Microbulk Gas Delivery

John Tapley
Air Products and Chemicals Inc.
Allentown, Pennsylvania

Microbulk gas delivery is a method for supply of argon, nitrogen, and oxygen in the liquid cryogenic state, an approach that is significantly more efficient than handling multiple high-pressure and liquid cylinders. Storage tanks range in size from 230 to 1500 liters, and are equipped with internal vaporizers and pressure-build regulators, enabling gas delivery at pressures up to 450 psig (3100 kPa). Each storage tank is capable of delivering product in either gaseous or liquid phase. Each tank has a flat base, which allows more flexible installation options than typical large bulk storage tanks. Only rarely do circumstances require a special foundation. Further, it is possible to install microbulk tanks inside buildings, whereby deliveries are made through a uniquely designed wall box on the building exterior.

A centralized microbulk storage tank replaces cylinders at multiple-use points throughout a facility. Low-cost, flexible piping options for inert gas applications include Kitec, a unique composite pipe with an aluminum core that is bonded to interior and exterior layers of polyethylene. It is flexible and lightweight, with threaded connections that allow simple yet durable installations.

When piping is not an option, portable 230-liter tanks can be placed at multiple-use points. When the tanks need to be replenished, they can be moved to a suitable access point for the microbulk tank truck to fill on-site. Full tanks are then returned to the use point. This approach still offers many of the benefits of microbulk supply, including improved quality control and elimination of wasted residual gas.

This article discusses custom gas blending, lists the benefits of microbulk gas delivery, and shows applications for welding, lasers, brazing, and heat treating.

Microbulk benefits
The microbulk tank truck allows fast on-site filling and automatic delivery shutdown. The vehicle is much smaller than traditional bulk delivery trucks. Its small size allows...
Cost comparison of cylinders vs. microbulk*

<table>
<thead>
<tr>
<th>Costs</th>
<th>Cylinders</th>
<th>Microbulk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas, delivery and rental ($/mo)</td>
<td>$195</td>
<td>$142</td>
</tr>
<tr>
<td>Residual gas lost</td>
<td>$30</td>
<td>$0</td>
</tr>
<tr>
<td>Total hard cost per month</td>
<td>$225</td>
<td>$142</td>
</tr>
<tr>
<td>Cylinder handling</td>
<td>$50</td>
<td>$0</td>
</tr>
<tr>
<td>Total cost per month</td>
<td>$275</td>
<td>$142</td>
</tr>
</tbody>
</table>

* Table assumes a typical customer who requires 10 nitrogen cylinders per month, with 20 minutes labor to changeout cylinders and 20% residual product in empty cylinder, converts to a 230-liter microbulk tank.

Microbulk offers advantages over traditional small bulk systems in applications that require a 1500-gallon storage tank or smaller.

The greatest advantage is flexibility. A traditional bulk storage tank is mounted on legs, making a robust concrete foundation necessary for installation. In contrast, a microbulk tank has a flat bottom and can be installed on most level, firm surfaces—for example, a loading dock or parking lot—without expensive site preparation.

Some examples of microbulk for metals process applications include:
- Argon or argon blend shielding gas for welding: Cylinders in multiple use points can be consolidated into one central supply storage area with pipe drops to each use point. Flow restrictors can be installed at each for greater control.
- Nitrogen for laser assist gas: Replacing multiple liquid cylinders and consolidating to a central microbulk supply eliminates cylinder changeout. Tanks are available at pressures up to 450 psi, which eliminates the need for the additional equipment typically required for small bulk tanks.
- Argon or nitrogen for gas backflushing in the vacuum furnace and protective atmospheres in metals treatment processes. Microbulk can replace cylinders for smaller shops with variable production cycles requiring volumes below traditional bulk supply.
- Nitrogen for brazing, sintering and annealing: As in the application above, microbulk can be an attractive alternative to cylinders for smaller shops with variable production cycles requiring volumes below traditional bulk supply.

Finally, metals processors who require small gas volumes now have options that can deliver the benefits associated with much higher volumes. Small tanks and small trucks benefit the small-volume user. Sizes, pressures, and configurations are available to meet processors’ needs while providing a cost-effective, reliable alternative to cylinders for nitrogen, oxygen and argon supply.