



Mount Rainier, the largest volcano in the magnificent Cascade Mountain Range, features 26 named glaciers which together form the largest single peak glacial system in the contiguous United States. Eruptions from Mount Rainier and other volcanoes in the Cascades have spread layers of very fine, abrasive volcanic ash over the entire region. Glacier movement, which is continual, grinds the hard rocks of the area into colloidal size dust.

Of the two million visitors to Mount Rainier National Park each year, about three-fourths enjoy informative, educational presentations within the audio-visual room of the Henry M. Jackson Memorial Visitor Center at Paradise, located at an elevation of 5,400 feet on the mountain's south slope. Unfortunately, while enjoying the surrounding scenery and walking the subalpine meadows, these visitors inadvertently tract clouds of the mountain dust into the exhibit and auditorium areas of the visitor center. Keeping these visitors comfortable so they can concentrate on the programs and have a quality experience is a challenge for park managers.

According to Ron Warfield, Assistant Chief Park Naturalist, normal maintenance removes most of the dust on a daily basis, but over the years it has found its way into every nook and cranny of the center. Lint from carpet, dust from everywhere and greasy fumes from a concession cafeteria all find their way into the projection room of the center's auditorium, which measures 10 feet x 15 feet with a ceiling height of eight feet.

The Application Design. For 25 years since 1967, antique film and slide projectors looped to a pair of film trees showed visitors continuous programs which enhanced their park experience despite the dust. In 1992, however, the staff member who had been maintaining the setup retired, and the equipment was replaced with sensitive, solid state projection devices.

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IAQ for Visitors

Like many technologically advanced devices, however, the new projectors "require absolute dust free environments to function properly," said Warfield. "Our solid state message repeaters produce spurious results when dust particles short-circuit connections. The least bit of dust wreaks havoc with the film trees and the video projector shuts down when it clogs with dust. Taped message repeaters sound like sandpaper commercials when dirty. We were losing at least a film or tape every week to the dust bunnies."

The projection room was originally designed to have a negative pressure, and a great volume of particulate matter had accumulated. An ordinary disposable air filter had been installed as a prefilter to the heavy duty exhaust fan which was positioned in the doorway, with negative pressure being run into the room. This setup, unfortunately, was blowing dust and other airborne particulate matter into the projection room. Warfield explained that the "simple furnace filter was expected to eliminate the problem...but was quickly overwhelmed by the volume of contaminants. Even with continual cleaning, the room would appear like a dusty attic."

Warfield continued, "after a struggle in 1993 to maintain the equipment under overwhelming odds, we decided to ask for help."

The Filter Choice. It was determined that positive pressure should be run instead, thereby pushing dust out of the room and that a cost-effective air filtration solution should be found. After several possibilities were researched, a set of washable, flexible hammock-style electrostatic air filters was purchased from Permatron Corporation.

The Permatron filters specified for this application consist of a layer of nonwoven media with a layer of woven electrostatic media on either side, bound together with a flexible vinyl edge. Independent laboratory tests indicate these filters offer 87%-96% average arrestance efficiency at 600 to 1200 CFM, high dust holding capacity and low initial air flow resistance. The Permatron filters carry a lifetime warranty and are UL classified Class II as to flammability.

After a thorough cleaning, the fan was reversed to provide positive pressure. Two of the filters were installed, as pre-and after-filters, on either side of the exhaust fan. The third was installed on an existing ceiling vent to prevent entry of contaminants from that source.

According to Warfield, "the filters are used to make sure the air is clean. They are not very large, but have made a large difference to our operating equipment which does not like heat or dust. The flexibility of the vinyl edge finalized our decision, as filters are typically made with a rigid frame. The surface of the fan housing is curved, so we needed a flexible filter over its face, to cover all the bases and do the job properly. The fan still flows freely but the dust is no longer entering the room, and the positive pressure keeps other dust from entering around door casings."

The filters were so effective at capturing airborne particulate matter in this configuration that within the first week, daily cleaning of the filters was required. Thereafter, weekly cleaning was sufficient, and an average cleaning schedule of twice each month is anticipated over time. Typical heating/cooling system applications require monthly cleaning for electrostatic air filters. Cleaning simply consists of rinsing with water.

Warfield concluded, "the projectors and message repeaters are humming along, visitors are once again enjoying programs without interruptions. Thanks to Permatron filters behind the scenes, a big part of the visitor experience in the Jackson Visitor Center at Paradise functions perfectly. And Mount Rainier remains the premier natural wonder of the Pacific Northwest."

Effective indoor air quality solutions need not be complicated or expensive. For visitor facilities at Mt. Rainier National Park, the installation of fine quality Permatron air filters within the existing HVAC system was the logical choice.

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