

## Purging: How Safe is Your Process?

Hydrogen-cooled generators—particularly those used at electric power plants—have been associated with significant safety concerns related to combustibility. Given the broad ignitable range of hydrogen (4%-75%), these generators must be effectively purged prior to any maintenance or in the event of unscheduled or emergency outages.

Purging with carbon dioxide (CO<sub>2</sub>) provides the ability to isolate hydrogen from atmospheric oxygen and create an ignition barrier.

Incomplete removal of hydrogen can increase susceptibility to ignition from sources as small as an operator's flashlight or static electricity from their clothing. Additional hazards that may arise include extended purge times as a result of insufficient purge flow rates, and incomplete total flow due to dry ice formation in cylinders or supply systems (line, regulator or valve). There is also the threat of anoxia or suffocation from entry prior to CO<sub>2</sub> removal or as a result of system leaks and "pooling."

### Risks of longer purge times and shorter specifications

Historically, most power plants have referred to specifications set forth by manufacturers to help guide their procedures. Classic guidance is to purge within one hour, which is the typical battery reserve attached to seal oil pumps. After this time, seal oil pumps may be inactive with the result of hydrogen venting directly to the atmosphere. The one hour window is often difficult and unrealistic for many power plants to achieve using their existing purging systems which rely on gas-phase cylinder supply.

Plants frequently report purge times of 4 to 6 hours and, in some cases, over 12 hours due to systemic limitations. This immediately opens them up to risks associated with longer events, including operator fatigue, loss of attention and an increased likelihood of an incomplete purge.

"Longer purging times increase the risk of hydrogen leaking directly into the immediate area during blackout conditions," notes Mark Doore, Director of Specialty and Process Equipment at Airgas, an Air Liquide company.

## Too much time between purges

Power plant operators have been able to reduce the number and frequency of generator purging events in recent years because of their ability to extend the period between shutdowns or unplanned outages. Less frequent purging, combined with employee turnover, can mean that a plant might need to conduct the purging process without sufficiently experienced personnel. Inexperienced operators are more susceptible to introducing small errors throughout the process that could have big consequences.

“We support initiatives that move away from relying solely on personal behavior-based safety strategies and build in more risk mitigation capacity through the use of safer systems to support plant operations,” said Andy Shurtleff, Business Development Manager for Industrial Segments at Airgas. “There are ways to make an operation safer and faster in a way that does not put all of the responsibility to maintain a safe process on the individual operator.”

## A better way to reduce risk and unintended consequences

Recent innovations now allow plant operators to conduct faster purges in blackout or shutdown conditions without the use of electrically powered or steam-assisted CO<sub>2</sub> vaporizers. This newly developed ability to purge at high flow rates without the use of electricity or steam now allows for preset controls which reduces operator intervention and risk to personnel.

Faster purging also yields a more efficient process with increased generator uptime. The result: Shorter turnaround times which reduce both direct costs for labor and opportunity costs related to lost generator revenue.

**Discover how Airgas can help you make your purging process safer here:**

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**Airgas**  
an Air Liquide company

**TurbinAL™**  
Purge H<sub>2</sub>-cooled generators safely, reliably, efficiently



**High-flow purge system for hydrogen-cooled generators**

- Improve safety and risk management with uninterrupted gas flow and minimized cylinder handling
- Depend on quick and reliable system activation with no power required
- Save time by eliminating dry ice formation and component freezing
- Increase efficiency with a quick and reliable CO<sub>2</sub> purge when compared to traditional methods

The patented TurbinAL™ high-flow CO<sub>2</sub> purge system from Airgas, an Air Liquide company, provides the power industry with the most effective system available for purging hydrogen-cooled generators. This system is designed to meet OEM specifications for pressure and flow without the need for additional regulators or a flow orifice. TurbinAL operates without electricity, providing full-purge capacity of greater than 8,000 SCFH for planned or emergency purges. It can be scaled for a wide range of generator sizes.

## Airgas TurbinAL High-Flow Purge System for Hydrogen-Cooled Generators

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