CASE STUDY FOR A HARD DISK DRIVE MANUFACTURER

PURAFIL®
FIRST IN CLEAN AIR
www.purafil.com

PURAFIL PREVENTS CORROSION FOR A HARD DISK DRIVE MANUFACTURER

THE PROBLEM

Though disk drive manufacturers have been aware of airborne molecular contamination (AMC) for some time, they have only recently focused on the effects chemical contamination has on drive components, manufacturing processes, and drive performance. Exposure to various acid gases can lead to corrosion of disks and drive components and therefore slowed production and lost revenue.

A leading hard disk drive manufacturer was concerned about the effects of AMC on potential upgrades to its manufacturing facility. Located in an urban area within a couple miles of the ocean, the manufacturer was concerned about exhaust from heavy, constant vehicular traffic and many other manufacturing companies. Sulfur and nitrogen oxides, chlorine, and ozone levels in the air surrounding the facility were anticipated to be especially high.

PURAFIL PROVIDES THE SOLUTION

Purafil, the leading manufacturer of gas-removal air filtration systems, met with representatives from the manufacturer to implement a three-step process to control AMC. The service is designed to characterize the reactive potential of an environment.

ASSESSMENT:

As part of the assessment of the facility, multiple sets of Purafil's Environmental Reactivity Coupons (ERCs) were placed in each area of concern to determine the corresponding reactivity level. The ERCs employ copper and silver sensors that react with airborne contaminants to form corrosion reaction products. Unlike direct monitoring technologies, Purafil's coupon technology makes it possible to observe and predict the synergistic effects of AMC on manufacturing processes. Multiple sets of ERCs were used to establish baseline data for the specification, design, and operation of a chemical filtration system.

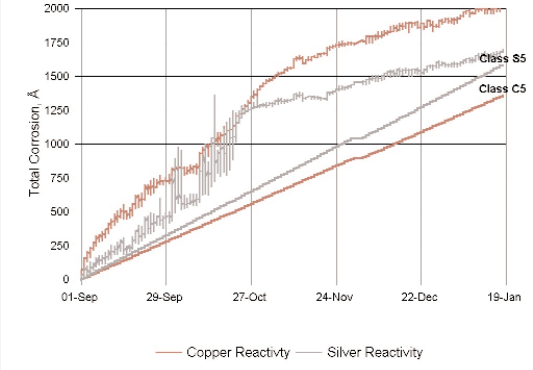

FIGURE 1 - ERM DATA - FRESH AIR INLET

Seven of Purafil's Environmental Reactivity Monitors (ERMs) were also used in the facility. A quartz crystal microbalance sensor plated with copper or silver continuously measures in real-time the mass accumulation of the corrosion films formed. These monitors continuously transmit data to the facility monitoring system and are sensitive enough to measure AMC levels as low as 1 ppb.

Data from the ERCs and ERMs allowed Purafil engineers to categorize the contamination level of the facility. A classification system has been developed for correlating the film thickness to the air quality of the environment. The classification levels are the result of studies performed with a number of microelectronics manufacturers and reflect what are considered to be acceptable levels inside a facility.

Based on ERC and ERM data, the outdoor air used for ventilation showed copper and silver reactivity rates indicative of a Class C5/S5-Severe environmental classification. (See Table 1 at the next page for environmental classifications of semiconductor cleanrooms.) This air, if left untreated, would pose an immediate threat to fabrication processes. (See Figure 1 for ERM results of outdoor air being used for ventilation.) High levels of sulfur and chlorine contamination were evident. The air was estimated to have concentrations in the ranges of 10-50 ppb for active sulfur compounds, 10-100 ppb for sulfur oxides, and >10 ppb for chlorine. All ERC measurements indicated extremely high levels of corrosive AMC for a disk drive manufacturing environment.

ADDITIONAL INFORMATION ON BACK

Purafil, Inc. • 2654 Weaver Way, Doraville, Georgia, 30340, U.S.A. • www.purafil.com • tel: (770) 662-8545 • (800) 222-6367

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
ISO 9001:2008

CONTROL:

To remove specified contaminants and those identified in the assessment, a Purafil Side Access system was placed on the fresh air inlet that supplies ventilation air to a mechanical room housing a recirculation air handler. The two-stage chemical filtration system houses Purafil's PK-18 MediaPAK™ disposable modules, which contain Purafil Select in the first stage and Puracarb in the second stage to control acid gases and volatile organic compounds. Purafil installed CPS-500/85 Purafilters™- pleated combination chemical-particulate filters capable of removing acid gases and volatile organic compounds. These filters replaced the existing particulate filters in the recirculation air handling units.

TABLE 1

COPPER CORROSION

CLASS	AIR QUALITY CLASSIFICATION	REACTIVITY RATE*
C1	Pure	<90 Å/30 days
C2	Clean	<150 Å/30 days
C3	Moderate	<250 Å/30 days
C4	Harsh	<350 Å/30 days
C5	Severe	≥350 Å/30 days

* Å = angstroms

SILVER CORROSION

CLASS	AIR QUALITY CLASSIFICATION	REACTIVITY RATE*
S1	Pure	<40 Å/30 days
S2	Clean	<100 Å/30 days
S3	Moderate	<200 Å/30 days
S4	Harsh	<300 Å/30 days
S5	Severe	≥300 Å/30 days

* Å = angstroms

ERCs were placed at the fresh air inlet, between the first and second stages of dry-scrubbing media, at the discharge of the chemical filter system, in the mechanical room, and in the cleanroom supplied by the recirculation air handling unit to evaluate the system's ability to remove specific types of AMC.

ERMs were placed at the fresh air inlet, the discharge of the chemical filter system, and in the mechanical room to spot trends in outdoor air quality filter performance and to correlate with ERC data. (See Figure 2 for a diagram of the test setup showing the ERC and ERM monitoring locations.)

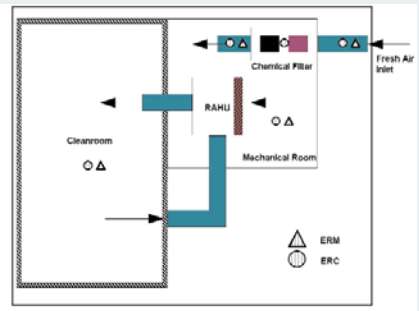

FIGURE 2: Diagram of chemical filter system evaluation

Monitoring data indicated that the chemical filter system completely removed active sulfur and chlorine contamination. Sulfur oxides were reduced by more than 87 percent. (See Table 2 at the bottom of this page for a summary of the chemical filter performance.)

MONITORING:

Purafil provides ongoing monitoring of the controlled environment and the performance of the AMC control system. Reactivity monitoring indicated an overall reduction in the total contaminant load. The chemical filter systems reduced the overall levels of AMC by more than 95 percent. ERC and ERM data was collected over a 90-day period and showed that the air quality improved from a Class C5/S5-Severeon the inlet side of the system to a Class C1/S1-Pure on the discharge side. (See Figure 3 for a representation of the effectiveness of the chemical filter system against the contaminants identified in the outside air.) Examination of the total and individual corrosion films data indicated the complete removal of active sulfur and inorganic chlorine contaminants within the AMC control system.

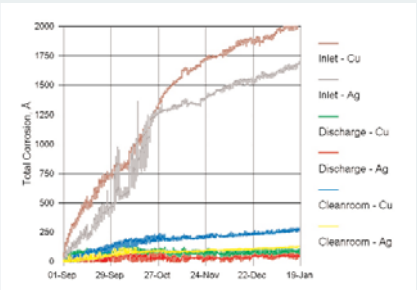

FIGURE 2: Chemical filter performance - ERM data

TABLE 2

ERM Monitoring Location	Copper Reactivity	Reduction	Class	Silver Reactivity	Reduction	Class
FRESH AIR INLET	579	n/a	C5	484	n/a	S5
CHEMICAL FILTER DISCHARGE	21	96.37%	C1	11	97.73%	S1
MECHANICAL ROOM	70	87.91%	C1	33	93.18%	S1
CLEANROOM	10	98.27%	C1	10	97.93%	S1