

# news line

A BOC GASES  
PUBLICATION  
FOR THE  
ELECTRONICS  
INDUSTRY

## INSIDE



New Edwards TPU  
exhaust system

3



BOC to install  
bulk TCS

5



Cost-effective  
Micro-LN™ generator

6



Modeller provides  
competitive edge

9



Site Services provide total  
gas management worldwide

10



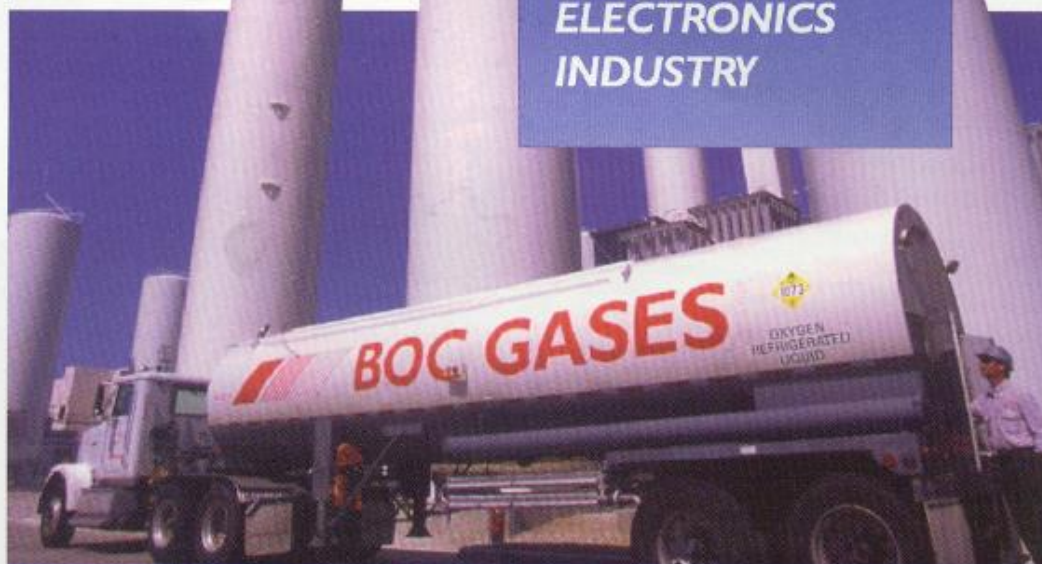
Atto to manufacture  
SpectraSafe™ cabinets

11



BOC Gases forms joint  
venture in Israel

12



## BOC Gases awarded 12 contracts in 18 months

Within the past 18 months, BOC Gases has won 12 major contracts to provide gas management strategies at wafer, integrated circuit and packaging facilities around the globe. Among the firms awarding contracts to BOC are TwinStar, Komatsu, Texas Instruments, Fujitsu, Toshiba, and UMC.

Projects include single-source supply and management of all cylinder and bulk gases, as well as design, installation, certification and operation of gas cabinets, valve manifolds and related gas distribution equipment.

"The industry is clearly moving toward total gas management," says John Walsh, BOC Gases, vice president-electronics. "Customers want a single-source supplier who can handle all the gas and gas-related aspects of their operation, from the point of manufacture to the point of application within the process tool."

(continued on page 4)



# Semiconductor International

## Industry Observation

### Semiconductor Industry Suppliers Face Twin Challenges

John Walsh, Vice President  
BOC Gases

The twin challenges of meeting surging demand and operating in new countries will continue to confront the semiconductor industry in the years ahead. Successfully meeting these challenges will require a seamless, comprehensive, technically advanced infrastructure provided by suppliers to the semiconductor industry.

In the past, when semiconductor manufacturers were tightly grouped in a few lead markets, suppliers faced few logistical problems in delivering their products to manufacturers. Local infrastructure was built over time and semiconductor industry suppliers could focus their investments on those key markets. Suppliers were judged chiefly by their performance in supplying each local manufacturing site. Today, as semiconductor manufacturers build facilities around the world, suppliers must be prepared to extend their reach and the level of services they provide.

#### A truly global industry

The semiconductor industry is in a dramatic growth phase with demand driven by a number of factors, including the introduction of Windows 95 and the continued penetration of the home marketplace. Integrated circuits have found their place in a fast-growing list of consumer products from cellular phones and personal organizers to automobiles, microwave ovens and washing machines. Historically, semiconductor manufacturers were located in the United States, Japan, and Europe — near their customers, the personal computer manufacturers in the same areas. Using the same rationale, the new fabs of today are being built near the manufacturing centers of these various consumer products in countries such as Korea, Singapore, Taiwan, China, Israel, Malaysia and the Philippines. The manufacturers of these consumer products want to work with local semiconductor manufacturers to obtain a synergism in design and research. And governments — recognizing the importance of developing a high-tech domestic industry — are now aggressively courting semiconductor manufacturers.

The reality of constructing, operating and supplying billion-dollar semiconductor fabs is challenging under any circumstances, but particularly so in countries where the infrastructure is new. Emerging markets generally lack adequate power supply, transportation, and air and water quality. These problems pose extreme challenges to companies whose previous experience is restricted to the United States



or Japan, where the local infrastructure was developed over the past three decades. Training a local work force is a priority as well, and confronting a new set of regulatory guidelines and cultural mores can raise even further issues.

Both semiconductor manufacturers and their infrastructure suppliers must be able to deliver highly qualified engineers and technicians to design and operate these state-of-the-art facilities. Infrastructure suppliers must be prepared to deal with the challenges listed above for their own operations, and collaborate with the semiconductor manufacturers on them as well. Supplier manufacturers on them as well. Suppliers with truly global operations and experiences are ready for these challenges.

#### Bigger is better

For semiconductor manufacturers to build faster, more powerful and less expensive integrated circuits, they must build larger, more expensive manufacturing facilities in search of cost savings. Only by achieving the simultaneous goals of high throughput and yield can semiconductor manufacturers realize the economies of scale necessary to reduce device costs.

This trend will also continue elevating the role of suppliers in the industry. True partnering — from design to problem solving to the eternal drive for lowest lifetime costs — is here today and will continue to drive the industry. A supplier to the semiconductor industry who is not committing significant resources to research in areas related to their customers' process efficiency is not likely to prosper in the coming decade.

Meeting the demands of large-scale plants independent of location and the pressures of cost containment are resulting in even greater emphasis in on-site supply schemes and on-site service personnel. By working closely with process and equipment engineering managers, on-site engineers, major contractors, plant safety personnel and local fire code officials, on-site services personnel help control inventory and administrative costs, increase up-time and safety, and provide access to the supplier's technology. Both of these trends — on-site supply and on-site services — will continue in the years ahead.

The future will see both semiconductor manufacturers and their suppliers shifting enormous financial resources and personnel to emerging markets, while continuing to invest heavily in R&D for the continuous improvement dictated by the pace of technology. Tackling these issues while coping with the current high demand is a key challenge for the industry and its suppliers. □

**Suppliers must  
address both  
exploding  
demand and  
operational  
migration over  
the coming  
years.**



# New Edwards TPU exhaust system features excellent availability, superior efficiency

Edwards High Vacuum International, the vacuum systems company of The BOC Group, recently introduced a new abatement technology—the Edwards Thermal Processing Unit (TPU)—for treating hazardous exhaust gases from semiconductor fab units.

Now commercially available, the TPU is currently being installed at Texas Instruments' DMOS 5 Phase II fab (see article on page 5). In addition, the Edwards TPU won the 1996 Best System for Environmental Technology Award from SGS Thomson, a French semiconductor manufacturer.

"As environmental audits of semiconductor manufacturers become more intense, PFC abatement will increasingly be required," says Adrienne Pierce, Edwards, product manager, exhaust management systems. "The TPU is designed to meet this challenge, as the semiconductor industry moves toward zero PFC emissions."

## **Treating troublesome PFCs**

The TPU removes the perfluorinated (PFC) gases thought to contribute to global warming, including  $C_2F_6$ ,  $CF_4$ ,  $NF_3$ , and  $SF_6$ .

Destruction efficiency for PFC gases exceeds 98 percent, with  $NO_x$  emissions of less than 3 parts per million (ppm). Used to treat high flows of hydrides, the TPU is ideal for complete abatement of plasma-enhanced chemical vapor deposition (PECVD) gases and treatment for APCVD, epitaxial, and other deposition systems.

## **Two-in-one technology**

The TPU, which complements Edwards' gas reactor column (GRC) technology,

combines thermal oxidation and wet scrubbing in a single unit.

Process gas flows from the vacuum pump directly into a cylindrical combustor. Fuel gas and air pass



through the porous cylinder wall, becoming incandescent with heat. This inward-fired adiabatic combustion efficiently destroys exhaust gases while minimizing deposition of byproduct solids.

The reacted gases move to a three-stage wet scrubber consisting of a flux force condensation scrubber, cyclone scrubber and packed tower. Condensation in the flux force scrubber removes most of the  $SiO_2$ . A water weir continually wets the sides of the scrubber to keep the hot gases from corroding the unit and to prevent particulates from blocking fluid flow.

Particulates not removed in the condensation stage are entrained in the cyclone scrubber, and the water is drained. In the final stage HF (hydrogen fluoride) is removed below 3ppm from the gas stream through a high-efficiency packed water tower.

## **Meets safety standards**

The TPU is fully certified to meet Semiconductor Equipment and Materials International's Standard S2-93. Compliance with electrical and safety standards ensures safe and reliable operation. In Sematech trials, TPU system availability was greater than 99 percent.

The compact TPU has a footprint of approximately 3 by 2 feet. System capacity is 200 standard liters of exhaust gas per minute. Exhaust gas enters the unit through four inlets at 50 standard liters per minute. By year end, TPUs will be network compatible with the iQ central monitoring system.

Two models are available. The TPU 4200, operating at 900 °C, can destroy  $C_2F_6$ , silane,  $SF_6$ , and  $NF_3$ . The higher operating temperature of the TPU 4214—1100 °C—enables it to destroy  $CF_4$  as well.

Edwards also offers a full line of GRCs. In the GRC, a two-stage process converts complex mixtures of exhaust gases to stable nontoxic inorganic salts.

GRCs are designed to break apart organic chlorides, which are precursors to dioxin formation.

Edwards' TPU and GRC combine to become the most effective range of products to meet the diverse challenges of protecting our environment. ■



# BOC Gases awarded 12 contracts

(continued from page 1)

Adds Walsh, "By focusing on the electronics industry as a market sector, BOC Gases has been able to respond to this new trend successfully, as demonstrated by the large number of major wafer and integrated circuit manufacturers who have chosen BOC as their total gas management partner."

## **A total solution for TwinStar**

BOC Gases was recently awarded the special gases and on-site services business at the first manufacturing facility of TwinStar Semiconductor, Inc. in Richardson, Texas. A joint venture between Texas Instruments and Hitachi, TwinStar manufactures 16 and 64 Mbit DRAM chips.

Cylinder gases to be supplied by BOC include silicon precursors such as silane, reactive gases such as tungsten hexafluoride, etching gases, and dopants.

BOC Gases was previously awarded the responsibility for bulk gases including systems installation and on-site service at TwinStar. With this new contract to provide and manage cylinder gases, BOC has become the sole supplier of gases and gas services to TwinStar.

Recently installed at TwinStar is a Spectra-N 3000 nitrogen generator equipped with BOC's newly developed oxygen side column (see "UHP on-site oxygen production," page 6). BOC handles all TwinStar's requirements for bulk gases including nitrogen, oxygen, argon, hydrogen and helium.

The gas distribution system at TwinStar has been certified to single and sub-parts-per-billion impurity levels using an atmospheric pressure ionization mass spectrometer (APIMS). Edwards High

Vacuum, the vacuum technology company of The BOC Group, is providing vacuum pumps and gas exhaust abatement systems at the point of use.

## **Bulk process gas systems for Komatsu**

On the wafer side, BOC Gases recently won a multi-year contract to sole-source bulk and cylinder gases and on-site

management services to Komatsu Silicon America.

The Komatsu facility will manufacture silicon wafers. According to Walt Preller, assistant marketing manager, BOC will design and install storage, control and distribution systems for bulk atmospheric, dopant and bulk process gases.

As the total system supplier to Komatsu, BOC will handle all bulk gas supply for the facility including nitrogen, oxygen, argon and hydrogen. Bulk process gases include hydrogen chloride and trichlorosilane. Dopant gases will be provided from the BOC clean-room filling facility in Research Triangle Park, North Carolina.

Under the terms of the agreement, BOC employees will work on-site at the Komatsu facility to manage all aspects of gas supply and distribution including inventory management, order placement, delivery, equipment maintenance and analytical support.

By working closely with the customer's engineers, managers, fire and safety



personnel, major contractors and the local municipality, BOC employees will help Komatsu control inventory and administrative costs and maximize facility uptime.

## **A single source for gases, systems and on-site gas management**

BOC Gases provides a single-source supply strategy for all gases, gas distribution systems and on-site gas management required by the semiconductor industry.

As part of a multinational corporation with annual sales of over \$5 billion, BOC Gases has more than 27,000 employees in 60 countries. A global network of ISO-certified merchant plants and strategically located supply centers ensures consistently pure gases, reliable delivery and uninterrupted supply worldwide. ■



## **BOC constructing Spectra-N™ 10,000 nitrogen generator**

BOC Gases is constructing a Spectra-N 10,000 generator to supply nitrogen to the Dawson Creek Business Park in Hillsboro, Oregon. This generator will supply customers with nitrogen having impurities of less than 10 ppb.

According to Chris Caso, BOC Gases proposals development engineer, "By placing the nitrogen generator at a BOC-owned location adjacent to the

Park, BOC will save customers valuable plant space."

The BOC site will be equipped with a bulk storage tank which will provide backup to the plant and allow customers the option of liquid delivery.

Scheduled for completion in 1996, this plant will supply nitrogen to both integrated circuit and wafer manufacturers in the Dawson Creek Business Park. ■

## **BOC Gases chosen as systems supplier at TI's DMOS 5, 6 fabs**

Texas Instruments has awarded two multimillion-dollar contracts to BOC Gases for design, construction, installation and commissioning of specialty gas distribution systems for its Dallas Metal Oxide Semiconductor (DMOS) fabrication facilities DMOS 5 and DMOS 6.

The BOC project scope includes over 20 different process gases and over

100 cabinet and manifold systems. BOC will provide a turnkey system including distribution piping, manufacturing equipment connection and facilitating gas rooms.

At DMOS 6 the BOC scope will be over twice as large as that at DMOS 5. BOC Gases is currently engineering and fabricating the gas distribution subsystems. ■

## **Contract awarded to BOC**

A wafer manufacturer located in Oregon, has awarded BOC Gases a long-term contract to provide cylinder and bulk process gases, as well as the storage, control and distribution systems for these products.

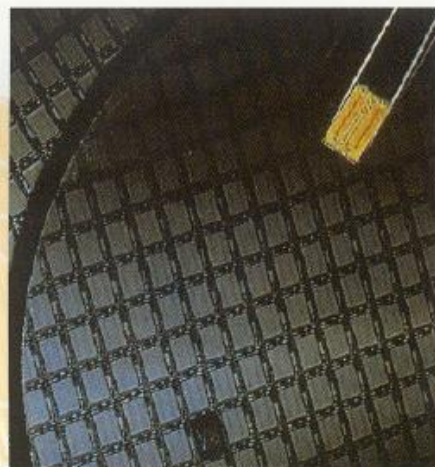
The facility is a green field site at which BOC has full responsibility for the design, fabrication, installation, commissioning and operation of all cylinder and bulk process gas systems.

"This contract award confirms our perception that the wafer industry is increasingly moving toward bulk delivery systems for process gases," says Tom Seidler, BOC Gases marketing manager. "Based on the large quantities of these gases consumed in wafer production, wafer manufacturers can significantly reduce gas costs while ensuring uniform purity with BOC bulk process gas systems." ■

## **BOC to install bulk TCS**

A major wafer manufacturer in the midwestern U.S. has awarded BOC Gases the responsibility to install a bulk trichlorosilane (TCS) system. The TCS will be used as a silicon source for epitaxial deposition.

**Wafer industry moving to bulk supply**  
Lew Mostowy, BOC Gases project design manager, believes wafer manufacturers will move toward



cost-effective bulk supply strategies, as the scale of wafer manufacture increases to meet industry demands.

Advantages of bulk supply of process gases include lower cost, simpler gas management and reduced labor. And having a large supply of process gas at a uniform purity enhances process consistency.

"This contract award is significant for two reasons," says Mostowy. "The most immediate impact is that this system will provide significant cost and process benefits to the wafer manufacturer. The longer term influence is that the installation of this system establishes a new benchmark for the industry which we anticipate will gain widespread acceptance as the potential benefits are recognized." ■



# *new* products and

## **New cost-effective Micro-LN™ generator**

BOC Gases has developed a new on-site nitrogen plant, the *Micro-LN* generator, as a low-cost nitrogen supply source for semiconductor manufacturing processes.

By using small volumes of existing on-site bulk liquid nitrogen as a cryogen, the *Micro-LN* unit eliminates the need for a turbine. Liquid nitrogen

feed provides the temperatures required for cryogenic distillation of air. The result: a cost-effective and highly reliable on-site plant.

Available for about half the cost of conventional on-site plants generating UHP-grade nitrogen, the *Micro-LN* generator has a capacity of 10,000 to 30,000 scfh of gaseous nitrogen.

With impurities of less than 1 ppm, the gas generated by the *Micro-LN* generator is suitable for many applications without additional purification.

The *Micro-LN* generator produces nitrogen at about one-third the cost of delivered bulk gas. By using liquid nitrogen primarily as a coolant for the *Micro-LN* cold box, customers can dramatically reduce bulk deliveries and gas costs. With a footprint of less than 500 square feet, the *Micro-LN* unit is skid-mounted for quick and easy field installation, requiring only a power source and condensate drains.

"The *Micro-LN* generator allows BOC Gases to deliver nitrogen at low cost for processes that do not require UHP-grade gas," says Merritt Peterson, marketing manager, electronic bulk gases. "The lower flow range is ideal for soldering or for use with a purifier, and provides an extremely cost-effective supply alternative to liquid nitrogen." ■

## **UHP on-site oxygen production**

BOC Gases has developed a design option to its *Spectra-N*™ on-site generator which achieves

inert impurities which are not removed with conventional purifiers.

BOC's current generation of *Spectra-N* generators, initially configured for nitrogen only, can be modified to incorporate the oxygen column in the event that an ultrahigh-purity oxygen requirement develops after the *Spectra-N* generator has been installed.

commercial economy by integrating oxygen and nitrogen columns in a single plant which demonstrates low ppb-level impurities for both products.

The purity of the oxygen produced by the generator exceeds that of delivered bulk oxygen, eliminating the need for on-site purification. The *Spectra-N* generator distillation process removes argon and other

The rated capacity of the oxygen generator is 3,200 scfh. Output can be higher or lower depending on the size of the *Spectra-N* generator to which the side column is fitted.

One *Spectra-N* generator with ultrahigh-purity oxygen production is already in operation at the TwinStar Semiconductor facility in Richardson, Texas. Four additional generators are on order for other customers. ■



## **Nitrapilot system**

### **...For packaging applications**

Nitrapilot, a standalone closed-loop system designed to maintain stable oxygen levels and low flow-rate settings of the inerting gas in reflow ovens and wave soldering machines, is currently undergoing extensive testing at BOC facilities in the United Kingdom.

With the Nitrapilot system, reduced flow rates can be achieved for stable set point oxygen levels at critical pre-selected locations. The benefit: steady operation with minimal operator intervention.



# services

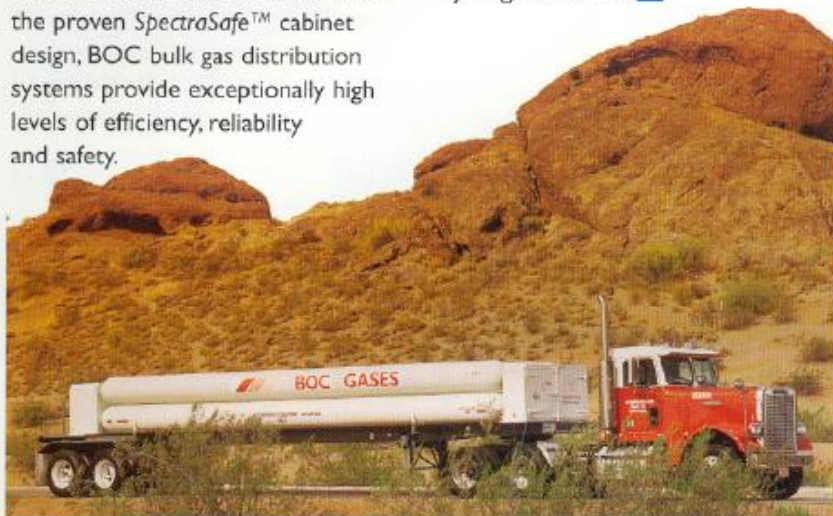
## New bulk process gases

BOC has added trichlorosilane and halocarbons to its growing line of bulk process gases. For high-volume applications, bulk delivery and storage can reduce operating costs while enhancing process consistency.

The BOC bulk process gas supply strategy includes engineered storage, control and distribution systems located at customer sites. Based on the proven SpectraSafe™ cabinet design, BOC bulk gas distribution systems provide exceptionally high levels of efficiency, reliability and safety.

BOC offers a number of on-site gas management services including maintenance and operation. The objective is to ensure optimum performance and sustained reliability of all installed gas distribution systems.

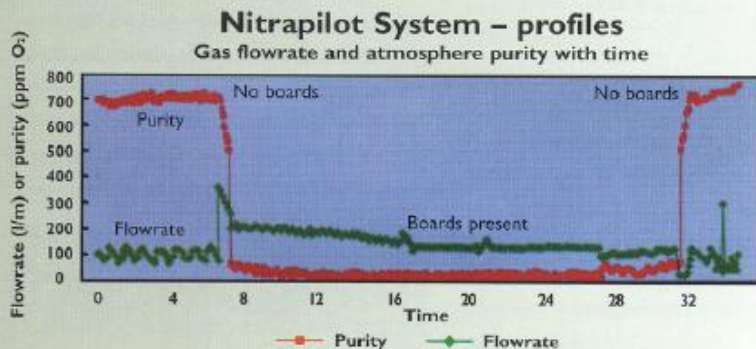
Other products in BOC's line of bulk process gases include silane and hydrogen chloride. ■



## ensures stable atmospheres

When used with data logging, the Nitrapilot system enhances statistical process control by

ensuring, monitoring and logging compliance with process requirements. ■



## BOC provides ClF<sub>3</sub> total system solution

To an increasing extent ClF<sub>3</sub> is being adopted by the industry for chemical vapor deposition (CVD) reactor cleaning.

Says John Sauer, BOC Gases assistant product manager, "BOC is uniquely positioned to provide the industry with a total system solution to the critical requirements for ClF<sub>3</sub> supply."

BOC employs the Spectra Steel® III cylinder for ClF<sub>3</sub>. This cylinder and valve combination was designed specifically for the delivery of high-purity reactive, halogen-based gases.

Upstream of the reactor, the BOC system includes a delivery manifold and distribution system specifically designed for ClF<sub>3</sub>. Downstream of the reactor, Edwards High Vacuum provides vacuum pumps compatible with ClF<sub>3</sub> and point-of-use reactor effluent treatment using the Edwards High Vacuum gas reactor column (GRC).

Relative to the alternatives, ClF<sub>3</sub> cleaning reduces particulate contamination at the wafer surface, increasing yield. In addition, the reduced cleaning cycle enabled by ClF<sub>3</sub> maximizes reactor uptime. ClF<sub>3</sub> in situ cleaning takes place at low temperatures and without a plasma.

### BOC now offers NF<sub>3</sub>

For reactor cleaning processes which employ a plasma, BOC now offers NF<sub>3</sub>. The NF<sub>3</sub> dissociates in the plasma, producing a high concentration of chemically-active compounds. In etch applications, high-purity NF<sub>3</sub> enables a high etch rate with good selectivity. ■





## Joe Aliprando: Excellence in Execution

Joe Aliprando is the manager of BOC's electronic gases engineering group. Based in Murray Hill, New Jersey, U.S., the group currently employs a team of engineers and technicians dedicated to the electronics industry.

A licensed Professional Engineer (PE), Joe holds three degrees: a B.S. in physics, an M.S. in engineering from Rensselaer Polytechnic Institute, and an MBA in industrial marketing from Rutgers.

**Newsline:** What does your group do at BOC?

**Aliprando:** The electronic gases engineering group engineers and installs gas systems for microelectronics manufacturing. We support initial customer discussions to define the need, design a system to meet the need, prepare the project schedule and manage the project through final commissioning.

The applications engineers in our group do the design and component selection for customer site gas distribution systems. Our project engineers also provide direct support to our customers by managing system installation, certification and turnover to the customer.

**Newsline:** What do you see as the "mission statement" for your group?

**Aliprando:** We focus on the design, fabrication and installation of high-

purity atmospheric and specialty gas systems for the semiconductor industry. Our mission is to provide systems that meet both the customer's specifications and BOC's stringent requirements for the safe delivery of hazardous gases.

Over 90 percent of our customers make either wafers or integrated circuits. The remainder manufacture a variety of electronics, including solar panels and flat display panels.

**"Our job is to make sure the gases and gas systems get customers on-line in the shortest time possible."**

**Newsline:** What is the key to BOC's continued success in today's electronics industry?

**Aliprando:** There are two critical success factors. One is focusing on the customer's performance specifications. The second is excellence in executing projects.

We win new customers by demonstrating our ability to design and implement gas management systems that meet their specifications.

We win repeat orders by executing projects in an accelerated time frame. Customers require vendors who can meet or exceed tight delivery schedules.

Cost is always a concern, of course. Gas supply and distribution systems are a significant element of customer cost, and BOC offers cost-saving design options which provide a competitive advantage to our customers.

**Newsline:** Why is speed so important to semiconductor manufacturers?

**Aliprando:** Because of the pace at which semiconductor technology evolves, microelectronics products—and the fabs in which they are made—have limited life spans. The billion-dollar fab we are helping to build today will be obsolete in a matter of years. The sooner fabs begin production, the better the return on our customer's investment. Our job is to make sure the gases and gas systems get customers on-line in the shortest time possible.

**Newsline:** What trends in semiconductor manufacturing do you see as having an impact on customer selection of a gas supplier?

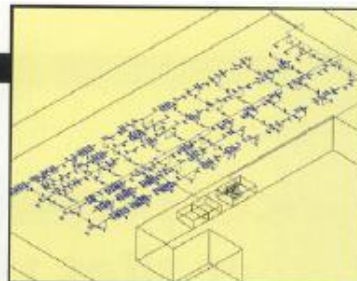
**Aliprando:** As more customers want total gas management, we need to provide a total solution that ensures reliable supply, consistent quality and high purity from the point of supply to the surface of the wafer.

**Newsline:** What are some of the challenges facing BOC as a leading gas supplier in the electronics industry?

**Aliprando:** One major challenge we are continually addressing through R&D is to develop new gases with the composition, specifications and purities our customers require for manufacturing new products and improving the performance of existing processes. Another challenge is to design and install improved gas distribution systems which deliver these higher purity products to the point of use safely, reliably and to the required specifications. ■



# BOC Fab Modeller provides competitive edge



3D Model of  
N<sub>2</sub> Distribution  
System

Over the past five years, BOC Gases has developed and enhanced the Fab Modeller, one of a series of powerful design tools, which are used to model the performance of gas distribution systems for semiconductor fabrication facilities. This tool creates an "intelligent pipework model" of each gas distribution system which can be used to produce an optimized design from the inception of a project.

## **A competitive edge in total system design**

The Fab Modeller is used by the design engineer to develop and optimize

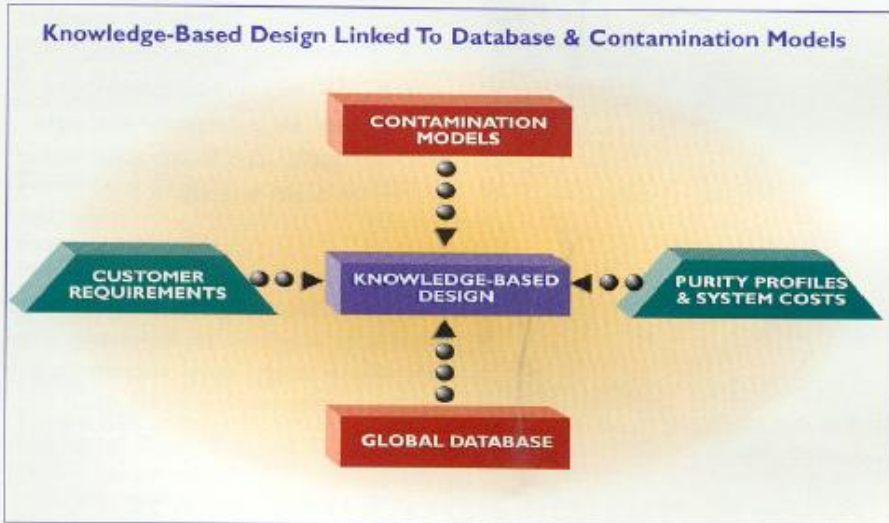
requirements for comprehensive system designs that will effectively satisfy the expected gas demands throughout the life of a project.

In use for more than two years on BOC projects, the Fab Modeller provides a competitive advantage for customers working with BOC Gases on total gas systems. Models created during the initial phase of the project are continuously updated to reflect design changes through installation and site expansion. In this way, potential problems are avoided by performing design verification analyses during the

The numerical models run by the Fab Modeller are based on engineering analysis, supported by APIMS component evaluations. Recently, a series of experiments were performed to test model calculations against the actual performance of a complete gas distribution system. "The results were very encouraging and give us new confidence in the accuracy of models," says Ruppert.

## **Continuous development to meet future demands of the electronics industry**

The Fab Modeller is being continuously enhanced to add new capabilities and to ensure that the most accurate modelling and engineering design practices are being used. Research program results are incorporated into the simulation programs as they become available. A unique feature of the Fab Modeller is its ability to model the contamination performance of special gases. In addition to the current model for hydrogen chloride, future releases of the Fab Modeller will characterize moisture effects in additional gases such as tungsten hexafluoride and hydrogen bromide.



pipework design alternatives; choose the best components and materials for a given application; dynamically refresh bills of material to reflect design changes; analyze the fluid dynamics and contamination performance of the system under varying operating conditions; identify long lead time components; and reliably forecast when the system will come on-line.

The capabilities inherent in the Fab Modeller enable BOC to rapidly and accurately respond to customer

entire process, from conceptual design to full-system build-out.

"Because we have simulated and predicted performance, we know the fluid dynamics in the pipe, if it will meet future growth requirements and what the contamination performance will be," notes Dave Ruppert, manager, systems management operation.

"Other vendors have modelling programs, but as far as we know, only BOC's Fab Modeller fully integrates pipework design and optimization with contamination modelling."

Wafer fabrication plants are both costly and complex. These plants must be designed to critical tolerances in order to achieve maximum productivity. In the future, it is expected that more demanding gas purity requirements will dictate a more analytical approach to the design of total gas systems for the electronics industry. This will make sophisticated modelling tools such as BOC's Fab Modeller an enabling technology to provide customers with the most cost-effective design solutions. ■



# Site services provide total gas management at customer sites worldwide

"Gas management at customer sites is becoming increasingly important to customer operational efficiency," says Chuck Knapp, BOC Gases national manager, site services. "A growing number of semiconductor manufacturers require a gas supplier who is completely integrated into the facility infrastructure and responsible for all gas systems."

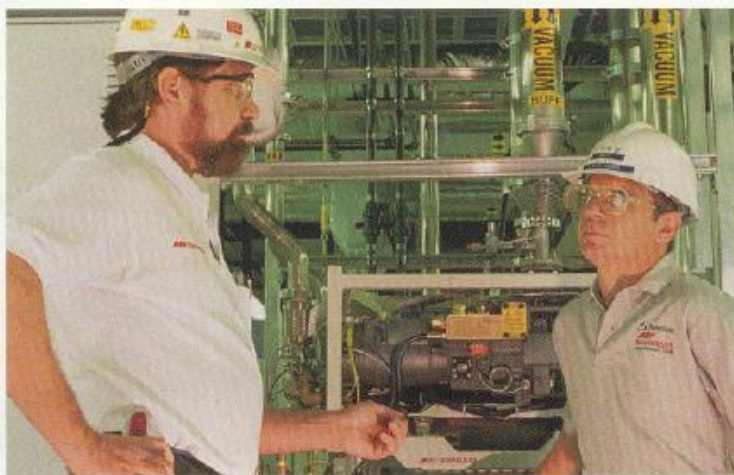
A key advantage of BOC's site services is flexibility. Customers can choose any combination of services to fit their gas management requirements at a particular site.

Knapp observes, "BOC Gases can provide customers with the level of service they want, then assume additional responsibilities as the customer requirements grow. Our primary focus is to make the customer's operation more efficient, and—at the end of the day—more profitable."

## Success stories

Some recent examples of customers outsourcing gas management to BOC site services:

**Texas Instruments.** At one Texas Instruments location, BOC Gases has total responsibility for gas cabinet systems management, including installation, commissioning, certification, operation and maintenance. "Having a BOC employee on site full time eliminates the need for Texas Instruments technicians to fix gas



cabinets, allowing them to concentrate on running their process tools," says Knapp.

**Motorola.** "Motorola is a good example of a customer beginning with limited service and then expanding BOC responsibility," notes Knapp. Initially, BOC Gases monitored gas cabinets and operated a just-in-time cylinder management system. Now BOC provides management services for more

than 300 systems, including cylinder monitoring, inventory and change-out.

**TwinStar, Komatsu.** "These are examples of customers who have contracted with BOC Gases to handle total gas management for a particular site, right from the start," says Knapp (see related stories on pages 4-5). ■

BOC Gases manages all gas systems for semiconductor manufacturer TwinStar, including bulk and cylinder inventory and all on-site gas equipment. We also help maintain vacuum pump operations through a strategic partnership with Edwards High Vacuum, another company of The BOC Group.

## More major contract wins for BOC Gases

- BOC Gases will supply gases to Fujitsu, a wafer manufacturer located in Gresham, Oregon ...
- Texas Instruments' Alpha integrated circuit fab facility in Thailand has awarded BOC Gases a contract to supply *SpectraSafe* gas cabinets. BOC has total responsibility for provisioning and installing the cabinets and valve manifolds ...
- Recent wins in the North Pacific region include Fujitsu, Toshiba, and UMC ...
- BOC special gases production plants are currently under construction in Singapore and Taiwan to enhance BOC Gases presence and service in the North Pacific region ■



# Atto to manufacture BOC Gases SpectraSafe™ cabinets

Atto, a leading manufacturer of gas cabinets and equipment, will begin manufacturing SpectraSafe gas cabinets for BOC in Korea later this year.

Under a recently signed agreement, BOC Gases has become part owner of the company and will participate on its board. Atto, formerly known as Han Kuk Atto Engineering, will supply SpectraSafe gas cabinets in the North Pacific region.

Atto's customers include three Korean semiconductor manufacturers—Samsung, Goldstar and Hyundai. The partnership

between BOC Gases and Atto provides BOC customers better service and faster delivery of SpectraSafe equipment in the North Pacific.

The SpectraSafe gas cabinet, designed by BOC Gases and SCI (a maker of quality gas cabinets located in Huntsville, Alabama), is currently manufactured in North America by SCI. "The synergy between the three manufacturers—BOC Gases, SCI, and Atto—will result in an unequaled combination providing technology and manufacturing capability to the users of the SpectraSafe equipment

and systems," said Scott Farber, BOC Gases product manager, electronic special gases systems.

SpectraSafe cabinets incorporate a unique six-valve manifold with a patent-pending monoblock valve design. The fully swept cabinet design with leak-tight components eliminates dead legs to ensure consistency in the purity of the gas stream. ■



## WORLDWIDE CONTACTS

### Benelux & France

#### BOC NV

Excelsiorlaan 41  
1930 Zaventem  
Brussels, Belgium  
Tel +32 27 197111  
Fax +32 27 253282

### China

#### Tianjin BOC Industrial Gases Co. Ltd.

Chen Tang Zhuang Industrial Zone  
He Xi District 300220  
Tianjin, People's Republic of China  
Tel +86 22 811 1437  
Fax +86 22 834 3883

### Germany

#### BOC Gase GmbH

Löffelstrasse 3  
D-70597 Stuttgart  
Germany  
Tel +49 711 976840  
Fax +49 711 7657530

### Hong Kong

#### Hong Kong Oxygen & Acetylene Co. Ltd.

DD-234, Lot 317  
Hang Hau  
Clearwater Bay  
Kowloon, Hong Kong  
Tel +852 27197100  
Fax +852 23580561

### Israel

#### Gas Technologies O.B. Ltd.

10 Maskit St. Ind. Area Herzlia  
P.O.B. 2035  
Herzlia 46120  
Israel  
Tel +972 9 559005  
Fax +972 9 567548

### Italy

#### SOL Industrie SpA

20052 Monza,  
via Gramsci 10  
Monza  
Tel +039 7395336  
Fax +039 7395265

### Japan

#### BOC Gases

Sumitomo Seimei  
Shin-Osaka Kita Bldg.  
1-14, Miyahara 4-Chome  
Yodogawa-ku  
Osaka, 532, Japan  
Tel +81 6 3963180  
Fax +81 6 3963199

### Korea

#### BOC Gases Co., Ltd.

15th Floor, Samsung Bldg.  
36-1 Yoido-Dong  
Youngdeungpo-ku  
Seoul 150-010  
Republic of Korea  
Tel +82 27809331  
Fax +82 27846333

### Malaysia

#### Malaysian Oxygen Berhad

P.O. Box 10633  
50720 Kuala Lumpur  
Malaysia  
Tel +60 37554233  
Fax +60 37566389

### Philippines

#### Consolidated Industrial Gases, Inc.

Corner Sheridan & Pioneer Streets  
Mandaluyong City 3119  
Philippines  
Tel +63 26318251  
Fax +63 26315083

### Shanghai

#### Shanghai BOC Industrial Gases Co., Ltd.

463 Chang Jiang Xi Lu  
Shanghai 200431  
The People's Republic of China  
Tel +21 6754154  
Fax +21 6754469

### Singapore

#### SOXAL Pte Ltd.

16 Jalan Buroh  
Jurong Town  
Singapore 2261  
Tel +65 2653788  
Fax +65 2651441

### Taiwan

#### BOC Lienhwa Industrial Gases

No. 44, 6FL,  
Cheng Teh Road Sec. 1  
Taipei, Taiwan  
Tel +886 2 5552260  
Fax +886 2 5553819

### United Kingdom

#### BOC Gases

The Priestley Centre  
10 Priestley Road  
The Surrey Research Park  
Guildford  
Surrey GU2 5XY  
United Kingdom  
Tel +44 (0) 1483 579857  
Fax +44 (0) 1483 244399

### United States

#### BOC Gases

575 Mountain Avenue  
Murray Hill, New Jersey 07974  
Tel +908 464-8100  
Fax +908 771-1120

#### Edwards High Vacuum, Inc.

1 Edwards Park  
301 Ballardvale Street  
Wilmington, MA 01887  
Tel +508 658-5410  
Fax +508 658-7969

### Internet

<http://www.boc.com>



# BOC Gases forms joint venture in Israel

BOC Gases and Israel's largest industrial gases company, Oxygen and Argon Works Ltd. (OXAR), have formed a joint venture to better serve that country's booming semiconductor industry.

The joint venture company, Gas Technologies O.B. Ltd. (Gastech), provides a full range of bulk and specialty gases, equipment and related services throughout the nation.

## Meeting Israel's need for high-purity gas expertise

Although BOC Gases has supplied customers in Israel for 15 years, the recent boom in Israeli semiconductor manufacturing, along with the industry's continued demand for faster delivery and total gas management solutions, has created the need for a greater BOC presence in Israel.

In response, Gastech was formed in 1995. Serving high-tech manufacturing customers in Israel, Gastech products and services include electronic specialty gases, on-site high-purity nitrogen generators, gas cabinets and associated equipment and technical service and support.

Israeli customers have the option of total gas management handled locally by Gastech. "The customer can lease BOC on-site generation equipment; our technicians and engineers will

operate and maintain it for them," says Gabe Bitton, manager, Gastech. "Our customers are experts on chips; we are experts on gases. The customers prefer to let us handle the gases portion of their operations."

Gastech serves more than 100 companies in electronics and other industries throughout Israel. Customers include major semiconductor and electronic component manufacturers.

## In-country capabilities make the difference

A new gas storage facility, currently being built near Beersheva, a large town in southern Israel, will enable

Gastech to supply specialty gases on a just-in-time (JIT) basis.

"When a customer orders gas from abroad, it can take 8 to 10 weeks for the product to arrive," says Bitton. "When the Gastech storage facility is completed later this year, it will enable us to deliver gases to any customer in Israel in 24 hours or faster."

Gastech is the only Israel-based gas company with a trained hazardous incident response team (HIRT). HIRT capabilities include a fully equipped HIRT vehicle and a containment vessel.

Gastech is supported by the worldwide technical, financial and human resources of BOC Gases. "We often fly engineers and other specialists in from BOC locations around the world to provide direct assistance to Israeli customers," notes Bitton. "The result is access to technology and innovation other Israeli gas companies cannot match."

OXAR, in business for almost half a century, employs 110 people at its headquarters in Herzlia, Israel. The major gas manufacturer in the nation, OXAR produces industrial gases using air separation units and also markets a broad line of gas mixtures and related technologies for gas and cryogenic applications. ■



BOC Gases is a trading name used by operating companies within The BOC Group, the parent company of which is The BOC Group plc

The stripe symbol and the words BOC, SpectraSafe, Spectra Steel, Micro-LN and Spectra-N are BOC Group trademarks  
© 1996 The BOC Group, Inc.

ELED10283/NCUS/0696/37.5M  
Published by BOC Corporate Relations