Evaluation of Ozone Emissions Destruction Units for Applied Materials' SACVD Chambers

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Motorola uses ozone in the sub-atmospheric chemical vapor deposition (SACVD) process in Applied Materials process tools. Ozone is generated continuously and delivered to the gas panels of the tools where it is either consumed in the process or diverted to the gas panel exhaust stream when not required by the process. As a result of the continuous generation of ozone, ozone emissions can be significant.

Ozone emissions are not only a potential concern for attributing to a community's ground level ozone concentrations and impacting attainment status to the National Ambient Air Quality Standards (NAAQS), but ozone is also a listed chemical of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and is subject to the reporting requirements of the Act. As required by the Act, the ozone emissions as well as other listed chemicals are reported on a site's toxic chemical release inventory (TRI). Several drivers, including public perception, have led to the development of Motorola Corporate and Sector goals to reduce TRI emissions.

In order to quantify ozone emissions from SACVD tools, Motorola conducted stack testing using extractive FTIR in addition to point of generation testing using ozone analyzers and a Draeger testing device. Tests were conducted on two different wafer fabs running these processes, and good agreement was reached between measurement methods and wafer fabs. Based on the measured ozone concentrations, algorithms were developed to accurately quantify ozone emissions.

Although several expensive solutions exist for reducing ozone emissions, low cost solutions were investigated to reduce ozone emissions from SACVD tools. A solution that appears to reduce ozone emissions and is relatively low cost to implement is point-of-use ozone catalytic destruction. These ozone destruction units were evaluated for Applied Materials 5200 Centura and an Applied Materials Precision 5000 to determine if ozone emissions reductions are feasible for multiple platforms/models of SACVD tools. An ozone destruction unit was installed on the divert line in the gas panel of each process tool to convert ozone to oxygen using a catalyst. The evaluation identified that the ozone destruction unit can significantly reduce ozone emissions levels.