

NSA

1 Ton More Dust Prevented from Entering Equipment

Revolution Pocket



How a Phoenix Data Center used Mechanical Filters to Improve Air Quality and Equipment **Protection in Extreme Dust Conditions**

Background

Data centers demand consistent cooling and clean air to keep critical infrastructure running 24/7. In high-growth regions like Phoenix, Arizona -now the 4th largest data center market globallymeeting this need is increasingly complex.

As of 2025. Phoenix data centers consumed 1.541 megawatts of power. With 100% outside air intake in a desert climate, managing dust and airflow is both essential and challenging.

Challenge

Harsh environments like Arizona pose a unique threat to data center cooling systems. Airborne dust from 100% outside air intake can clog HVAC systems, reduce energy efficiency, and compromise sensitive equipment.

Downing Filtration in Phoenix partnered with a local mega data center to evaluate whether traditional charged media or mechanical filters provided better long-term protection in these extreme conditions.

The challenge: balance dust removal, energy use, and filter lifespan—without sacrificing efficiency or increasing maintenance, for the best ROI.



Filter performance doesn't remain static.

Charged media can lose effectiveness over time, especially in environments with high dust loading. Mechanical filters, however, may actually improve filtration efficiency as dust builds up.

Selecting the right filter is about long-term performance, not just initial specs or cost.

"Mechanical media outperforms charged media, which loses efficiency over time and allows considerably more dirt to penetrate the filter and enter equipment."

Jason Downing President, Downing Filtration

Solution

Over a 3-month field test, Downing Filtration installed and monitored two filter types: charged media and Rensa's Revolution Pocket, a mechanical filter designed for durability and efficiency.

We measured pressure drop, weight gain, and particle counts across thousands of filters in full operation to determine real-world performance under high-dust conditions.

Results & Impact

The results were clear:

- Mechanical filters outperformed charged filters by a wide margin, improving in efficiency from MERV 11 to MERV 13, while charged filters degraded from MERV 13 to MERV 10.
- Mechanical filters captured 0.85 pounds of dust per filter, compared to 0.35 pounds of dust by charged filters.
- Across 4,000 filters, that's an extra 1 ton of dust removed from the system in just 3 months.

This performance not only protected downstream equipment and cooler media, but also sustained airflow and reduced maintenance, while saving energy.

For data centers in harsh environments, advanced mechanical filtration-like the Revolution Pocketoffers a better return on investment by reducing risk, saving energy, and extending equipment life.



Mechanical filters captured an extra 1 ton of dirt in 3 months

With an additional 0.5 pounds of dust per filter, and 4,000 bags in a single building, that resulted in removing an extra 1 ton of dirt in 3 months - all kept out of the data hall and cooler media.



CHARGED: 3 Months Performance





Mechanical filter's performance significantly outperformed Charged filter

The performance of mechanical filters improved over time, increasing from MERV 11 to MERV 13, while charged filters degraded from MERV 13 to MERV 10.

Higher dust holding capacity leads to lower total cost of ownership

Mechanical filters provide better long-term efficiency, airflow stability, and equipment proteciton.



Mechanical vs. Charged Filter Comparison



Reduced Footprint

Lower shipping volume, reduced labor time



Less Disposal

Lower disposal volume, storage & environmental impact



Energy Savings

Stable pressure drop, reduced energy from fans, lower utility