and wellness of a hospital patient was tackled by a Canadian doctor fifteen years ago. Over a ten-year period, he studied 100,000 patients to establish whether 99 percent purity was really needed. The study verified that the only difference between 99 percent purity and 93 percent is cost - about 60 percent. Based on these results, many hospitals in Canada switched to the far less expensive 93 percent purity medical oxygen for all of their departments.

Another area of the study reinforced the fact that when a patient breathes through a mask, atmospheric air is also inhaled. Thus, by the time the intake reaches the patient’s lungs, it is only 80 to 85 percent pure. According to medical studies, oxygen that is as little as 80 percent concentrated is still four times more pure than plain air, and is well within the range required to raise the blood oxygen level as much as is needed. Purity does affect some patients with lung conditions, and these do require 99 percent purity. But for the vast majority of patients, the only 99 percent figure is valid.

In the U.S., the FDA straddles the issue of purity. That agency has ruled that both 93 and 99 percent purity are acceptable for medical oxygen, but the decision of which is more appropriate is left up to the physician.

To ensure compliance, all OGSI hospital oxygen systems are equipped with a continuous monitoring station – an in-line oxygen analyzer that ensures that the oxygen’s purity and concentration of CO and CO₂ gases remain within mandated limits. If the oxygen analyzer senses conditions outside the set limits, an alarm sounds, the system is shut down, and the supply to the hospital system is automatically switched to a secondary source.

The monitoring system installed in the OGSI systems was developed by OGSI. A calibration gas kit is also sold with the generator, as well as flow controls. When the medical oxygen generator was first developed, the calibration kit was offered as an option, but few customers were prepared to pay for it. But shipping a high-pressure calibration gas cylinder can be a problem, so OGSI simply made it a standard part of the package.

Alaska Hospitals Install Generators
OGSI has installed oxygen generators in two hospitals in Alaska. The output of one is fed directly into the hospital’s central supply system. In another hospital, an oxygen generator is used to fill 50 H-cylinders per day. In cylinder filling operations, the generator is used to fill high-pressure cylinders (up to 2200 psig) (See Figure 2). In central supply systems, oxygen from the generator is fed directly into the system at up to 80 psig (See Figure 1).

The cylinder filling generator (OGSI CFP-500) was installed in a Unalakleet, Alaska, hospital that is located approximately 180 miles west of Nome. The hospital is operated by “The Alaska Native Tribal Health Consortium,” a non-profit health organization based in Anchorage.
Oxygen that is as little as 80 percent concentrated is still four times more pure than plain air.

Alaska, which provides health services to approximately 130,000 Alaska Natives and Native Americans living in Alaska. Established in 1997, ANTHC is owned and managed by Alaska Native tribal governments and their regional health organizations.

This generator replaced an older unit that needed to be upgraded, but its manufacturer had gone out of business and replacement parts could not be obtained. The generator was ordered through the website and shipped directly to its installation point where it was plugged in and ready for operation in minutes.

The second generator, which feeds a central supply system, is installed at the South Peninsula Hospital in Homer, Alaska, 123 miles from Anchorage. That system, an OGSi Dual OGS-175 generator, supplies the hospital system at a rate of 1.6 scfm, into an 80-gallon tank, which feeds directly into the hospital’s central supply. It meets all of the hospital’s oxygen needs at a significant cost savings over the bulk oxygen system that it replaced. The hospital’s central system was previously supplied from a liquid oxygen tank.

While overseas installations have offered the biggest markets for on-site medical oxygen generators, projections are that disaster preparedness programs in hospitals, nurseries, home healthcare, fire departments, and civilian disaster control centers will spur applications in the U.S. by a considerable margin.

Bob Schlehr

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