

NATIONAL SLAG ASSOCIATION



LEACHATE FROM BLAST FURNACE SLAG - What it is and How to treat it

The following is a brief description of Blast Furnace Slag chemistry and the phenomenon of leaching as it relates to this material.

BLAST FURNACE SLAG - Defined

Blast Furnace Slag is defined as the non-metallic product consisting essentially of silicates and alumino-silicates of calcium and other bases that is developed in the molten condition simultaneously with iron in a blast furnace. The blast furnace is the primary means for reducing iron oxides to molten, metallic iron. Molten iron collects at the bottom of the blast furnace and the liquid slag floats on it. Periodically both are tapped from the furnace, with the slag being solidified and recycled for use in a variety of markets; including construction aggregates, GGBS cement, glass, and as a substitute for natural materials.

Typical Air-Cooled Blast Furnace slag chemistry is as follows:

<u>CONSTITUENT</u>	<u>PERCENT by WEIGHT</u>
Calcium Oxide (CaO)	32 to 45
Magnesia (MgO)	5 to 15
Silica (SiO ₂)	32 to 42
Alumina (Al ₂ O ₃)	7 to 16
Sulfur (S)	1 to 2
Iron Oxide (Fe ₂ O ₃)	0.1 to 1.5
Manganese Oxide (MnO)	0.2 to 1.0

These constituents usually exist as an isomorphous mixture with the following general formula:



This formula represents the Melilite mineral series.

LEACHATE – What it is, How to treat it

Leachate can be described as a solution or product that is obtained when a solid material has been extracted or dissolved by the action of a percolating liquid (water). Whenever water comes in direct contact with a solid material, the potential for leachate to form exists.

Typically leaching is an aesthetic issue and not harmful to the environment.

The potential for leaching is source specific. Several methods have been developed to limit the potential for leaching. These include treating slag with: hydrogen peroxide, permanganate (potassium or sodium), hypochlorite or aging. If leaching does occur, remediation can be accomplished by dilution, containment of the leachate and removal by vacuuming, or natural oxidation, all of which can be effective.

TYPICAL CHEMICAL PROGRESSION



The rate of leaching diminishes rapidly with time and as the chemical nature of the sulfur products change from sulfide to sulfate by aging (oxidation). Although no exact timetable for this process has been established, most leachate events are of short duration and are a one time occurrence. The occurrence of Blast Furnace slag leachate, while uncommon, is irritating to those nearby due to the odor. Fortunately, its long-term impact on the environment appears minimal. An Environmental Impact Study by the Army Corps of Engineers (Bethlehem Steel, Sparrows Point, PA) has stated that little, if any, environmental damage is to be expected to the existing eco-system due to the presence of slag in an aquatic environment. A Risk Assessment Study on iron and steel slag is available from the **National Slag Association**.

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