

MINERAL PROCESSING UNDER THE EPA SPOTLIGHT

The USA's Environmental Protection Agency is focusing its attention on mineral processing activities. **Dean Miller** and **John Jacus** explain why operators should review their materials handling and disposal.

ON 10 DECEMBER 2003, the United States Environmental Protection Agency (EPA) announced that among its priorities for the next three years would be increased enforcement against mineral processing facilities.¹ The question naturally arises whether this initiative will subject the industrial minerals sector to increased environmental scrutiny.

While mineral processing most commonly applies to post-beneficiation activities in the metals mining sector, operators in the industrial minerals sector also should be aware of the provisions of the Resource Conservation and Recovery Act (RCRA),² which generally excludes mineral beneficiation wastes from hazardous waste regulation. However, it does not exempt most mineral processing wastes.

Industrial mineral operators need to review their materials handling and disposal practices, which may impact their ability to manage waste streams as "solid waste" instead of "hazardous waste" by asserting and maintaining the Bevill exemption under the RCRA.

RCRA regulatory framework

RCRA Subtitle C is the 'cradle-to-grave' programme for regulating hazardous waste in the USA. Hazardous waste is a sub-category of solid waste. A solid waste is any discarded material, which includes solids, liquids and gases. Requirements for managing hazardous wastes are much more stringent than those for solid wastes, including strict requirements for identification, accumulation and storage, transportation, and record keeping.

Hazardous wastes fall into two primary categories; listed wastes and characteristic wastes. Listed wastes are specific industrial waste streams that have been identified as harmful to human health or the environment. Characteristic wastes are those that are ignitable, corrosive, reactive or toxic, which are specifically defined characteristics.

Exemptions from solid waste regulation include exemptions for point-source discharges regulated under the Clean Water Act and materials subject to *in situ* mining. Exemptions from hazardous waste regulation include exemptions for mining overburden returned to the mine site and the "Bevill" exemption for wastes derived from mineral beneficiation and certain mineral processing operations.

The Bevill exemption

The most important exemption for the mining industry is the "Bevill" exemption,³ which provides that "mining and mineral processing wastes generated by extraction, beneficiation, and processing activities" are exempt from regulation as hazardous wastes; they are merely managed as solid wastes.

EPA interprets this exemption to cover extraction and beneficiation wastes and 20 specifically identified mineral processing wastes that are not generated by the industrial

minerals sector. All other mineral processing wastes that exhibit a hazardous characteristic must be managed as hazardous wastes.

The Bevill exemption is intended to exempt high volume, low toxicity wastes from hazardous waste regulation. It applies only to operations in which the primary feedstock comprises less than 50% secondary or recycled materials.

Only wastes uniquely associated with extraction and beneficiation operations are covered by the exemption. Therefore, wastes from ancillary operations such as motor pool and laboratory operations are not exempt. Ancillary wastes include: used oil, discarded commercial chemicals, cleaning solvents, filters, empty drums, wastes and general refuse. Also, residues and by-products that are not disposed or speculatively accumulated are generally not considered wastes.

There are two primary ways to lose the Bevill exemption. The first is to engage in mineral processing operations which produce wastes that are not one of the 20 specifically exempted waste streams. The other is to mix non-exempt waste with Bevill exempt waste.

Mineral processing vs. beneficiation

Distinguishing between mineral processing and beneficiation can be a difficult task but there are some basic principles to consider. Mineral processing operations generally follow beneficiation and change the concentrated mineral value into a more useful chemical form. During mineral processing, the physical and chemical structure of the incoming ore or mineral feedstock is destroyed. These operations commonly involve heat (eg. smelting) or chemical reactions (eg. acid digestion) which result in the destruction of the physical structure of the ore.

In contrast, mineral beneficiation operations generally separate the mineral values from the waste material thereby concentrating them, and remove impurities or prepare the feedstock for further processing. Beneficiation operations also commonly result in a change in the particle size of the feedstock.

EPA has identified several specific activities as beneficiation operations including: crushing, grinding, washing, dissolution, crystallisation, filtration, sorting, sizing, drying, calcining to remove water and/or carbon dioxide, leaching, gravity concentration, magnetic separation, electrostatic separation, and flotation.

EPA uses several criteria to distinguish mineral beneficiation from processing including whether the resulting waste stream resembles the original feedstock, and whether the volume of the waste stream is large relative to the volume of the original feedstock.

Significantly, all wastes generated downstream of the first mineral processing step are considered mineral processing wastes, even if EPA has identified a downstream operation as beneficiation. For example, flotation or grinding downstream of acid digestion is considered mineral processing.

Industrial mineral operators should be aware that any process using strong acid, such as acid washing of high purity silica sand, may draw scrutiny from EPA even if the process does not technically constitute "digestion," and may ultimately be determined to be a beneficiation process. Therefore, understanding whether an operation constitutes mineral beneficiation or processing is a critical step in evaluating its RCRA compliance obligations.

The Bevill mixture rule

EPA has devised a mixture rule for hazardous wastes that can have a dramatic impact on any mining operation. As noted above, wastes are considered hazardous if they are specifically listed or if they exhibit certain hazardous characteristics. If any amount of a listed waste is mixed with any amount of a non-hazardous (ie. Bevill exempt) waste, all of the resulting mixture is considered a listed hazardous waste. For example, if spent solvents (listed as Fooz wastes) are disposed of in a Bevill exempt impoundment, all of the waste in the impoundment could be considered a listed hazardous waste.

Mixtures involving characteristic wastes are handled a little differently. Any mixture of a characteristic waste and a non-hazardous (eg. Bevill exempt) waste is hazardous only if the mixture exhibits a hazardous characteristic, unless that characteristic is imparted to the mixture by an exempt (Bevill exempt) waste.

However, there is a catch. The mixture still is subject to Land Disposal Restrictions (LDR),⁴ which impose waste-specific treatment standards before a waste can be disposed of on land. As a result, if characteristic waste is disposed of in a Bevill exempt impoundment, even though the waste in the impoundment exhibits no hazardous characteristic other than that of the Bevill exempt waste, the entire impoundment could become subject to the LDR treatment standards.

Avoiding the LDR treatment standards is difficult because wastes that do not meet those standards cannot be disposed of on land unless EPA grants a variance, extension, or exclusion or if the waste is managed under an approved “no migration” petition. In addition to the disposal prohibition, the LDR programme establishes limits and prohibitions regarding the dilution and storage of wastes.

Bevill exempt status

If an operator finds itself in the position of having to defend the Bevill exempt status of its waste — or whether the material in question even constitutes a waste — there are some important strategic issues to consider. For example, it is preferable to resolve the issue on a site-specific factual (as opposed to legal) basis.

Generally, it is simpler to establish that the facility engages in beneficiation rather than processing operations (or that there is no violation of the Bevill mixture rule) than it is to challenge the EPA interpretation of the Bevill exemption. However, the difficulty of this task varies depending on the complexity and nature of the facility’s operations.

If a facility engages in operations that EPA specifically has identified as beneficiation operations, or if there are few ancillary waste streams to evaluate for mixture rule purposes, the analysis can be relatively simple.

However, for large, complex or unique operations the Bevill determination can be challenging. In these situations it is essential to have legal counsel experienced in Bevill issues working closely with in-house technical personnel to carefully analyse each step in the facility’s operation to determine whether the line between mineral beneficiation and processing has been approached. In addition, it is critical to identify each ancillary waste stream that is not “uniquely associated” with extraction and beneficiation operations. Otherwise, at the end of the process, EPA could determine that although the facility does not engage in mineral processing, the primary waste impoundments are either hazardous waste

or subject to the LDR requirements because that impoundment contains ancillary wastes that are hazardous.

It also is important to carefully analyse the impact that any operational changes may have on the Bevill exempt status of a facility's waste. Changes to processes that either cross the line from beneficiation into processing or create wastes that are not "uniquely associated" with extraction and beneficiation operations could result in the loss of Bevill exempt status.

Summing up

Industrial minerals operators can prepare for increased enforcement scrutiny by evaluating the status of their operations as being either mineral beneficiation or mineral processing. In addition, they should evaluate any proposed operational changes to determine the potential impact they would have on the Bevill exempt status of waste streams. They can also evaluate post and future waste management practices in order to avoid a Bevill mixture problem, rendering exempt materials subject to full RCRA regulation.

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¹ 68 Fed. Reg. 68893 (Dec. 10, 2003).

² 42 U.S.C. §§ 6901-6992k (1994).

³ 42 U.S.C. §§ 6921(b)(3)(C), 6982 (p).

⁴ 40 CFR part 268.