ATTACMENT 1

Chlorine Exhaust Abatement Tool

The Naval Research Laboratory is in the process of installing a chemical vapor deposition reactor for the growth of silicon carbide. Part of the process uses chlorinated gas sources and so it will be necessary to abate the chlorine in the mostly hydrogen exhaust gas stream before it is removed from the laboratory building by exterior fans. The abatement tool must meet the following operational and safety requirements.

1. Abatement of Chlorine should be at least 98% efficient. The reactor exhaust composition and maximum flows into the abatement tool are: 100 SLM hydrogen with 200 SCCM of Chlorine; other exhaust gas constituents are unreacted propane (max = 30 SCCM), unreacted silane (max = 30 SCCM) and Argon (max = 5 SLM).
2. It is desired that abatement be done by a wet treatment approach. The abatement tool must be configurable to at least treat 1 to 4 exhaust streams.
3. The abatement tool must fit into the work-site laboratory; available foot print is ca. 40 inches X 30 inches and 72 inches in height. Because of limitations to the floor loading capacity, the weight of the unit for the above footprint should not exceed 750 pounds (fully filled). In addition, the tool will be powered by either 120 V or 3 phase 208V with a power consumption of less than 2 KVA. Nitrogen gas is available as a diluent up to 100 SLM.
4. The abatement tool must perform its task in a laboratory environment where the operating temperature is 25 +/- 5 C with a relative humidity < 70%.
5. The abatement tool exhaust fluid is to be neutralized before being discharged into the building sewage system. The abatement tool can be connected to the building fresh water (with appropriate check valves, etc.) to periodically or continuously fill the tool as needed.
6. Due to the presence of hydrogen in the exhaust stream, the tool should be explosive proof and/or be surrounded by a safety containment system.
7. The abatement tool should have sensors which will at least shut off itself in the event of pump failure, pump cavity leak or a high temperature condition in the treatment fluid (above the boiling point of water). These sensors will also trip at least one relay (dry) in the tool that can be externally connected to modify actions of other equipment in the laboratory and/or the building alarm system.
8. The abatement tool must have a monitor display of its alarm and sensor state and have the ability for the operator to remotely monitor the tool's state via communications along an RS-232 cable or other of conventional type. The tool should have visual indicators (Red lights) for a failure condition.
9. It is desired that the tool should have a high reliability, as measured by mean time between failures in excess of 7000 hours.
10. The abatement tool should come with standard manuals (English), warrantees, and training options. The quotation should include other options and spare parts that the manufacturer normally supplies. It is desired that an extended (24 month) warrantee be provided from the date of delivery because the equipment is not expected to be run until approximately June 2005.