



Engineered to order. Built to last.

SF6 GAS AND THE ENVIRONMENT

SF6 Advantages (1, 2)

The electric power industry has been using Sulfur Hexafluoride (SF6) gas as a dielectric and insulating material for many years. Its popularity is mainly due to its unique physical and electrical properties including:

- 1) Dielectric strength twice that of air.
- 2) Nontoxic, nonflammable and noncorrosive.
- 3) Chemically stable with high breakdown strength. SF6 molecules provide excellent arc extinction during electrical operations which minimizes contact wear and maintenance.
- 4) Excellent thermal conductivity. High heat transfer permits lower operating temperatures.
- 5) Readily available in many commercial locations.

For distribution voltage switchgear, SF6 provides these important advantages:

- 1) Size reduction
- 2) Weight reduction
- 3) Reliable operation
- 4) Ease of installation
- 5) Ease of handling
- 6) Ease and reduction of maintenance

Common Applications

Electrical uses include high voltage circuit breakers, high voltage transformers, distribution voltage switchgear, gas insulated power substations, gas insulated transmission lines, radar equipment, linear particle accelerators and generators.

Approximately 80% of the annual consumption of SF6 is used for gas insulated substation (GIS) equipment and medium voltage switchgear including circuit breakers and load break switches. Of the 80%, medium voltage switchgear accounts for approximately 10%. In both electrical applications,

the equipment is designed to contain the gas in sealed pressure systems which are assembled, filled and tested in a controlled environment.

Nonelectrical uses include molten magnesium and aluminum protection and purification, leak detection, tracer gas studies, propellants, insulating windows, shock absorbers, lasers and in the electronics industry as a plasma etchant gas. The other 20% of the annual consumption of SF₆ is used in these applications which typically require release of the gas into the atmosphere.

SF₆ and the Ozone Layer⁽²⁾

SF₆ does not deplete the ozone layer when released into the atmosphere. This is because SF₆ does not contain chlorine atoms as do CFCs (chlorinated fluorocarbons).

SF₆ and the Greenhouse Effect / Global Warming ⁽²⁾

SF₆ has been identified as a greenhouse gas. This means that SF₆ is one of a group of gases which can absorb and reradiate back to earth some of the earth's natural infrared radiation. Greenhouse gases are important to maintain the natural surface temperature of the earth. Some greenhouse gases (predominantly water vapor (H₂O) and carbon dioxide (CO₂)) are naturally occurring and some are the result of manmade processes (more CO, methane (CH₄), chlorinated fluorocarbons (CFCs), a substitute for Freon (HCFC-22), SF₆ and others). The effect of absorbing and reradiating infrared radiation back to earth is termed the "greenhouse effect". The resultant increase in the earth's natural atmospheric temperature is termed "global warming".

Recent measurements show the current concentration of SF₆ in the atmosphere is very small, about 3.2 parts per trillion by volume (pptv). In comparison, CO₂ concentration is estimated at 355 parts per million (ppmv). The relative contribution of SF₆ to global warming (or emission rate) is estimated to be about 0.01%. In 100 years, at its present rate, it's contribution is estimated to be less than 0.1%. In comparison, the current concentration of for HCFC-22, another greenhouse gas which is a substitute for CFCs such as Freon, is 105 pptv with an estimated emissions rate of 788% through the year 2100.

EPA Position on SF₆

The EPA is working on a voluntary program to reduce the emission of SF₆ into the atmosphere. The program encourages users and suppliers of SF₆ electrical equipment to gather data on usage, upgrade old equipment, recover and recycle the gas, and to improve the sealing methods of gas pressure vessels.

The National Electrical Manufacturers Association (NEMA) has been working for the past several years with the major suppliers of SF₆ electrical equipment to collect data on volume and annual release of SF₆. Many utilities and other end users of the equipment are also making good progress on gathering data for more accurate evaluation.

G&W's Position on SF6

G&W is a major supplier of SF6 load and fault interrupting switches worldwide. A long time manufacturer of oil switchgear, in the early 70's the company began the move away from oil and now produces both SF6 gas and solid dielectric switchgear. Today, the use of SF6 as a preferred switching dielectric is well established. G&W supports the efforts of NEMA and the EPA through continuous quality improvement in its design, manufacturing and production testing processes. Switches are 100% fine leak tested around all welds and entrance areas prior to shipment. Reclamation equipment is utilized in the manufacturing process and is recommended in field installations.

References:

(1)AccuDri® SF6 Brochure. Allied Chemical, 1995, 97-0103.4M.S95M.

(2)EPA Conference Proceedings, Electrical Transmission and Distribution Systems, Sulfur Hexafluoride, and Atmospheric Effects of Greenhouse Gas Emissions Conference, August, 1995.