

**Volcanic ash is:**



<2mm (0.1 in) diameter, hard, abrasive and corrosive, and conductive if wet

# VOLCANIC ASHFALL

## ADVICE FOR: WASTEWATER COLLECTION AND TREATMENT MANAGERS

### IMPACTS ON WASTEWATER COLLECTION & TREATMENT SYSTEMS

Volcanic ash can cause serious damage to wastewater collection and treatment systems.

- Urban areas with combined wastewater and stormwater sewers are particularly vulnerable.
- Ash can enter sewer networks via inflow and infiltration (e.g. through illegal connections, cross-connections, gully-traps, manhole covers, cracks in sewer pipework).

SYSTEM COMPONENT	IMPACTS OF VOLCANIC ASHFALL
WASTEWATER NETWORK	<ul style="list-style-type: none"> <li>• Ash may enter wastewater networks if there are combined sewers, or through inflow and infiltration.</li> <li>• Once in wastewater networks, ash may form unpumpable masses which may cause wastewater overflows.</li> <li>• Ash-laden wastewater will cause accelerated damage to pump impellers (pitting and thinning of metal).</li> </ul>
PRE-TREATMENT	<ul style="list-style-type: none"> <li>• Mechanically-cleaned screens are highly vulnerable to damage as ash can abrade moving parts and block screens which may lead to motor and gearbox damage.</li> <li>• Fine screens are more vulnerable than coarse screens.</li> <li>• Ash may damage comminutors.</li> </ul>
PRIMARY TREATMENT	<ul style="list-style-type: none"> <li>• Ash may damage grit classifiers.</li> <li>• Ash will increase the volume of sludge for disposal, and will increase the inorganic content of sludge.</li> </ul>
SECONDARY TREATMENT	<ul style="list-style-type: none"> <li>• Ash can enter open-air biological reactor tanks both through airfall and via influent.</li> <li>• The main impact is likely to be reduced capacity (due to ash accumulation on tank floors) rather than interference with bacterial processes. pH control may help prevent 'toxic shock' to bacterial populations.</li> <li>• Ash may damage biofilms in trickling filters</li> </ul>
TERTIARY TREATMENT	<ul style="list-style-type: none"> <li>• Any residual very fine ash may increase suspended solid load of effluent, which may interfere with disinfection.</li> </ul>
SLUDGE TREATMENT	<ul style="list-style-type: none"> <li>• Expect an increased volume of sludge with an increased inorganic content.</li> </ul>
GENERAL IMPLANTS	<ul style="list-style-type: none"> <li>• Airborne ash may clog aeration pump filters, requiring them to be changed more frequently.</li> <li>• Ashfalls may affect road networks, which may affect staff access and deliveries of supplies.</li> <li>• Ashfalls can cause electrical power outages.</li> <li>• Expect increased maintenance.</li> </ul>

### CASE STUDY

#### City of Yakima, Washington State, USA

#### Volcanic Ash Can Cause Serious Damage to Wastewater Treatment Plants:

The City of Yakima, Washington State, USA, sustained US \$12.5 million (current value) damage to its plant following the 1980 eruption of Mt. St Helens which deposited approximately 10 mm (0.4 in) of sand-sized ash on the city. Damage was primarily due to the mechanically-cleaned bar screen and grit classifier.



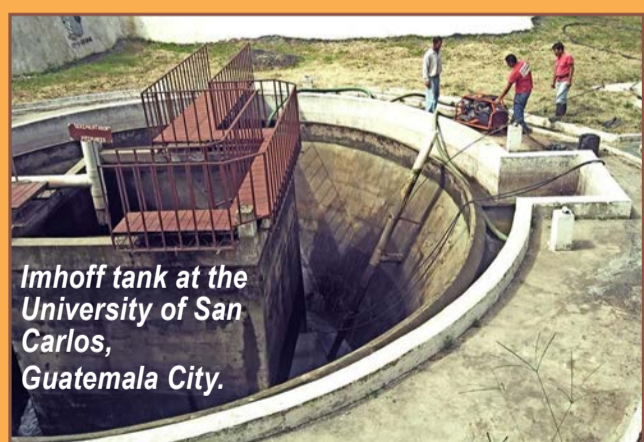
Wastewater treatment plant, Argentina.

The biological reactors (pictured) continued to function without problems despite receiving 7–12 mm (0.3–0.5 in) of ashfall from the 2015 eruption of Calbuco volcano, 165 km (103 miles) away in Chile. This was partly because the town's storm drains and sewers are well separated, so very little ash entered the plant in raw wastewater. Photo by Daniel Blake.



Damage to pump impellers.

Ash-laden wastewater will cause accelerated damage to pump impellers including metal pitting and thinning. Photo by Carol Stewart.



Imhoff tank at the University of San Carlos, Guatemala City.

Following the Pacaya eruption in 2010, which deposited 20–30 mm (0.8–1.2 in) of ash across the city, ash accumulated to a depth of 5 meters (16 ft 5 in) in this tank and had to be removed using sludge pumps. The normal two year replacement timeframe for the pump impellers was reduced to 15 days. Photo by Alvaro Zepeda, MAPRECO, Guatemala City.

### 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.

- Coordinate plans with emergency management groups, scientists, and infrastructure providers, and incorporate up-to-date information from the local ashfall warning agency into operational decisions.
- Arrange equipment and labor requirements for increased maintenance and site cleanup.
- Ensure that staff working outdoors are supplied with adequate personal protective equipment (long-sleeved clothing, heavy footwear, fitted goggles and properly-fitted P2, N95 or FFP2 dust masks). Masks should be changed when clogged.
- If industry-certified masks are not available, other masks may provide partial protection. For more information: <https://www.ivhnn.org/index.php/ash-protection>
- Review stocks of essential items as an ashfall may affect road and air transport.
- Ensure access to back-up power generation, particularly for pumping stations.

#### HOW TO RESPOND

- Shut down non-essential equipment before ashfall arrives.
- Step up preventative maintenance such as checking the performance of pump station equipment.
- Consider bypassing raw-water from pumping stations and treatment plants (especially those with mechanical screening equipment) as a protective measure to avoid severe and costly damage.
- Cover exposed equipment such as air-conditioning and heat pump units, switchboards, and electric motors to protect them from airborne ash.
- Monitor the presence of ash in raw wastewater.
- Monitor torque on motor-driven equipment.
- Limit the ingress of ash into buildings: **See companion Buildings poster.**
- Work with local authorities to limit ingress of ash into waterways and sewer lines.

### • FURTHER RESOURCES •

[https://volcanoes.usgs.gov/volcanic\\_ash/waste\\_water.html](https://volcanoes.usgs.gov/volcanic_ash/waste_water.html)  
[www.ivhnn.org](http://www.ivhnn.org) (volcanic health hazards information)

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