CRYOGENIC INDUSTRIES

FrostByte

Volume 10 No. 2 A Newsletter from Cryogenic Industries Summer 1999

Cryoquip develops the world's largest known gas dryer

Cryoquip recently completed fabrication of the world's largest known propylene gas dryer. The unit, commissioned in Taiwan by Formosa Plastics, processes 50,000 kg/hr (110,000 lb/hr) of propylene for use as a reaction feed gas.

A propylene stream is dried by adsorption on two molecular sieve beds, one is on line while the other is being regenerated. The beds are alternated automatically to ensure a constant stream of dry gas in accordance with the customer's specifications. The regeneration cycle is controlled by a continuous sampling of the drier outlet stream by the moisture analyzer. The beds are automatically switched when the feed stream senses water in excess of 3 ppm by weight value. Should the moisture analyzer fail, a secondary moisture analyzer, together with a time based system, serves as a back up.

Special design considerations were warranted, including the continuous maintenance of water content, local temperature and pressure transmitters, automatic steam controls, liquid drainage, and level indicators. The water content less than 3 ppm by weight consideration was required to prevent unwanted byproducts and deterioration in the reactor and further downstream equipment. Because of the corrosive properties of the highly salinic, moist atmosphere on the Taiwanese peninsula, unique paint and coating treatments were necessary, including a five-step coating process cured to a greater-than-normal 12-15 mil dry film thickness. Unique statistical process control measures were also required, including a 10% x-ray inspection of all butt joints from each welder, doubling the standard 5%.

The world's largest known GPEC dryer is located at Formosa Plastic's VCM facility in Maillao Yun-Lin, Taiwan, R.O.C.

The system comprises dual molecular sieve beds, a low pressure steam heater, condenser, knock-out vessel, blowers, and instrumentation. The gas dryer skid was designed by Gas Purification Engineering Co., Irvine, CA, USA, who provided Cryoquip Engineering with piping and instrumentation diagrams (P&IDs). From the P&IDs, Cryoquip Engineering designed the unit to minimize the required footprint while ensuring its performance. All manufacturing drawings and the required skid, piping and miscellaneous materials were engineered, tested and fabricated by Cryoquip.

For more information, contact Adam Zarate at Cryoquip, +1.909.677.2060 or azarate@cryoquip.com.

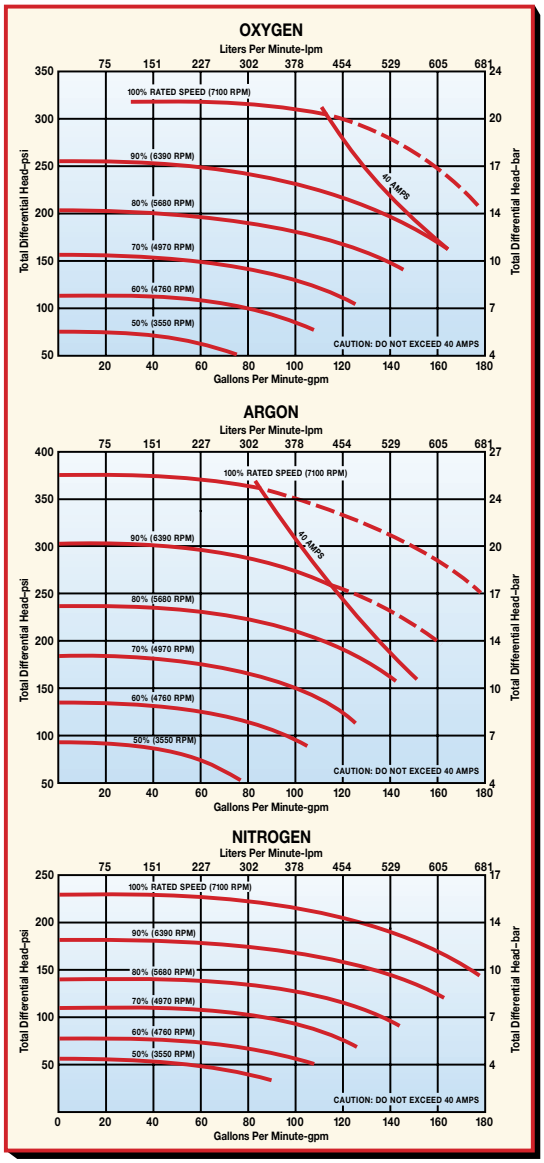
Inside This Issue

LECTRAN® pumping system offers high performance, low cost

Used by all major producers of cryogenic liquid products, the LECTRAN® mobile cryogenic pumping system is part of ACD's worldwide product line currently supplied by Pittsburgh Cryogenic Services, Inc. (PCS). These electrically operated pumping systems are used for efficiently transferring liquid cryogenic products from a truck or semi-trailer to a stationary storage tank or other vessel. (See Performance Curves.)

Varied product line

Flexibility is the key to meeting customer needs, and LECTRAN systems are designed to permit tailoring the system to the delivery vehicle's performance characteristics and customer pumping needs. For example, systems are offered with several different gear ratios—as well as direct drive—to accurately match the PTO rpm with the alternator's speed requirements. Also, customers can choose systems offering the desired pressure and flow rates and in constant or variable speed.



Simple, yet full-featured

All LECTRAN systems consist of a brushless AC generator (alternator), electric motor, cryogenic pump, and associated controls. The alternator is driven by the truck engine's power takeoff or auxiliary power unit. It provides the electricity needed to power an electric motor, which in turn drives the liquid transfer pump.

At a cost about one-quarter that of hydraulic pumping systems, LECTRAN is an excellent alternative that offers significant benefits, including:

- leak-free, environmentally safe operation
- complete liquefied gas transfer system
- highly reliable components, requiring minimal maintenance
- driver-friendly safe and easy operation
- lightweight, compact, and easy to install components
- highly efficient operation, using less horsepower than competitive systems
- availability in constant-or variable-speed
- variable flows and pressures (by regulation of the power source)

- alternator installation in any of several positions for maximum flexibility
- pump shaft sealed against both static and dynamic leakage
- single-source maintenance service
- most parts and systems shipped same day
- customer service line answered 24 hours a day

What's new

ACD will be introducing a CO_2 offloading system later this year. PCS will continue as the supplier of the LECTRAN product line, including the new CO_2 LECTRAN delivery system. Using an ACD CRYO cryogenic pump (see article on CO_2 pumps in Fall 1998 issue of FrostByte), this product will fulfill the need for an efficient, lightweight, low-cost system for this growing market segment. PCS will also add a new, more powerful alternator to its product line. This new unit—a 60 KVA alternator—will provide the higher energy output needed to operate a pump capable of delivering much higher flow rates and pressures.

"The new system will offer performance comparable to hydraulic transfer systems, but at lower cost, higher reliability, and greater safety," said Carl Henningson, General Manager of PCS. These new products are expected to be released later this year. "Each fills a specialized need of many customers in the cryogenic industry," added Henningson.

For more information, contact Carl Henningson at Pittsburgh Cryogenic Services, Inc., tel +1.724.695.1910 or pittcryo@pulsenet.com.

ACD exceeds the industry cleaning standards

ACD has reorganized its manufacturing facilities and upgraded its capabilities to ensure that part cleanliness and pump assembly meet and exceed industry standards. All of ACD's oxygen compatible pumps are assembled and parts are cleaned in this new "clean room."

The 600 ft^2 (56 m^2) clean room has two separate areas that vary from class 100 to class 10,000 standards. The clean room has positive airflow/pressure using 720 cfm, self-powered, 99.99% pure HEPA filters. A laminated flow bench is used to clean smaller parts such as mechanical seals, valves, gaskets, etc. For pumps, a larger class 10,000 area is used for assembly and cleaning to meet oxygen compatibility requirements.

Prior to parts entering the clean room, they are pre-cleaned in a new multi-stage cleaning area. Deionized water is heated to 120° F (48° C) and used as a constant throughout the cleaning and rinsing process. Ultra-sonic cleaning is used for parts with cavities or hard to reach areas. After the parts are cleaned, a final anti-tarnish finish is applied in accordance with CGA standards.

"ACD has invested heavily to expand and reorganize the manufacturing facility to ensure all parts are assembled in a clean environment. For oxygen compatible pumps, ACD has raised the bar by assembling pumps in our clean room, providing assurance to our customers that ACD pumps exceed their standards," said Joe Zarrinnegar, Operations Manager.

The improvements made by ACD have proven valuable as recent audits by major industrial gas customers have yielded high marks. ACD's focus is to improve the process guaranteeing the product meets and exceeds customer expectations and that of industry standards.

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P2K development continues

ACD's new P2K pump development remains on schedule. A beta test program has been established and will begin this fall with production scheduled for January 2000.

"Customers will significantly benefit from the many design features of the P2K pump, from maintenance to overall pump performance. Our development team has done a great job listening to customers and making necessary changes," said Bob Lilly, Product Development Manager.

The P2K pump line has a flow range of 0.5-4.5 gpm (1.9-17.1 lpm) based on pressures from 3,000-6,000 psi (207-414 bar). Plans are being developed to increase the flow range to meet higher process conditions and new applications.

For more details, see the Winter/Spring 1999 issue of FrostByte or contact Bob Lilly at ACD, tel +1.949.261.7533, fax +1.949.261.6285 or blilly@acdcom.com.

Cryogenic Industries Member Companies' Pump and Vaporizer Training Workshop Schedule

September 28 & 29–Pump Workshop
CryoAtlanta, Inc.
Location: Atlanta, GA USA

Contact: Tom Farmer
Atlanta, GA USA
Tel 888.217.9355 (USA only)
Tel +1.404.696.8113
Fax +1.404.696.8116
tfarmer@bellsouth.net

October 19 & 20–Pump Workshop
Pittsburgh Cryogenic Services, Inc.
Location: Imperial, PA USA

Contact: Carl Henningson
Imperial, PA USA
Tel: 800.327.6461 (USA only)
Tel: +1.724.695.1910
Fax: +1.724.695.1926
pittcryo@pulsenet.com

Nov 9 & 10–Pump Workshop
CryoCal, Inc.
Location: Santa Ana, CA USA

Contact: Mike Coco
Santa Ana, CA USA
Tel: +1.949.724.8636
Fax: +1.714.641.1921
cryocal@ix.netcom.com

Cosmodyne and Woikoski partner for a successful plant installation

Interview with Clas Palmberg, President of Oy Woikoski AB

Q Describe your first contact with Cosmodyne.

A I visited Cosmodyne in Torrance for the first time the day the Gulf War broke out. As a government military supplier, Cosmodyne had a hectic time. The company produced small, extremely dependable 1 to 6 tpd portable liquid plants to military specifications, mainly for the U.S. Navy and Air Force. These plants, due to high power consumption and lack of automation, were not well suited for the highly competitive commercial market.

I also visited Cosmodyne's sister company Cryo-Chem in Murrieta, which was developing a fully automated cylinder filling system called Compufil®. Together with Cosmodyne, we specified the demands of Woikoski—25 tpd, low specific power consumption and a high degree of automation—with the help of components from the Compufil® system and those "clever guys in Murrieta." This resulted in an offer of a one of a kind plant, very similar to today's ASPEN 1000, but with some unsolved questions. Years later I received a brochure of the ASPEN 1000 plant, Cosmodyne's response to market demands similar to our own.

Q Why did you choose Cosmodyne?

A The Cosmodyne plant has numerous advantages:

- It is truly prefabricated and built into containers or container frames, which allows assembly of nearly all equipment and piping, including analyzers and electrical wiring, at the manufacturer's site.
- The plant can be fully tested at the manufacturer's site and your own personnel can be trained under supervision of the manufacturer.
- Shipping and erection of the plant is easy.
- The plant is fully movable and, thus, has a high resale value.
- The plant has a very high grade of automation and all parameters are stored in an archive for later use.
- The ASPEN is assembled with easy to obtain and maintain components with some grade of redundancy. For instance, the ASPEN uses two identical nitrogen recycle compressors at full capacity. However, if one fails, the plant will continue to operate, although at a lower production rate.
- Installing a liquefier can double the nitrogen capacity of the plant.
- Upgrade to the ASPEN 2000 is easy.

Q How has the plant been performing?

A The plant was erected in only six weeks and has been performing to our full satisfaction since. In my opinion, there is no serious competitor to Cosmodyne for this type of plant.

Q Is this Woikoski's first plant?

A Woikoski started production of acetylene in 1912 and the production of hydrogen and oxygen by the electrolysis of water in 1913. The first air separation plant was taken into use in 1932 and there have been seven other air separation units at different locations before the ASPEN plant. Two gaseous units still exist, but are not in use. Two additional units were left on the Russian side of the border after World War II and are still in use.

Q For what are the products from the Cosmodyne plant used?

A The products are used for the usual commercial market, including welding, metallurgical and medical purposes as well as applications for the electronic and food industries. Distribution is handled by Woikoski's 10 subsidiaries, most of them including cylinder filling facilities and 130 resellers.

Q Where is the plant situated?

A The plant is situated in Voikoski connected to our hydropower station, which was refurbished for this very purpose during the period of 1994-1997.

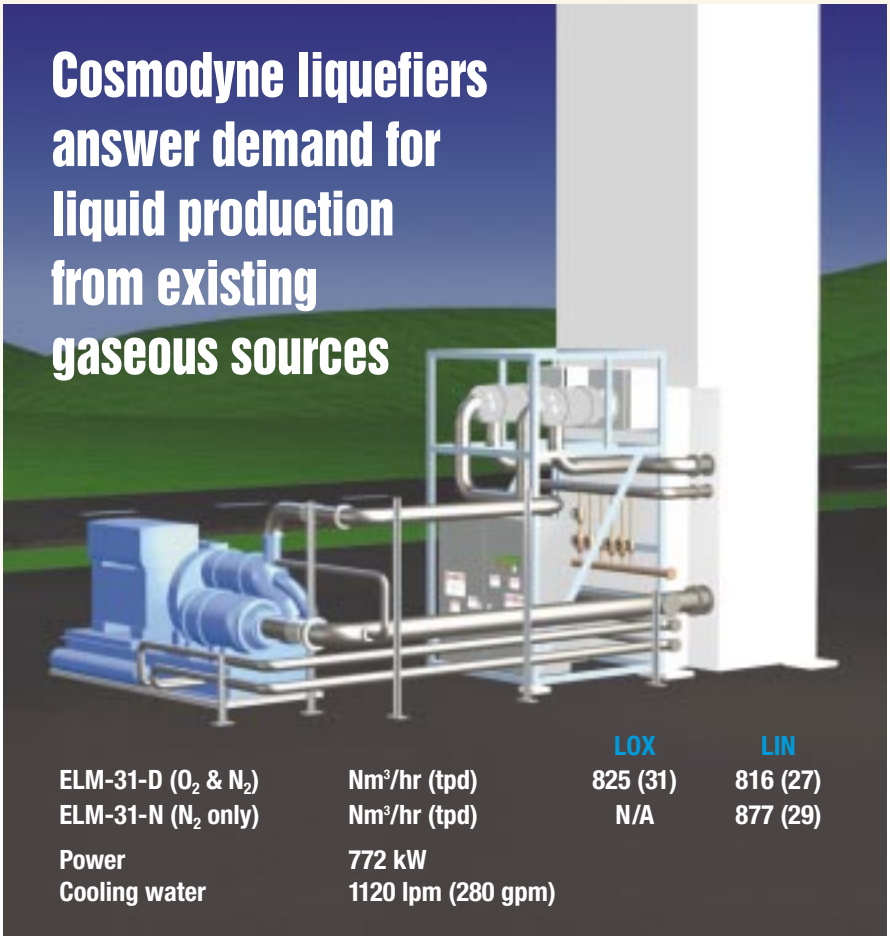
The hydropower plant was originally built in 1917 and the direct current was used for electrolysis and later, in the 1930s, for air separation plants. The same idea used in 1917 seems to apply in 1999.

Q Why were you pleased with the service from Cosmodyne?

A Cosmodyne has lived up to all our expectations. The standard plant had to be modified due to different pressure vessel codes in Finland and many special demands from Woikoski. Here Cosmodyne showed great flexibility, ability and skill. During training and start-up, Cosmodyne also performed very well. Due to cold weather conditions, the air compressor had to be reprogrammed and the Ingersoll-Rand personnel from the U.S. arrived at the plant within very short notice.

We also experienced an equipment failure, which was dealt with in a timely fashion. Within 24 hours of notifying Cosmodyne, a representative arrived in Finland to correct the problem, and the plant was in production 12 hours later.

It was a pleasure to work with the Cosmodyne people, and the project was highly supported by the management of Cosmodyne and Cryogenic Industries.



ELM Series

Cosmodyne has introduced the ELM Series oxygen and nitrogen liquefiers in response to customer demand for making liquid from existing gaseous sources. The units also can be used to liquefy the nitrogen gas available on Cosmodyne's ASPEN Series liquid plants. Both the ELM and ASPEN designs share many of the same components, which simplifies spare part replacement and operator training.

The ELM uses an efficient nitrogen recycle process to liquefy either nitrogen or oxygen. Due to its pre-fabricated, modular design, the unit ships in standard ISO containers. This minimizes the total installed cost.

Several standard capacities are offered, including 30, 80 and 120 tpd. Other sizes also are available.

For more information, contact George Pappagelis at Cosmodyne, +1.310.320.5650 or info@cosmodyne.com.

Cosmodyne GFED Series plants offer portability and low installation cost

The GFED Series air separation plants were designed in response to a growing need for maximum portability and minimum on-site installation expense. Since their inception, the number of different applications for which the GFEDs are used has grown and even includes medical oxygen applications. These containerized units are available in 4 tpd and 6 tpd models, producing liquid oxygen and nitrogen. Since the plants are air-cooled, only electricity is required for operation.

Each plant is shipped in two ISO-style containers. The cold box and weather-tight air compressor package are packed in one container with the balance of the plant—purification system, lube oil system, and electrical controls—permanently installed in the primary plant container. The latter also houses the operator's control station.

GFED Series Performance Specifications

20°C (68°F); 50% RH; 1 atm.

		GFED-1		GFED-3	
		maximum LO_2	*maximum LN_2*	*maximum LO_2*	*maximum LN_2*
Production					
Liquid oxygen	Nm³/hr (tpd)	105 (4)	0	157 (6)	0
Liquid nitrogen	Nm³/hr (tpd)	0	120 (4)	0	180 (6)
Total liquid production	Nm³/hr (tpd)	105 (4)	120 (4)	157 (6)	180 (6)
Purity					
Liquid oxygen	% O_2	99.6	–	99.6	–
Liquid nitrogen	ppm O_2	–	99.5	–	99.5
Power	kW	372		420	

Once on site, installation can be accomplished in one day and production can begin within the next. Each GFED plant is factory tested to ensure minimum downtime on-site.

For more information about the GFED Series containerized air separation plants, contact George Pappagelis at Cosmodyne, +1.310.320.5650 or info@cosmodyne.com.

ACD CRYO launches new web site

ACD CRYO is now at the world's fingertips…via the Internet. The company has launched the first release of its web site, which will be developed continuously and will include a corporate profile, product and service information, and links to related sites. In addition, information seekers will be able to communicate directly with the company's employees through a hyperlink.

"Our web site will give the customer a communication entry point to our organization. We expect it to become an active interface to existing and new customers to learn about our company and our products. It will also allow our new customers to become comfortable with us before they have direct contact," said Walter Eggs, General Manager of ACD CRYO.

View the web site at http://www.acdcryo.com.

Profile

Hanner joins Cryogenic Industries

Ron Hanner recently joined Cryogenic Industries as Regional Marketing Manager servicing the European marketplace. He works out of the Cryogenic Industries-Europe office in London, England. Previously, he worked at Sulzer AG in Switzerland as Sales and Marketing Manager and as a technical consultant.

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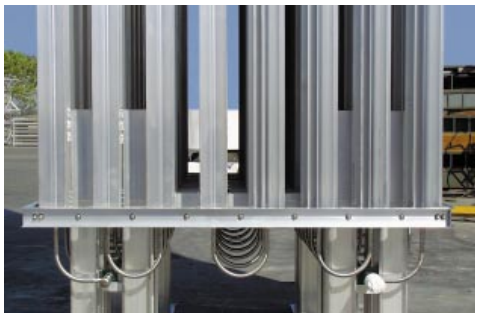
Cryoquip manufactures hybrid ambient vaporizers featuring a varying number of fins

Cryoquip is now offering a new, unique "hybrid" style ambient vaporizer, which features heat exchange arrays of varying numbers of fins. The hybrid maximizes heat transfer efficiency, minimizes material content, and reduces both capital costs and maintenance de-icing costs.

The hybrid vaporizer accomplishes this by reducing the number of elements in the unit's boiling section. Conventional ambient vaporizers, on the other hand, are designed with uniform fin arrays throughout the sub-cooled, boiling, and super heat sections. In these traditional designs, ice loading is typically concentrated densely in a relatively small section of the vaporizer. This ice build-up is difficult to remove and often too dense to defrost during off stream cycles. Ice carry-over between switching cycles leads to deterioration of the vaporizer's performance. The ice build-up is especially apparent in severe climate zones such as marine or extended freeze period climates.



Marine climates, where ambient vaporizers experience heavy icing, are characterized by dry bulb temperatures between -2° C (28° F) and +10° C (50° F) at approximately 100% relative humidity. These conditions exist for extended periods of one month or more. Vaporizer aluminum surface temperatures most commonly exist at temperatures less than 0° C (32° F).

Extended freeze period climate zones normally include areas where the temperature remains below freezing for more than two weeks at a time. Vaporizers are often designed with substantially more surface area because defrosting does not occur during off stream cycles. Adequate surface area is provided in order to meet vaporizer flow requirements at the end of the freeze period, the time when maximum ice loading can occur.

Continuous operation also poses a dilemma. If ambient vaporizers are operated continuously without a defrost cycle, particularly in high dew point atmospheric conditions, heavy icing will occur on the vaporizer fin surface. The icing is similar to those in other severe climate zones.

The sub-cooled and boiling sections of the vaporizer usually make up half of the heat load requirements. The boiling section of the vaporizer is a constant temperature region. (Most typical industrial gas fluids boil at a temperature close to -196° C (-320° F).) Here, fin surface temperatures remain relatively constant and result in the probable formation of ice.

Typically, aluminum fins become completely iced over after a couple of days of operation. Fins become less efficient as the ice builds. Shorter finned extrusions lose their efficiency quicker under these icing conditions. Eventually a cylinder of ice will develop, totally encompassing the extrusion element. The fins underneath the cylinder of ice become less useful and, in fact, the ice surface itself becomes the heat transfer element. Regardless whether the unit is comprised of 4-fin or 8-fin arrays, the time period required to reach this condition is about the same. Therefore, a vaporizer built using 4-fin arrays in the boiling section can achieve similar results as one with an 8-fin array, but with lower material costs.

If these icing conditions are expected during the operation of the vaporizer, the hybrid design is worth considering. Reducing the number of fins in the boiling section of the vaporizer will result in vaporizer performance similar to that produced by conventional designs over extended periods of operation or in severe climate conditions.

Reduction of fins in vaporizers operating in these conditions will result in more effective distribution of the ice load through the vaporizer; greater open area and exposure to the benefits of wind and solar radiation; increased "sloughing" of the ice resulting in reduced ice densities over more extended operation times; a reduction in vaporizer cost due to less material required to vaporize; and more effective defrosts during off stream cycles because of greater extrusion exposure to wind and solar radiation.

With conventional vaporizer designs, the more compact fin arrangements allow for less air circulation through the boiling section. This reduces a conventional unit's ability to remove ice and leads to denser ice formations.

Typically, ice build-up in the superheat section is significantly less than that in the boiling section. As a result, the hybrid vaporizers are designed with a greater number of fins in the superheat region in order to more effectively transfer heat to the fluid. This leads to a more compact design and a higher heat transfer rate per length of extrusion.

This combination of a reduced finned boiling section and an enhanced finned superheat section are the keys to the hybrid vaporizer's unique construction and its efficient operation.

For more information, contact Patrick Billman at Cryoquip, +1.909.677.2060 or pbillman@cryoquip.com.

Calendar of Events

SEP 7–10 IIOGE '99 (INDONESIAN INTERNATIONAL OIL & GAS EXHIBITION AND CONFERENCE), Bali International Convention Center
Contact South East Asia Conference & Exhibition Company
112 A Shirland Road, London W9 2 EQ UK
Tel +44.171.286.9720, Fax +44.171.396.0097, seace@dircon.co.uk

SEP 14–16 APEX '99, Detroit, MI USA
Contact Society of Manufacturing Engineers Expositions Division
One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930 USA
Tel 800.733.EXPO (3976–USA only), Fax +1.313.271.2861

SEP 19–24 20TH INTERNATIONAL CONGRESS OF REFRIGERATION, Sydney, Australia
Contact ICR99 Secretariat, Tel +61.3.9328.2399, Fax +61.3.9328.4116
icr99@airah.org.au, www.airah.org.aw/icr99

SEP 20–23 PUMP USERS EXPO '99
Nashville, TN USA, Opryland Hotel Convention Center
Tel +1.818.776.9830, Fax +1.818.885.1391

OCT 2–6 1999 NWSA ANNUAL CONVENTION
New Orleans, LA USA, Contact National Welding Supply Association
Tel +1.215.564.3484, Fax +1.215.564.2175, assnhqt@netaxs.com

OCT 18–21 WELDEX '99, Birmingham, United Kingdom
Tel +44.1322.660070, Fax +44.1322.667633

OCT 19–20 SEMICON SOUTHWEST
Austin, TX USA, Contact SEMI North America
Tel +1.650.964.5111, Fax +1.650.967.5375, semihq@semi.org, www.semi.org

OCT 26–28 INTERACTIVE ENERGY 1999 EXPO & CONFERENCE
Houston, TX USA, Contact Zeus Development Corporation
2424 Wilcrest, Suite 250, Houston, TX 77042 USA
Tel +1.713.952.9500 or 888.478.3282 (USA only), Fax +1.713.952.9526
www.interactiveenergy.com

OCT 26–29 OIL & GASTEC '99, Kiev/Ukraine, Contact Messe Dusseldorf International GmbH, Boddan, Chmelnizkij 55, 252054 Kiev/Ukraine
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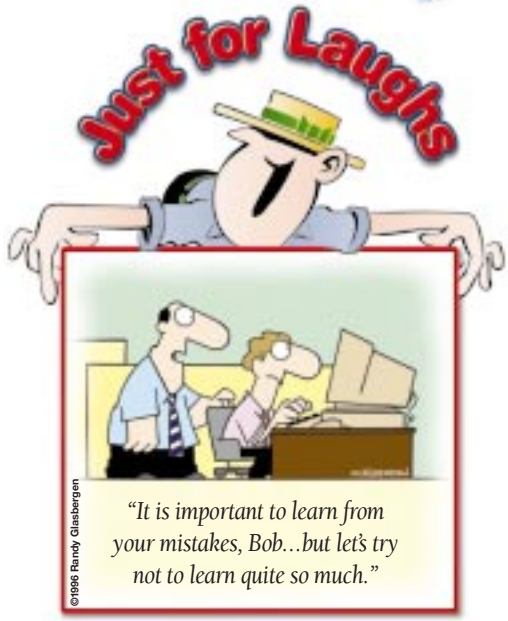

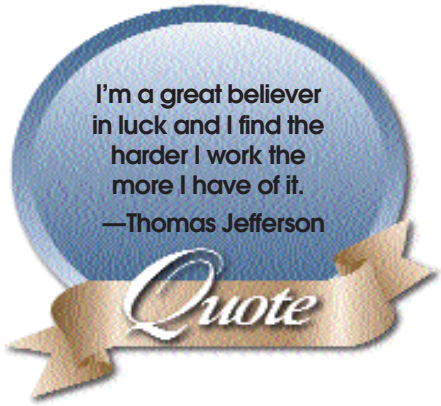

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