

# Middlesex Gases' Growth Formula

## NITROGEN AND MICROBULK IN NEW ENGLAND'S BIOTECH AND PHARMA MARKETS

by Ron Lucas

In an era where some distributorships are troubled by a shrinking manufacturing base and consolidation woes, Middlesex Gases & Technologies has found a key to growth — particularly in nitrogen sales. Its territory now spans Rhode Island, Eastern Massachusetts and Southern New Hampshire and it has achieved an annual sales figure that exceeds \$13 million.

Bo Martin, President of Middlesex Gases, says, "We were able to accomplish this because we created the capability to offer nitrogen customers a complete package. We have the ability to start with a design concept, and then turn that concept into a reality."

Guy Sylvester, Senior Product Engineer agrees. "The fact that we have the technical expertise to design and install turnkey systems makes us truly unique."

### BOSTON NEEDS NITROGEN

Boston is a prime market for nitrogen with demand driven by ongoing expansion in biotechnology. The reason, according to Ron Perry, General Sales Manager, is the concentration of biopharmaceuticals/life science companies as well as universities and colleges. "This area has a high density of scientists and researchers," observes Perry. "Every month it seems we hear of a new potential sale involving a pharmaceutical company either moving into the area, or having us involved in an expansion of their existing facility."

Martin agrees, "Pharmaceutical companies view this as a key geographic area for conducting research, testing and manufacturing. As a result, we've seen the demand for nitrogen skyrocketing 10 to 20 percent a year in this industry while the traditional manufacturing base in New England is declining or at best is flat."

One way Middlesex has tapped into the trend is to link up with startups. "Being able to be on the ground floor when a company first begins, and then grow with that company, has been a huge path to suc-

cess for us," says Perry. "Companies start with as few as a couple of people and ultimately grow into multi-million dollar firms."

In fact pharmaceuticals and biotech firms account for 80 percent of the firm's nitrogen business, with precision, high-end manufacturers operating lasers representing the remaining 20 percent. "Middlesex discovered that once a manufacturer acquires its first laser, productivity soars and it soon may acquire a second laser. It also learned that nitrogen business leads to additional sales opportunities with regulators, piping, and manifold systems," says Martin.

### NITROGEN EATERS

Biotech and Pharmaceutical firms typically use nitrogen for applications such as fume hoods, blanketing, cryofreezers, mass spectrometers, and atmospheric chambers. Atmospheric chambers can consume the largest amounts depending upon the duration of the testing that is required. A customer with two or three cryofreezers can consume thousands of cubic feet per month. Amounts consumed by individual cryofreezers can vary depending on whether the lab stores samples in the vapor or liquid phase.

According to Sylvester, storing samples in the vapor phase requires smaller amounts of liquid nitrogen, although with a continuous draw of product. "The vapor phase is less damaging to cells and is used when the end user is moving samples in and out of the freezer between tests. The colder liquid phase is typically used for long-term storage."

Fume hoods/blanketing are used to keep the inert atmosphere from interacting with biological materials and chemicals. They can consume considerable amounts of liquid nitrogen depending on the needs of the lab.

Atmospheric chambers can range in size from table-top models to room-sized units. Inside the chamber, printed circuit boards, scientific equipment, and military parts are heated and rapidly cooled to test for cracks or other defects.

*Middlesex Gases & Technologies, Inc.,  
Everett, MA, sells approximately  
20 million cubic feet of nitrogen  
a month by delivering  
BioPharma/Life Science customers  
packaged solutions and peace of mind.*



The Middlesex microbulk support team surrounded by their Orcas and service vehicles: (l to r) David Sudanowicz, Microbulk Distribution; Shane Poole, Service Technician; Henry Torres, Microbulk Distribution; Mike Beaulieu, Filling Operations Manager. (Missing from photo is Scot King, Service Technician.)



Two 1,500 liter nitrogen Perma-Cyls supply liquid nitrogen to Genzyme's Low-loss fill system. One 1,000-liter Perma-Cyl supplies nitrogen in gas phase throughout their building.



Tom Stack mounts a 230-liter nitrogen Perma-Cyl with Cyl-Tel gauge onto the scale of their Low-Loss fill station.



Guy Sylvester, Senior Product Engineer (left) meets with Tom Stack, Genzyme Corp's Associate Director Lab Service at Genzyme's One Mountain Road, Framingham location.

A unit may stay dormant for days, but when it's on duty it draws a large amount of nitrogen. "The system must be capable of operating through a complete test cycle that can last up to 24 hours," explains Sylvester. Nitrogen demand can be considerable during the duration of the testing.

### MICRO IN THE MIDDLE

The introduction of the microbulk supply system provided Middlesex with a tremendous opportunity to capture the niche between liquid dewars and bulk. "A customer can save big dollars by trimming handling and storage of extra dewars," notes Mike Lee, Specialty Gas Manager.

To service this niche, Middlesex installs Perma-Cyl tanks filled by MicroBulk trucks all made by Chart Industries, New Prague, MN.

In crowded areas like Boston, end-users can find it difficult to acquire permits for bulk tank installations. Bulk tanks also require installing a concrete support pad outside the building. "From an aesthetic standpoint, researchers usually don't like having either a concrete pad or a large tank sitting outside their building," says Perry. "Installing Perma-Cyls inside their facility helps to reduce the eyesore and permitting challenges. It also increase efficiency by placing them close to the point-of-use."

MicroBulk Trucks are also ideal for heavily populated areas because their cryopumps are quieter than those used on bulk trailers. In addition, these smaller 3,000-gallon trucks are more maneuverable in confined spaces.

The firm now has over 60 tanks in the field ranging in size from 1,000 liters to 3,000 gallons. Last year, the firm invested \$250,000 to acquire a second MicroBulk truck. Having two nitrogen MicroBulk-trucks gives Middlesex the ability to provide our customers continuous service and supply. "Additionally, our new trailer-mounted model allows us the flexibility to attach another tractor if its engine goes down," says Tom Martin, Executive Vice President of Operations.

Having two MicroBulk trucks, Middlesex now dispatches between 9 and 12 million cubic feet of nitrogen a month.

### AUDITS REVEAL SAVINGS POTENTIAL

When it approaches a new customer, Middlesex performs a cost analysis of its current operation. It looks at factors such as labor costs resulting from moving liquid dewars, gas losses, and faulty equipment gauges. "Their liquid dewars can typically have 10 percent product still inside when they exchange them," explains Sylvester.

"In addition, customers without a microbulk system need standby dewars to assure continuous supply. While idle, these dewars can lose another 10 percent through their insulation," adds Lee.

Gauge reliability is another common issue. The gauges on many liquid dewars can become unreliable since they are mechanical devices operating inside a dewar at -320°F. This creates the risk of running out of product or false alarms late at night or on weekends, which is why customers prefer using the Perma Cyl cylinders over the standard liquid nitrogen dewars.

### THE GENZYME SOLUTION

A recent major installation at Genzyme Inc., Framingham, MA, illustrates Middlesex's turnkey approach. Middlesex's audit revealed Genzyme, a \$2.7 billion biotechnology firm, had lab support staff moving up to 80 liquid dewars throughout their building for a host of applications creating safety issues, gas loss, labor costs, and decreased operational efficiency. They also learned their scientists were very worried about running out of product, resulting in potentially losing months of work and thousands of dollars.

Middlesex converted them to a microbulk system and centralized their nitrogen source. "Most of their need was for gas-phase nitrogen," recalls Sylvester. "As a result, our in-house technical support team installed a 1,000 liter Perma-Cyl and a fill box. We then sub-contracted GMP Piping Inc, to install piping throughout the building to various points of use. This eliminated 70 percent of their liquid dewar use."

However, for their liquid applications, such as cryofreezers, Genzyme analysis revealed it would be too expensive to install the required vacuum lines throughout their three story building. Instead,

they opted to install two 1,500 liter tanks and connected them to a Low Loss Fill Station.

Lab support people need only connect the hoses and push a button to fill the liquid dewar. Genzyme no longer has to ship and receive dewars to this location.

This change improved lab safety. “Now they were moving far fewer 600-pound liquid dewars around their facility. We also replaced the round-bottom models they had with easier-to-handle Perma-Cyls liquid dewars that come with a square base that we believe are more stable,” recalls Sylvester.

Switching to Middlesex has also allowed Genzyme to capture significant gas savings. “They were experiencing far more than typical product losses,” explains Sylvester. “When a weekend approached, lab support people would hook full vessels up to critical applications and pull out tanks that could be nearly 3/4 full. They needed to avoid the risk of running out of product during the weekends.”

Middlesex eventually duplicated a similar setup in a second building, allowing Genzyme to realize an estimated \$40,000 year in savings.

Thomas Stack, Genzyme Corp’s Associate Director of Lab Services, heralded the results. “Middlesex Gases and Technologies has clearly been the leader in providing creative solutions to our specialty gas requirements over the last four years. New state-of-the-art technology, such as the Chart MicroBulk low-loss system has performed well and allowed us to reduce our 230-liter, liquid nitrogen dewar handling by 70 percent. There has also been a considerable cost savings realized from this system as well as important safety improvements. Overall, I have been very impressed with Middlesex’s team of professionals, their technical knowledge and ability to manage and install complete turnkey systems,” affirmed Stack.

## CENTRALIZE THEIR SUPPLY

Creating a central supply area is a chief strategy for optimizing nitrogen use. “Some customers place freezers in multiple areas throughout a building,” says Lee. “Consolidating them into a single room optimizes their real estate and improves efficiencies.”

For example, Middlesex is capable of installing a Perma-Cyl inside a dedicated cryofreezer room and feeding the units directly through vacuum jacketed piping. “Once they have a dedicated area, customers can add special equipment or shelving to the room to make their tasks even more efficient,” says Lee.

Middlesex Gases technical support team also assures its systems are expandable. Once the customer’s area has been consolidated, customers soon discover how efficient their new system is and often want to expand their in-house capabilities.

## IN-HOUSE ENGINEERING

Turnkey packages don’t happen by accident. Middlesex created a special in-house engineering team with the know-how to design them. The team, headed by Mike Beaulieu, Filling Operations Manager, includes Shane Poole and Scot King, both service technicians.



Low-Loss fill station controls. Middlesex installed this system at Genzyme to help curb excessive dewar handling.

Together, they work closely with the sales rep to service an account.

According to Bo Martin, creating the team made the firm more price competitive while offering customers a “one-stop shopping” experience that made their life easier.

“We start by asking a lot of questions,” says Beaulieu. “We’ll ask about details such as their applications and flow rates, along with their goals — whether they want a top-of-the-line package or a bare-bones system.” The customer’s future expansion plans are also taken into consideration during this process.

With the customer specifications in hand, the team then designs and installs a system. Although occasionally certain projects are outsourced depending upon the complexity of the job, the majority of the installation and piping jobs are done in-house by Middlesex’s technical support team.

Perma-Cyls are so versatile the team can install them in just about any room required — even on roofs or in basements. “Orca’s cryopump delivers 250 psi —

enough pumping power for us to deliver product up to several floors if required,” says King.

The team also handles any subcontracting that is required. If a customer needs a bulk tank, the crew will find a contractor to design everything from the cement pad to the fencing. “In one case we even hired a rigger to position a tank through a second floor window,” adds Poole.

The team has taken on some unique challenges. Lee recalled one instance where a customer’s growing demand exceeded the capacity of its two 1,000 liter microbulk’s internal vaporizers. Lee recommended upgrading to two 1,500 liters models coupled with a 10-foot tall external vaporizer.

Unfortunately, the customer had a 9-foot ceiling. Undeterred, the team came up with a novel solution. “We created a support system and placed the vaporizer at a 45 degree angle. That not only allowed it to fit the space, it also improved the vaporizer’s efficiency,” recalls Lee.

## MANIFOLD SYSTEMS ’R US

In some cases where customers need liquid nitrogen Middlesex installs manifold systems manufactured by SGD, Inc. of Emerson, NJ. These systems switch automatically between a primary and secondary bank of vessels. “The system further notifies the customer that the switch was made and they need to order gas again,” says Beaulieu. Middlesex has several already in the field with more going in every week.

“This is also a turnkey system. We design the system, install the manifold, run tubing to the point of use, and even connect lines to lab equipment,” says Beaulieu.

The in-house engineering team has built specialized fill equipment for expensive mass spectrometers. The devices consume considerable amounts of nitrogen. They come with a single inlet, and have three different delivery points distributed through three regulators with different flow and pressure requirements.

Middlesex recently contacted a manufacturer of mass spectrometers, Applied Bio Systems. Middlesex obtained detailed information on the mass spectrometers requirements. Middlesex partnering with its specialty gas equipment supplier SGD, then built a mass spec gas distribution panel just for this device. "It is a wall-mounted unit that comes with the necessary regulators, fittings, and all the appropriate flow rates and pressures pre-calculated," says Beaulieu.

Mass spectrometers have a big appetite for nitrogen. A single test might last as long as 24 hours. If interrupted, the experiment can be ruined. The customer might also have to reboot the device, resulting in lost time.

### **SUPERIOR INSTALLS, SUPERIOR SERVICE**

Middlesex backs up its turnkey installations with superior service. It monitors its nitrogen Perma-Cyls using DataOnline's (of Berkeley Heights, NJ) Cyl-Tel wireless telemetry system. As liquid levels drop to preset levels, sensors alert Middlesex via the internet, phone, and email, and the firm promptly dispatches a microbulk truck to their site. Tank readings are posted on a website, and technicians at Middlesex back up the automated alerts with their own observations.

"We start at 6 a.m. and look at the readings every day," says Poole. "The customer can also go online and see graphs of their usage, and hour-by-hour data, which can help them plan their production cycle."

Middlesex can also identify customer equipment problems. "If a tank normally draws product at a steady rate and we see it has taken a sudden drop, we alert the customer before a problem arises," says Poole.

### **MAINTENANCE MATTERS**

When projects can last for several months and research dollars run into the thousands, maintenance on cryofreezers becomes vital. Middlesex stepped up to this service over the years to ensure all its customers can enjoy peace of mind.

The firm now has two service vans dedicated to Perma-Cyl installations and preventive maintenance programs on cryo freezers. Its factory-trained technicians perform periodic checks on sensors and printed circuit boards, conduct leak and vacuum tests, examine set points and alarms, and replace solenoids or other components showing signs of wear.

### **TRAINING AND EXPERIENCE**

In the final analysis, Martin believes it is training and experience that ultimately puts Middlesex out in front. "Everyone on our team has extensive training and experience," observes Martin. "They have attended training schools conducted by Praxair, Chart, SGD, and other manufacturers. They participate several times a year, both in-house and at the manufacturer's site in training sessions that update them on new products and technologies. It's this kind of dedication to maintaining and expanding our knowledge base that makes this team unbeatable."

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