Nitrogen Safety

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*Your local **gas generation** partner*

Some of Peak's customers are concerned about nitrogen generators reducing levels of nitrogen in the lab or increasing the level of oxygen to a dangerous level. Below is some information that explains why nitrogen gas generators are the safest way to supply nitrogen to your instrumentation and why they pose no danger, in terms of changing atmospheric levels of nitrogen or oxygen.

The biggest danger to lab personnel is a rapid depletion of oxygen levels in the lab. Once the level of oxygen reduces to < 18% there is a risk of impaired judgement and physical ability (Figure 1). For serious risk to the wellbeing of lab personnel, the O_2 content of the lab would need to be reduced below 11%. To reduce the level of O_2 in the atmosphere of a laboratory measuring 3m x 3m x 2.5m, which has a total volume of 22,500L would require 675L N_2 to be released instantaneously to decrease O_2 levels by 3%, and 2250L N_2 to reduce O_2 levels below 11%.

A nitrogen generator producing 32LPM nitrogen would take over 20 minutes to produce 675L and over 1hr to produce 2250L of nitrogen. The 32LPM produced would at worst increase nitrogen levels by 0.14% per minute, assuming there was no air exchange within the room and this temporary separation of air has no effect on the overall air composition.

Nitrogen used by the instrument is vented back into the room, so there is no appreciable change in the overall levels of oxygen or nitrogen, the gases are only temporarily separated. Again, the amounts of gas that are temporarily separated by the generator are so small compared to the volume of air within the laboratory that the effect is negligible. In terms of nitrogen generator performance, if the oxygen content of the air in the room were to rise over time, the purity of N_2 from the generator would gradually decline. The output from all of Peak's nitrogen generators is consistent over time, demonstrating that the overall concentrations of N_2 and O_2 in the lab atmosphere are not changed by the generator.

If we contrast the amount of nitrogen that is contained in a cylinder of nitrogen (9000L) or the amount of gas that is produced from 1L of liquid nitrogen (700L), it quickly becomes apparent that a significant leak from a cylinder or spillage of liquid nitrogen poses a much larger risk to laboratory personnel, since this can cause an instantaneous change in levels of O_2 in the lab atmosphere to below 11% through loss of only 25% of a cylinder's contents or a spillage of just 3L liquid N_2.

For this reason, the NERC (Natural Environment Research Council UK) in their "Guidance on Design of Safe Laboratories" recommend a nitrogen or hydrogen gas generator. Visit:

https://nerc.ukri.org/about/policy/safety/procedures/ for more information.

This document outlines the dangers associated with oxygen enrichment of atmospheres from liquid and bulk supply. The **Hazard of Inert Gasses and Oxygen Depletion** document, further illustrates the benefits of having an N_2 generator in the lab from a health and safety aspect.

O_2 (Volume %)	**Effects and symptoms on exposed**
18-21	No noticeable effect detected by the individual. Any source of gas contributing to change in atmosphere should be investigated and assessment carried out to determine whether environment is safe for continuation of work
11-18	Reduced physical and cognitive function without the individual realising
8-11	Possibility of sudden loss of consciousness. Risk of death below 11%
6-8	Loss of consciousness after a short time period, with resuscitation if carried out immediately
0-6	Almost immediate loss of consciousness and brain damage highly likely

Figure 1