CRYOGENIC INDUSTRIES
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A NEWSLETTER FROM CRYOGENIC INDUSTRIES SUMMER 2012

ACD's P2K Supplies Argon for Aircraft Engine Plant in Asia

In response to rising growth trends in the Asian Pacific region, a major aircraft engine manufacturer recently commissioned its newest engine manufacturing plant at Seletar Aerospace Park in Singapore. The state-of-the-art aircraft turbine manufacturing facility was designed by a leading Singapore based industrial gas company, who worked closely with Cryogenic Industries Malaysia to develop a system suitable for their specifications. An ACD dual automatic P2K pumping system was selected to provide a high pressure argon gas supply to the facility from a large 26,000 liters vertical storage tank.

ACD's reciprocating, skid-mounted P2K system was engineered to supply high pressure liquid argon to Cryoquip ambient air vaporizers rated at 300 m^3/hr. The argon gas is stored in two pallet-mounted buffer tanks, allowing the flexibility to add additional pallets to accommodate customer consumption as future demand increases.

High pressure argon from the buffer storage flows through a pressure regulating manifold that reduces the pressure to 90 barg (minimum) for process use. A pressure transmitter relays a signal to begin the pumping operation when the pressure in the buffer tanks is down to 110 barg and shut down when 200 barg is reached. Operation of the dual pumping system, related valves, actuator, and temperature and pressure sensors is controlled by a programmable logic controller (PLC) mounted on the P2K skid. In the event that the temperature goes below a pre-set limit, as indicated by the low outlet vaporizer temperature, the system control panel will automatically change over to the standby vaporizer.

It is anticipated that the plant will have the capacity to produce about two hundred and fifty latest generation fuel efficient engines per year, for use on the latest state of the art aircraft being manufactured in the USA and Europe. The multi-million dollar plant is capable of manufacturing approximately half of the company's projected annual demand for engines over the next seven to eight years. With the plant's successful start-up, ACD looks forward to the continued growth of the aerospace industry in the ASEAN region and providing its customers with highpressure cryogenic transfer solutions.

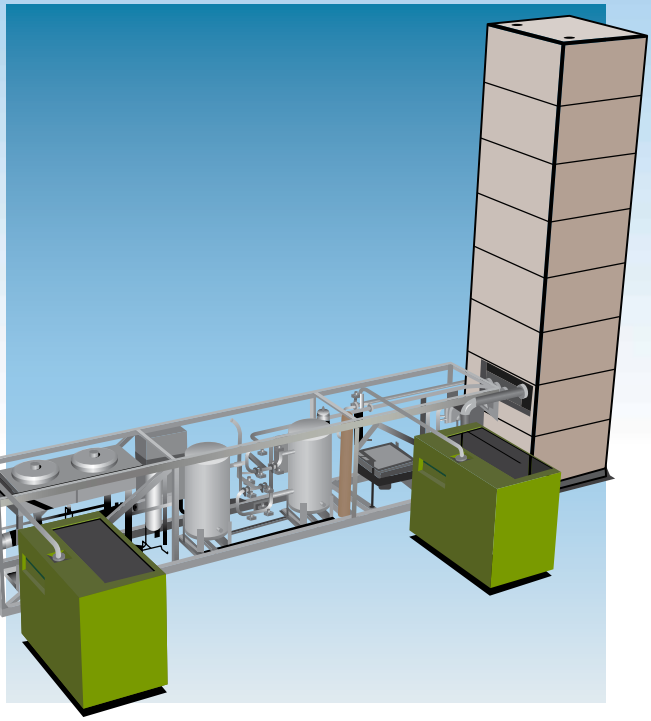
For more information on this article contact Teng Wai Cheong at ACD Malaysia at +603 5740 8770 or wcteng@pd.jaring.my.

Improved Efficiency Small Capacity ASU's

Traditionally, most customers value mobility and simplicity for small air separation plants (below 15 metric tons per day total liquid capacity). These small plants are usually installed as a "pilot plants" to develop new markets. Once the market develops, the small air separation plant is replaced with a larger more efficient plant and the small air separation plant is relocated to develop another market area. Others purchase the small plants for remote locations to supply the product to specific nearby customers, such as plants for the oil and gas drilling customers. Still others purchase multiple small plants in lieu of a single larger plant where the road infrastructure is poor and road transportation is difficult. In many of these remote locations, the power to the air separation plant is generated at site via diesel or gas generators and air cooled plant is required since there is no adequate cooling water available. Thus, many of the customers give priority to simple modularized plant design for easy relocation and a simple process design for robust reliability above other factors.

However, these traditional priorities are now shifting, as more and more customers are putting plant efficiency at the top of their plant design requirements. With ever increasing power and diesel costs around the world, many of our customers are discovering that they not only need a robust, highly modularized plant but also an efficient one. Power costs have become much more prevalent in the customers' economic analysis. Simply put, energy costs have now become the driving factor in many of the new applications for even small air separation plants.

To meet this new paradigm, Cosmodyne has improved the small air separation plant design to increase efficiency while maintaining the modularized design and reliability. Cosmodyne achieved efficiency gains by changing various aspects of the plant design. An ACD turbo-expander with booster compressor is now incorporated into the process. The expander booster compressor utilizes the available energy from the highly efficient, near-isentropic expansion occurring at the turbo-expander that produces the required low temperature. In previous designs, the energy from the turbo-expander had simply dissipated to atmospheric via an air brake. Another part of the plant that was improved was the heat exchanger design. Working closely with the heat exchanger manufacturer and using Cosmodyne's internal field operating database, the heat exchanger design was revised to incorporate a high efficient sub-cooler for liquid products as well as the latest technology high performance fins with close approaches to extracts more energy from the process to reduce the power consumption. Also, the columns were redesigned with improved tray design and spacing for lower pressure drops and higher yield.



Engineering changes have resulted in a substantial improved specific power. For example, the previous generation GFED 3 produced 7 metric tons per day of liquid oxygen at 2.4 kW-hr/Nm^3 specific power. The new plant (with single compressor design) produces 8 metric tons per day of liquid oxygen at 2.0 kW-hr /Nm^3; an improvement of 17%. Moreover, all the new designs are field proven components to assure reliability. The expander-compressor unit and the higher efficient chiller compressor are from Cosmodyne's ASPEN plants. There are currently over 35 ASPEN plants operating around the world with tremendous reliability records.

Although many parts of the air separation plants have changed, the new plants still maintain the most efficient modularized design. The air treatment module is now skid mounted for better accessibility and lower fabrication time. The coldbox is now taller than the GFED. However, the air treatment module and the coldbox still fit into standard containers for simple and economical shipment.

Currently Cosmodyne is continuing to offer both GFED plants as well as the new improved small air separation plants to meet different customers' requirements.

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On-site Gas Purging Made Easy

BOC Australia's containerized mobile gas purging unit

Cryoquip Australia has worked closely with BOC in Australia and developed a high flow containerized purge vaporizer for use in a wide variety of purging applications.

The standard 20' container consists of an ambient vaporizer, high velocity flame proof fans, a switching system, and a pressure-building coil.

The benefits of the unit are that everything is provided in one container. This "plug-and-play" unit is easy to move and unload on site and the doors are easy to open.

For a small footprint, the TAF5120L4 unit has a very high flow capacity of over 4,000 Nm^3/hr.

For long duration purges, the system has an integrated automatic switching system, which switches the liquid flow internally, enabling half of the unit to defrost while the other half is operating.

- Electrical equipment to suit hazardous areas
- Luted inlet to prevent excessive ice build-up

The containers are fitted with high velocity flame proof EXE rated fans and intrinsically safe electrics, enabling the units to be used on Petrochemical sites and in hazardous areas. The system has also been manufactured for use with all the cryogens, including liquid nitrogen, oxygen, argon, LNG and ammonia.

- 2 Vaporizers in one
- Built-in switching system

Purge applications often use ISO containers of liquid cryogens, which have limited pressure building capacity. The containerized unit has a built-in pressure building coil that boosts the pressure building capability of the liquid vessels, in order to achieve the high purge flows required.

BOC Australia has nick-named the units "BIG RED" and use distinctive RED containers. In the last 3 years, BOC has purchased 3 units for Australia, as well as several purging vaporizer bundles for use in New Zealand.

Recent purges in far north of Western Australia used the BIG Red units with steam heated VSI 640 vaporizers. The engineers on site were very impressed with both the containerized and steam heated units. The vaporizers exceeded design capacity and the customer was extremely happy, and asked if they could retain the equipment on site, ready for the next purge.

For more information on this article contact Tim Born at Cryoquip Australia at +613 9791 7888 or tborn@cryoquip.com.au.

Global Service Centers Servicing the World

A worldwide marketing and sales organization needs a global service group and Cryogenic Industries has put together a truly international line up. 4 locations in the USA; 2 locations in Canada; and centers in Australia, Brasil, China, Europe, India, Korea, Malaysia and soon to be in Dubai.

All products and equipment manufactured by Cryogenic Industries companies are technically supported and serviced from these centers. Potential customers will find knowledgeable and capable sales representatives under the same roof where customers find the parts and service assistance they require. Whether you need a new pump or turbo, a replacement seal, a low cost fitting or a multi million dollar air separation plant you call the same number in a location close to you in your time zone. In addition to a full spare parts service, Cryogenic Industries Service Companies provide equipment exchange programs, motor and alternator repair, technical advisors for system start up, test facilities, geographic customization of standard systems, and technical seminars on equipment operation, maintenance and repair. All makes and models of pumps and equipment are serviced.

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Cryogenic pump training workshops* are offered to managers, engineers, and technicians to provide expertise in pump theory, installation, replacement, and maintenance. Our free two-day seminars are held twice a year at our service facilities, supplying customers with the knowledge and experience they need to maximize product performance.

For more information on this article contact your local service center at the address given.

Green Energy in Asia

Energent Corporation has recently expanded our green energy activities to Asia. Applications include recovery of waste heat in incinerators, recovery of waste heat from the main propulsion engine of container ships, recovery of waste heat from refineries and generation of power from geothermal resources. To have an impact we have formed relationships with Asian companies having Engineering Procurement and Construction ("EPC") capabilities.

For example, a hermetic Variable Phase Turbine generator was developed to generate power from an incinerator. This unit is a part of an Organic Rankine Cycle operating with a refrigerant working fluid. The refrigerant cools the generator and bearings, resulting in a unit with no external shaft seals. Greenhouse gas emissions from this turbine are zero. A view of the turbine is shown in figure 1. Power can range from 100 kW to 300 kW depending upon the heat source.

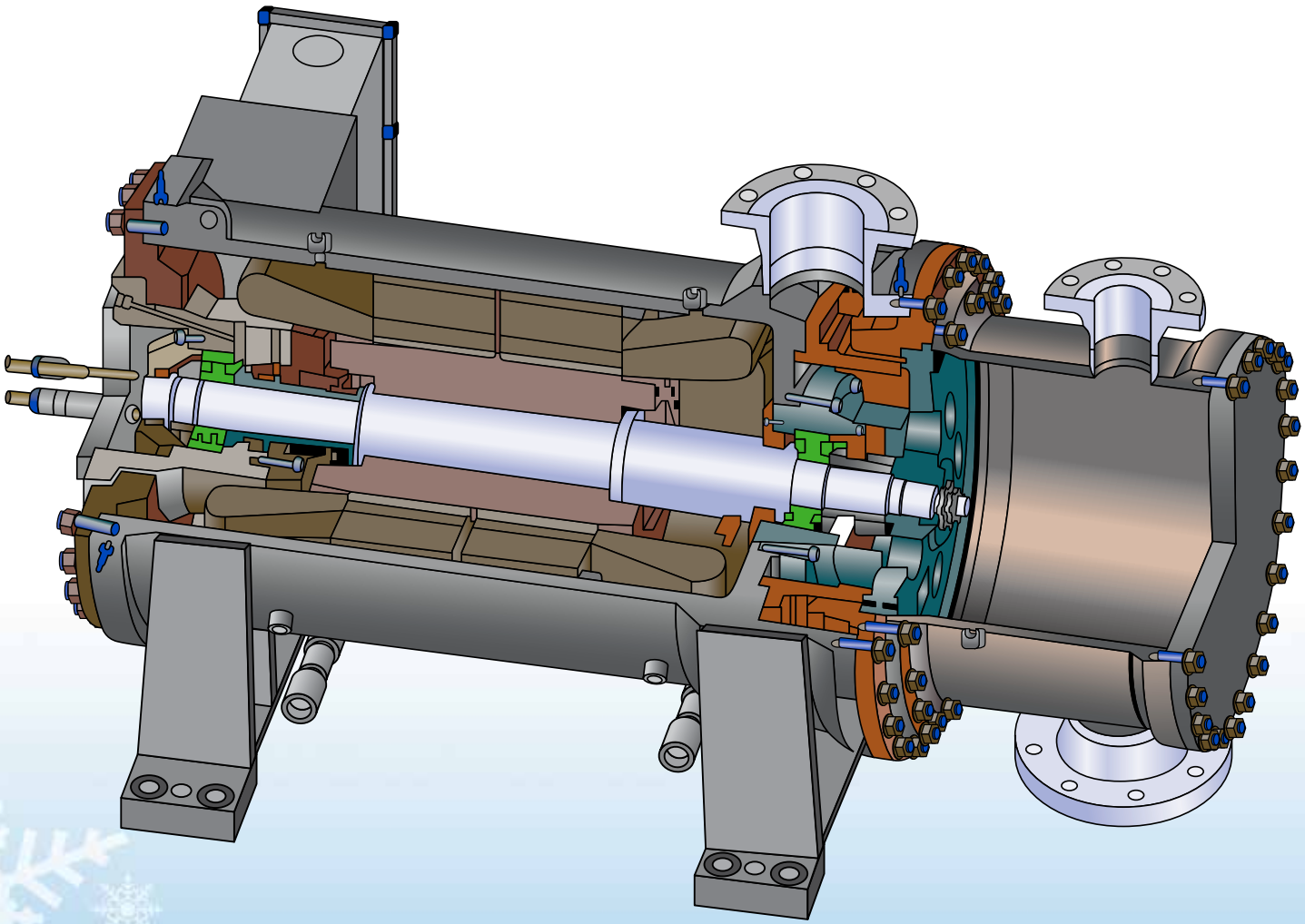

Figure 1 Hermetic Variable Phase Turbine for Waste Heat Recovery

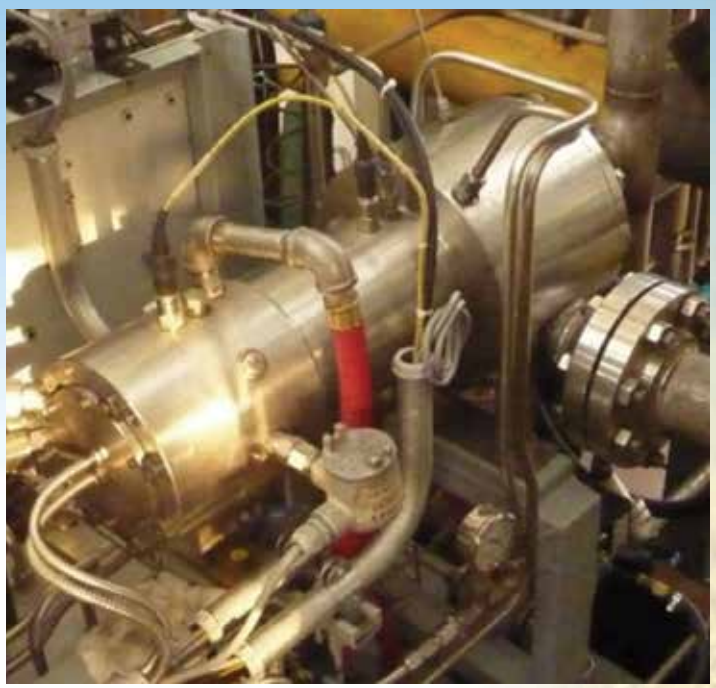

Figure 2 Nanosteam® Turbine Operating in Power Plant

In addition to Japan, a geothermal power plant was demonstrated in Taiwan. The Energent turbine for this power plant was the Microsteam® turbine (see www.energent.net for details).

This unit produces a maximum of 300 kW from the ammonia-steam mixture used in the power plant or from steam alone for pressure reducing valve replacement. The demonstration plant, shown in figure 3 produced power successfully in a 30 day acceptance test.

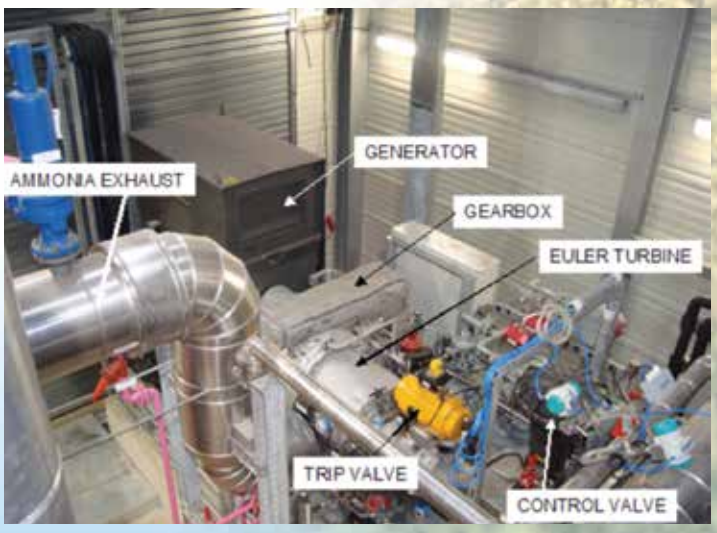

Figure 4 Euler Turbine Generator Operating in Geothermal Power Plant

For inquiries for projects or turbomachinery in Asia contact Lance Hays at Energent at +1 949 261 7533 or lhays@energent.net and we will forward the inquiries to our EPC partners in Japan and China.

Another project used our nanosteam® turbine to generate power from an onsen ("hot spring") in Japan. Instead of lowering the temperature of the hot water by mixing it with cold water, the temperature was lowered for bathers by transferring some of the heat to a power plant. Energent provided the turbine generator for the power plant. The unit is shown in figure 2. The nanosteam turbine generates 100 kW at 56,000 rpm with a high speed generator from a mixture of ammonia and steam or (in the case of replacing pressure reducing valves) from steam alone.

Figure 3 Geothermal Plant Operating at Qingshui, Taiwan with Microsteam® Turbine

A ubiquitous source of energy lies in the low temperature water found in refineries and other process plants. The water occurs as condensate from steam used for heating and water used to cool higher temperature product streams. Energent is providing an Euler turbine generator to generate 3.4 megawatts from a waste water stream in China. The low temperature water is used to vaporize an ammonia-steam mixture which is expanded in the turbine. A similar unit was provided for the same working fluid for a geothermal plant in Germany. This unit, with a capacity of 600 kW is shown in figure 4.

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