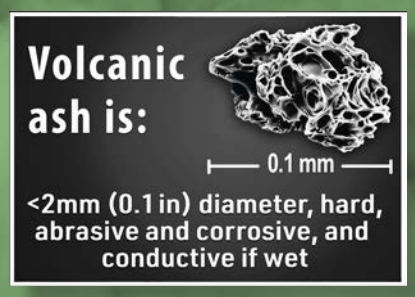

VOLCANIC ASHFALL

ADVICE FOR: **OPERATORS OF GENERATORS AND HVAC SYSTEMS**

ASH IMPACTS ON GENERATORS & HVAC SYSTEMS

Volcanic ash can cause power outages, so utility operators may require emergency power generation during and after ashfalls. Air intakes on generators and heating, ventilation and air-conditioning (HVAC) systems are vulnerable to impacts from airborne ash and need to be protected.

- Air filters in both generators and HVAC systems can become clogged rapidly during ashfalls, even when airborne ash concentrations are relatively low. High-spec filters (such as 110 PPI foam) clog much more rapidly than lower-spec filters because they trap particles more efficiently. Clogged filters reduce air flow which may cause stalling and overheating.
- Ash may accumulate on HVAC condenser fins leading to blockages causing overheating and increased frequency of shutdowns.
- Impacts generally depend on the concentration and particle size of airborne ash and the duration of high concentrations. Finer particle sizes stay suspended and remobilize more readily. Fine ash may be drawn into engine air filters and radiators, bypassing pre-filters over external generator air intakes.
- Long-duration or repeated ashfalls, or wind remobilization of ash deposits in dry conditions, can all cause ongoing impacts.
- High humidity increases ash adhesion to filters and radiators. Fine dry ash may also adhere due to its electrostatic properties.
- HVAC condenser units with low fan speeds block more readily.
- Intakes and condensers with a horizontal air intake direction, or systems with a hood, ingest substantially less ash than systems with air that enters vertically.
- Ash may cause accelerated corrosion and wear to exposed metal components such as fuel valves or electrical switches, usually over timescales of weeks to months.
- Ingestion of ash into generator motors may cause accelerated damage to moving parts and block fuel filters, lines and valves, but this has only rarely been reported.
- Outdoor electric motors or generators with air cooling are also at risk of blockage (and corrosion), especially for units where air circulates internally.

ⓘ *See companion Power Transmission and Distribution Systems and Power Plant posters.*

Moderate airborne ash concentration in Rotorua, New Zealand.

At 11:30 am on 17 June 1996, following an eruption of Ruapehu volcano (140 km/87 miles away), a layer of ash was visible on vehicles. Visibility was approximately 1 km/0.6 miles (compared to a clear air visibility of 70 km/44 miles). Airborne ash concentrations were not measured but were likely 0.1–0.5 mg/m^3 as PM_{10} (airborne particles less than 10 microns in size). In these conditions, high spec filters may need replacing every few hours and low spec filters every few days. Photo by Rotorua District Council, New Zealand.

High airborne ash concentration in Jacobacci, Argentina.

Following wind remobilization of fine ash from the 04 June 2011 eruption of Cordón Caulle volcano in Chile, visibility was 30–50 metres (33–55 yards) around 235 km/145 miles away. Airborne ash was measured in the range of 1–10 mg/m^3 as PM_{10}. In these conditions, all air filters will likely need replacing at least hourly for generators and HVAC systems to remain operational. Photo by Municipality of Jacobacci, Argentina.

Adaptations to protect generator equipment in Bariloche, Argentina, from repeated airborne ash exposure following the 2011 eruption of Cordón Caulle volcano, Chile. Photos by Tom Wilson.

• FURTHER RESOURCES •

https://volcanoes.usgs.gov/volcanic_ash/equipment_HVAC.html

www.ivhhn.org (volcanic health hazards information)

Content by George Williams, Daniel Blake, Tom Wilson and Carol Stewart. Layout by Lisa M. Faust. Version 1 of International Volcanic Ash Impacts Posters, November 2020.

RECOMMENDED ACTIONS

WHERE TO FIND HAZARD & WARNING INFORMATION

Refer to the website of your local volcano observatory, national weather service and/or disaster management agency for warnings of ashfall.

HOW TO PREPARE

Operational plans should be developed well in advance for infrastructure at risk from volcanic ashfall. Plans should have procedures that incorporate up-to-date ashfall forecast information into operational decisions.

- Coordinate plans with emergency management groups, scientists and infrastructure providers.
- Anticipate increased maintenance and review stocks of essential items, especially air filters.
- Anticipate high labor requirements during and after an ashfall. Note also that ashfalls may disrupt road access and/or fuel supplies for generators, so plans should address these issues.
- Install hoods over exposed air intakes to reduce ash ingress.
- Seal or cover sensitive equipment such as external fuel values and switches.
- If acquiring new generators or HVAC systems, consider systems with high spec and/or multistage filtration (e.g. coarse building intake filter and high-specification unit filter). These will provide greater protection but will need to be replaced more often during an ashfall due to clogging.

HOW TO RESPOND

- Initiate priority schedule for inspection, cleaning and preventive maintenance.
- Ensure staff have adequate personal protective equipment (long-sleeved clothing, heavy footwear, fitted goggles and a properly-fitted P2, N95 or FFP2 dust mask). Masks should be changed when clogged.
- If industry-certified masks are not available, other masks may provide partial protection. For more information: www.ivhhn.org/index.php/ash-protection
- Regularly check and service air and fuel intakes and filters. Air filters will likely need replacing at least hourly in high airborne ash concentrations.
- Add temporary filtration and/or hoods to external air intakes if necessary. Monitor and replace filters as needed.
- Beware that wet ash may be electrically conductive.

Cleaning Guidance:

- Remove air filters before cleaning. Vacuum or gently (using no more than 30 psi pressure) blow away excess ash from air intakes, then wipe down with a cloth.
- Avoid cleaning with water as this may increase clogging of radiator fins.
- Isolate and ground energized equipment before cleaning. Wet ash may be conductive which may increase the risk of short-circuiting. Avoid cleaning electrical equipment with water.
- Maintain a clean site, especially in front of air intakes, to minimize remobilization of ash. In dry weather, dampening surroundings may help minimize remobilization.
- Store collected ash in bags and/or cover ash stockpiles to prevent recontamination of the site.

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