Noble and Needed

With Tight Supply and High Demand,
Having a Reliable Argon Supplier is More Important Than Ever

Anthony Colalillo, Argon Product Manager, Air Products and Chemicals, Inc.

Argon is a monatomic, chemically inert gas composing slightly less than 1% of the earth’s atmosphere. While not as rare as other noble gases, the unique challenges in producing crude liquid argon (CLAR) for purification, and the special properties of this noble gas have led to its strong demand and tight supply.

Production and Supply

The major components of air are nitrogen, oxygen and argon, plus typically minor amounts of water, carbon dioxide, carbon monoxide, non-condensates (helium, neon, and hydrogen), heavy rare gases (krypton, xenon) and other gases.

Argon is commercially produced as a co-product from the cryogenic distillation of air. Because the boiling points of argon and oxygen are very close (see table), argon is most cost effectively produced in situations where a significant amount of oxygen is also being manufactured. The two leading industries that use oxygen in these large quantities are steel and petrochemicals. A slipstream of oxygen/argon mixture is taken off of the air separation unit’s (ASU) main distillation column and further cryogenically distilled into crude or pure argon (PAR). The crude argon can then be further purified using a deoxo process.

<table>
<thead>
<tr>
<th>Component of Air</th>
<th>Volume % of Air</th>
<th>Molecular Weight</th>
<th>Normal Boiling Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen (N₂)</td>
<td>78.8</td>
<td>28.01</td>
<td>-196 °C (-320 °F)</td>
</tr>
<tr>
<td>Oxygen (O₂)</td>
<td>20.95</td>
<td>32</td>
<td>-183 °C (-297 °F)</td>
</tr>
<tr>
<td>Argon (Ar)</td>
<td>0.93</td>
<td>39.95</td>
<td>-186 °C (-303 °F)</td>
</tr>
</tbody>
</table>

A number of factors are currently affecting the supply and cost of argon including energy costs, strong ties to the steel and petrochemical marketplace, and a geographical disparity in production and usage. Because of these challenges it’s critical to have a reliable supplier.

A Reliable Supplier

Worldwide argon capacity has been calculated at 18,500 tons per day (tpd) with nameplate capacity in the United States at 4200 tpd. While there is a tight global supply and demand balance due to an increase in demand and a lack of new supply sources, Air Products has been able to offer its customers reliability through an extensive network of production facilities.
Noble and Needed

With Tight Supply and High Demand, Having a Reliable Argon Supplier is More Important Than Ever

Anthony Colalillo, Argon Product Manager, Air Products and Chemicals, Inc.

In the United States, Air Products has 37 argon production plants spread throughout the country, of which 22 have purification capabilities. This network, combined with the company’s fleet of dedicated argon delivery trucks and railcars, enables Air Products to produce and distribute argon throughout the country. Air Products’ proprietary TELALERT® telemetry systems installed at customer locations provide additional supply reliability by automatically tracking argon usage and enabling Air Products to deliver the gas where and when our customers need it.

We can supply small and large volume argon users through our microbulk and bulk supply options. While the majority of pure argon is supplied at 99.997% purity, Air Products also has the capabilities for further on-site argon purification to seven 9’s (99.99999%) on either a sale of gas or sale of equipment basis.

Applications

Argon is a colorless, tasteless, non-corrosive, non-flammable and non-toxic gas with a specific gravity of 1.38 and exceptionally poor heat transfer abilities. These characteristics make it ideal for a diverse range of applications from furnace cooling to use as a window glass insulation barrier. The following table highlights some of the most common applications for argon in the metals industry.

<table>
<thead>
<tr>
<th>Applications for Argon</th>
<th>Benefits of Argon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inerting atmosphere for heat treating of reactive metals such as titanium and molybdenum</td>
<td>Allows processing of reactive metals at high temperatures without risk of oxidation or other unwanted chemical reactions.</td>
</tr>
<tr>
<td>Molten metal blanketing</td>
<td>Prevents oxidation and gas pickup of molten metal, plus improves casting quality and increased yield.</td>
</tr>
<tr>
<td>Electric arc welding (TIG and MIG)</td>
<td>Shields the weld pool from air due to its density and inertness, plus requires lower arc voltage than other shielding gases (ideal for thin metal welding).</td>
</tr>
<tr>
<td>Thermal spray plasma</td>
<td>Most favored primary plasma gas. Usually used with a secondary plasma gas (hydrogen, helium and nitrogen) to increase its energy. Easiest gas to form a plasma and tends to be less aggressive towards electrode and nozzle hardware, plus produces lower noise levels. Completely inert to all spray materials.</td>
</tr>
<tr>
<td>Plasma cutting</td>
<td>Allows for easy start-up of arc and uniform plasma discharge due to its low ionization potential, without reactivity to metals</td>
</tr>
<tr>
<td>Metal refining (AOD – Argon Oxygen Decarburization)</td>
<td>Allows for efficient desulfurization, decarburization, degassing and bath mixing with minimal metal oxidation when injected with oxygen.</td>
</tr>
</tbody>
</table>

In addition to applications in the metals industry, argon is also useful for the following applications: window insulation; electronics manufacturing; electric light bulbs; solar cells and semiconductor manufacturing including wafer production, fiber optics/optoelectronics, printed circuit boards fabrication and device packaging.

Although argon is an atmospheric gas, it’s considered somewhat rare and more costly than nitrogen and oxygen due to the additional steps required to produce it. Therefore, its conservation has gotten quite a bit of attention from Air Products and our customers in recent years.
Noble and Needed

*With Tight Supply and High Demand, Having a Reliable Argon Supplier is More Important Than Ever*

Anthony Colalillo, Argon Product Manager, Air Products and Chemicals, Inc.

Air Products leak detection service can identify and repair costly leaks in argon piping systems, improving safety, part quality and economic performance. This comprehensive service performed by experienced industrial gas technicians can include leak detection audits, gas optimization, identification of potential increases in operating efficiencies, and recycle options. For example, Air Products’ analyses have show that just one, 1/32 inch hole in an operating line at 80 psig working pressure can waste gas worth about $20,000 per year.

**Our Commitment**

Air Products remains committed to the argon marketplace with continued improvements to both our supply chain and distribution process. This includes expansion of existing facilities, building new facilities, and improving productivity of existing assets. Our industrial gas specialists are here to discuss applications you may have for this unique gas.

---

**For more information**

**Corporate Headquarters**

Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195
Tel 800-654-4567
Fax 800-272-4449
Email gigmrktg@airproducts.com

**Asia**

Air Products Asia, Inc.
Suite 6504-7, Central Plaza
18 Harbour Road
Wanchai
Hong Kong
Tel 852-2527-1922
Fax 852-2527-1827

**Europe**

Air Products PLC
Hersham Place Technology Park
Walton-on-Thames
Surrey KT12 4RZ, United Kingdom
Tel +44 800 389 0202
Fax +44 1932 258502

---

**tell me more**

www.airproducts.com