VOLCANIC ASH IS: HARD, HIGHLY ABRASIVE, MILDLY CORROSIVE & CONDUCTIVE WHEN WET.

VOLCANIC ASHFALL

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

Ash Impacts on Generators and HVAC Systems

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

- 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 such as 60 PPI foam, 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 overheating and increased frequency of shutdowns.
- Overall impacts depend both on the concentration of airborne ash and the duration of high concentrations. Grainsize is also important. Finer grainsizes tend to stay suspended and remobilise more readily. For generators, fine-grained ash is less likely to be removed by pre-filters over external air intakes, and may be ingested into engine filters.
- Long-duration or repeated ashfalls, or wind remobilisation 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 systems with low fan speeds block more readily.
- Horizontal air intakes and condensers, or systems with a hood, ingest substantially less ash than vertical systems.
- 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.

See companion posters on "Advice for Power Transmission and Distribution System Operators" and "Advice for Power Plant Operators" for additional information on effects of ash on power supply systems.

Adaptations to protect generator equipment in Bariloche, Argentina, from repeated airborne ash exposure following 2011 eruption of Cordón Caulle volcano, Chile. Top: sealed fuel valve. Bottom: hood to protect air intake. Photos: Tom Wilson.

Recommended Actions

WHERE TO FIND WARNING INFORMATION

See www.geonet.org.nz for ashfall forecasts in the event of a volcanic eruption.

HOW TO PREPARE

At-risk facilities should develop operational plans for managing ashfall events. The plan should have procedures for the following incorporating up-to-date ashfall forecast information from GeoNet into operational decisions.

- Anticipate increased maintenance schedule and review stocks of essential items, especially air filters.
- Anticipate high labour requirements during an ashfall crisis. Note also that ashfalls may cause disruptions to road access and/or fuel supplies for gensets, so plans should address these issues.
- Install hoods over 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 filtration. These will provide greater protection but will need to be replaced more often

HOW TO RESPOND

- **Initiate priority schedule for inspection, cleaning and preventative maintenance.**
- **Ensure that staff have adequate personal protective equipment (long-sleeved clothing, heavy footwear, fitted goggles and a properly-fitted P2 or N95 dust mask).**
- **Regularly check and service air and fuel intakes and filters. Air filters may need to be replaced as often as every 30 minutes in heavy ashfalls.**
- **Add temporary filtration to external air intakes if necessary. Monitor and replace as needed.**

Cleaning guidance

- **Vacuum or gently (using no more than 30 psi pressure) blow away excess ash from air intakes, then wipe down with a cloth. Remove air filters before cleaning.**
- **Avoid cleaning with water as this may increase clogging of radiator fins. Also wet ash may be conductive thus may increase risk of short-circuiting. Isolate and earth energised equipment as appropriate.**
- **Advise staff not to clean electrical equipment, to limit the use of water in clean-up and to be careful when cleaning near electrical equipment.**
- **Maintain a clean site, especially in front of air intakes, to minimise remobilisation of ash. In dry weather, dampening surroundings may help minimise remobilisation.**
- **Store collected ash in bags, or cover ash stockpiles, to prevent recontamination of the site.**

See companion poster on "Advice for Urban Clean-Up Operations".

FURTHER RESOURCES:

http://www.geonet.org.nz (volcano monitoring information)

http://volcanoes.usgs.gov/volcanic_ash (volcanic ash impacts and mitigation encyclopedia)

http://www.ivhhn.org (information on volcanic health hazards)

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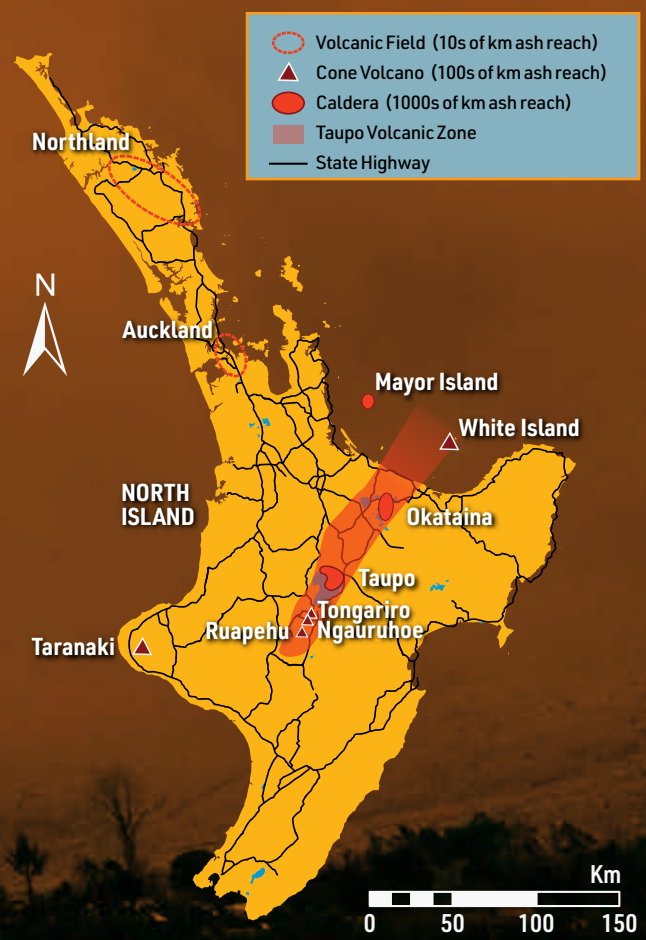
Low to Moderate Airborne Ash

Rotorua CBD at 11:30 am on 17 June 1996, following an eruption of Ruapehu volcano earlier that morning. A layer of ash is visible on vehicles. Visibility is approximately 1 km (compared to clear air visibility of 70 km). Airborne ash concentrations were not measured but were likely in the range 0.1–0.5 mg/m^3 as PM_{10}. In these conditions, high spec filters may need replacing every few hours to days, and low spec filters every few days to weeks. Photo: Rotorua District Council

High to Very High Airborne Ash

Visibility of 30–50 metres in the town of Jacobacci, Argentina, following wind remobilisation of fine ashfall from the 4 June 2011 eruption of Cordón Caulle volcano, Chile. Airborne ash was measured in the range 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: Municipality of Jacobacci.



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