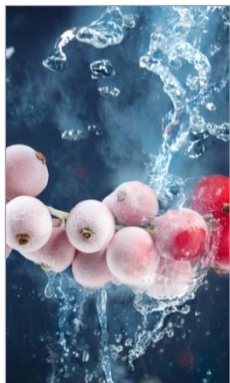


# Gas Applications



## Food and Beverage

Extend shelf life, eliminate harmful bacteria from food and add a “fizz effect” to beverages are a few examples of gas applications.

### Food

- | Food freezing and chilling
- | Packaging

### Beverage

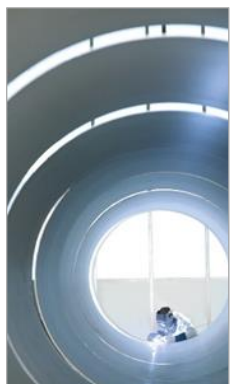
- | Carbonation
- | Blanketing, purging and sparging

N<sub>2</sub>

CO<sub>2</sub>

O<sub>2</sub>

Spec



## Metals

Gases such as argon, nitrogen and oxygen have a substantial impact on productivity increase, cost reduction and product quality.

### Metal fabrication

- | Cutting and welding
- | Thermal processes
- | Thermal coating

### Metallurgy, materials processing

- | Melting, reheating and casting
- | Heat treatment

Ar

O<sub>2</sub>

N<sub>2</sub>

Spec



## Environmental

Oxygen and carbon dioxide bring reliability and efficiency to water treatment, while nitrogen and ozone are used to reduce emissions up to 99%.

### Water Treatment

- | Aerobic treatment
- | Neutralization and remineralization

### Air Emissions

- | VOC emissions control
- | NO<sub>x</sub> abatement
- | Carbon capture, utilization & storage

N<sub>2</sub>

CO<sub>2</sub>

O<sub>2</sub>

O<sub>3</sub>



## Refining

Using oxygen in refinery processes significantly increases performance and hydrogen is crucial for reducing SO<sub>2</sub> emissions.

### Up & Midstream

- | Purging and inerting
- | Pipeline services

### Refining

- | Oxygen enrichment
- | Desulphurization

N<sub>2</sub>

CO<sub>2</sub>

O<sub>2</sub>

H<sub>2</sub>



## Pharma & Specialty Chemicals

Nitrogen is a powerful ally in ensuring safety and improving efficiency. Oxygen can bring advantages such as higher yields and more flexibility.

- | Inerting
- | VOC recovery

- | Liquid phase oxidation
- | Blanketing, purging and sparging

N<sub>2</sub>

O<sub>2</sub>



## Electronics

There are hundreds of gases used in the semiconductor, solar, display and LED markets. Reliability, productivity increase and product quality are some of the advantages of using the right molecule.

- | Fabrication
- | Atmosphere control

- | Purging
- | Leak detection

N<sub>2</sub>

Ar

H<sub>2</sub>

Spec

He

# Gas Applications



## Healthcare

Millions of patients worldwide rely on medical oxygen for life support, both at home and at the hospital. MRIs require a continuous supply of a cryogenic product to cool the magnetic coils.

- | Respiratory assistance
- | Anesthesia
- | MRI cooling
- | Clinical diagnostics

O<sub>2</sub>

He

N<sub>2</sub>O

Spec

## Plastics and Rubber

In many curing, molding, inerting and cleaning applications, gas and cryogenic solutions represent energy-efficient opportunities for manufacturers to increase productivity and product quality while also enhancing environmental performance.

- | Extrusion foaming
- | Injection molding
- | Mold Temperature Control
- | Cleaning

CO<sub>2</sub>

N<sub>2</sub>

## Pulp and Paper

The use of gases such as oxygen and carbon dioxide can increase capacity, reduce dependence on hazardous chemicals, improve pulp washing efficiency and stabilize pH, alkalinity and calcium levels in papermaking.

- | Pulp wash
- | Bleaching
- | pH control

O<sub>2</sub>

CO<sub>2</sub>

O<sub>3</sub>

## Additive Manufacturing

Process gases play a vital role in additive manufacturing and are involved in every step of the AM fabrication chain – from metal powder production to surface finishing.

- | 3D printing
- | Powder atomization and packaging
- | Powder storage and handling
- | Post processing

N<sub>2</sub>

Ar

He

CO<sub>2</sub>

H<sub>2</sub>

## Glass

A wide variety of industrial gases is used along the various steps of the glass value-chain. In melting, for instance, using oxy-fuel improves efficiency and product quality, while the use of oxygen and hydrogen ensures the perfect glass surface finishing.

- | Melting
- | Forming
- | Primary processing
- | Secondary processing

O<sub>2</sub>

H<sub>2</sub>

N<sub>2</sub>

Spec

## Aquaculture

Maintaining the right oxygen level in the water improves feed utilization, shortens the growth period and reduces fish mortality.

- | Flow-through farms oxygenation
- | RAS water quality
- | pH c| Sea cage oxygenation
- | Fish transportation

O<sub>2</sub>