



Cobalt – Guidance for Local Authorities

Description and Background

Cobalt is a hard grey metal with magnetic properties. Cobalt is ubiquitous at low quantities in the environment although concentrations vary. Almost never occurring in native form, cobalt is usually combined with elements such as arsenic and sulphur.¹ The main locations where cobalt is mined are Zambia, Congo, Canada, Russia and Australia.

Cobalt is primarily used for its magnetic properties, to make alloys with other metals and for jet engine and cutting tool production. It is also used as a pigment in glass, ceramics and paints as paint dryer, and as a catalyst for the petroleum industry and in batteries. Radioactive isotopes of cobalt, which do not occur naturally, are used in medicine.

Affected Areas

Naturally occurring

In the UK, BGS and SEPA have undertaken stream sediment studies² to determine the extent of trace contaminants. The highest concentrations of cobalt are often found in waters containing high iron or manganese however the concentration of total cobalt in freshwaters is generally low.

Contamination sources

Higher concentrations are generally associated with industrialised or mining areas. The production of alloys and chemical compounds containing cobalt, sewage effluents, urban run-off and agricultural run-off are major sources of cobalt contamination¹.

Health Significance

Cobalt is an essential element for human health, being a constituent of vitamin B12. Severe health effects from exposure to naturally occurring cobalt are rare, with most effects reported due to inhalation. Ingestion of large quantities of cobalt may cause effects on the blood and liver as well as dermatitis³.

There is no WHO Guideline Value for cobalt and the EU Drinking Water Directive does not set a standard for cobalt.

Risk Assessment and Monitoring

The Private Water Supply Regulations do not require routine monitoring for cobalt. However the Regulations require that the water does not contain any substance at a concentration or value which would constitute a potential danger to public health. If the monitoring local authority considers that cobalt may be present it would be prudent to include it when sampling.

Options for resolving at source

Cobalt is unlikely to be an issue for drinking water, and where it is detected is likely to be associated with industrial pollution and other contaminants of far greater significance. The location of an alternative source is likely to be the most effective option.

Treatment

Cobalt should be readily removed by most conventional water treatment processes, especially those involving sedimentation or adsorption. Some pre-oxidation to Cobalt's +3 oxidation state may be necessary should be readily achieved.

In the unlikely event that point of use treatment for cobalt is required, an absorptive process is likely to be the most cost effective option. Successful removal of cobalt using bentonite and diatomaceous earth sorbants has been reported. Ion exchange is also likely to be successful, and some selective resins are available for industrial water treatment⁴.

References / Further reading

¹Nagpal, N.K. 2004. *Ambient water quality guidelines for cobalt*
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²Shand, P, Edmunds, W M, Lawrence, A R, Smedley, P L, and Burke, S. 2007.
The natural (baseline) quality of groundwater in England and Wales.
British Geological Survey & Environment Agency, RR/07/06 & NC/99/74/24

³Cobalt Compounds Hazard Summary. Revised 2000.
US EPA website

⁴ Al-Shahrani S.S. 2014. *Treatment of wastewater contaminated with cobalt using Saudi activated bentonite.*
Alexandria Engineering Journal 53 (1) 201-211.

FAQ Fact Sheet for Owners and Users

To be developed if necessary