

## ***On-Site Fluorine (F<sub>2</sub>) Generation For Chamber Cleaning Applications***

***Lower your costs and lock-in your chamber cleaning gas supply***

Large-scale manufacturers of integrated circuits and flat panel displays (TFT/LCD) can now lower production costs by using on-site Fluorine generation for their chamber cleaning applications.

Dedicated on-site Fluorine generation is the lowest cost chamber cleaning option and can offer savings of up to 50% less than equivalent NF<sub>3</sub> pricing.



### ***Air Products Will Own and Operate the On-Site Fluorine Plant – Delivering 100% Uptime***

A sale-of-gas agreement allows the customer to lock-in Fluorine supply for chamber cleaning processes without supply chain concerns. With this arrangement, Air Products will own and operate the on-site plant and be fully responsible for consistently providing the Fluorine volumes you need for your process, at 100% uptime, ensuring security of supply.

#### ***Typical Terms***

- Sale of Gas Contract structure
- F<sub>2</sub> plant owned and operated by Air Products
- 10 year term
- Back-up with NF<sub>3</sub>

#### ***Chamber Cleaning Gases – Typical Specifications***

	Fluorine	NF <sub>3</sub>
<b>HF</b>	<100 ppm	<1 ppm
<b>SF<sub>6</sub></b>	<5 ppm	<10 ppm
<b>H<sub>2</sub>O</b>	<5 ppm	<1 ppm
<b>CF<sub>4</sub></b>	<500 ppm	<150 ppm

#### ***Physical Properties***

- Purity = 99%
- Delivery pressure = 15-20 psig.
- Flow rate = 150-2000 MT/yr.

#### ***Experience***

Air Products has over 30 years of experience operating multiple, large-scale Fluorine manufacturing plants and proven capabilities in:

- F<sub>2</sub> plant operational excellence
- F<sub>2</sub> and HF safety
- Emergency Response
- NF<sub>3</sub> supply
- Chamber Cleaning optimization
- Logistics

### ***The global Leader in the Technology of Chamber Cleaning***

In addition to our long history of working with Fluorine, Air Products pioneered the use of  $\text{NF}_3$  in chamber cleaning applications over 20 years ago.

- We have completed extensive work to characterize chamber cleaning effectiveness with both  $\text{NF}_3$  and Fluorine.
- Our testing has demonstrated  $\text{NF}_3$  and  $\text{F}_2$  chamber cleans are equally effective.

With today's manufacturing process requiring such large volumes of chamber cleaning gases, customers can now save costs by changing to on-site Fluorine supply. Only Air Products has the combination of extensive chamber cleaning process experience, along with a long history of Fluorine production and handling experience, to ensure a manufacturer of consistent material supply with minimal logistic concerns.

### ***Work Locally***

Air Products will work with your local regulatory agencies to provide safeguards that address any risks associated with on-site Fluorine supply. Our history with Fluorine production along with our extensive on-site plant experience, uniquely qualify us to interact with your local agencies to meet all safety requirements.

***On-site Fluorine supply can save you money in your chamber cleaning operations. Talk to us, we'll listen!***



***Air Products has over 40 years of experience in operating large-scale Fluorine plants, including 5 existing generators, and can safely and reliably meet all your chamber cleaning gas demands.***

***For More Information***

If you would like additional information or technical assistance, please feel free to contact:

Air Products and Chemicals, Inc.  
Timothy Maykut  
Fluorine Product Manager  
Email: [maykutt@airproducts.com](mailto:maykutt@airproducts.com)  
+1-610-481-4967

**tell me more**  
**<http://www.airproducts.com/electronics>**