

Clean Air and the Data Processing Industry



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Why should IT Management be concerned about the cleanliness of their data centers? With the common challenges facing the data center community today it makes sense to outsource the cleaning process. The goal of an outsourced cleaning program is to help streamline the problemsolving process for the busy data center professional through a unique set of industry standards and best practices. The results will be a controlled environment that has minimal particulate contamination, which minimizes equipment failure and allows the IT professional to focus on the responsibilities of running the data center itself.

The data processing industry uses the United States Federal Standard 209E to determine the relative cleanliness of a computer facility. FS 209E establishes the maximum levels of particulate contamination permissible in certain controlled environment.

According to FS 209E, the maximum limits of particles per cubic foot of sampled air in a data center are: 100,000 particles of .5 microns in size, 20,000 particles of 1.0 microns in size, and 2,000 particles of 3.0 microns in size.

When particle counts exceed these limits, there is a greater occurrence of equipment failure and data input/output error. Destructive Interaction between airborne particulate and electronic instrumentation occur primarily through the following:

- Interference with moving parts – Relative motion can cause abrasion and head media crashes.
- Deposits of contamination on a sensitive material may result in shorts and corrosive failure.
- Premature clogging of filtered devices will restrict airflow, which will induce internal overheating and head crashes.

"Clean" is a subjective term. I have a standard for a clean room, and my kids have their own standards. This subjectivity of cleanliness can be applied to data centers also.

The human eye can see particles as small as 100 Microns, or 1/10th of a millimeter. Lets look at a typical ISO Class 9 (100,000) Data Center. The specifications of this data center allow for 100,000 particles @ 0.5 micron per cubic feet of air. The airflow is 80-100 CFM per server. This means that 10,000,000 particles enter every minute.

Let's assume that 5% of the particles remain inside the server. This equals 500,000 particles remain per minute, or 7.2 billion particles remain per day.

These particles can cause Thermal Failure, Electrical Shorts, ESD, and Physical Wear and Tear on your sensitive equipment. The following is taken from Dell's System Guide: "...as it draws in air to cool the computer, the power supply fan also draws dust and other particles into the computer. This contaminant buildup increases internal temperature and interferes with component operation. To minimize these conditions, Dell recommends keeping your work environment clean" Microsoft Knowledge Base Article #842465 "...Excessive room temperature, bad ventilation, or dust accumulation can cause electronic components, such as processors, to behave erratically..." Gateway Server Guide, "...Avoid dusty or dirty work environments. Dust and dirt can clog the internal mechanisms and cause the server to overheat...Damage caused by extreme temperatures is not covered by your warranty."

How do you prevent the potential problems associated with particle accumulation inside your data center?

Follow Data Center Best Practices: Restrict Access, Clean Up After Yourself, Create and follow maintenance plans, make data center safety a priority, Monitor and Inspect Your Environment.



An untidy data center is a set of accidents waiting to happen. Pegasus Cleanroom Services is an ISO 9001:2000 registered company that can assist you with scheduling Cleaning frequencies based on your unique circumstance, and documented safety inspections.

WHY CLEAN THE SUBFLOOR PLENUM

The subfloor plenum is an extension of the air conditioning system and the lifeline of any computer room. Precision air conditioning controls are used to regulate temperature and humidity in the data center. The subfloor plenum is used to deliver this control to the sensitive equipment in the data center.

Unfortunately, because of gravity, the plenum is also the area most prone to dirt and dust. Allowed to accumulate, these contaminants will be swept up and carried to your equipment by the circulating air conditioning so vital to your equipment's operation. The impact of contaminated airflow includes clogged circuitry, increased risk of fire, accidental fire suppressant discharge, and health problems.

“Computers, like giant electric furnaces, generate vast amounts of heat and their components are very sensitive to extremes of temperature, humidity, and the presence of dust.”¹

Just as regular inspection and maintenance of the HVAC system prevents unnecessary downtime and improves its performance, so too, the air plenum which delivers the conditioned air, must receive the same care.

Although numerous reasons for data center cleanliness can be found, the following are the most critical in today's data centers:

ELECTROSTATIC DISCHARGE AND DUST FIRES

There is a link between constant movement of air and dust across concrete surfaces and static electricity

FERROUS METALS ON CIRCUIT BOARDS

The high volume of air blown over circuit boards to cool can deposit both dust and tiny ferrous metal slivers on electronic components

OVERHUMIDITY AND RUST

The opposite end of the spectrum from Electrostatic Discharge. Rust can be found on the floor jacks and grid as well as other metal equipment and duct work.

HEAD CRASHES AND MECHANICAL WEAR

Today's disks are particularly vulnerable to dust. Particles passing through equipment filters can group inside disk drives, creating particle sizes big enough to strike a floating head.

FIRE SUPPRESSION SYSTEM DUMP

Dust and other small particles can look like smoke to fire detectors. According to data center insurance companies, over 1/3 of all fire suppression system releases each year are accidental.

PEACE OF MIND

Preventative maintenance is a much more acceptable cost than downtime.

“The cost of detecting and preventing environmental threats to a data center is often less than the cost of system downtime. Such budgeting for an acceptable amount of downtime is a reactive and often costly approach, especially when it is possible to prevent such occurrences. Many of the causes are literally under your nose; in the air you breathe and under the floor that you walk on. The trouble is, most are invisible.”²



PEGASUS DATA CENTER SERVICES

is the proven choice for critical environment cleaning. Our professional technicians have the expertise to properly design and implement a maintenance program that includes your subfloor plenum and ensures your equipment performs at its peak.

1 Liebert Corporation. "The Seven Elements Every Manager Should Know About Computer Air Conditioning"

2 Renee M. Robbins - Infosystems

