## 137: SELF-SUFFICIENT SUPPLY OF OXYGEN IN THE VAN BUREN HOSPITAL OF THE VALPARAISO SAN ANTONIO HEALTH SERVICE CHILE

*Fuentes R., Aranguiz J.C., Gonzalez J.C., Castro G., Pedemonte S., Zamorano L., Naudon S., Verdessi D.*

**Objective:**
This paper describes the study, installation, and operation of an oxygen-producing plant to replace the liquid oxygen cryogenic tank and allow Van Buren Hospital to become self-sufficient in its oxygen production.

**Methods:**
Oxygen is the most important clinical gas used in a hospital. The constant high demand for this gas translates into a substantial expense for the hospital. In 1995 the Valparaiso San Antonio Health Service (SSVSA) installed a plant that produced one cubic meter of oxygen per hour in the Hanga Roa Hospital on Easter Island, which has only 15 beds and is located 3,800 kilometers from the continent. This small plant has been successful, operating continuously since its installation and eliminating the need to transport gas by ship or air from the continent.
Van Buren Hospital, on the other hand, is the most complex hospital of the region. It has 626 beds and offers services such as neurosurgery, kidney transplant, and cancer treatment. Its annual budget is US$17-million. In 2001 it had 12,162 major surgical operations, 177,311 consultations with specialists, 298,882 emergency consultations. It used 216,975 cubic meters of oxygen in 1998 and 186,560 cubic meters in 2001. The expenditure for oxygen in 2001 was US$ 172,239.
Oxygen production in most large facilities in Chile is typically done using cryogenic fractionation. Given the economy of scale necessary, this has led to a monopoly of the oxygen supply business at the local level.
Two decades ago an alternative technology was developed using the ceramic, zeolite, which absorbs nitrogen from the air (78%) and leaves the remaining air (22%) composed of oxygen (21%) and other gases (1%).
The Physical Resources Study Unit of SSVSA developed a project to replace the old cryogenic process with the new zeolite absorption technology and make Van Buren Hospital a self-sufficient oxygen producer. The Ministry of Health approved the financing for the project in 2001. Acquisition was carried out via the Development Program of the United Nations. The design complies with the Canadian norm CAC/CSA-Z305.6-92 ratified in 1997 and the United States norm USP XXII (93% +/- 3% oxygen). The main system consists of two generators, each capable of producing 26 cubic meters of oxygen with a maximum purity of 96%, which is sufficient to supply 100% of the hospital's oxygen needs. So one generator serves as a back-up. In case of emergency this system is further backed up by a generator with security batteries, which uses a system of 30 cylinders, with a reserve of 120 cylinders, of 9 cubic meters each. The support system connects to a network of containers with liquid oxygen. The companies selected to carry out the work offered special training to its employees to install the system. The total cost of the plant was US$ 431,395 and has a working life of 20 years. Maximum production is 455,520 cubic meters per year, with normal production running from 186,000 to 210,000 cubic meters per year.

**Results:**
The system was put into operation in May of 2002. In June of that year the purchase of oxygen was reduced from 21,216 cubic meters in 2001 to 1,646 cubic meters in 2002. Due to adjustments in the system of purity, 7,000 cubic meters were purchased in July and August, but from September on the new plant provided 100% of the hospital's oxygen needs. Depending on the volume of production the per cubic meter production costs run between US$ 0.13 to US$ 0.15, without amortization, and US$ 0.24 to US$ 0.27 with amortization. The market price for oxygen is US$ 1.10 including tax, so the system will pay for itself in 36 months and allow annual savings of US$ 118,000.

© 2003. Reproduced as licenced to ISQua.

**Conclusions:**
The installation of operation of new oxygen plant technology, not only allowed Van Buren Hospital to become self-sufficient in its oxygen production, but also led to substantial savings in operational costs, thus freeing resources to be allocated to improve patient care.

© 2003. Reproduced as licenced to ISQua.