EPRI

# toxics release inventory

## Chemical Profile

*Environment*
*Science & Technology Development*

# Cobalt

### What is cobalt?

Cobalt (Co) is a shiny gray metal that is hard and magnetic. In nature, it usually combines with other elements to form cobalt compounds. Small amounts of these compounds are naturally present in soils, rocks, and water.

Cobalt combines with other metals to form mixtures called alloys. Some of these are "superalloys" that maintain their strength at very high temperatures. For example, a superalloy of cobalt and steel is used in manufacturing jet engines. Cobalt is also used in paint and porcelain enamel finishes as a drying agent, in wear-resistant cutting and grinding tools, in electronic components that rely on its magnetic properties, and in formulating vitamin $B_{12}$. Physicians implant artificial hip and knee joints made of cobalt alloys and use man-made isotopes of cobalt for radiation therapy.

### How is cobalt released by electric utilities?

Trace amounts of cobalt are present in coal and oil. When electric utilities burn these fuels at their power plants, cobalt is released. Most of this cobalt is carried by particles of ash.

Coal-burning power plants are equipped with devices to capture ash particles before they reach the air. Particle control devices typically capture more than 99% of the ash, so very little ash enters the air. Cobalt-carrying ash captured by these devices is usually sent to ash ponds or land disposal sites.

The U.S. Environmental Protection Agency (EPA) estimates that U.S. power plants released about 40 tons of cobalt into the air in 1994.

### Is cobalt also released by other sources?

Cobalt is released into the air by soils as they erode in wind and rain, by volcanoes when they erupt, and by forest fires and seawater evaporation.

Cobalt released by human activities comes mainly from nickel, copper, silver, lead, and iron mines and refineries; metal production facilities; industrial boilers that burn coal and oil; vehicles that burn gasoline; and incinerators that burn refuse and sewage sludge. Industries reporting to EPA released 52 tons of cobalt into the environment in 1996. About 64% was released to the soil.

### What happens to cobalt after it is released by electric utilities?

Ash particles carrying cobalt settle to the ground after they are released into the air from power plants. Cobalt compounds that dissolve in water are carried to the ground by rain and snow. Other cobalt compounds that don't dissolve reach the ground through gravity and air turbulence. Cobalt may stay in water and soil for years.

Ash pond wastewater discharged into public waterways may contain small amounts of cobalt, but these amounts are regulated by local permits.

### How might people be exposed to cobalt?

People are commonly exposed to small amounts of cobalt naturally present in the air they breathe, the water they drink, and the foods they eat. For example, leafy green vegetables are a natural source of cobalt in people's diets. Industrial workers may breathe cobalt dust or fumes, or touch substances that contain cobalt.

### What are the potential effects of cobalt on human health?

Very small amounts of cobalt in people's diets are necessary for good health. These amounts can be supplied by vitamin $B_{12}$, a compound that contains cobalt. Cobalt also benefits health when it is used to stimulate red blood cell production in the treatment of anemia.

However, some people exposed to small amounts of cobalt for a long time develop an allergic reaction to it. The most common reaction is itching when cobalt contacts their skin. In less common, severe cases, people experience vomiting when they swallow cobalt or asthma attacks when they breathe it.

People who are not allergic have health problems only when they are exposed to very large amounts of cobalt not normally found in the environment. For example, some breweries used to add cobalt to beer to stabilize the foam. Drinking large quantities of this beer caused serious heart problems, and the practice of adding cobalt has been discontinued. Breathing large amounts of cobalt for a long time may cause asthma, pneumonia, liver and kidney damage, and thyroid problems. Although research is ongoing, cobalt has not been found to cause cancer in people.

**How likely is it that utility releases pose a risk to human health?**

It is unlikely that cobalt from power plants poses a significant risk to human health. EPA has evaluated the potential health risks of breathing cobalt for people who live near power plants that burn coal or oil. In EPA's initial screening assessment, these risks were so low that the Agency eliminated utility cobalt from further analysis as an inhalation health hazard.

Since airborne ash particles carrying cobalt are widely scattered before they settle to the ground, it is unlikely that ash from power plants significantly increases the amount of cobalt in soil, water, or food.

**How is cobalt regulated?**

EPA requires that 1000 pounds or more of cobalt be reported if it is spilled or released without a permit. Under the National Pollutant Discharge Elimination System, federal and state regulators determine how much cobalt each power plant may release in wastewater discharges. The Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health have set limits on the amount of cobalt in workplace air. The Nuclear Regulatory Commission regulates radioactive isotopes of cobalt.

**Where can I get more information about cobalt?**

The Agency for Toxic Substances and Disease Registry (ATSDR) has a fact sheet with answers to frequently asked health questions about cobalt. It is available through the ATSDR Information Center at 1-800-447-1544, or on the Internet at http://www.atsdr.cdc.gov/tfacts33.html

EPA also has a fact sheet that is available on the Internet at http://www.epa.gov/ttnuatw1/hlthef/cobalt.html

This Toxics Release Inventory Chemical Profile is available by email at tricoord@epri.com. Funders of Environment may download it from the Internet at http://www.epriweb.com/eg/funders/tri/index.html



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