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STATE OF ILLINOIS
Pollution Control Board

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PETITION OF HORSEHEAD RESOURCE DEVELOPMENT COMPANY, INC. FOR AN ADJUSTED STANDARD UNDER 35 ILL. ADM. CODE 720.131(c)	))))	**AS 00-2** **(Adjusted Standard – RCRA)**

NOTICE OF FILING

TO: Dorothy M. Gunn, Clerk
Illinois Pollution Control Board
100 West Randolph Street – 11th Floor
Chicago, IL 60601

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Chief Legal Counsel
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524 S. Second Street
Springfield, IL 62701

PLEASE TAKE NOTICE that on Friday, August 6, 1999, we hand delivered to the Clerk of the Pollution Control Board HORSEHEAD RESOURCE DEVELOPMENT COMPANY, INC.'S PETITION FOR AN ADJUSTED STANDARD, a copy of which is attached hereto and served upon you.

Respectfully submitted,

HORSEHEAD RESOURCE DEVELOPMENT COMPANY, INC.

By: ______________________
One of its Attorneys

John N. Moore
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THIS FILING IS SUBMITTED ON RECYCLED PAPER

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Horsehead Resource Development Company, Inc. ("HRD") hereby petitions the Illinois Pollution Control Board ("Board") for an adjusted standard under 35 Ill. Adm Code 720.131(c) for crude zinc oxide ("CZO") produced by HRD at its Chicago facility (hereinafter referred to as the "Facility"). By separate motion filed today, HRD requests that the Board incorporate the entire record from docket AS 00-001 into this proceeding, which includes HRD's Petition for an Adjusted Standard dated July 20, 1999. (The Board dismissed AS 00-001 on August 5, 1999.) Therefore, for the reasons stated in HRD's Petition for an Adjusted Standard (AS 00-001), HRD respectfully requests the granting of this Petition for an Adjusted Standard for CZO produced from the recycling of EAF dust, as well as smaller quantities of zinc-bearing hazardous and non-hazardous waste feedstocks, at HRD's HTMR Facility.

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One of its Attorneys

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Respectfully submitted,

HORSEHEAD RESOURCE DEVELOPMENT COMPANY, INC.

By: ______________________
One of its Attorneys

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Date: August 6, 1999

CERTIFICATE OF SERVICE

I, the undersigned, on oath state that I have served the foregoing PETITION FOR AN ADJUSTED STANDARD upon the following in the manner indicated below, this 6th day of August, 1999:

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board
100 West Randolph Street – 11th Floor
Chicago, IL 60601
(HAND DELIVERY)

Peter Orlinsky
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Transaction Date 8/6/99

INVOICE
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PURCHASER/FILER:

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Address 7231 N. Claremont Ave.
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	✓		#1109	

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AS 00-2			75.00
TOTAL			75.00

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70-2553/719
1046954

1109

DATE 8-5-99

Illinois Pollution Control Board $ 75.—

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OF EVANSTON
820 Church Street • Evanston, IL 60201

Forsched Resource Dev. Co.

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NOTE: THIS IS A PUBLIC COPY -- CONFIDENTIAL DATA IS REDACTED ON PAGES 21 AND 23, AND EXHIBITS 8 AND 9.

PETITION FOR AN ADJUSTED STANDARD

Submitted to the

ILLINOIS POLLUTION CONTROL BOARD

By

HORSEHEAD RESOURCE DEVELOPMENT COMPANY, INC.

Adjusted Standard No. 99-_______
(RCRA)

Date: July 20, 1999

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13. Excerpts from "A Pocket Guide to Zinc" and related information provided by the International Zinc Association.

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PETITION FOR AN ADJUSTED STANDARD

INTRODUCTION

Horsehead Resource Development Company, Inc. ("HRD") hereby petitions the Illinois Pollution Control Board ("Board") for an adjusted standard under 35 Ill. Adm. Code 720.131(c) for crude zinc oxide ("CZO") produced by HRD at its Chicago facility (hereinafter referred to as the "Facility"). Section 720.131(c) authorizes parties to petition for a determination that "[m]aterials that have been reclaimed but must be reclaimed further before recovery is completed are not solid wastes if, after initial reclamation, the resulting material is commodity-like." HRD's CZO, like CZO produced elsewhere in the United States and in other countries, has substantial economic value and is sold for valuable consideration in markets worldwide. It is used to produce zinc and other metal products, often as a direct process substitute for zinc concentrates produced from mined ore. HRD produces CZO from the recycling of electric arc furnace ("EAF") dust, a hazardous waste, along with significantly smaller quantities of other metal bearing feedstocks, in HRD's high temperature metal recovery ("HTMR") process. Recycling EAF dust results in multiple environmental benefits, including a reduction in the volume of EAF dust that otherwise would be wastefully disposed of in landfills, conservation of non-renewable natural resources (e.g., zinc ore), and saving energy by reducing the need for mining and smelting of zinc ores. CZO therefore is preferable to many other primary and secondary zinc feedstocks, including virgin zinc ores, and its use promotes sustainable development.

The Board's recently granted adjusted standard for EAF dust zinc oxide processed by Big River Zinc Corporation ("BRZ") is squarely on point with and strongly supports this Petition. See In re Petition of Big River Zinc Corporation for an Adjusted Standard Under 35 Ill. Adm. Code 720.131(c) (April 15, 1999, amended May 6, 1999), AS 99-3. The BRZ adjusted standard demonstrates the existence of an active market for CZO and confirms the commodity-like nature of the material. CZO produced by HRD is virtually identical in source, composition, and function to the EAF dust zinc oxide processed by BRZ. Both materials are produced by HTMR facilities, contain similar concentrations of zinc and other constituents, and are used to produce zinc and other products. Moreover, CZO meets the Section 720.131(c) adjusted standard criteria for similar reasons as the EAF zinc oxide. Therefore, the BRZ adjusted standard provides a compelling precedential basis for the Board to grant this Petition. See Part II.F.1. of this Petition. As explained in detail in this Petition, CZO, like the EAF dust zinc oxide processed by BRZ, unquestionably meets the criteria in Section 720.131(c) for an adjusted standard for a commodity-like material for the following reasons:

1. CZO is substantially reclaimed from hazardous waste, and only minimal additional processing is necessary to produce finished zinc products.

2. CZO has a documented history of substantial economic value. It has an average market value of approximately $200 per ton, and it is sold in both domestic and international markets.

3. CZO is similar in composition and equivalent in process suitability to zinc concentrates produced from mined ore.

4. CZO has guaranteed end markets, and all CZO produced by HRD is sold and shipped off-site, into the stream of commerce, immediately after production

5. CZO is managed in an environmentally protective manner.

6. An adjusted standard for CZO is consistent with variances for commodity-like materials issued by the Board and other regulatory agencies, and supports the mandates of Illinois and federal law prioritizing recycling over disposal.

Part I of this Petition, which sets forth the legal basis for this Petition for an adjusted standard, describes the regulation of general applicability, states the reasons and basis for the adjusted standard, and summarizes HRD's operations and control equipment. Part II of the Petition demonstrates that HRD's CZO meets all of the criteria in Section 720.131(c) for determining when a material is "commodity-like" and not a solid waste. Based on the information contained in this Petition, HRD respectfully requests that the Board grant HRD an adjusted standard from the definition of solid waste for CZO produced by HRD at the Facility.

I. LEGAL BASIS FOR THIS PETITION.

Section 28.1 of the Illinois Environmental Protection Act ("Act") authorizes the Board to grant an adjusted standard from a regulation of general applicability upon request of persons who can justify the adjusted standard. 415 ILCS 5/28.1(a). The regulation of general applicability from which HRD seeks an adjusted standard is 35 Ill. Adm. Code 721.102 (definition of solid waste). As explained in Part II of this Petition, the criteria to be used in justifying the adjusted standard are established by Board regulation.

Section 28.1(d) of the Act sets forth the basic procedural requirements for an adjusted standard, and the Board's implementing regulations include more specific requirements applicable to RCRA adjusted standards in particular. See 35 Ill. Adm. Code 106.410 et seq. Those regulations require the following information to be provided:

(a) Identification of the regulation of general applicability for which HRD seeks an adjusted standard;

(b) A written statement outlining the scope of the "evaluation," the nature of, the reasons for and the basis of the adjusted standard, consistent with the level of justification contained in the regulation of general applicability;

(c) The nature of HRD's operations and control equipment; and

(d) Any additional information which may be required in the regulation of general applicability.

See 35 Ill. Adm. Code 106.413. HRD addresses the first three factors below. The fourth factor is not applicable here, since the "regulation of general applicability" (35 Ill. Adm. Code 721.102) does not require any such additional information.

A. The Regulation of General Applicability.

Illinois law, like federal law, classifies non-product materials derived from the reclamation or other treatment of "listed" hazardous wastes as solid and hazardous wastes.[1] Neither Illinois law nor federal law, however, regulates as solid or hazardous waste all material produced from the reclamation of hazardous waste. Products, refined materials, and other non-wastes produced from the reclamation of listed hazardous waste and that are used beneficially are not solid or hazardous wastes: "Materials that are reclaimed from solid wastes and that are used beneficially are not solid wastes and hence are not hazardous wastes under this provision unless the reclaimed material is burned for energy recovery or used in a manner constituting disposal." 35 Ill. Adm. Code § 721.103(e)(1) (emphasis added). When the United States Environmental Protection Agency ("U.S. EPA") promulgated the identical federal equivalent of this rule in 1985, U.S. EPA explained that its purpose was to make clear that fully reclaimed

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[1] See 35 Ill. Adm. Code 721.102(c)(3) (cross-referencing column 3 of the table in Appendix Z) and 721.103(e)(1) (Illinois law); see also 40 C.F.R. § 261.2(c)(3) and § 261.3(c)(2)(i) (federal law).

products are not wastes, even if the products subsequently are refined to increase their commercial value:

> [C]ommercial products reclaimed from hazardous wastes are products, not wastes, and so are not subject to RCRA Subtitle C regulations. Thus, regenerated solvents are not wastes. Similarly, reclaimed metals that are suitable for direct use, or that only have to be refined to be useable, are not wastes.

50 Fed. Reg. 614, 634 (Jan. 4, 1985) (emphasis added).

B. Reasons and Basis for the Adjusted Standard.

As explained in detail later in this Petition, HRD fundamentally transforms a low-zinc, high-iron hazardous waste feedstock into a high-zinc, low-iron CZO product. CZO and other crude zinc oxides are commodities that are used and sold throughout the world. As a result, HRD has always understood that its CZO is a fully reclaimed product and is not a minimally processed or partially reclaimed material. The Illinois Environmental Protection Agency ("Illinois EPA") has taken the position that CZO may not be a fully reclaimed product and, therefore, would be subject to regulation as a solid and hazardous waste. Illinois law provides, however, that even a partially reclaimed material can be excluded from regulation as a solid waste if it is "commodity-like." 35 Ill. Adm. Code 720.131(c). Therefore, to resolve any question that may exist regarding CZO's regulatory status, HRD is filing this Petition for an adjusted standard.[2] An adjusted standard for CZO will resolve any potential regulatory issue that may exist, and it will further encourage recycling of EAF dust and reduce depletion of non-renewable natural resources.

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[2] The filing of this Petition should not be construed as an admission of law or fact that CZO is, or at any time has been, a solid waste.

C. **HRD's Operations and Control Equipment.**

HRD is the largest operator of HTMR facilities in the United States, and is the largest recycler of inorganic hazardous wastes. Historically, for almost sixty years, the prior owners of HRD's "Waelz" rotary kilns in Palmerton, Pennsylvania, operated the kilns to produce zinc-based products from oxidized zinc ores and similar zinc-bearing secondary materials.[3] In the mid-1970s, as mine reserves were being depleted, the operators of the Waelz kilns explored other raw material sources of zinc for the Waelz kilns, and found that steelmaking dusts, including EAF dust, could serve as an effective alternative to the oxidized zinc ores. Zinc is an abundant constituent in EAF dust; its concentration ranges from five to forty-two percent, or up to eight times more zinc than in raw ore. Lead and cadmium also are present in recoverable quantities in EAF dust.

EAF dust was processed for metal recovery in Palmerton before U.S. EPA listed the material as K061 in 1980, and EAF dust resource recovery efforts accelerated thereafter. The recycling of EAF dust in Waelz kilns has served as a national model of resource recovery and waste minimization. Significantly, U.S. EPA relied on the proven performance of HTMR technologies when it designated HTMR as the Best Demonstrated Available Technology ("BDAT") for K061 under the Resource Conservation and Recovery Act's ("RCRA") land disposal restrictions program. U.S. EPA concluded that the HTMR process conserves natural resources by recycling zinc and other metals recovered from the EAF dust that otherwise would be mined, and recycles the K061 into non-waste products. 53 Fed. Reg. 31138, 31162 (Aug. 18,

---

[3] The Waelzing process derives its name from the German verb "waelzen," which means to trundle or roll, aptly describing the rolling movement of the feed material along the inside slope of the kiln.

1988).[3] EPA also has designated HTMR as the BDAT for other metal-bearing wastes. See 57 Fed. Reg. 37194, 37207 (Aug. 18, 1992) (F006); 63 Fed. Reg. 28556, 28560 (May 26, 1998) (together with stabilization, for non-listed wastes). HRD's Facility is located at 2701 114[th] Street in Chicago, and was first permitted by the Illinois EPA Division of Land to operate a solid waste management facility in 1989. The Facility employs two Waelz kiln HTMR units[5] and accepts for recycling K061 and smaller quantities of other hazardous and non-hazardous zinc-bearing feedstocks. More than ninety percent of the feedstock consists of EAF dust. A process flow diagram of the Facility is included as *Exhibit 1*. Notably, all phases of HRD's feedstock management occur in an enclosed, negative pressure environment, and all material transfer points are equipped with collection equipment and baghouses to prevent material loss and to recycle the collected material.

HRD receives EAF dust and other zinc-bearing feedstocks from off-site by enclosed railcar and truck. Upon arrival at the facility, the feedstocks undergo confirmatory testing and sampling. This sampling and testing consists of visual inspection for nonconforming material, tests for radioactivity and the collection of generator-specific samples for metal content analysis. The feedstocks are then unloaded for direct introduction into the recycling process, without

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[3] U.S. EPA originally designated HTMR as BDAT in the so-called "First Third" rulemaking, in which U.S. EPA also established recycling as the required treatment method for K061. 53 Fed. Reg. 31138, 31163 (Aug. 17, 1988). Although the U. S. Court of Appeals for the D.C. Circuit subsequently vacated and remanded the treatment method determination; API v. U.S. EPA, 906 F.2d 729 (D.C. Cir. 1990), the BDAT designation was not challenged and, therefore, was not an issue in the litigation. Neither the rulemaking following the remand, 56 Fed. Reg. 41164 (Aug. 19, 1991), nor the decision upholding the rule, SMA v. U.S. EPA, 27 F.3d 642 (D.C. Cir. 1994), affected the BDAT designation for K061. Although the U.S. EPA more recently also has designated stabilization as a BDAT (along with HTMR) for metal-bearing wastes in general, the agency's findings regarding HTMR's resource recovery benefits remain true today.

storage, in the Curing and Blending ("C&B") Building. (Illinois EPA approved the design of the C&B Building pursuant to a permit revision dated October 30, 1992.) Immediately upon unloading in the C&B Building, feedstocks are conditioned with water to achieve a moisture content of approximately 10 percent, cured, and blended before transfer to a feed hopper for transport to the HTMR processing area. These preparatory steps achieve a uniform feed composition for processing in the HTMR units to achieve optimal efficiency. The C&B Building is sealed and equipped with collection equipment and a baghouse to prevent material loss and to recycle the collected material. The C&B Building is operated under negative pressure to prevent fugitive emissions.

The blended zinc-bearing feedstock is conveyed by fully enclosed belt conveyors from the C&B Building to feed bins that supply the Waelz kiln HTMR units. From the feed bins, the feedstock is metered in proper proportion with a carbon source, for example, coke (added as a reducing agent) onto a completely enclosed conveyor and transferred to the HTMR unit. In the HTMR recycling process, a complex series of chemical oxidation and reduction reactions concentrate the non-ferrous metals of the feedstocks into CZO. The feedstocks are first heated to a temperature high enough (approximately 1200° C) to chemically reduce nonferrous metals. Then, these constituents are reoxidized in a countercurrent air stream, and the resulting product is cooled and collected as CZO. The HTMR process also produces the Iron-Rich Material ("IRM") product, which is a coarse aggregate. The IRM is sold as an asphalt aggregate, an iron source for cement production, or as an aggregate for construction use. The process produces no wastes and no water discharges.

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[5] HRD employs two types of HTMR units: a) rotary Waelz kilns in Palmerton, Pennsylvania, Chicago, Illinois, and Rockwood, Tennessee, and b) a flame reactor in Beaumont, Texas. See also 40 C.F.R. § 261.3 (identifying types of HTMR units).

CZO produced from the HTMR recycling process is collected continuously in product collectors and rail car loading tanks. The collected CZO is then transferred by enclosed screw conveyor to fully-enclosed pressure differential rail cars for shipment off-site.

II. APPLICATION OF THE ADJUSTED STANDARD CRITERIA DEMONSTRATES THAT CZO IS COMMODITY-LIKE AND NOT A WASTE.

Section 720.131(c) authorizes a determination that a material is not a solid waste if the material, after initial reclamation, is commodity-like. Section 720.131(c) provides in full that:

> "The Board will determine that those materials that have been reclaimed but must be reclaimed further before recovery is completed are not solid wastes if, after initial reclamation, the resulting material is commodity-like (even though it is not yet a commercial product, and has to be reclaimed further). This determination is based on the following criteria:
>
> 1) The degree of processing the material has undergone and the degree of further processing that is required;
>
> 2) The value of the material after it has been reclaimed;
>
> 3) The degree to which the reclaimed material is like an analogous raw material;
>
> 4) The extent to which an end market for the reclaimed material is guaranteed;
>
> 5) The extent to which the reclaimed material is handled to minimize loss; and
>
> 6) Other relevant factors."

35 Ill. Adm. Code 720.131(c); see also id. 720.130, 720.133 (procedures for determinations). (These criteria are identical to the federal criteria for a commodity-like variance. See 40 C.F.R. § 260.31(c)). As discussed in detail below, CZO unquestionably meets the criteria for an adjusted standard for a commodity-like material because CZO: (i) is substantially reclaimed from hazardous waste; (ii) has substantial value; (iii) is a substitute for zinc concentrates produced from mined ore; (iv) has guaranteed end markets; and (v) is handled to eliminate or minimize

product loss. Other relevant factors also support an adjusted standard. One such factor is the Board's recently-promulgated adjusted standard for EAF zinc oxide processed by BRZ. The BRZ adjusted standard is compelling and favorable precedent because it confirms the commodity-like nature of CZO. HRD demonstrates in this Petition that CZO meets the adjusted standard criteria for substantially the same reasons as the EAF zinc oxide in the BRZ adjusted standard. A related factor is consistency with variances from the definition of solid waste promulgated by other regulatory agencies (including a variance issued by Tennessee for the same EAF dust zinc oxide material that was the basis for the BRZ adjusted standard). Another factor is encouraging recycling of EAF dust and the conservation of non-renewable resources, thereby promoting sustainable development.[6] HRD therefore respectfully requests that an adjusted standard from the definition of solid waste for HRD's CZO be granted.[7]

In the remainder of this Petition, HRD applies each criterion for an adjusted standard for a commodity-like material to CZO to demonstrate that CZO is commodity-like and not a solid waste The adjusted standard regulations are substantively identical to the federal regulations at 40 C.F.R. §§ 260.30-260.33. U.S. EPA precedent therefore is relevant to interpreting and applying the commodity-like adjusted standard criteria, and HRD addresses U.S. EPA precedent in this Petition where appropriate. See Recycle Technologies, AS 97-9, slip. op. at 6 ("[T]he Board has referred to USEPA preamble language interpreting the federal counterpart to the

---

[6] U.S. EPA first promulgated the provisions on which the Board's adjusted standard authority is based in the context of the redefinition of solid waste. 50 Fed. Reg. 614 (Jan. 4, 1985). One of the principal purposes underlying these regulations was promoting appropriate recycling, thereby rendering this factor "relevant" to HRD's Petition for an adjusted standard.

[7] In addition to the BRZ adjusted standard, the Board has decided two adjusted standard petitions under Section 720.131(c): In re Petition of Recycle Technologies, Inc. for Adjusted Standard Under 35 Ill. Adm. Code 720.131(c) (Sept. 3, 1998), AS 97-9; In re Petition of

Board regulations at issue."). U.S. EPA clearly intended that the criteria be applied to individual materials in a common-sense manner. "The Regional Administrator (or an authorized state) may weigh these factors as she sees fit, and may rely on any or all of them to reach a decision." 50 Fed. Reg. at 655. Even though not all the criteria must be relied on in making a decision, HRD demonstrates that CZO meets each and every criterion for an adjusted standard for a commodity-like material.

A. CZO Has Undergone Substantial Processing.

The first factor to be considered is the degree of processing that the material has undergone and the degree of further processing that is required. According to the Board, the "more substantial the initial processing, the more likely the resulting material is to be commodity-like." Recycle Technologies, AS 97-9, slip op. at 7 (quoting 50 Fed. Reg. at 655) HRD recycles EAF dust and other metal-bearing feedstocks in its HTMR process to produce CZO in a complex series of chemical reduction and oxidation reactions. These reactions fundamentally transform relatively low-zinc, high-iron wastes that are incapable of being processed at a zinc refinery[8] into the high-zinc, low-iron CZO product that requires only minimal additional processing. The HTMR process also produces the high-iron product IRM. The HTMR process results in substantial processing for the following reasons:

1. Zinc is concentrated in the CZO, quadrupling in content from approximately 15 percent in the blended HTMR feedstock to approximately 60 percent in the CZO product.

Chemetco, Inc. for Adjusted Standard from 35 Ill. Adm. Code 720.131(a) and (c) (March 19, 1998), AS 97-2.

[8] Zinc refineries are incapable of recycling EAF dust and similar low-zinc wastes because the refinery equipment is neither designed nor built to remove the significant levels of non-zinc constituents (e.g., iron) in steel industry waste feedstocks. See pages 13-15 below for a detailed description of zinc refinery equipment used to process CZO.

2. Iron is concentrated in the IRM, nearly doubling in content from approximately 27 percent in the HTMR feedstock to approximately 50 percent in the IRM product.

3. Transforming the HTMR feedstock into CZO results in an approximately two-thirds reduction in mass.

The HTMR process plainly produces a significant transformation in the physical and chemical properties of the feedstock material.

Transformation of HTMR Feedstock Into CZO (Percent by Weight)

Major Constituents	HTMR Feedstock	CZO
Zinc (Zn)	14.9	58.8
Iron (Fe)	26.5	5.3
Calcium (Ca)	5.0	1.0
Manganese (Mn)	2.2	0.5
Magnesium (Mg)	2.0	0.4
Silicon (Si)	1.5	0.4
Sulfur (S)	1.1	0.9
Chlorine (Cl)	0.9	4.5
Lead (Pb)	0.8	3.6
Sodium (Na)	0.7	1.7
Potassium (K)	0.6	2.1
Aluminum (Al)	0.5	0.1
Fluorine (Fl)	0.3	0.3

Notes:
(1) Source: HRD, 1998. <u>See</u> Exhibits 2 (HTMR Feedstock) and 3 (CZO). The analyses reflect elemental composition only, and do not reflect the presence of oxygen in the oxidized compounds.
(2) HTMR Feedstock includes a blended carbon source added as a reducing agent.
(3) All sample results are on a dry basis.

The degree of further processing of CZO required is minimal in comparison to the initial HTMR processing. Once transformed in the HTMR recycling process, CZO is suitable for use as a direct feedstock in zinc production, as a direct feedstock for calcining, or as an ingredient in the production of micronutrients. (CZO is not used for fertilizer.) Each use is described in further detail below.

1. Direct feedstock in the zinc production process.

HRD's CZO is used as a direct feedstock in zinc production. CZO is a high-quality feedstock substitute for zinc ores that have been mined and processed.[2] CZO is a more predictable and uniform feedstock than the zinc concentrates produced from mined ore, since CZO's constituent ranges are typically narrower than the constituent ranges in zinc concentrates produced from mined ore. See table below at page 24. Since CZO is already high in zinc, little additional processing is necessary.

HRD sells CZO to Zinc Corporation of America ("ZCA") for use as a direct feedstock in ZCA's zinc production process in Monaca, Pennsylvania. (ZCA and HRD are separate companies owned by Horsehead Industries, Inc.) ZCA's zinc refinery processes various zinc-containing feedstocks to produce zinc metal slabs and ingots. The refinery feedstock typically includes zinc concentrates produced from mined ore, purchased zinc-bearing secondary materials such as CZO, and other zinc oxides.

ZCA's processing of CZO into zinc metal consists of sintering and thermal reduction. These two processing steps are summarized below, and a flow chart of the ZCA zinc production process is included at *Exhibit 4*.

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[2] Sulfide zinc ores extracted from the ground typically contain three to five percent zinc. This mined ore is usually beneficiated at the mine to concentrate the material containing zinc (and/or other valuable metals). The beneficiated ore is referred to throughout this Petition as "zinc concentrates produced from mined ore."

Preliminarily, it is worth noting that virgin zinc ore is subject to a number of processing operations even before it reaches the quality of CZO and thus becomes a suitable feed for zinc production. These operations, which are necessary to concentrate the zinc content, include extraction and beneficiation processes such as mining, crushing, milling, sequential flotation/separation, dewatering, and drying. Subsequent to these steps, zinc concentrates produced from mined ore also must be "roasted" at high temperatures in air to produce roasted zinc concentrates and recover sulfur as sulfur dioxide gas. The resulting roasted zinc concentrate is then sent to the sinter plant. The sulfur dioxide is converted to sulfuric acid in another process and sold to third parties. By comparison, CZO is low in sulfur content and already of sufficiently high-grade that it does not require any pre-sintering processing steps.

(i) Sintering – CZO, as well as roasted zinc concentrates and other low-sulfur zinc oxides, must physically be agglomerated into a coarse, larger-sized material before charging to the electrothermic furnace. The sintering process physically prepares (i.e., densifies and hardens) the zinc oxides, and reduces slightly the other minor constituents in the zinc feed.[10] The zinc oxides are mixed with a carbon source (for fuel) and with silica to bind the materials together. The sintering machine operates at approximately 900-1200° centigrade.

Sintering results in two materials: zinc sinter and a lead concentrate. The zinc sinter is an agglomerated material that is hard and porous in physical composition and is the feed for the electrothermic furnace. The lead concentrate produced from sintering serves as a feedstock in another processing circuit.

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[10] More technically, sintering is "the process of heating fine particles to an elevated temperature without complete fusion such that the small solid particles in contact with one another adhere and agglomerate into larger, more useful particles." Robert D. Pehlke, Unit Practices of Extractive Metallurgy (1973), at 16. See *Exhibit 5*.

(ii) Thermal reduction – Zinc sinter is heated in an electrothermic furnace, which vaporizes and condenses the sinter feed, resulting in zinc metal and a non-hazardous slag. The purpose of the thermal reduction is to remove oxygen and the remaining minor constituents in the zinc sinter. The thermal reduction step results in Prime Western Grade zinc metal suitable for direct sale or production of specialty zinc products.

2. Direct feedstock for calcining.

CZO produced at the Facility is also sent to HRD's facility in Palmerton for calcining. Calcining further purifies the CZO, and results in a zinc calcine product. The zinc calcine is then sold to ZCA, where it is sintered with the other zinc feedstocks to produce a physically uniform and agglomerated feed for thermal reduction. Zinc calcine ranges from 60 to 65 percent zinc, compared to less than 60 percent in the CZO, and lead and chlorine are reduced.

Comparison of HTMR Feedstock, CZO and Zinc Calcine (Percent by Weight)			
Major Constituents	HTMR Feedstock	CZO	Zinc Calcine
Zinc (Zn)	14.9	58.8	62.7
Iron (Fe)	26.5	5.3	6.5
Calcium (Ca)	5.0	1.0	1.9
Manganese (Mn)	2.2	0.5	0.6
Magnesium (Mg)	2.0	0.4	0.6
Silicon (Si)	1.5	0.4	0.5
Sulfur (S)	1.1	0.9	0.7
Chlorine (Cl)	0.9	4.5	1.0
Lead (Pb)	0.8	3.6	0.7
Sodium (Na)	0.7	1.7	0.9
Potassium (K)	0.6	2.1	0.8
Aluminum (Al)	0.5	0.1	0.2
Fluorine (F)	0.3	0.3	0.2

Notes:
(1) Source: HRD, 1998. *__See__ Exhibits 2 (HTMR Feedstock), 3 (CZO) and 6 (Zinc Calcine). The analyses reflect elemental composition only, and do not reflect the presence of oxygen in the oxidized compounds.*
(2) All sample results are on a dry basis.

The calcining of the CZO also results in a reduction of the amount of salts charged to ZCA's sinter machine, which increases the efficiency and longevity of the product collectors. To ensure optimal process efficiency, ZCA blends the zinc calcine, CZO, roasted zinc concentrates, and other zinc-bearing feeds into a uniform feedstock mix before sintering.

Calcining and other processes that perform a similar function are commonly employed by zinc producers worldwide to further purify CZO and other feedstocks and reduce the salts content. As explained below, Zinc Nacional, a Mexican zinc products manufacturer, calcines

CZO, as do other foreign metal manufacturing facilities.[11] Likewise, BRZ, which produces zinc products from crude zinc oxide purchased from other producers, washes the salts from the zinc oxide to purify the material and prevent corrosion of BRZ's refining equipment. See Big River Zinc Corporation (April 15, 1999), AS 99-3, slip op. at 8-9. More generally, calcining and similar processes are not unique to the zinc recycling industry. Zinc producers that use zinc concentrates produced from mined zinc ores typically calcine or otherwise process the concentrates to remove naturally-occurring salts, thereby further purifying the product. Like sintering, calcining also may serve to densify and harden the feedstock into a more easily managed pellet-like material. Indeed, ZCA's sintering process is similar in function to HRD's calcining process, and ZCA sinters nearly all of its zinc feedstocks, including zinc concentrates produced from mined zinc ores, before final processing in the electrothermic furnace.

3. Ingredient in the production of micronutrients.

HRD sells CZO to Zinc Nacional, a pyrometallurgical facility located in Monterrey, Mexico. The CZO sold to Zinc Nacional is used as an ingredient in the production of micronutrients for animal feed products. HRD transports the CZO by pressure differential rail car to the Mexican border where Zinc Nacional takes title to the product. At Zinc Nacional's facility, the CZO is unloaded within a fully enclosed building. The operating areas of the plant are also equipped with collection equipment and baghouses to prevent product loss and to recycle the collected material. Zinc Nacional transports the CZO pneumatically in an enclosed conveyance to a cone pelletizer. The pelletized CZO is then fed via covered conveyor belt to a

[11] See also *Exhibit 7*, letter from Ling Wong to Tom Theobald, which states that three of four Japanese companies calcine CZO (referred to as "Waelz oxide" in the letters) into calcined zinc concentrate.

two-stage calcine process that volatilizes certain metal compounds, removes salts, and produces a zinc oxide, which is sold to the agriculture industry as a micronutrient for animal feed products.

4. Summary.

HRD's HTMR process substantially transforms the hazardous waste feedstock from a low-zinc, high-iron waste mixture to the high-zinc, low-iron CZO product suitable for direct use in the zinc production process, for calcining in HRD's calcining kilns, and as an ingredient in the production of micronutrients. The CZO results from substantial processing of the feedstock and requires only minimal additional processing to produce zinc products. CZO therefore meets the first criterion of the adjusted standard for commodity-like products.

B. CZO Has Substantial Value.

The second criterion to be considered is the value of the material after it has been reclaimed. According to the U.S. EPA guidance, "[o]bviously, the more valuable a material is after initial processing, the more likely it is to be commodity-like." 50 Fed. Reg. at 655. The HTMR process transforms material with negative economic value into a material with substantial positive economic value. More specifically, the hazardous wastes used to produce CZO have negative economic value because generators must pay for the material to be either disposed of or recycled. Indeed, EAF dust's high iron content and relatively low zinc content prevent zinc production facilities from using EAF dust directly as a feedstock. The processing of EAF dust and other feedstocks in HRD's HTMR process produces the commodity-like product CZO, which, along with other zinc concentrates, is part of the worldwide market in zinc commodities. CZO is a valuable product because it is high in zinc and low in constituents like iron that cannot be processed at zinc production facilities. Zinc's price is established by supply and demand on the London Metal Exchange ("LME"). The long term average LME price for zinc is approximately 58 cents/pound, but in the past ten years the LME zinc price has varied from a low of 39.7 cents/pound in September 1993 to a high of 93.7 cents/pound in March 1989.

The value of most zinc-bearing materials, including CZO, is based on a formula that is generally accepted in the worldwide industry. The generic formula is typically to pay the LME price for a fixed percentage of the zinc contained in the material. The buyer (e.g., a zinc refiner), may also revise the formula to include and deduct a "processing" charge from the zinc payment, which represents an approximate overall cost to process the material in the zinc production process. The processing charge will increase or decrease with the price of zinc, so that the mine and the zinc producer share in the risk associated with fluctuations in the zinc price. Finally, credits and debits may be paid by the buyer (or applied to the seller) for certain non-zinc constituents in the zinc-bearing material.

As explained below, CZO is produced and sold worldwide as a process substitute for zinc concentrates produced from mined ore. Moreover, the economic value of HRD's CZO, like other CZO and zinc concentrates produced from mined ore, is substantial and quantifiable. CZO therefore meets the "value" criterion of an adjusted standard for commodity-like products.

1. CZO is produced and sold worldwide as a process substitute for zinc concentrates produced from mined ore.

Hundreds of thousands of tons of CZO and similar zinc feedstocks are sold worldwide as a process substitute for zinc concentrates produced from mined ore because they contain high zinc content and are suitable for processing at zinc manufacturing facilities. CZO's economic value, like any other valuable zinc-bearing material, depends largely on its zinc content and the LME price for zinc. The same is true for other zinc concentrates or secondary materials purchased by ZCA and other zinc producers.

The Commodities Research Unit, a London-based research firm, issued a report concluding that demand for CZO will continue to grow:

> [T]he increase in zinc recovery from [EAF] dusts would satisfy almost a quarter of the growth in zinc demand in the next decade. . . . It seems likely that much of the [EAF] dust will be processed into oxide, which will be used at smelters, substituting for concentrate. We believe that the zinc concentrate market has a tendency to surplus over the next ten years. The growth in zinc recovery from oxides will reinforce that tendency.

Zinc Rich EAF Dusts: Market Growth, Technology Choice and Profit Potential, CRU International Ltd. at 197 (emphasis added). At least a dozen plants in Europe, Japan and Mexico produce hundreds of thousands of tons of CZO from EAF dust by the HTMR process. The table below summarizes the annual output of crude zinc oxide from these foreign facilities.

Foreign Crude Zinc Oxide Production (Tons)	
Country	Production
Germany (3 plants)	44,000
Italy (1 plant)	22,000
Japan (5 plants)	101,000
France (1 plant)	27,000
Spain (1 plant)	27,000
Mexico (1 plant)	27,000
TOTAL	248,000
Source: Exhibit 7 and ZCA.	

CZO would not be produced and marketed worldwide on commercial terms if markets did not exist for it. CZO produced at the facilities in these countries is both sold to other companies, and used on-site to produce finished zinc products, since some of the facilities are located in integrated zinc manufacturing complexes. Indeed, "[t]hanks to its excellent quality, Waelz oxide [i.e., CZO] as a secondary feedstock is increasingly replacing primary ore concentrates in the European zinc and lead smelters."[12] Whether CZO is sold to zinc production facilities or used on-site by zinc manufacturers, it is an economically and environmentally desirable substitute for zinc concentrates produced from mined ore.

2. **The economic value of HRD's CZO is substantial and quantifiable.**

CZO's economic value is quantified by its transaction price. The commercial transactions for CZO sold by HRD, as well as for transactions for other zinc oxide products, are summarized below. The transaction price of at least $200 per ton for CZO clearly demonstrates the established economic value of CZO.

Economic Value of Crude Zinc Oxides ($/ton)	
Transaction	**Approximate Transaction Price**
HRD CZO sale to Zinc Nacional (Mexico)	(1)
HRD CZO sale to ZCA	(1)
AmeriSteel (crude zinc oxide) sale to Big River Zinc Corporation	$200(2)
Sale of "typical" zinc concentrate produced from mined ore to ZCA	$266(3)

Notes:
(1) Based on 1998 sales figures.
(2) As quoted in Big River Zinc Corporation's 1998 petition for an adjusted standard (page 17 of the petition). See footnote 14 below and accompanying discussion.
(3) Based on 1998 average London Metal Exchange Special High Grade zinc price of 45 cents/lb.

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[12] Remarks of Gunter Okon, Chairman of the Board of B.U.S., Berzilius Umwelt-Service AG (April 2, 1998), at the Annual General Meeting.

Each of these commercial transactions demonstrates that CZO and similar zinc oxides have substantial economic value:

- HRD sells CZO produced from its HTMR facilities to Zinc Nacional in Monterrey, Mexico. Zinc Nacional refines the CZO into an enriched zinc product suitable for use as a micronutrient for animal feed products (zinc is an essential human and animal nutrient). Documentation of the Zinc Nacional 1998 sales transactions is included at *Exhibit 8*.
- HRD sells CZO to ZCA for refining into zinc metal and oxide products. Documentation of the ZCA 1998 sales transactions is included at *Exhibit 9*.
- BRZ has agreed to purchase crude zinc oxide produced by AmeriSteel for at least $200 per ton. See Big River Zinc Corporation (April 15, 1999), AS 99-3, slip op at 17. AmeriSteel's crude zinc oxide, which is produced from EAF dust, is virtually identical in source, composition and process suitability to HRD's CZO product.
- The value of zinc concentrates produced from mined ore on the open market provides a useful comparison because these concentrates and CZO are both marketed worldwide for their zinc value. As shown in the table, typical zinc concentrate produced from mined ore, assuming a 45¢/lb. LME Special High Grade Zinc Price (1998 average), is valued at approximately $266 per ton.

3. Summary.

CZO has substantial economic value, as demonstrated by an established history of commercial transactions and its important role in zinc commerce worldwide. CZO's precursors cannot be processed directly into zinc products and they have negative economic value. The CZO produced by recycling these wastes in the HTMR process has substantial economic value [13] CZO compares favorably in value to other zinc oxide products, as demonstrated by its value relative to other zinc sources, and CZO is produced throughout the world as a zinc feedstock. CZO is commodity-like and not a waste. CZO thus meets the "value" criterion of the adjusted standard.

C. CZO Is Similar to Zinc Concentrates Produced from Mined Ore.

The third factor to be considered is the extent to which CZO is analogous to a raw material. According to the U.S. EPA guidance, "[i]f the initially-reclaimed material can substitute for a virgin material, for instance as a feedstock to a primary process, it is more likely to be commodity-like." 50 Fed. Reg. at 655. U.S. EPA's guidance is directly on point with respect to CZO because CZO is similar in composition, particularly with respect to the critical constituent zinc, and equivalent in process suitability to zinc concentrates produced from mined ore , which are used in primary processes to produce zinc. CZO therefore meets the third criterion of the adjusted standard for commodity-like products.

In 1997, approximately 10 million metric tons of zinc concentrates produced from mined ore were produced throughout the world for use in the manufacture of zinc and allied products (e.g., lead and cadmium oxides and metals, sulfuric acid). A comparison of the ranges of the major constituents in CZO with those in zinc concentrates produced from mined ore demonstrates the similarities of the two materials and their suitability for direct processing into zinc products.

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Comparison of Major Constituents in CZO and Zinc Concentrates Produced From Mined Ore (Percent by Weight)		
Element	**CZO(1)**	**Zinc Concentrates Produced From Mined Ore(2)**
Zn	56.3 to 61.4	48 to 61
Cl	3.4 to 5.1	<0.01 to 0.24
Fe	3.2 to 6.6	1.5 to 11.5
Pb	2.7 to 4.1	0.05 to 4.0
S	0.7 to 1.2	29.5 to 33.3

Notes:
(1) Source: HRD, 1998. See Exhibit 3.
(2) See Exhibit 10.

CZO's constituent ranges are narrower than those in zinc concentrates produced from mined ore. CZO therefore is typically a more predictable and uniform feedstock relative to zinc concentrates produced from mined ore. Moreover, CZO's low sulfur content obviates the need to roast CZO before sintering at the zinc refinery. In summary, CZO is similar in composition and process suitability to zinc concentrates produced from mined ore. CZO therefore meets the third criterion of the adjusted standard.

D. End Markets Are Guaranteed for CZO.

The fourth factor to be considered is the extent to which an end market is guaranteed for the CZO. Evidence of such a guarantee includes "value, traditional usage, or contractual arrangements." 50 Fed. Reg. at 655. End markets are guaranteed for CZO for several reasons. First, as explained above in Part II.B., CZO has substantial value in the market for zinc feedstocks. It is a suitable alternative to zinc concentrates produced from mined ore and other zinc-bearing feedstocks. So long as a market exists for zinc products, which is certain for the indefinite future, an end market will exist for CZO.

Second, HRD sells CZO to Zinc Nacional and to ZCA's Monaca facility. Both sales agreements apply an LME-based valuation for calculating the price paid for the contained zinc in the CZO.

Third, HRD has sold all of the CZO from the Facility since it commenced operations. HRD has never stored or otherwise stockpiled CZO produced at the Facility, and all CZO produced by HRD is processed directly, without storage, into zinc-bearing products. This fact alone establishes CZO's "value, traditional usage, [and] contractual arrangements." 50 Fed. Reg. at 655.

Fourth, as explained above at pages 19 to 21, HRD's CZO is just one of many different zinc concentrate products traded in worldwide markets annually. Each year hundreds of thousands of tons of zinc feedstocks are sold for their zinc value, including hundreds of thousands of tons of crude zinc oxides produced from EAF dust. See table above at page 20. Likewise, other zinc oxides similar in process suitability to CZO, such as AmeriSteel's crude zinc oxide, are produced and sold worldwide.

Finally, millions of tons of zinc concentrates produced from mined ore are sold domestically and internationally every year. CZO is a substitute for these materials.

In summary, CZO has a clear history of "value, traditional usage, [and] contractual arrangements." HRD has contractual arrangements to sell CZO, and CZO is a popular, economically competitive substitute for zinc concentrates produced from mined ore in the United States and abroad. Accordingly, an end market is guaranteed for CZO.

E. CZO Is Handled to Minimize or Eliminate Loss.

The fifth factor is the extent to which the CZO is handled to minimize or eliminate loss. CZO is managed in an environmentally protective manner throughout all phases of its life cycle from generation to production of zinc metal. HRD and ZCA carefully manage CZO to eliminate loss to the greatest possible extent for economic and environmental reasons. See Recycle Technologies, AS 97-9, slip op. at 11 ("The Board notes that [Recycle Technologies] has a financial incentive not to lose the filtered used antifreeze: if it loses material, it has less to sell back to customers.") HRD's handling of CZO therefore satisfies the fifth criterion of the adjusted standard for commodity-like products.

1. Handling of CZO from production through off-site shipment.

HRD carefully manages CZO in an environmentally protective manner from the time it is produced through the time of off-site shipment into the stream of commerce. As described in the next paragraph, all of HRD's unloading and conveyance operations are enclosed to prevent any product loss. These operations are under negative pressure to eliminate potential fugitive emissions. HRD is in compliance with all air permits.

CZO is pneumatically conveyed from the product collectors to enclosed pressure differential rail cars for off-site shipment immediately after production. (HRD does not store CZO.) The rail car loading tank, into which the CZO is transferred after production, is inside an enclosed building that is equipped with collection equipment and a baghouse to prevent product loss. The rail car loading tank empties CZO into pneumatic discharge rail cars through a pipe that extends down into the rail car. CZO is transported to its destination in compliance with Department of Transportation regulations for Class 9 substances.

2. **Handling during processing into zinc metal.**

CZO also is managed in an environmentally protective manner at ZCA's refinery in Monaca and at HRD's calcining facility in Palmerton. CZO that arrives in Monaca is off-loaded from railcars through pneumatic conveyances that preclude environmental exposure. CZO is stored in process bins in the enclosed sintering building. All product transfer points in the building are vented to collectors to prevent product loss.

CZO transported to HRD's calcining facility in Palmerton is pneumatically unloaded into surge bins and metered into a mixer, where it is conditioned with water prior to calcining. To prevent product loss, all conveyance systems are totally enclosed, and the surge bins are vented to a product collector. The conditioned CZO is fed into the calcine kiln by an enclosed conveyor, which has fugitive collectors on the system transfer system points. Any CZO in the collectors is recycled to the process. Inside the calcine kiln, pressurized seals eliminate potential emissions from both ends of kiln.

3. **Handling during processing into micronutrient ingredient.**

Zinc Nacional also handles HRD's CZO in an environmentally protective manner at its facility in Mexico. Zinc Nacional's materials receiving and preparation areas are fully enclosed, all conveyances are enclosed, and the facility has collection equipment and baghouses in all of its operating areas to prevent product loss and to recycle the collected material.

4. **Summary.**

CZO produced at the Facility is handled in a manner that minimizes loss to the greatest extent possible during all phases of its life cycle. HRD has invested millions of dollars in product management systems for CZO to ensure that it is managed so as to prevent the escape of this valuable material into the environment. The environmentally protective management of this material therefore satisfies the fifth criterion of the adjusted standard.

F. Other Relevant Factors.

Three other factors support HRD's Petition for an adjusted standard for its CZO product. First, the Board recently granted an adjusted standard under Section 720.131(c) to BRZ for a crude zinc oxide that is virtually identical to HRD's CZO in source, composition and function. The BRZ adjusted standard represents an indistinguishable precedential basis for HRD's petition, and virtually mandates the conclusion that HRD's CZO is a commodity-like material when processed into zinc products. The BRZ adjusted standard demonstrates conclusively the existence of an active market for CZO and provides independent confirmation of the commodity-like nature of the material. The fortuitous timing of the BRZ and HRD petitions greatly simplifies the Board's task here. Another, related factor is consistency with variances from the definition of solid waste for commodity-like zinc products promulgated by other agencies, including one for the same EAF zinc oxide that was the basis for the BRZ adjusted standard. A third factor is consistency with the resource conservation and waste minimization mandates of Illinois and federal law. Recycling EAF dust into CZO produces several major environmental benefits, including recycling rather than land disposal of the valuable constituents in EAF dust, and reduction in the mining and processing of scarce and non-renewable natural resources (and the associated energy savings).

1. The Big River Zinc adjusted standard for crude zinc oxide.

On April 15, 1999, the Board granted a petition submitted by BRZ for crude zinc oxide material produced from the HTMR processing of EAF dust.[14] (The Board amended the adjusted standard on May 6, 1999, by removing the constituent concentration specifications and revising the zinc oxide sampling requirements.) See *Exhibit 11* for copies of the decisions. The Board's findings in the BRZ adjusted standard opinion and order are relevant precedent for HRD's CZO because CZO, like the crude zinc oxide in the BRZ adjusted standard, is produced from the HTMR processing of EAF dust (and smaller quantities of other zinc-bearing material). CZO and BRZ's zinc oxide are similar in constituent composition.[15] CZO and BRZ's zinc oxide are used to produce zinc products. Therefore, the BRZ adjusted standard for crude zinc oxide strongly supports HRD's petition for an adjusted standard for CZO.

More specifically, CZO meets the adjusted standard criteria for virtually the same reasons as BRZ's zinc oxide:

- The degree of HTMR processing of CZO is substantial, and significantly increases the value of the recycled EAF dust. The degree of processing of BRZ crude zinc oxide likewise is substantial. See Big River Zinc Corporation (AS 99-3), April 15, 1999, slip op. at 12 (Board determination that HTMR processing is substantial in terms of both the process and its effect on EAF dust).

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[14] In re Petition of Big River Zinc Corporation for an Adjusted Standard Under 35 Ill. Adm. Code 720.131(c) (April 15, 1999, amended May 6, 1999), AS 99-3. The crude zinc oxide is referred to as "EAF dust zinc oxide" in the Board's opinion and order.

[15] For example, the AmeriSteel EAF dust zinc oxide included in BRZ's petition contains, on average, 59.5% zinc, 7.5% lead, and 8% chlorides. HRD's CZO contains, on average, 58.8% zinc, 3.6% lead, and 4.5% chlorides. Compare Big River Zinc Corporation (April 15, 1999), AS 99-3, slip op. at 7 with *Exhibit 3* of this Petition.

- Once HRD recycles EAF dust, its value is nearly the same (approximately $200) as the purchase price for crude zinc oxide that BRZ will purchase from AmeriSteel. See id. at 13 (BRZ's zinc oxide has significant value).
- HRD's CZO, like BRZ's zinc oxide, is chemically similar to zinc concentrates produced from mined ores, and both materials typically require removal of some constituents before final processing (i.e., roasting the mined concentrates to remove sulfur, and calcining CZO to remove salts). See id. at 13 (EAF zinc oxide is similar to mined zinc sulfide concentrates and can be substituted for the mined concentrates)
- End markets for CZO are guaranteed; likewise, BRZ's contract with AmeriSteel provides an end market for a comparable zinc oxide material. Id. at 13-14.
- Finally, HRD's CZO and the BRZ zinc oxide are managed in an environmentally protective manner from initial production through end use to guard against product loss. Id. at 14.

In summary, since HRD's CZO and the BRZ crude zinc oxide are similar products, used similarly as substitutes for zinc concentrates produced from ore, and are managed in an environmentally protective manner, the Board's adjusted standard for BRZ strongly supports this Petition, and confirms the commodity-like nature of CZO.

2. Other variances from the definition of solid waste.

HRD is aware of two other promulgated variances from the RCRA definition of solid waste for commodity-like zinc products. First, in September 1998, the Tennessee Department of Environmental Conservation ("TDEC") granted a variance to AmeriSteel for its crude zinc oxide product (which is the same zinc oxide product that is the subject of the BRZ petition for an adjusted standard). TDEC evaluated AmeriSteel's crude zinc oxide when sold "for further processing into high-grade zinc oxide." See *Exhibit 12*. TDEC determined that the crude zinc oxide satisfied all applicable criteria for a commodity-like material, and the criteria applied to AmeriSteel are identical to the criteria applicable here. Since AmeriSteel's crude zinc oxide and HRD's CZO are similar products, used similarly as substitutes for zinc concentrates produced from ore, and are managed in an environmentally protective manner, TDEC's variance for AmeriSteel's crude zinc oxide supports HRD's Petition for an adjusted standard for CZO.

In the third relevant variance, the U.S. EPA applied the federal variance criteria (which, as noted in this Petition, are identical to the criteria applicable here) in 1991 to promulgate a rule that excludes from the definition of solid waste a material known as "splash condenser dross residue"("SCDR"). SCDR is produced from the processing of EAF dust in HTMR processes that contain splash condensers. 56 Fed Reg. 41164, 41173 (Aug. 19, 1991). Applying the criteria, U.S. EPA determined that the SCDR: (1) results from substantial processing; (2) is sold for value (or reprocessed on-site to recover additional zinc; (3) contains zinc concentrations comparable to other non-waste sources (i.e., 50 to 60 percent zinc); (4) is guaranteed an end market; and (5) is handled safely up to the point of final reclamation. U.S. EPA's exclusion for SCDR directly supports this Petition. Like SCDR, CZO is produced from the processing of K061. Like SCDR, each of the factors set forth in the regulations is applicable to CZO. Therefore, the SCDR exclusion supports HRD's Petition for an adjusted standard for CZO.

3. An adjusted standard supports statutory resource recovery and waste minimization mandates.

An adjusted standard for CZO used as a substitute for zinc concentrates produced from mined ore supports the resource recovery and waste minimization mandates of RCRA and the Act by encouraging the recycling of EAF dust and other zinc-bearing secondary materials. See 415 ILCS 5/2(a)(iv), 5/20(c); 42 U.S.C. § 6902(a)(6); see also n.6, supra, at page 10. The encouragement of recycling is "relevant" to an adjusted standard proceeding as a result of the purposes underlying U.S. EPA's original promulgation of the provision on which the Board's authority is based.

U.S. EPA has stated HTMR's resource recovery and waste minimization benefits in clear terms:

> The use of HTMR is also consistent with national policy, identified in [RCRA and its amendments] to reduce the quantity of hazardous constituents disposed. Since HTMR is a technology that recovers valuable constituents from waste materials, there is typically no increase in the volume of the waste residuals resulting from recovery treatment. . . . In addition, because metals are being recovered instead of land disposed, they do not have to be processed from ore concentrate; this saves energy and pollution of another source.[16]

Recycling zinc from EAF dust produces several clear environmental benefits:

- Over 4 million tons of EAF dust have been recycled to date by HTMR technologies in the United States, recovering over 600,000 tons of zinc and other valuable metals that otherwise would have been wastefully disposed of in landfills.
- Conservation of millions of tons of domestic zinc ore reserves annually. Sulfide zinc ores contain between 3 and 5 percent zinc on average, compared with an average of 20 percent zinc in EAF dust and nearly 60 percent zinc in CZO. Thus, one ton of CZO contains approximately as much zinc as more than 10 tons of zinc ore.
- Reduces the need for importation of zinc concentrates.
- Results in lower energy costs compared with mining and processing of virgin zinc ores.

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[16] U.S. EPA, Best Demonstrated Available Technology (BDAT) Background Document (Addendum) For All Nonwastewater Forms of K061 at 3-18 (July 1992).

Zinc recycling promotes sustainable development, especially because zinc, unlike many other materials, is capable of repeated recycling with little or no deterioration of its chemical and physical properties.[17] Indeed, 36 percent of the world's zinc supply comes from recycled zinc. See A Pocket Guide to World Zinc (*Exhibit 13*). In the United States, the federal government has estimated that, with increasing recovery, recycled zinc will account for 40 percent of total consumption by 2000. An adjusted standard for CZO will create additional incentives to recycle EAF dust in an environmentally protective manner, thereby further supporting the resource conservation and waste minimization mandates of Illinois and federal law.

CONCLUSION

HRD's valuable CZO product is produced and sold as a process substitute for zinc concentrates produced from mined ore. CZO meets all of the criteria for an adjusted standard from the definition of a solid waste for a commodity-like material because CZO: (i) is substantially reclaimed from hazardous waste; (ii) has substantial value; (iii) is a substitute for zinc concentrates produced from mined ore; (iv) has a guaranteed end market; and (v) is handled to minimize or eliminate product loss. Moreover, an adjusted standard for CZO is consistent with the BRZ adjusted standard for EAF zinc oxide, as well as variances from the definition of solid waste issued by other regulatory agencies. An adjusted standard also will encourage recycling of EAF dust, conservation of natural resources and reduced energy consumption (thereby promoting sustainable development HRD therefore respectfully requests the granting of this Petition for an adjusted standard for CZO produced from the recycling of EAF dust, as well

---

[17] Additional information from the International Zinc Association explaining the benefits of zinc recycling worldwide is included at *Exhibit 13* of this Petition.

as smaller quantities of zinc-bearing hazardous and non-hazardous waste feedstocks, at HRD's HTMR Facility.

Respectfully submitted,

HORSEHEAD RESOURCE DEVELOPMENT
COMPANY, INC.

By: ______________________
One of its Attorneys

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Date: July 20, 1999

CERTIFICATE OF SERVICE

I, the undersigned, on oath state that I have served the foregoing PETITION FOR AN ADJUSTED STANDARD upon the following in the manner indicated below, this 20th day of July, 1999:

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board
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HRD - CHICAGO, IL

EXHIBIT i

HORSEHEAD RESOURCE DEVELOPMENT CO., INC.

Chicago, Illinois Facility

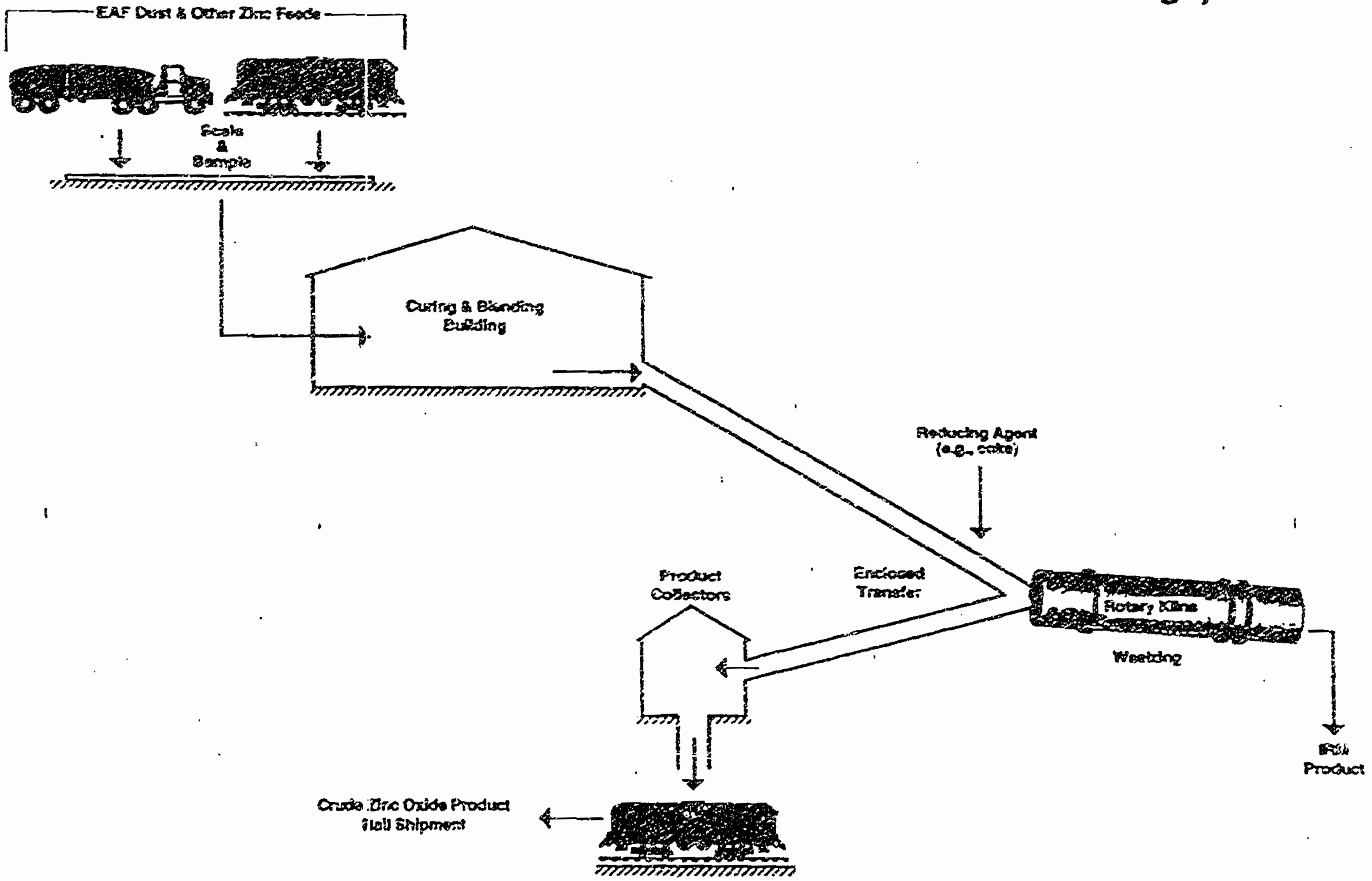


EXHIBIT 2

DATE: 3/05/99 HORSEHEAD RESOURCE DEVELOPMENT COMPANY REPORT: LDO409RP
TIME: 8:45:34 LAB ANALYSIS - PROCESS CONTROL MONTHLY COMPOSITES PAGE: 1

WAELZ KILN FEED FROM: 1/01/98 TO: 12/31/98 CALUMET

	AVERAGE TO DATE	JANUARY 1998	FEBRUARY 1998	MARCH 1998	APRIL 1998	MAY 1998	JUNE 1998	JULY 1998	AUGUST 1998	SEPTEMBER 1998	OCTOBER 1998	NOVEMBER 1998	DECEMBER 1998
Zn %	14.89167	13.2	13.9	12.7	14.0	14.6	16.9	13.4	14.2	15.7	17.4	17.7	14.8
Pb %	.80750	0.82	0.86	0.75	0.77	0.74	0.76	0.75	0.91	0.98	1.03	0.76	0.59
Cl- %	.85750	0.80	0.55	1.00	0.67	0.98	0.99	0.94	0.65	1.13	1.20	0.72	0.74
Al %	.50750	0.64	0.39	0.40	0.45	0.55	0.51	0.50	0.54	0.57	0.52	0.50	0.41
Fe %	26.40833	27.3	27.4	26.7	28.0	26.6	25.1	27.5	27.0	26.6	24.6	23.3	26.8
Cd %	.02333	0.023	0.039	0.016	0.027	0.023	0.019	0.021	0.072	0.030	0.014	0.030	0.026
Cu %	.26500	0.27	0.26	0.25	0.23	0.25	0.70	0.28	0.29	0.20	0.26	0.32	0.29
Mn %	2.16250	2.08	2.20	2.00	2.14	2.19	2.26	2.41	2.22	2.21	2.20	2.07	1.97
Na %	.68833	1.13	0.62	0.76	0.65	0.61	0.61	0.62	0.64	0.85	0.62	0.64	0.51
Ba %	.01600	0.019	0.015	0.013	0.017	0.014	0.015	0.021	0.018	0.017	0.014	0.016	0.011
Ca %	4.97583	4.95	4.96	4.31	4.86	5.56	5.09	6.42	5.37	4.81	4.63	4.71	4.04
Sr %	.33833	0.43	0.33	0.25	0.23	0.23	0.22	0.26	0.31	0.36	0.44	0.52	0.48
Mg %	1.95417	1.98	1.91	1.89	2.02	2.05	2.27	2.10	1.94	1.41	1.82	2.04	1.82
Ni %	.06325	0.058	0.066	0.053	0.052	0.072	0.034	0.058	0.071	0.041	0.060	0.100	0.066
V %	.02617	0.024	0.031	0.027	0.027	0.028	0.026	0.024	0.028	0.025	0.024	0.023	0.027
As %	.00533	< 0.0050	0.0090	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
K %	.57667	0.56	0.53	0.57	0.59	0.59	0.52	0.56	0.59	0.63	0.69	0.57	0.52
Se %	.00010	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sb %	.00550	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.006	< 0.005	< 0.005	< 0.005	< 0.010	< 0.005	< 0.005
Ag %	.00263	0.003	< 0.001	0.003	0.003	0.004	< 0.001	< 0.001	0.003	0.005	0.003	0.004	0.003
Hg %	.00022	0.00030	0.00021	0.00019	0.00014	0.00012	0.00035	0.00040	0.00005	0.00027	0.00025	0.00023	0.00016
Si %	1.53083	2.42	1.81	1.37	1.24	1.29	1.31	1.30	1.81	1.43	1.50	1.55	1.34
Sn %	.05158	0.046	0.043	0.043	0.041	0.044	0.046	0.049	0.054	0.064	0.060	0.063	0.066
Ti %	.03508	0.038	0.039	0.035	0.032	0.032	0.039	0.037	0.043	0.017	0.036	0.042	0.031
Co %	.00167	0.001	0.006	0.001	< 0.001	< 0.001	0.002	< 0.001	0.001	< 0.001	0.001	0.002	0.002
Cr %	.01042	< 0.010	< 0.010	< 0.010	< 0.010	0.015	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
S %	1.11833	0.99	1.24	0.96	0.90	1.20	0.98	0.90	0.94	1.19	1.16	1.36	1.60
Bi %	.00608	< 0.005	0.006	< 0.005	0.008	0.006	< 0.005	< 0.005	0.008	< 0.005	< 0.010	< 0.005	0.005
F- %	.26583	0.27	0.25	0.22	0.23	0.28	0.28	0.30	0.27	0.29	0.29	0.28	0.23
CN- %	.00250	0.0062	0.0021	0.0020	0.0020	0.0020	0.0027	0.0010	0.0020	0.0030	0.0040	0.0020	0.0010
C %	16.00083	12.70	16.20	19.10	15.90	16.90	15.50	13.20	15.45	17.71	15.89	13.10	20.36
Mo %	.01800	0.012	0.017	0.021	0.021	0.012	0.020	0.028	0.013	0.010	0.018	0.024	0.012
P %	.11050	0.110	0.110	0.120	0.110	0.170	0.036	0.130	0.130	0.120	0.100	0.130	0.110
SiO2 %	3.27417	5.18	3.88	2.92	2.54	2.77	2.79	2.78	3.87	3.06	3.21	3.32	2.87

EXHIBIT 3

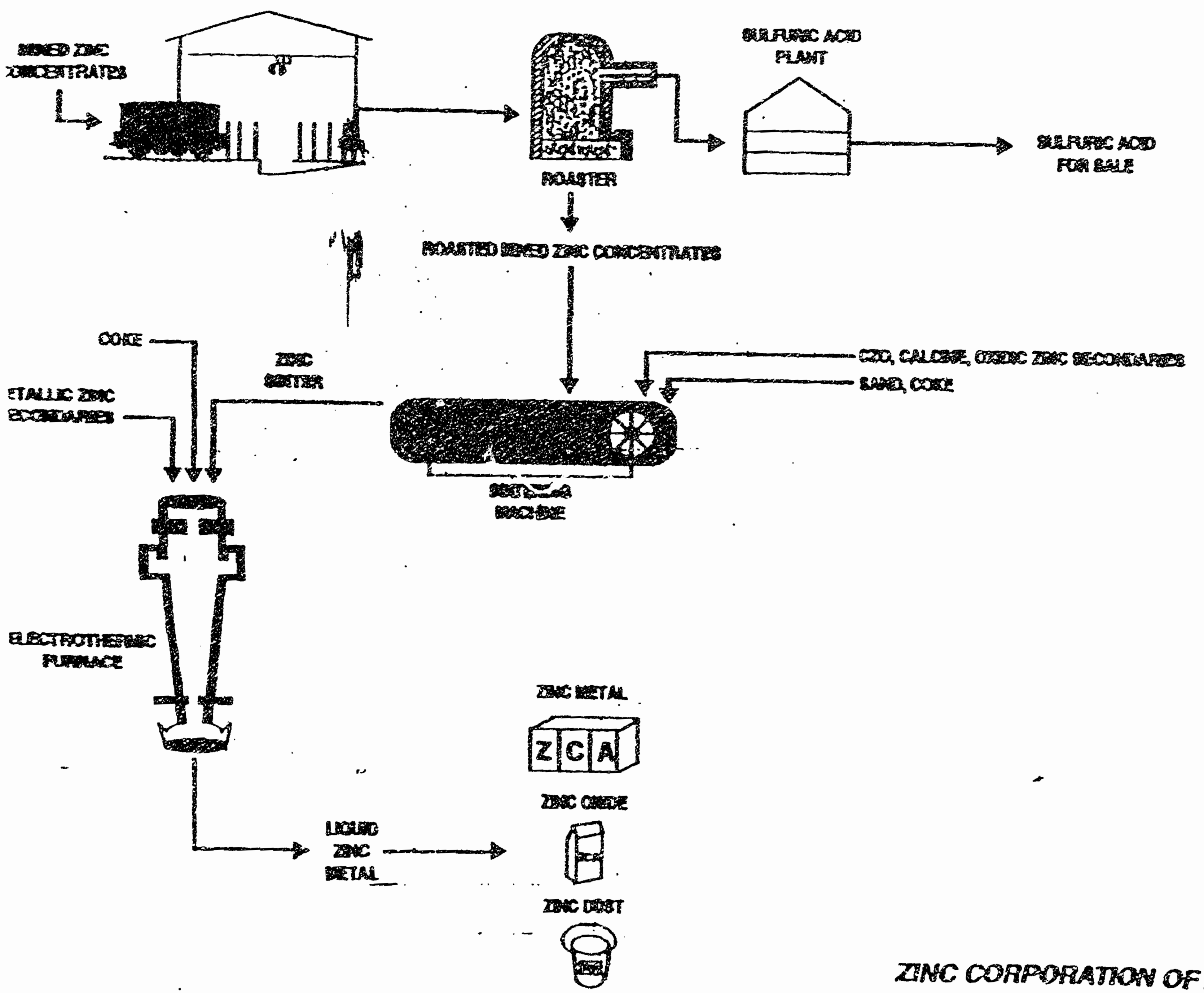
HORSEHEAD RESOURCE DEVELOPMENT COMPANY
LAB ANALYSIS - PROCESS CONTROL MONTHLY COMPOSITES

CZO PRODUCTION   FROM: 1/01/98 TO: 12/31/98   CALUMET

	AVERAGE TO DATE	JANUARY 1998	FEBRUARY 1998	MARCH 1998	APRIL 1998	MAY 1998	JUNE 1998	JULY 1998	AUGUST 1998	SEPTEMBER 1998	OCTOBER 1998	NOVEMBER 1998	DECEMBER 1998
Zn %	58.79167	57.7	56.3	60.3	61.3	58.5	60.2	59.7	57.0	60.3	56.0	56.8	61.4
Pb %	3.57750	4.03	4.10	3.99	3.84	3.36	3.47	3.77	3.65	3.84	3.23	2.99	2.66
Cl- %	4.50833	4.51	4.72	5.05	4.88	3.81	4.44	4.67	4.92	4.88	4.86	4.01	3.35
Al %	.07367	0.075	0.067	0.056	0.061	0.087	0.061	0.050	0.071	0.069	0.095	0.110	0.082
Fe %	5.25000	6.60	6.13	3.76	4.39	6.43	3.22	4.61	4.89	4.47	5.76	6.39	6.35
Cd %	.11450	0.091	0.110	0.110	0.110	0.140	0.110	0.120	0.130	0.120	0.120	0.120	0.093
Cu %	.09725	0.100	0.110	0.077	0.090	0.098	0.090	0.051	0.087	0.084	0.120	0.150	0.110
Mn %	.47500	0.52	0.46	0.34	0.40	0.51	0.40	0.41	0.42	0.44	0.63	0.62	0.55
Na %	1.74167	2.04	1.84	2.03	1.75	1.55	1.65	1.77	1.63	1.98	1.79	1.66	1.21
Ba %	.00475	0.004	0.004	0.009	0.004	0.005	0.005	< 0.002	0.003	0.005	0.005	0.006	0.005
Ca %	.91250	1.09	1.02	0.70	0.81	1.16	0.79	0.77	0.78	0.84	1.12	0.94	0.93
Cr %	.07000	0.082	0.067	0.030	0.036	0.048	0.031	0.043	0.049	0.064	0.120	0.150	0.120
Mg %	.40000	0.46	0.40	0.29	0.37	0.47	0.45	0.34	0.36	0.15	0.46	0.57	0.48
Ni %	.01358	0.009	0.009	< 0.005	0.011	0.013	0.047	0.007	< 0.010	< 0.005	0.013	0.022	0.012
V %	.00808	0.006	0.006	0.004	0.004	< 0.010	0.007	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
As %	.00767	< 0.0050	0.0090	< 0.0050	< 0.0050	< 0.0050	0.0330	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
K %	2.12917	2.14	1.99	2.42	2.37	1.94	2.06	2.27	2.26	2.34	2.06	1.91	1.79
Be %	.00010	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Se %	.00508	< 0.005	< 0.005	0.006	< 0.005	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Ag %	.00500	0.006	< 0.001	0.006	0.006	0.009	< 0.001	0.004	0.006	0.006	0.004	0.005	0.004
Hg %	.00020	0.00021	0.00044	0.00029	0.00020	0.00014	0.00009	0.00018	0.00020	0.00028	0.00011	0.00017	0.00008
Si %	.35417	0.49	0.50	0.10	0.30	0.17	0.40	0.20	0.46	0.15	0.48	0.57	0.23
Sn %	.11617	0.100	0.100	0.120	0.110	0.110	0.110	0.094	0.100	0.110	0.140	0.160	0.140
Ti %	.00533	0.006	0.007	0.004	0.004	0.005	0.004	0.003	0.006	0.005	0.006	0.008	0.006
Co %	.00100	< 0.001	0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Tl %	.01000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
S %	.89833	0.90	1.10	1.07	0.72	0.79	0.69	0.89	0.75	0.76	0.86	1.23	1.02
Sb %	.00750	0.005	< 0.005	< 0.005	0.005	< 0.005	0.029	0.007	0.009	< 0.005	< 0.005	< 0.005	< 0.005
F- %	.27750	0.30	0.30	0.26	0.24	0.25	0.23	0.27	0.32	0.27	0.29	0.34	0.26
C %	.54583	0.34	0.60	0.79	0.57	0.85	0.55	0.37	0.46	0.43	0.75	0.79	0.55
Mo %	.00579	0.0050	0.0070	0.0080	0.0060	0.0050	< 0.0005	0.0060	0.0050	0.0100	< 0.0050	0.0070	< 0.0050
P %	.02342	0.021	0.022	0.013	0.016	0.062	0.000	< 0.010	0.025	0.033	0.023	0.025	0.023
SiO2 %	.76167	1.04	1.08	0.63	0.65	0.41	0.86	0.43	0.98	0.32	1.03	1.22	0.49

ZCA - MONACA, PA

EXHIBIT 4



ZINC CORPORATION OF AMERICA
Monaca, PA Facility

EXHIBIT 5

UNIT PROCESSES OF EXTRACTIVE METALLURGY

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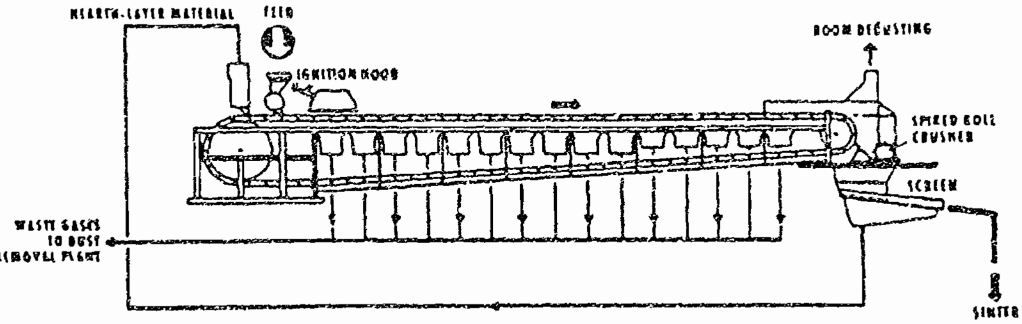

Fig. 2-7. Dwight-Lloyd Sintering Machine

Source: *Lurgi Manual*, Lurgi Gesellschaften, Frankfurt (Main) Germany, June 1961, p. 150.

S'nter-roast offers an advantage over the previously described roasting processes in that agglomeration of the roasted material is accomplished. The blast furnace requires a suitably large particle size, and hence iron and lead sulfide ores are sinter-roasted. This process is usually carried out on a Dwight-Lloyd sintering machine, as shown in Fig. 2-7. Roasting is accompanied by incipient fusion, which produces a porou; cinder-like material called sinter.

The Dwight-Lloyd sintering machine, which was developed more than 50 years ago, consists of a series of pallets or grates mounted on an endless track. The concentrate is charged to a depth of about 6–20 in. on the pallets, which move over wind boxes at 2–3 ft/min. Combustion of the bed is initiated on its surface by a burner, and the combustion is maintained and carried through the mass of the charge by the air drawn through the concentrate to the wind box below, which is coneected to a suction fan-Relatively high temperatures (900–1200°C) are developed in the material, causing it to fuse into a compact mass. After the sinter has reached the end of the machine it is discharged, cooled, and sized to provide a uniform product. Fines from the sizing operation are returned as charge material.

In sinter-roasting, the sulfur in the ore acts as a fuel. The relatively high temperatures and oxidizing conditions usually provide low sulfur contents, particularly for the roasting of pyrite (FeS_2) or pyrrhotite (FeS). In the case of low sulfur or oxide ores, fuel is added. The latter case is referred to simply as sintering and is used in particular for preparation of charge material to the iron blast furnace.

2-3 Sintering

The requirement for coarse charge material for the blast furnace necessitates agglomeration of fine ores. One method for agglomerating fines is by sintering. Sintering is the process of heating fine materials to an elevated temperature without complete fusion such that the small, solid particles in contact with one another adhere and agglomerate into larger, more useful particles. The predominant mechanisms in the action of sintering are surface diffusion and incipient fusion, and both occur in the commercial sintering of ore.

The sintering of large quantities of material is often necessary in the operation of a metallurgical plant. This process provides an opportunity to use fine material, and often makes a particular process feasible by converting available fine materials to an agglomerated form for use as a charge material. Sintering is sometimes carried out in rotary kilns or by batch processing on sinter pans or hearths. Flow of air through the charge may be by updraft or downdraft methods, but the predominant industrial technique for sintering ore is on a moving hearth, as with the Dwight-Lloyd continuous sintering machine. As originally designed for processing copper ores, the sulfide fines were distributed in a thin layer along a traveling belt made up of grates. The charge was ignited and the sulfur burned out of the ore as air was drawn through the charge by large fans. The fines fused together, forming a strong sinter cake that was desirable for charging to a blast furnace. The basic difference between the processing of sulfide ores and the sintering of oxide-ferrous ores is the self-contained fuel of the sulfide material. In the processing of hematite or magnetite fines, carbon in the form of coal or coke has to be added to provide fuel for the sintering process.

The utilization of the Dwight-Lloyd machine (Fig. 2-7) in the processing of iron ores is essentially the same as for nonferrous sulfide ores. A schematic diagram of an iron ore sintering plant is shown in Fig. 2-8. It is evident that an important part of the sinter plant is the mixing system that blends the fine ores, limestone, coke, plus the fines returned from the sinter strand. The charge mix is loaded onto the moving grates of the sintering machine, where it passes under a burner that ignites the bed. Air is drawn through the burning bed by the suction system below,

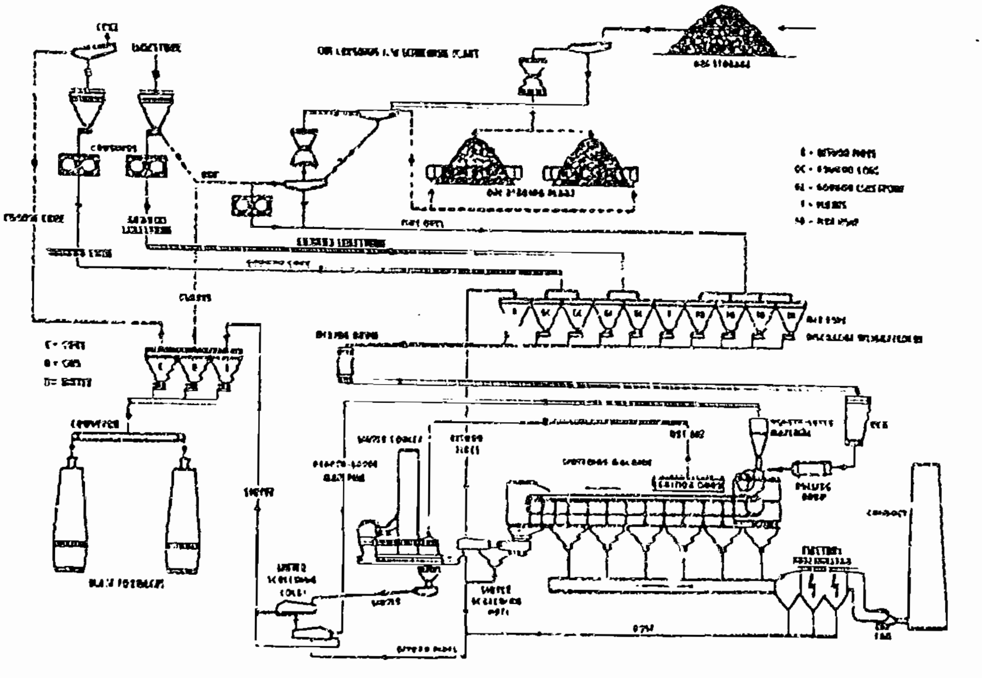

Fig. 2-8. Iron Ore Sintering Plant for Preparation of Self-fluxing Sinter

Source: *Lurgi Manual*, Lurgi Gesellschaften, Frankfurt (Main) Germany, June 1961, p. 151.

and at the end of the strand the sinter drops off the pallets, where it is cooled and screened. The undersize particles are then returned to the sintering process as recycle.

The *fuel requirement* for the sintering of iron oxide ores ranges from 5–8% coal or coke, and is relatively independent of the material to be sintered. The optimum for the fuel requirement varies slightly and depends upon whether or not chemical reactions are involved in the sintering process. The presence of appreciable amounts of limestone or water will require additional fuel, and may depress the maximum temperature achieved. Variation in the carbonate or moisture content of the sinter mix will give a variation in the width of the hot zone that moves down through the ore bed. In normal downdraft sintering, the combustion of the fuel in the sinter mix is initiated in the upper levels of the sinter bed. The hot combustion gases are pulled downward through the bed and preheat the sinter charge.[2] The presence of water in the sinter mix will limit the increase in temperature of the sinter bed until the water is vaporized. The presence of carbonate, such as limestone that is charged to self-fluxing sinter (see Pyrometallurgy III), will result in a broadening of the combustion front that follows the heat front down through the bed.

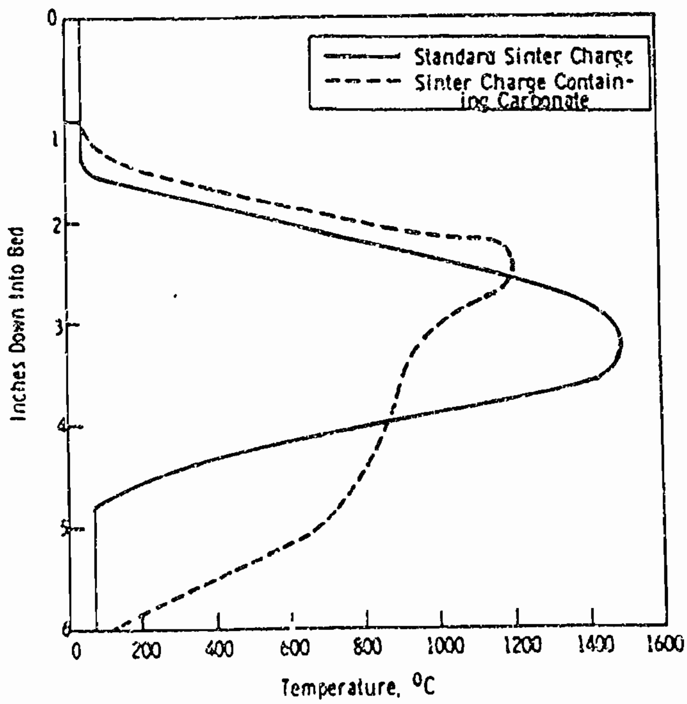

Fig. 2-9. Temperature Distribution for Two Sinter Mixes.

(Combustion is occurring approximately at the midpoint of the bed)

[2] S. Eketorp, *STEELMAKING, The Chipman Conference*, p. 180, MIT Press, Cambridge, Mass., 1965.

Figure 2-9 shows the influence of the presence of a large amount of calcium carbonate in the charge. The peak temperature of the bed is decreased and the width of the hot zone is increased. A well-defined planar front should occur in sintering, as illustrated by the solid line in Fig. 2-9.

The engineering relationships for design of sintering operations are based on flow of air through porous beds. Of particular importance is the bed permeability, which often can be determined by laboratory sintering tests.[3,4] In commercial operations, 1 to 3½ tons of material can be sintered per square foot of hearth area per day on a Dwight–Lloyd sintering machine. A decrease in fuel requirements could be achieved through the use of preheated air supplied from a closed hood over the sinter strand. Up to 40% of the thermal energy required for sintering can be supplied by fuels such as flue gas, natural gas, or fuel oil burned in a hood above the sinter machine. With this "mixed firing process," the mechanical and chemical properties of the sinter can be improved.[5]

Control of the sintering of iron ores by the Dwight–Lloyd process is of particular importance as the productivity of the iron blast furnace increases. The control of material flow and suitable proportioning of raw materials to provide a chemically uniform sinter mix is of prime importance. Maximum utilization of the sinter strand requires control of the "burn through" point such that combustion is completed just as the sinter reaches the discharge end of the strand. The temperature in the wind box often can be used to monitor this "burn through" point.[6]

EXHIBIT 6

ZINC CALCINE PRODUCTION FROM: 1/01/98 TO: 12/31/98 PALMERTON

	AVERAGE TO DATE	JANUARY 1998	FEBRUARY 1998	MARCH 1998	APRIL 1998	MAY 1998	JUNE 1998	JULY 1998	AUGUST 1998	SEPTEMBER 1998	OCTOBER 1998	NOVEMBER 1998	DECEMBER 1998
	62.69667	63.91	63.72	62.50	60.16	63.43	63.56	61.72	63.10	62.35	62.82	62.80	63.07
	.65750	0.48	0.29	0.45	0.64	0.42	0.39	1.41	0.66	0.96	0.67	0.64	0.88
	.95167	0.85	0.35	1.05	0.87	0.66	0.59	1.32	1.02	1.21	1.17	1.09	1.24
	.15500	0.16	0.20	0.19	0.21	0.16	0.15	0.14	0.14	0.13	0.14	0.12	0.12
	6.52750	6.75	6.57	6.62	7.91	6.71	7.15	6.22	6.10	6.10	6.45	5.95	5.80
	.05683	0.047	0.014	0.009	< 0.002	0.023	0.038	0.018	0.044	0.120	0.087	0.120	0.160
	.07058	0.069	0.078	0.072	0.078	0.071	0.065	0.069	0.060	0.077	0.068	0.072	0.068
	.57667	0.53	0.68	0.58	0.70	0.58	0.61	0.54	0.54	0.52	0.58	0.53	0.53
	.90833	1.11	0.70	0.93	0.74	0.71	0.74	1.04	0.98	1.11	0.92	0.89	1.03
	.00533	0.005	0.007	0.006	0.006	0.005	0.006	0.005	0.005	0.005	0.005	0.005	0.004
	1.89583	1.58	1.77	1.84	2.40	1.80	1.68	2.18	1.81	2.10	1.90	1.61	1.88
	.10658	0.110	0.120	0.130	0.140	0.120	0.120	0.088	0.092	0.081	0.089	0.100	0.089
	.60250	0.56	0.65	0.61	0.74	0.64	0.58	0.62	0.54	0.54	0.59	0.58	0.58
	.01892	0.023	0.022	0.016	0.024	0.018	0.024	0.014	0.016	0.013	0.017	0.022	0.018
	.00983	0.010	0.008	0.009	0.012	0.009	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	.00492	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0040	0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	.82833	0.88	0.54	0.74	0.64	0.58	0.51	1.10	0.97	1.03	0.94	0.92	1.09
	.00010	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	.00500	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	.00308	0.004	0.002	0.002	0.002	0.002	0.003	0.006	0.002	0.006	0.003	0.003	0.004
	.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00005	< 0.00005	< 0.00005	< 0.00005
	.47325	0.820	0.590	0.680	0.660	0.059	0.390	0.260	0.430	0.370	0.490	0.570	0.360
	.08100	0.081	0.110	0.088	0.078	0.084	0.086	0.067	0.073	0.076	0.075	0.078	0.076
	.01200	0.011	0.017	0.015	0.017	0.011	0.011	0.011	0.011	0.010	0.011	0.009	0.010
	.00100	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
	.01000	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
	.67833	0.60	0.53	0.66	0.65	0.53	0.54	0.53	0.68	0.70	0.62	0.79	1.31
	.00575	0.007	< 0.005	0.006	0.007	0.005	< 0.005	< 0.005	< 0.005	0.005	0.008	< 0.005	0.006
	.23583	0.23	0.18	0.23	0.29	0.23	0.20	0.26	0.21	0.28	0.24	0.21	0.27
	.01100	0.013	0.010	0.009	0.010	0.009	< 0.010	0.008	0.021	0.005	0.013	0.014	0.010
	.02192	0.021	0.029	0.028	0.025	0.041	0.015	0.026	0.012	0.010	0.030	0.011	0.015
	1.11417	1.75	1.39	1.45	1.40	1.25	0.83	0.56	0.92	0.79	1.05	1.22	0.76

EXHIBIT 7

EXHIBIT 7

Page	Description
1	Summary of EAF dust processing capacities in Europe, Japan, and the United States. From Kola, "Steel Industry Dust: Solving of a Problem by Recycling" (1993).
2	Letter from Ling Wong to Tom Theobald (Nov. 5, 1998).

Treatment of EAF-dust

B.U.S

Company	City/Country	Capacity t/a	Process
ASER S.A.	Bilbao, Spain	80 000	Waelz
Recytech SA	Fouquiéres lez Lens, France	80 000	Waelz
B.U.S Metall GmbH	Duisburg, Germany	55 000	Waelz
B.U.S Zinkrecycling	Freiberg, Germany	45 000	Waelz
Nuova Samim S.p.A.	Ponte Nossa, Italy	65 000	Waelz
Europe		**325 000**	
Himeji Steel	Himeji, Japan	35 000	Waelz
Kaneko Trading	Sekijo	40 000	Waelz
Mitsui Mining & Smelting	Miike	60 000	Half Shaft
Toho Zinc	Onahama	50 000	Elec. Furn.
Sotetsu	Aizu	60 000	Waelz
Sumitomo Metal Mining	Shisaka	60 000	Waelz
Japan		**305 000**	
Florida Steel	Jackson, Tennessee	7 000	Tetronic
HRD	Palmerton, Pensylvania	245 000	Waelz
	Calumet, Illinois	70 000	Waelz
	Rockwood, Tenessee	80 000	Waelz
Laclede Steel	Alton, Illinois	36 000	Elkem
North Star Steel	Beaumont, Texas	27 000	Flame reactor
Nucor	Blytheville, Arkansas	11 000	Tetronic
ZIA Technology	Caldwell, Texas	27 000	Rotary Red.
USA		**503 000**	

Fig. 13

ITOCHU
335 Madison Avenue
New York, NY 10017
Tel: 212-818-8186
Fax: 212-818-8502

November 5, 1998

To: Mr. Tom Theobald
Zinc Corporation of America

c.c. Mr. Mike Helms

From: Ling Wong
ITOCHU International

RE : WAELZ OXIDE

We are pleased to provide the data on waelz oxide producers in Japan as you have requested.

Sumitomo Metal Mining Co., Ltd. - Shisakajima Plant

1. Located on an island near Shikoku with annual waelz oxide production of 70,000 WMT.
2. Currently producing 25,000 DMT of ZNO (zinc calcined concentrate) and supplying Harima plant where zinc metal is being recycled.
3. Harima's capacity is 50,000 DMT.
4. Harima plant, located in Harima City, Hyougo Prefecture (near Kobe), is owned by Sumitomo Metal Mining Co., Ltd.

Mitsui Metal Mining Co., Ltd. - Miike Plant

1. Located in Fukuoka-Kyushu with annual waelz oxide production of 70,000 WMT.
2. Currently producing 25,000 DMT of ZNO and supplying Hachinohe plant where zinc metal is recycled.
3. Hachinohe plant, located in Aomori Prefecture, is jointly owned by Mitsui (main portion), Sumitomo, Toho and Mitsubishi.

Himeji Steel Refining Co., Ltd.

1. Plant is located in Himeji Prefecture with annual waelz oxide production of 48,000 WMT.
2. Currently producing 17,000 DMT ZNO and supplying Harima plant and Hachinohe plant where zinc metal is recycled.
3. Himeji Steel Refining Co. is jointly owned by several electric furnace steel producers in Himeji Prefecture area.

Soutetsu Metal Co., Ltd.

1. Plant is located in Aizu City / Fukushima Prefecture) with annual waelz oxide production of 50,000 WMT.
2. Currently producing 17,000 DMT ZNO, mainly for own consumption to generate powder zinc oxide with balance being sold to Hachinohe plant.

Ryouhou Recycle Co., Ltd.

1. Plant is located in Onahama / Fukushima Prefecture) with annual waelz oxide production of 50,000 WMT.
2. Owned by Toho Zinc Co., Ltd.
3. In addition to recycling zinc, they are also recycling cadmium and lead.

We hope this information proves helpful to you.

Best regards,

Ling Wong

EXHIBIT 10

Typical Mined Zinc Concentrate Assays
(% weight unless noted)

Constituent	ZCA/Balmat	Iscay Cruz	Minnova/Quebec	Red Dog	Asarco/Leadville	San Vicente
Zn	54-57	54.9	51	54-57	48-50	61
S (total)	29.5-32.5	33.3	33.3	31-33	30-32	32
Fe	4.6-6.0	8.7	10.8	4.5-6.0	10.5-11.5	1.5
SiO_2	1.0-2.0	1.2	1.2	3.0-3.6	-	0.2
MgO	0.5-1.3	0.10	0.03	0.01-0.03	-	0.7
Pb	0.3-0.9	0.3	0.05	2-4	1.4-1.6	1.1
CaO	0.4-1.0	0.1	0.04	0.05-0.10	-	1.2
Cu	0.03-0.2	0.3	0.9	0.07-0.10	0.4-0.6	0.04
Cd	0.10-0.14	0.09	0.14	0.25-0.35	0.25-0.3	0.15
Ni	<0.001	<0.002	0.02	0.003-0.007	-	--
Ti	<0.001	<0.005	--	0.002-0.004	-	--
Cl	<0.01	<0.01	8 ppm	0.01-0.02	-	0.2
Al_2O_3	<0.03	0.1	0.3	0.05-0.50	-	0.04
Mn	0.10	0.04	0.03	0.001-0.008	-	-
As	<0.02	0.02	194 ppm	0.03-0.08	0.01	0.04
Cr	-	--	20 ppm	0.01-0.04	-	0.009
Hg	0.017	5 ppm	0.7 ppm	50-120 ppm	<0.01	1 ppm
Ag	40g/MT	1.64 oz/t	15.7 g/MT	3.0-4.0 oz/t	3.5-5 oz/t	38 g/MT
Sn	<0.005	0.005	380 ppm	0.002-0.007	-	0.009
F	0.04	<0.01	12 ppm	0.002-0.005	-	100 g/MT

Source: ZCA and zinc concentrate brokers

EXHIBIT 11

ILLINOIS POLLUTION CONTROL BOARD
April 15, 1999

IN THE MATTER OF:	)	
	)	
PETITION OF BIG RIVER ZINC	)	AS 99-3
CORPORATION FOR AN ADJUSTED	)	(Adjusted Standard - RCRA)
STANDARD UNDER 35 ILL. ADM. CODE	)	
720.131(c)	)	

LEE R. CUNNINGHAM AND RICHARD M. SAINES OF GARDNER, CARTON & DOUGLAS APPEARED ON BEHALF OF PETITIONER; and

CHRISTOPHER P. PERZAN APPEARED ON BEHALF OF THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY.

OPINION AND ORDER OF THE BOARD (by K.M. Hennessey):

Petitioner Big River Zinc Corporation (BRZ) operates an electrolytic zinc refinery in Sauget, St. Clair County, Illinois. BRZ uses various zinc-containing materials as feedstock for its refinery. One of the zinc-containing materials that BRZ would like to use is recovered from dust emitted from electric arc furnaces used to produce steel. This secondary zinc oxide material would ordinarily be considered a "solid waste" and a "hazardous waste" under the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§ 6901 *et seq.*, and corresponding Illinois hazardous waste laws and regulations. BRZ would like to use this secondary zinc oxide material without becoming subject to Illinois' hazardous waste requirements.

To that end, BRZ has filed a petition for an adjusted standard under 35 Ill. Adm. Code 720.131(c). Section 720.131(c) allows the Board to determine that certain materials are not solid wastes, and therefore not hazardous wastes, if they meet certain criteria. BRZ asserts that zinc oxide material recovered from electric arc furnace dust (EAF dust) by a high temperature metals recovery process meets these criteria. BRZ also proposes several conditions on the adjusted standard. The Illinois Environmental Protection Agency (IEPA) recommends that the Board grant the adjusted standard, subject to certain conditions.

The Board finds that BRZ has established that zinc oxide material recovered from EAF dust by a high temperature metals recovery process is not a solid waste. The Board therefore grants BRZ's petition for an adjusted standard, subject to the conditions set forth in the order that follows this opinion.

PROCEDURAL HISTORY

On September 24, 1998, BRZ filed a petition for an adjusted standard, subject to conditions. On October 15, 1998, the Board accepted this matter for hearing and on

October 16, 1998, IEPA filed a response to the petition. In that response, IEPA recommended that the Board grant BRZ's request for an adjusted standard with conditions, subject to certain additional conditions. On October 27, 1998, BRZ filed a reply in which it proposed new and modified conditions on the adjusted standard, including the conditions that IEPA requested.[1]

Hearing Officer John Knittle held a hearing on the adjusted standard petition on December 17, 1998. BRZ presented one witness, whom the hearing officer found to be credible. BRZ also introduced four exhibits, each of which the hearing officer admitted.[2] At hearing, BRZ proposed to amend one of the conditions it had proposed for the adjusted standard. Tr. at 5-6; Exh. 4. Counsel for IEPA stated at hearing that IEPA agreed to all of the conditions that BRZ had proposed both before and at hearing. Tr. at 24. IEPA offered no testimony or exhibits. The parties chose not to file posthearing briefs.

LEGAL FRAMEWORK

The status of materials as "solid wastes" is significant because under the laws and regulations that Congress and the United States Environmental Protection Agency (USEPA) have established, only those materials that are "solid wastes" can be regulated as "hazardous wastes" under RCRA and corresponding Illinois hazardous waste laws and regulations. Accordingly, materials that are not solid wastes are not subject to Illinois' hazardous waste regulations, which impose various requirements on persons who generate, treat, store, dispose, recycle, or transport hazardous waste. See 35 Ill. Adm. Code 722-726, 728.

Generally, a solid waste is any discarded material. See 35 Ill. Adm. Code 721.102. A solid waste is a hazardous waste if it exhibits a "characteristic" of hazardous waste (*i.e.*, it is toxic, corrosive, ignitable, or reactive) or if it is "listed" as hazardous waste (*e.g.*, it comes from a specific type of process, such as electroplating). See 35 Ill. Adm. Code 721.103, 721, Subparts C and D.

BRZ would like to reclaim zinc from zinc oxide material that has been recovered from EAF dust without becoming subject to Illinois' hazardous waste regulations. Exh. 3 at 2, 21. BRZ asks the Board to determine that zinc oxide material recovered from EAF dust with a high temperature metals recovery process, which the Board will refer to as "EAF zinc oxide," is not a solid waste. BRZ seeks this determination under 35 Ill. Adm. Code 720.131(c). That provision establishes standards and criteria for the Board to use in determining whether certain materials are not solid wastes. See 35 Ill. Adm. Code 720.130(c). Section 720.131(c) reads as follows:

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[1] BRZ's petition, which was entered into evidence at hearing as an exhibit, is cited as "Exh. 3 at _." The parties treat BRZ's reply as part of the petition and the Board will consider it as if it was entered into evidence at hearing with the petition. However, for clarity, the Board cites BRZ's reply as "Reply at _." IEPA's response is cited as "Resp. at _."

[2] The transcript of the hearing is cited as "Tr. at _." Hearing exhibits are cited as "Exh. _."

The Board will determine that those materials that have been reclaimed but must be reclaimed further before recovery is completed are not solid wastes if, after initial reclamation, the resulting material is commodity-like (even though it is not yet a commercial product, and has to be reclaimed further). This determination will be based on the following criteria:

1) The degree of processing the material has undergone and the degree of further processing that is required;

2) The value of the material after it has been reclaimed;

3) The degree to which the reclaimed material is like an analogous raw material;

4) The extent to which an end market for the reclaimed material is guaranteed;

5) The extent to which the reclaimed material is handled to minimize loss; and

6) Other relevant factors. 35 Ill. Adm. Code 720.131(c).

FINDINGS OF FACT

In this section of the opinion, the Board sets forth its findings of fact regarding (1) zinc, (2) BRZ's current operations, (3) EAF dust, (4) EAF zinc oxide, and (5) BRZ's proposed operations.

Zinc

In 1997, the total world production and consumption of zinc was approximately 8.5 million tons. Zinc can be used to galvanize products; to produce brass; to create alloys used to produce such items as door handles and carburetor parts; to create chemicals such as zinc powder for alkaline batteries and zinc oxide; to coat steel; and for various other uses. Exh. 3 at 3, Att. B at 5. The average annual growth in consumption of zinc in the western world was 2.4% from 1988 to 1997. Exh. 3, Att. B at 1. The price of zinc is established by supply and demand on the London Metals Exchange (LME). Exh. 3 at 3.

BRZ's Current Operations

BRZ's Products

BRZ operates an electrolytic zinc refinery in Sauget, St. Clair County, Illinois. Exh. 3 at 1, 7. BRZ currently produces approximately 105,000 tons of zinc per year. Exh. 3, Att. J at 2.

parts, and produce zinc oxide (*e.g.* Exh. 3, Att. J at 2. BRZ

pound logs for large galvanizing lines. BRZ produces special high grade quality zinc (99.995% zinc), which is the most widely recognized standard for zinc. Depending on customer specifications, BRZ also debases its special high grade zinc to produce alloys that Exh. 3 at 19. BRZ has long-term end markets for all of its products. Att. N.

BRZ's Process

BRZ recovers zinc from two types of materials, the first of which is zinc sulfide concentrates that are mined. BRZ also recovers zinc from secondary zinc oxide material. Secondary zinc oxide material is a by-product of other industries that use zinc, including steel mills, brass mills, brass and bronze ingot factories, and galvanizers. The mined zinc sulfide concentrates arrive as wet filter cake; the secondary zinc oxide material arrives as wet filter cake or as dry material in "supersacks." Exh. 3 at 2, 4, 10-11, 14, 17, 20, Att. J at 2.

In the first step of BRZ's process, BRZ may use an acid solution to remove magnesium from the zinc sulfide concentrates to prepare them for further processing. Exh. 3 at 10-11. Secondary zinc oxide material does not require this initial step. Exh. 3 at 10-11, 17-18, Att. H, J at 2-3.

BRZ then processes zinc sulfide concentrates and secondary zinc oxide material in a fluid bed roaster. The roasting step removes sulfur from the feed material. Exh. 3 at 12, 19, Att. J at 2. BRZ then leaches the roasted material to separate zinc and various other metals. From the slurry that results, BRZ filters the solids, and puts the remaining solution through four purification stages. The purification process yields a purified zinc sulfate solution from which zinc is recovered through an electrolytic process. The electrolytic process yields zinc cathodes that are of special high grade quality (99.995% pure zinc). BRZ then melts the cathodes into one of six shapes for delivery to customers. Exh. 3 at 12-13, 19.

BRZ's refining process produces a number of by-products, including sulfuric acid, lead-silver concentrate, copper cement, copper-cobalt concentrate, cadmium oxide, and zinc sulfate monohydrate. BRZ has long-term end markets for these by-products. Exh. 3 at 12-13, 19-20.

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[3] In this opinion, when the Board refers to a percentage of a constituent in a material, it does so by weight.

EAF Dust

EAF dust is a source of secondary zinc oxide material. EAF dust is generated in electric arc furnaces, which produce steel by heating steel scrap. These furnaces emit gases that contain EAF dust. Air pollution control equipment in these furnaces removes EAF dust from the gases. These furnaces generated approximately 900,000 tons of EAF dust in the United States in 1997. Exh. 3 at 5, 13-14.

EAF dust is composed of approximately 20% to 30% iron and 15% to 30% zinc. It also includes other constituents such as lead, cadmium, chloride, fluoride, aluminum, calcium, potassium, magnesium, manganese, sodium, and silica. Because of its high iron content and other impurities, zinc cannot be recovered directly from EAF dust in most, if not all, zinc smelting and refining operations. Exh. 3 at 5, 13-14.

In 1996, nearly 40% of the EAF dust generated in the United States was disposed of in landfills. Exh. 3 at 6. It costs approximately $80 per ton to dispose of EAF dust. Exh. 3 at 16.

EAF Zinc Oxide

High Temperature Metals Recovery

While zinc cannot be recovered directly from EAF dust in most zinc smelters and refineries, zinc oxide material recovered from EAF dust can be processed in zinc smelters and refineries. Zinc oxide material can be recovered from EAF dust when the dust is put through a high temperature metals recovery (HTMR) process. HTMR units include rotary kilns, rotary hearth furnaces, plasma furnaces, and electric furnaces. Exh. 3 at 6-7, 10, Att. F, H.

HTMR processing increases the levels of zinc, lead, and cadmium in EAF dust. These changes are desirable in the zinc refining process. HTMR processing also lowers the levels of constituents that are considered contaminants in the zinc refining process (*e.g.*, iron, calcium, magnesium, alumina), except for sodium, chloride, fluoride, and potassium. Exh. 3 at 10, 18, Att. H.

In 1994, approximately 1.2 million tons of EAF dust per year was processed worldwide, mostly to produce zinc oxide material. Exh. 3 at 18, Att. L. EAF dust processing is done in a variety of HTMR units and the resulting zinc oxide material is sold primarily to produce zinc, but also to produce zinc chemicals. Exh. 3 at 18, Att. L. Several facilities in the United States produce or are capable of producing EAF zinc oxide. Exh. 3 at 6, 18, Att. L, M. Markets for EAF zinc oxide exist in North America, Asia, and Europe. Exh. 3 at 19. Once EAF dust has been through the HTMR process, the value of the resulting zinc oxide material approaches the value of mined zinc sulfide concentrates (currently $250 to $300 per ton). Exh. 3 at 8, 16-17, 21.

BRZ would like to purchase EAF zinc oxide. Tr. at 13; Exh. 3 at 1-2, 6. BRZ intends to use the material as feedstock for its zinc refinery. Exh. 3 at 1, 8. EAF zinc oxide can substitute for and supplement mined zinc sulfide concentrates. Exh. 3 at 2, 14. After washing EAF zinc oxide (described below), BRZ plans to use the material in the same manner it uses the mined zinc sulfate concentrates. The products and by-products from EAF zinc oxide would be essentially indistinguishable from those of the mined materials. Exh. 3 at 16, 19, 21.

Not all zinc oxide material recovered from the HTMR processing of EAF dust would be suitable feed for BRZ's refinery. Exh 3. at 7. To be economical for BRZ, EAF zinc oxide must meet the following specifications (on average):

> 50% zinc;

< 20% lead;

< 5% iron;

< 4% total gangue materials (silica plus calcium plus magnesium); and

< 2% chloride or capable of being water washed to achieve < 2% chloride.
Exh. 3 at 7.

For BRZ to be able to wash EAF zinc oxide to < 2% chloride, the feed should arrive at BRZ's facility with < 13% chloride. Reply at 5-6, Att. O. In addition, BRZ could accept EAF zinc oxide produced during the three-month start-up period of an HTMR unit with up to 7% iron. Tr. a 5-6; Exh. 4.

<u>AmeriSteel, Inc.'s HTMR Process</u>

One of the companies that processes EAF dust with an HTMR unit is AmeriSteel, Inc. (AmeriSteel). AmeriSteel is a steel manufacturer located in Jackson, Tennessee. AmeriSteel's HTMR unit is a rotary hearth furnace. Exh. 3 at 8-9.

To process EAF dust, AmeriSteel first mixes the dust with a source of carbon (commercial grade coal or coke purchased on the open market) to form briquettes. The carbon acts as a reducing agent. AmeriSteel places the briquettes in the rotary hearth furnace to recover both zinc oxide material and an iron material. Materials that volatilize at lower temperatures vaporize and leave the furnace in a gas stream. These materials then oxidize, form a solid, and are collected in an air pollution control device called a baghouse. This material collected in the baghouse is EAF zinc oxide. Tr. at 18-19; Exh. 3 at 9-10; Reply at 3, Att. P. Once AmeriSteel achieves full capacity, it is expected to produce approximately 9,600 tons per year of EAF zinc oxide from the 24,000 tons of EAF dust that Ameristeel generates annually. Exh. 3 at 10.

AmeriSteel's EAF Zinc Oxide

AmeriSteel's HTMR process increases the zinc content of EAF dust from 20-25% to 59.5%, increases the lead content from 3% to 7.5%, increases the cadmium content from 0.05% to 0.1%, and decreases the iron content from 19-24% to 0.1%. AmeriSteel's HTMR process lowers the levels of constituents that are considered contaminants in BRZ's refining process, except for sodium, chloride, fluoride, and potassium. Exh. 3 at 10, 18, Att. H, K.

BRZ has determined that, except for the chloride level of the material, AmeriSteel's EAF zinc oxide is an ideal feed for its zinc refinery. Exh. 3 at 8. Ameristeel's EAF zinc oxide is chemically similar to mined zinc oxide and zinc sulfide concentrates:

Constituent	Mined Concentrates		AmeriSteel's EAF Zinc Oxide
	Zinc Oxide	Zinc Sulfide	
% zinc	54	59.1	59.5
% lead	4.9	1.2	7.5
% cadmium	0.38	0.5	0.1
% iron	2.5	1.5	0.1
% copper	0.02	0.3	0.1
% sulfur	<1	31	<1
% arsenic	.7	<0.02	<0.01
% calcium	2.4	1	0.05
% silica	14.8	0.8	0.02
% magnesium	0.6	0.4	0.01
% alumina	2.7	0.1	0.02
% sodium	N/A	<0.02	3
% chloride	0.07	<0.1	8
% fluoride	0.03	0.05	0.15

Exh. 3 at 14, 17, Att. D, H, K. With the exception of chloride and fluoride, AmeriSteel's EAF zinc oxide also meets typical zinc refiner specifications for zinc sulfide concentrate blends and falls within the range of secondary feed specifications that zinc refiners have established. Exh. 3, Att. F, H, K.

EAF zinc oxide produced by AmeriSteel and others has levels of zinc comparable to that of mined concentrates. Exh. 3 at 17, Att. D, H, K. If used in BRZ's refining process, EAF zinc oxide would have chemical advantages and disadvantages compared to mined concentrates. The primary advantages of EAF zinc oxide are that it is higher in lead than mined concentrates and lower in sulfur than mined zinc sulfide concentrates. AmeriSteel's EAF zinc oxide has the additional advantage of being lower in iron than mined concentrates. Exh. 3 at 14, 17-18, Att. D, H, J at 3, K.

EAF zinc oxide has two primary disadvantages when compared to mined concentrates. First, EAF zinc oxide has higher levels of sodium, chloride, fluoride, and potassium, which are present as inorganic salts. While EAF zinc oxide can be introduced directly to BRZ's roaster, inorganic salts in the material could corrode BRZ's refining equipment if their levels are not first reduced. However, as discussed below, BRZ plans to wash EAF zinc oxide to reduce its levels of inorganic salts. Tr. at 13-17; Exh. 3 at 11, 14, 17-18, Att. D, H, J at 3, K.

The second primary disadvantage of EAF zinc oxide is that it may be in the form of dry dust rather than wet filter cake. Exh. 3 at 14. The dry dust is more difficult to handle. Exh. 3 at 14. Att. J at 3. As discussed below, however, BRZ's washing process will turn this dry dust into wet filter cake that BRZ can then put through its refinery equipment.

BRZ's Proposed Operations

EAF zinc oxide is expected to arrive at BRZ's Sauget facility in the form of dry dust. BRZ plans to keep the dry EAF zinc oxide totally enclosed from unloading until washing. BRZ has designed a material handling/wash system to handle that material. Exh. 3 at 14, 20, Att. J at 3-4. On September 22, 1998, IEPA granted BRZ an air pollution control permit to construct the system. The construction permit limits emissions of particulate matter from the handling/wash facility to 1.68 tons per year. Exh. 2; Exh. 3, Att. J.

Dry secondary zinc oxide material is expected to arrive at BRZ's Sauget facility in bulk or in supersacks. Approximately 90% of this material is expected to arrive by rail. BRZ plans to unload railcars of the bulk material through ventilated air slides to silos equipped with High-Efficiency Particulate Air (HEPA) filters. Ultimately, BRZ plans to add four silos, each with a capacity of 1.5 railcars. BRZ proposes to locate the silos on concrete or asphalt pads that BRZ could wash into a sump. BRZ plans to pump the sump contents into the washing process. Exh. 3 at 15, Att. J at 4.

Supersacks of the material are expected to arrive by boxcar or truck. BRZ plans to leave supersacks in boxcars for intermediate storage. The boxcars would be unloaded at a covered loading dock that is to be attached to the washing plant. Supersacks that arrive by truck would be stored inside the washing plant. BRZ would be able to store approximately 150 tons of that material inside the washing plant. Exh. 3 at 15, Att. J at 4.

BRZ plans to use a truck to move the supersacks to a supersack discharge station to empty them. BRZ proposes to maintain the discharge station under negative pressure to avoid fugitive emissions. BRZ would vent the discharge station through a baghouse to collect any secondary zinc oxide material. Exh. 3 at 15, Att. J at 5.

BRZ proposes to convey the secondary zinc oxide material (from the silos and the supersack discharge station) in an enclosed, ventilated conveyor (or by pneumatic conveyor) to a tank where BRZ would mix the material with water. BRZ proposes to pump the resulting slurry into a washing tank. BRZ plans to add soda ash to the washing tank to raise the pH to a level that would not dissolve zinc and other heavy metals but would dissolve the inorganic salts that could corrode BRZ's refining equipment. Exh. 3 at 11, 15-16, Att. J at 5.

After washing, BRZ proposes to create wet filter cake by removing water from the slurry with a pressure filter. BRZ plans to transport the filter cake by enclosed conveyor belts to the concentrate storage building. In the concentrate storage building, BRZ would blend the washed secondary zinc oxide material with zinc sulfide concentrates to create feed for the roaster, after which the material would go through the refining process outlined on page four of this opinion. Exh. 3 at 15-16, Att. J at 5.

Some producers of EAF zinc oxide may wash the material before delivering it to BRZ. In that case, the material would arrive at BRZ's Sauget facility as wet filter cake, which BRZ can handle in the same manner that it currently handles filter cake feed material. Tr. at 14-15; Exh. 3 at 14, 20. Typically, the largest suppliers of secondary zinc oxide material either wash the material at their facilities to produce wet filter cake or ship the material as dry dust in pneumatic trailers. Smaller suppliers typically package the secondary zinc oxide material in supersacks. Exh. 3, Att. J at 4.

BRZ's Proposed Contract With AmeriSteel

BRZ and AmeriSteel have reached agreement on contract terms under which BRZ plans to buy AmeriSteel's full production of EAF zinc oxide. Tr. at 17-18; Exh. 3 at 8, Att. G at 1. AmeriSteel's full monthly production is estimated to be approximately 800 tons. Exh. 3, Att. G. Under the contract, the price of EAF zinc oxide is based on a percentage of its zinc content and the LME price for zinc. Exh. 3, Att. G at 2. Because EAF zinc oxide can substitute for and supplement BRZ's mined zinc sulfide concentrates, BRZ would pay AmeriSteel a high percentage of what it would normally pay for mined zinc sulfide concentrates. Exh. 3 at 8, 17. BRZ is willing to pay a price for EAF zinc oxide that far exceeds its cost of freight. Tr. at 13; Exh. 3 at 17.

The AmeriSteel contract would be effective upon execution and continue until December 31 of the year following the year in which BRZ begins commercial operation of its washing plant. Thereafter, the contract would continue from year to year "with annual negotiation of the terms to reflect current market conditions." Exh. 3, Att. G at 1-2. As proposed, either party could cancel the contract by giving the other party 180 days notice of cancellation. Exh 3, Att. G at 2. AmeriSteel has indicated that it will not execute the contract "until all regulatory issues have been resolved, including this adjusted standard proceeding." Tr. at 17-18; Exh. 3 at 9.

DISCUSSION

In this section, the Board first discusses whether EAF zinc oxide is a solid waste. The Board then discusses whether the provision under which BRZ seeks this determination is available in this case. Next, the Board evaluates each of the factors upon which this determination is based. Lastly, the Board discusses the conditions that apply to this determination.

Status of EAF Zinc Oxide

Section 720.131(c) allows the Board to determine that certain materials that would otherwise be solid wastes are not solid wastes if certain conditions are met. Therefore, the Board initially must determine that EAF zinc oxide is a solid waste; if it is not, BRZ has no need for an adjusted standard.

A "solid waste" is any discarded material not otherwise excluded in the regulations. See 35 Ill. Adm. Code 721.102(a)(1). One of the several ways that a material may be considered "discarded" is by being "recycled" in a manner specified in Section 721.102(c) of the regulations. See 35 Ill. Adm. Code 721.102(a)(2). Section 721.102(c)(3) specifies, in part, that if a "listed sludge" is recycled by being "reclaimed," it is a solid waste. See 35 Ill. Adm. Code 721.102(c)(3) and 721.Appendix Z.[4]

The Board finds that EAF zinc oxide fits within this category. First, EAF zinc oxide is considered a "listed sludge." A "sludge" includes a "solid . . . waste generated from [an] . . . air pollution control facility . . . ." 35 Ill. Adm. Code 721.101(c)(2); 35 Ill. Adm. Code 720.110. EAF dust, from which EAF zinc oxide is recovered, is generated from an air pollution control facility and is therefore a sludge. Furthermore, EAF dust is "listed" because it is listed as a hazardous waste from a specific source under 35 Ill. Adm. Code 721.132 (listing emission control dust/sludge from the primary production of steel in electric furnaces as hazardous waste K061).

While this listing applies to EAF dust rather than EAF zinc oxide, Sections 721.103(c)(2)(A) and (d)(2) further provide that a material derived from the treatment of a listed hazardous waste is itself the listed hazardous waste. See 35 Ill. Adm. Code 721.103(c)(2)(A) and (d)(2). USEPA, which promulgated the federal regulations upon which these regulations are based, explains that "all of the residues from treating the original listed wastes are likewise considered to be the listed waste . . . ." 54 Fed. Reg. 1056, 1063 (Jan. 11, 1989). Therefore, EAF zinc oxide is also considered a listed sludge.[5]

Second, the Board finds that EAF dust and the resulting EAF zinc oxide are being recycled by reclamation. A material is "reclaimed" if it is:

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[4] For a detailed discussion of how materials become solid wastes, please refer to Petition of Chemetco, Inc. for Adjusted Standard From 35 Ill. Adm. Code 720.131(a) and (c) (March 19, 1998), AS 97-2, slip op. at 11-12.

[5] Compare Petition of Recycle Technologies, Inc. for an Adjusted Standard Under 35 Ill. Adm. Code 720.131(c) (September 3, 1998), AS 97-9, slip op. at 7-8 (if used antifreeze (spent material that is not a listed hazardous waste) is a characteristic hazardous waste, the initially but yet to be completely reclaimed material derived from that used antifreeze is a hazardous waste only if it exhibits a characteristic of hazardous waste).

processed to recover a usable product, or if it is regenerated. Examples are recovery of lead values from spent batteries and regeneration of spent solvents. 35 Ill. Adm. Code 721.101(c)(4).

When USEPA promulgated the federal regulation upon which this regulation is based, it explained that materials are reclaimed if "material values . . . are recovered as an end-product of a process (as in metal recovery from secondary materials)" or if they are "processed to remove contaminants in a way that restores them to their usable original condition." 50 Fed. Reg. 614, 633 (Jan. 4, 1985). The Board finds that EAF dust that is processed by HTMR into zinc oxide material is being "reclaimed." The Board also finds that EAF zinc oxide that is washed to remove contaminants (inorganic salts) is being "reclaimed." See 35 Ill. Adm. Code 721.101(c)(4). Because EAF zinc oxide is a listed sludge that is recycled by being reclaimed, it is a solid waste.

Availability of Section 720.131(c)

Generally, a waste being reclaimed remains a waste until reclamation is completed. See 50 Fed. Reg. 614, 620, 633-634, 655 (Jan. 4, 1985). Section 720.131(c) provides an exception to this principle for material that is initially reclaimed, but that requires further reclaiming before recovery is completed.

In discussing the federal counterpart to Section 720.131(c), USEPA explains that the provision is designed to address those situations in which "the initial reclamation step is so substantial that the resulting material is more commodity-like than waste-like even though no end-product has been recovered." 50 Fed. Reg. 614, 655 (Jan. 4, 1985).

The Board finds that EAF dust that has been processed in an HTMR unit has been initially but not fully reclaimed. HTMR processing increases the eventual recovery of zinc, lead, and cadmium values from EAF dust. HTMR processing also decreases the levels of materials that are considered contaminants in BRZ's refining process, such as iron, calcium, magnesium, and alumina. However, EAF zinc oxide requires further processing to recover end products. First, BRZ must wash the EAF zinc oxide to remove inorganic salts before it can be roasted in BRZ's roaster. BRZ then must put the washed material through its refining process, during which BRZ would roast, leach, purify, and further recover the material. The refining process recovers various metals, including a special high grade quality zinc.

The Board finds that Section 720.131(c) is available in this case because once EAF dust has been processed in an HTMR unit to create EAF zinc oxide, it has been initially but not completely reclaimed.

Section 720.131(c) Factors

The Board must determine whether EAF zinc oxide is commodity-like based on the Section 720.131(c) factors set forth on page three of this opinion. The Board finds that EAF zinc oxide is commodity-like based on these factors. The Board addresses these factors in turn.

The Degree of Processing the Material has Undergone and the Degree of Further Processing That is Required

When explaining the federal counterpart to Section 720.131(c), USEPA stated, "the more substantial the initial processing, the more likely the resulting material is to be commodity-like." 50 Fed. Reg. 614, 655 (Jan. 4, 1985). Here, the initial processing is HTMR. HTMR is a physical and chemical process that is performed in certain equipment, such as a rotary kiln, rotary hearth furnace, plasma furnace, or electric furnace.

HTMR processing of EAF dust can more than double the levels of zinc in EAF dust, and it can substantially increase its levels of lead and cadmium. The increased concentrations of these metals are desirable for BRZ's refining process. HTMR processing also reduces the levels of numerous undesirable constituents in EAF dust. Without HTMR processing, EAF dust is not suitable to directly produce zinc in most, if not all, zinc smelting and refining operations. HTMR processing increases the value of EAF dust from a negative $80 per ton (its cost of disposal) to a value that approaches the value of mined zinc sulfide concentrates (currently $250 to $300 per ton).

After undergoing HTMR processing, EAF dust can be refined directly. However, BRZ proposes to wash EAF zinc oxide to reduce the inorganic salts that could corrode BRZ's refining equipment. After washing the material, BRZ plans to roast, leach, purify, and further process the material. This refining process recovers various metals, including a special high grade quality zinc.

BRZ and IEPA maintain that EAF zinc oxide will be fully reclaimed after the wash, *i.e.*, that the wash alone constitutes all of the "further processing that is required." BRZ and IEPA view the washed EAF zinc oxide as a product, not a waste, and thus do not view the subsequent refining as relevant to this factor. Exh. 3 at 13-16; Resp. at 3-4. In support of its position, BRZ introduced a letter from the State of Tennessee Department of Environment and Conservation that indicates that secondary zinc oxide material recovered by HTMR processing is fully reclaimed without any washing. See Exh. 3, Att. A. The Board notes, however, that USEPA guidance indicates that putting secondary zinc oxide material derived from K061 through an electrolytic zinc refining process constitutes further reclamation under RCRA. See RCRA Permit Policy Compendium, 9444.1994 (09) (December 19, 1994 letter to Paul R. DiBella from David Bussard, Director, Characterization and Assessment Division, Office of Solid Waste and Emergency Response, USEPA). This USEPA guidance suggests that the subsequent refining is relevant to this factor.

The Board finds that even if the subsequent refining is relevant, the HTMR processing is substantial, both in terms of the process itself and its effect on EAF dust. The Board therefore finds that this factor supports BRZ's claim that EAF zinc oxide is commodity-like.

The Value of the Material After It Has Been Reclaimed

USEPA states that "the more valuable a material is after initial processing, the more likely it is to be commodity-like." 50 Fed. Reg. 614, 655 (Jan. 4, 1985). As noted above, once EAF dust has been through the HTMR process, the value of the resulting secondary zinc oxide material approaches the value of mined zinc sulfide concentrates. BRZ and AmeriSteel have reached agreement on contract terms and the price of EAF zinc oxide is to be based on a certain percentage of the zinc content of the material and the LME price for zinc. BRZ would pay AmeriSteel a high percentage of what BRZ would normally pay for mined zinc sulfide concentrates. BRZ is prepared to pay a price for EAF zinc oxide that far exceeds its cost of freight.

The Board finds that EAF zinc oxide has significant value.

The Degree To Which the Reclaimed Material is Like an Analogous Raw Material

According to USEPA, "[i]f the initially-reclaimed material can substitute for a virgin material, for instance as a feedstock to a primary process, it is more likely to be commodity-like." 50 Fed. Reg. 614, 655 (Jan. 4, 1985). EAF zinc oxide can substitute for zinc sulfide concentrates from mines. While not identical, the two materials are chemically similar. Both materials typically would require some form of contaminant removal before BRZ would introduce them to its roaster (*i.e.*, BRZ processes mined concentrates with an acid solution to remove magnesium; BRZ proposes to wash EAF zinc oxide with a mixture of water and soda ash to reduce levels of inorganic salts). After the wash, BRZ plans to use EAF zinc oxide filter cake in the same manner it uses the filter cake of mined concentrates. The products and by-products from EAF zinc oxide would be nearly identical to those of the mined materials. Aside from its chloride and fluoride levels, AmeriSteel's EAF zinc oxide meets the specifications of a typical zinc refiner for zinc sulfide concentrate blends.

The Board finds that EAF zinc oxide is very similar to mined zinc sulfide concentrates and can be substituted for the mined concentrates.

The Extent To Which an End Market for the Reclaimed Material is Guaranteed

In discussing this factor, USEPA states:

> If the [petitioner] can show that there is an existing and guaranteed end market for the initially-reclaimed material (for instance, value, traditional usage or contractual arrangements), the material is more likely to be commodity-like. 50 Fed. Reg. 614, 655 (Jan. 4, 1985).

In this case, the evidence established that EAF zinc oxide is sold primarily to produce zinc, but also to produce zinc chemicals. Several facilities in the United States produce or are capable of producing EAF zinc oxide. There are markets for EAF zinc oxide in North America, Asia, and Europe.

BRZ's contract with AmeriSteel would provide another end market for the EAF zinc oxide that AmeriSteel produces. AmeriSteel's EAF zinc oxide meets specifications necessary for BRZ to economically process the material. With the exception of chloride and fluoride, AmeriSteel's EAF zinc oxide also meets typical zinc refiner specifications for zinc sulfide concentrate blends and falls within the range of secondary feed specifications that zinc refiners have established. BRZ also established that there are end markets for its products and by-products. These factors corroborate that a market for feed material exists.

The Board finds that there is an end market for EAF zinc oxide.

The Extent To Which the Reclaimed Material is Handled to Minimize Loss

USEPA states that the "more carefully a material is handled, the more it is commodity-like." 50 Fed. Reg. 614, 655 (Jan. 4, 1985). Typically, the largest suppliers of secondary zinc oxide material either wash it themselves and deliver it as wet filter cake (which BRZ can handle as it currently handles filter cake feed material) or ship the material as dry dust in pneumatic railcars. Smaller suppliers typically package the secondary zinc oxide material in supersacks.

BRZ proposes to handle dry secondary zinc oxide material, which is expected to arrive in bulk or in supersacks, in a totally enclosed facility. Railcars of the bulk material are to be unloaded through ventilated air slides to silos with HEPA filters. The silos are to be on concrete or asphalt pads with sumps to transfer any spillage to the washing process. Supersacks of the material are to be stored in enclosed areas and emptied under negative pressure in a discharge station with air filters. IEPA issued an air pollution control construction permit that limits emissions of particulate matter from the handling/wash facility to 1.68 tons per year.

The Board also notes that producers of EAF zinc oxide and BRZ have financial incentives not to lose the material: if producers lose the material, they have less to sell to BRZ; if BRZ loses the material, it has less feedstock for its refinery.

The Board finds that EAF zinc oxide will be handled to minimize loss.

Other Relevant Factors

The Board will not consider any additional factors based on this record. When discussing Section 720.131(c)(6), BRZ states that the grant of an adjusted standard will encourage the recycling of EAF dust and decrease the amount of the material that is landfilled. Exh. 3 at 21; Reply at 3. While the Board encourages recycling, the Board may consider "other relevant factors" only to the extent that they are relevant to whether EAF zinc oxide is commodity-like. BRZ has not established that an increase in EAF dust recycling is relevant to that question.

Board Determination

The Board finds that BRZ has established that EAF zinc oxide is commodity-like. Accordingly, the Board determines that EAF zinc oxide is not a solid waste.

Conditions on the Adjusted Standard

The Board will first set forth the conditions that BRZ proposes on the adjusted standard, and then set forth the Board's findings on those conditions.

BRZ's Proposed Conditions

BRZ proposes the following conditions on the adjusted standard, which it amended to reflect the conditions that IEPA requested:

a. The materia' accepted shall consist of zinc oxide reclaimed from EAF dust (K061) using an HTMR process;

b. The material accepted shall meet the following specifications as monthly averages[:]

    (1) > 50% zinc;

    (2) < 20% lead;

    (3) < 5% iron;

    (4) < 4% total gangue materials (silica plus calcium plus magnesium); and

    (5) < 13% chloride; provided, however, that the material accepted may contain up to 7% iron for a period of up to three months during the start-up of the process producing the materials;

c. BRZ shall maintain records which document the sources of the reclaimed zinc oxide and which are adequate to demonstrate that the materials accepted meet the specifications set forth in Condition b, above; and

d. BRZ shall maintain the records required under Condition c, above, for a period of three years and shall make such records available for inspection and copying at any reasonable time during normal business hours upon request by Illinois EPA.

Tr. at 5-6; Exh. 4; Reply at 6.

BRZ proposes to "take representative samples from the shipments of reclaimed zinc oxide . . . and composite them on a monthly basis." Reply at 5. BRZ would analyze the monthly composites for zinc, lead, iron, chloride, silica, calcium, and magnesium to determine compliance with its proposed specifications. *Id.* BRZ maintains that it should be able to "accept the infrequent individual shipment which exceeds these specifications if the normal production of the supplier meets specifications and those shipments can be blended with other shipments such that the blended materials meet the specifications." *Id.* at 4. IEPA has agreed to all of these proposed conditions. Tr. at 24.

Board Findings

BRZ's proposed conditions (b) and (c), and the manner in which BRZ proposes to comply with these conditions, raise a number of questions. Initially, it is unclear how BRZ would composite samples. For example, it is unclear whether a composite of samples from each shipment would be tested individually or whether samples from multiple shipments would be composited for testing. It is also unclear whether samples of shipments from different producers would be composited or whether separate composites would be tested for each producer.

In addition, it does not appear that BRZ would keep shipments of EAF zinc oxide segregated and unprocessed while it awaits test results. Accordingly, if a composite sample exceeds the proposed specifications, it is unclear how BRZ could identify the shipment in order to blend it "such that the blended materials meet the specifications." In addition, by the time BRZ receives test results on a composite sample, BRZ may already have blended the material with other feed material and, in fact, may already have refined the material.

It is also unclear how BRZ ever could violate these conditions of the adjusted standard as BRZ interprets them. If a test shows that material greatly exceeds the specifications, BRZ could comply by simply mixing portions of that material in piecemeal fashion with compliant materials until all of the noncompliant material is used. It is also unclear whether BRZ would have to test the blend to confirm compliance.

These proposed conditions also raise environmental and regulatory concerns. First, if an adjusted standard is granted, RCRA regulations would not apply to the materials during their shipment to BRZ, and during their storage and processing at BRZ. If BRZ could blend noncompliant material (*e.g.*, material that exceeds the lead limit) until the blend met the specifications, transporters would be able to transport in Illinois (and BRZ would be able to handle and store) material that exceeds the specifications without being subject to Illinois' hazardous waste regulations. Likewise, an Illinois producer of EAF zinc oxide with material intended to be shipped to BRZ that exceeds the specifications could handle and store that material without being subject to Illinois' hazardous waste regulations.

Second, the specifications on the contents of EAF zinc oxide relate directly to BRZ's ability to economically use the material. The failure of the material to meet the specifications calls into question the degree of processing that the HTMR unit provided, the value of the material, the degree to which the material is like mined zinc sulfide concentrates, and the extent to which there is an end market for the material. Thus, to the extent that material fails to meet these specifications, the Board would be less likely to find that the material is commodity-like under Section 720.131(c).

In order to protect the environment and to ensure the commodity-like character of EAF zinc oxide that BRZ accepts for processing, the Board will limit the applicability of this adjusted standard to EAF zinc oxide that meets the specifications. Representative samples of each shipment of EAF zinc oxide must be collected, composited, and tested in accordance with generally accepted practices, such as those specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication No. SW-846 (Third Edition).

In addition, the Board's determination applies only to EAF zinc oxide to be processed through BRZ's electrolytic zinc refinery in Sauget, Illinois. BRZ cannot accept the material under the adjusted standard for a different use or for processing at a different facility.

Of course, the Board is not determining the status of EAF zinc oxide intended for BRZ when that material is outside of Illinois. The Board's determination applies only to EAF zinc oxide when it is in Illinois. If EAF zinc oxide is produced outside of Illinois, the composite sampling of each shipment must meet the specifications before the shipment to BRZ enters Illinois.

In addition, the Board's determination applies only to EAF zinc oxide that has arrived at BRZ's Sauget facility or that is under a legally binding contract for sale to BRZ. Without this requirement, an unscrupulous generator of EAF zinc oxide could accumulate the material at its facility and seek to evade Illinois' hazardous waste regulations by claiming that it plans to sell the material to BRZ.

BRZ has several options if it objects to the conditions that the Board has placed on this adjusted standard. First, under the Board's procedural rules, BRZ may move the Board to reconsider the conditions that the Board has placed on this adjusted standard. Second, BRZ may appeal the Board's adjusted standard to the Illinois Appellate Court. Third, BRZ may choose to consider EAF zinc oxide a solid waste in lieu of accepting the material under the conditions of the adjusted standard.

CONCLUSION

The Board finds that BRZ has established that zinc oxide material produced by subjecting EAF dust to an HTMR process is commodity-like. Accordingly, the Board finds that EAF zinc oxide is not a solid waste and grants BRZ's petition under Section 720.131(c) for an adjusted standard, subject to the conditions set forth in this order.

The Board emphasizes that this determination applies only to EAF zinc oxide to be processed through BRZ's electrolytic zinc refinery in Sauget, St. Clair County. That EAF zinc oxide also must meet certain specifications. In addition, this determination applies only to

EAF zinc oxide when it is in Illinois and either at the Sauget facility or under a legally binding contract for sale to BRZ.

This opinion constitutes the Board's findings of fact and conclusions of law in this matter.

ORDER

1. The Board finds that zinc oxide material produced by subjecting electric arc furnace (EAF) dust from the primary production of steel (K061 under 35 Ill. Adm. Code 721.132) to a high temperature metals recovery (HTMR) process is not a solid waste and grants Big River Zinc Corporation (BRZ) an adjusted standard under 35 Ill. Adm. Code 720.131(c).

2. The adjusted standard is subject to the following conditions:

   a. The determination described in paragraph one of this order applies only to zinc oxide material:

      (1) that is to be processed through BRZ's electrolytic zinc refinery in Sauget, St. Clair County, Illinois;

      (2) that is in Illinois;

      (3) that has arrived at BRZ's Sauget, St. Clair County, Illinois facility or that is under a legally binding contract for sale to BRZ; and

      (4) that meets the following specifications by weight:

         (a) >50% zinc;

         (b) <20% lead;

         (c) <5% iron (or <7% iron in material produced by an HTMR unit during the first three months that the HTMR unit produces zinc oxide material from EAF dust from the primary production of steel (K061 under 35 Ill. Adm. Code 721.132));

         (d) <4% total gangue materials (silica plus calcium plus magnesium); and

         (e) <13% chloride;

b. BRZ must maintain records that document the sources of all zinc oxide material that BRZ accepts under this adjusted standard;

c. BRZ must maintain records that demonstrate that each shipment of zinc oxide material that BRZ accepts under this adjusted standard meets the specifications set forth in paragraph 2(a)(4) of this order; for this demonstration, representative samples of each shipment of zinc oxide material must be collected, composited, and tested in accordance with generally accepted practices, such as those specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication No. SW-846 (Third Edition); and

d. BRZ must maintain the records required under paragraphs 2(b) and 2(c) of this order for a period of three years and must make such records available for inspection and copying at any reasonable time during normal business hours upon the Illinois Environmental Protection Agency's request.

IT IS SO ORDERED.

Section 41 of the Environmental Protection Act (415 ILCS 5/41 (1996)) provides for the appeal of final Board orders to the Illinois Appellate Court within 35 days of service of this order. Illinois Supreme Court Rule 335 establishes such filing requirements. See 172 Ill. 2d R. 335; see also 35 Ill. Adm. Code 101.246, Motions for Reconsideration.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, hereby certify that the above opinion and order was adopted on the 15th day of April 1999 by a vote of 7-0.

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board

ILLINOIS POLLUTION CONTROL BOARD
May 6, 1999

IN THE MATTER OF:	)	
	)	
PETITION OF BIG RIVER ZINC	)	AS 99-3
CORPORATION FOR AN ADJUSTED	)	(Adjusted Standard - RCRA)
STANDARD UNDER 35 ILL. ADM. CODE	)	
720.131(c)	)	

ORDER OF THE BOARD (by K.M. Hennessey):

On April 15, 1999, the Board granted petitioner Big River Zinc Corporation (BRZ) an adjusted standard, subject to certain conditions. On April 28, 1999, BRZ moved the Board to reconsider its decision. BRZ also moved the Board to decide the motion to reconsider at the Board's May 6, 1999 meeting. On May 5, 1999, the Illinois Environmental Protection Agency (IEPA) filed a response to the motion to reconsider.

The Board grants BRZ's motion to decide this matter today. The Board also grants BRZ's motion to reconsider and sets forth in this order the modified terms of BRZ's adjusted standard.

BACKGROUND

The Board's findings of fact and conclusions of law are set forth in its opinion of April 15, 1999 and are incorporated here by reference. Below, the Board highlights the facts and proceedings relevant to BRZ's motions.

BRZ operates an electrolytic zinc refinery in Sauget, St. Clair County, Illinois. BRZ uses various zinc-containing materials as feedstock for its refinery. BRZ sought an adjusted standard because it wants to use a zinc-containing material recovered from dust emitted from electric arc furnaces used to produce steel. This secondary zinc oxide material would ordinarily be considered a "solid waste" and a "hazardous waste" under the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§ 6901 *et seq.*, and corresponding Illinois laws and regulations. BRZ wants to use this secondary zinc oxide material without becoming subject to Illinois' hazardous waste requirements.

To that end, BRZ filed a petition for an adjusted standard under 35 Ill. Adm. Code 720.131(c). Section 720.131(c) allows the Board to determine that certain materials are not solid wastes if they meet certain criteria. The status of materials as "solid wastes" is significant because under the laws and regulations that Congress and the United States Environmental Protection Agency have established, only those materials that are "solid wastes" can be regulated as "hazardous wastes" under RCRA and corresponding Illinois laws and regulations. Those laws and regulations impose various requirements on persons who generate, treat, store, dispose, recycle, or transport hazardous waste. See 35 Ill. Adm. Code

722-726, 728. Materials that are not solid wastes are not subject to Illinois' hazardous waste regulations.

The secondary zinc oxide material for which BRZ sought an adjusted standard is recovered from electric arc furnace dust (EAF dust) by a high temperature metals recovery (HTMR) process. The Board refers to this material as "EAF zinc oxide." BRZ also proposed several conditions on the adjusted standard. IEPA recommended that the Board grant the adjusted standard, subject to the conditions that BRZ proposed.

In its April 15, 1999 opinion, the Board found that BRZ established that EAF zinc oxide is not a solid waste. The Board therefore granted BRZ's petition for an adjusted standard, but modified the conditions that BRZ had proposed.

MOTION TO EXPEDITE

BRZ moves the Board to decide the motion to reconsider at the Board's May 6, 1999 meeting. Motion to Expedite (Mot. Exp.) at 4. BRZ attached the sworn affidavit of George Obeldobel, President of BRZ (Affidavit), to both the motion to reconsider and the motion to expedite. BRZ is scheduled to begin receiving shipments of EAF zinc oxide on May 11, 1999. Affidavit at 4. BRZ states that its business relationships with its suppliers will be threatened if the Board does not modify the adjusted standard before that date. Mot. Exp. at 3.

The Board's resources permit it to address BRZ's motion to reconsider at the Board's May 6, 1999 meeting. Accordingly, the Board grants the motion to expedite and below rules on BRZ's motion to reconsider.

MOTION TO RECONSIDER

BRZ moves the Board to reconsider its April 15, 1999 decision in this matter. Motion to Reconsider (Mot. Rec.) at 1. Specifically, BRZ asks the Board to modify a condition of the adjusted standard that the Board granted to BRZ. *Id.* at 15. The adjusted standard reads as follows:

1. The Board finds that zinc oxide material produced by subjecting electric arc furnace (EAF) dust from the primary production of steel (K061 under 35 Ill. Adm. Code 721.132) to a high temperature metals recovery (HTMR) process is not a solid waste and grants Big River Zinc Corporation (BRZ) an adjusted standard under 35 Ill. Adm. Code 720.131(c).

2. The adjusted standard is subject to the following conditions:

    a. The determination described in paragraph one of this order applies only to zinc oxide material:

(1) that is to be processed through BRZ's electrolytic zinc refinery in Sauget, St. Clair County, Illinois;

(2) that is in Illinois;

(3) that has arrived at BRZ's Sauget, St. Clair County, Illinois facility or that is under a legally binding contract for sale to BRZ; and

(4) that meets the following specifications by weight:

(a) >50% zinc;

(b) <20% lead;

(c) <5% iron (or <7% iron in material produced by an HTMR unit during the first three months that the HTMR unit produces zinc oxide material from EAF dust from the primary production of steel (K061 under 35 Ill. Adm. Code 721.132));

(d) <4% total gangue materials (silica plus calcium plus magnesium); and

(e) <13% chloride;

b. BRZ must maintain records that document the sources of all zinc oxide material that BRZ accepts under this adjusted standard;

c. BRZ must maintain records that demonstrate that each shipment of zinc oxide material that BRZ accepts under this adjusted standard meets the specifications set forth in paragraph 2(a)(4) of this order; for this demonstration, representative samples of each shipment of zinc oxide material must be collected, composited, and tested in accordance with generally accepted practices, such as those specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication No. SW-846 (Third Edition); and

d. BRZ must maintain the records required under paragraphs 2(b) and 2(c) of this order for a period of three years and must make such records available for inspection and copying at any reasonable time during normal business hours upon the Illinois Environmental Protection Agency's request.

> *In Re* Petition of Big River Zinc Corporation (April 15, 1999), AS 99-3, slip op. at 18-19.

BRZ takes exception to the sampling requirements of paragraph 2(c) of the adjusted standard. In particular, BRZ asks the Board to amend this provision so that each shipment of EAF zinc oxide need not meet the specifications of paragraph 2(a)(4). Rather, BRZ proposes to determine compliance with the specifications based on a monthly composite of shipment samples. Mot. Rec. at 4, 15.

The Board notes that BRZ previously proposed sampling based on monthly averages. See Big River Zinc, AS 99-3, slip op. at 15. However, as the Board noted in its April 15, 1999 opinion, BRZ failed to adequately explain how its proposal would work. Specifically, BRZ failed to explain how it would composite samples and whether samples from different producers would be composited together or separately. In addition, BRZ proposed blending shipments that exceeded the specifications with other materials "such that the blended materials meet the specifications," but failed to explain how it would determine whether the blended materials meet the specifications. *Id.* at 16.

BRZ now explains that it proposes to sample each truckload, barge, railcar, or supersack of EAF zinc oxide that arrives at its facility. Mot. Rec. at 2, 5-7; Affidavit at 2-3. BRZ states that it would test a supplier-specific composite on a monthly basis for each supplier to determine compliance with the specifications. *Id.* BRZ states that it uses this sampling and testing approach for its mined zinc sulfide concentrates. Mot. Rec. at 2, 6-7; Affidavit at 2.

BRZ asserts that the requirement that each shipment of EAF zinc oxide meet the specifications is cost-prohibitive. Mot. Rec. at 8; Affidavit at 3. BRZ states that AmeriSteel, Inc. (AmeriSteel), which is expected to be a primary supplier to BRZ, and others like it would have to send samples off-site for testing. According to BRZ, these suppliers would have to hold the shipments for several days to await test results, resulting in demurrage fees. BRZ states that the off-site testing fees and demurrage fees would represent a significant portion (20-40%) of the value of the EAF zinc oxide. Mot. Rec. at 9-10; Affidavit at 3. For these reasons, BRZ concludes that the requirement that each shipment meet the specifications will prevent BRZ from purchasing EAF zinc oxide from its prospective suppliers. Mot. Rec. at 2-3, 5, 8; Affidavit at 3.

BRZ states that it can process an occasional shipment of inferior product and that it will ensure that all EAF zinc oxide received is processed. Affidavit at 3. BRZ states that if a supplier continues to provide inferior product, "BRZ will terminate its contract with its supplier and process whatever product remains." *Id.*

In its response, IEPA notes that while the Board's conditions were more strict than those that BRZ proposed, and IEPA agreed to, the Board's conditions were not without basis. IEPA Response (Resp.) at 3. IEPA believes, however, that if "process and [supplier] QA/QC [Quality Assurance/Quality Control] standards are met and consistently followed, that should ensure a consistent product and less frequent sampling of actual content would be acceptable." *Id.* at 4. IEPA also suggests that the Board define shipment as a production cycle, or on a rolling average, rather than an individual truck or railcar. *Id.* IEPA also proposes that the Board permit BRZ to blend only within the same shipment. *Id.* IEPA further suggests that the Board allow "a reduction in the sampling frequency based on the generator's ability to use QA/QC procedures to produce consistently on-specification material." *Id.* at 5. It is not clear whether IEPA believes the material should be tested before or after it is shipped.

The Board notes that BRZ proposed the specifications as a condition of the adjusted standard. However, as noted above, the Board found that BRZ's proposed conditions, as interpreted by BRZ, were potentially unenforceable. Accordingly, the Board crafted enforceable conditions to address specifications and sampling. While BRZ now has clarified its proposal, BRZ's interpretation of its proposed conditions remains problematic.

These problems arise because BRZ continues to propose that the specifications be a condition of the adjusted standard. But BRZ will not know, until the end of the testing period, whether the material it has already received meets the required specifications on an average basis. If the material fails to meet the specifications, the adjusted standard would not apply to the material and the material would be considered a hazardous waste. In that situation, BRZ would have violated Illinois hazardous waste laws and regulations. For these reasons, BRZ's proposed condition is not workable.

Accordingly, the Board will take a different and more workable approach. The Board already has found that AmeriSteel's EAF zinc oxide meets specifications necessary for BRZ to process the material economically. See Big River Zinc, AS 99-3, slip op. at 14. Other HTMR processes are capable of producing a similar quality material. Hearing Exhibit 3 at 10, Attachment H. The Board further finds that BRZ plans to process all EAF zinc oxide that it receives and that if a supplier consistently provides an inferior product, BRZ would terminate its contract with that supplier. Affidavit at 3. Limiting the scope of the adjusted standard to EAF dust that has been processed by HTMR and that is to be processed through BRZ's electrolytic zinc refinery, as the Board did in its April 15, 1999 order, is an adequate proxy for the monthly average specifications. Accordingly, the Board will delete the condition regarding specifications from the adjusted standard. The Board also will modify the adjusted standard to clarify that it applies only to EAF zinc oxide that will undergo BRZ's electrolytic zinc refining process. The Board also will make other minor changes to the terms of the adjusted standard for clarification.

The Board took a similar approach in *In re* Petition of Recycle Technologies, Inc. (September 3, 1998), AS 97-9. In that case, the Board granted an adjusted standard under Section 720.131(c) to a petitioner that processed used automotive antifreeze. The Board did not impose a condition regarding specifications, but did limit the scope of the adjusted standard to used automotive antifreeze that the petitioner had processed in a specific manner and would further process in a specific manner. See Recycle Technologies, AS 97-9, slip op. at 12.

However, the Board does believe it necessary, as IEPA suggests, that BRZ sample and test the materials it receives. BRZ has already proposed that the adjusted standard require it to do so, and this information would allow IEPA to assess whether BRZ is indeed processing material that is EAF dust that has undergone HTMR processing. Accordingly, the Board will require BRZ each month to take representative samples of the material it receives from each supplier and composite the samples on a supplier-specific basis. BRZ must test each composite sample on a monthly basis, and maintain records of sampling and test results for three years and make those records available for IEPA to inspect.

The Board grants BRZ's motion to reconsider and grants BRZ the following amended adjusted standard:

1. The Board finds that zinc oxide material produced by subjecting electric arc furnace (EAF) dust from the primary production of steel (K061 under 35 Ill. Adm. Code 721.132) to a high temperature metals recovery (HTMR) process is not a solid waste and grants Big River Zinc Corporation (BRZ) an adjusted standard under 35 Ill. Adm. Code 720.131(c).

2. The adjusted standard is subject to the following conditions:

   a. The determination described in paragraph one of this order applies only to zinc oxide material:

      (1) that will undergo BRZ's electrolytic zinc refining process at its facility in Sauget, St. Clair County, Illinois;

      (2) that is in Illinois; and

      (3) that has arrived at BRZ's Sauget, St. Clair County, Illinois facility or that is under a legally binding contract for sale to BRZ;

   b. BRZ must maintain records identifying the suppliers of all zinc oxide material that BRZ accepts under this adjusted standard;

   c. Each month, BRZ must take representative samples of the zinc oxide material that it accepts from each supplier and composite the samples on a supplier-specific basis. BRZ must test each composite sample on a monthly basis to determine the percentage by weight of zinc, lead, iron, total gangue materials (silica plus calcium plus magnesium), and chloride in the sample. Each sample must be collected and tested in accordance with generally accepted practices, such as those specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication No. SW-846 (Third Edition); and

d. BRZ must maintain records of the information required in paragraphs 2(b) and 2(c) of this order for a period of three years and must make them available for the Illinois Environmental Protection Agency (IEPA) to inspect and copy at any reasonable time during normal business hours upon IEPA's request.

IT IS SO ORDERED.

Section 41 of the Environmental Protection Act (415 ILCS 5/41 (1996)) provides for the appeal of final Board orders to the Illinois Appellate Court within 35 days of service of this order. Illinois Supreme Court Rule 335 establishes such filing requirements. See 172 Ill. 2d R. 335; see also 35 Ill. Adm. Code 101.246, Motions for Reconsideration.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, hereby certify that the above order was adopted on the 6th day of May 1999 by a vote of 7-0.

Dorothy M. Gunn

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board

EXHIBIT 12

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Solid Waste Management
Fifth Floor, L & C Tower
401 Church Street
Nashville, Tennessee 37243 - 1535
615-532-0780

September 11, 1998

Mr. Thomas J. Sack, Project Manager
AmeriSteel Dust Processing Division
U.S. 45 North
P.O. Box 3670
Jackson, TN 38303

SUBJECT: Request for Variance From Classification as a Hazardous Waste for Crude Zinc Oxide Reclaimed from K061 Electric Arc Furnace Dust

Dear Mr. Sack:

After giving public notice of our intent to grant a variance from classification as a solid waste, and therefore from classification as a hazardous waste, for AmeriSteel Dust Processing Division's zinc oxide concentrate (crude zinc oxide or CZO), this Division has received no comment on the proposed action during the 30-day comment period. Based on our previous review of AmeriSteel's proposal, upon the low likelihood that this properly-managed waste will pose a threat to the public health or the environment, and upon the lack of public comment, the decision to grant a variance for this material is now final.

This variance, which is applicable to crude zinc oxide produced at the Dust facility by reclamation of K061 Electric Arc Furnace Dust, and destined for sale to Horsehead Resource Development and to Zinc Nacional for further processing into higher-grade zinc oxide, is granted under the following conditions:

1) That the material will continue to be handled and transported in a manner consistent with a commodity-like status, i.e., transfer by enclosed delivery systems from the Dust facility to the receiving facility.

2) That the Department will be informed in writing prior to sale to new customers, detailing the end-use and processes to be employed by the receiving facility.

This variance will remain in effect for a period of five (5) years from this date of issuance, or until September 11, 2003. This action is authorized pursuant to Tennessee's Rule Chapter 1200-1-11-.01(4)(a)3. and in accordance with the conditions listed under Rule 1200-1-11-.01(4)(b).

Should you have questions regarding this action, you may contact Elizabeth A. Jayne of my staff at (615) 532-0834.

Sincerely,

Tom Tiesler

Tom Tiesler, Director
Division of Solid Waste Management

cc: J. Andrew Goddard, Attorney, Bass, Berry & Sims PLC
Elizabeth A. Jayne, Field Operations Support, DSWM, Nashville
Randy Harris, DSWM, Jackson Environmental Assistance Center
Dave Dowlen, Waste Activity Audit, DSWM, Nashville
Barbara Donoho, Waste Activity Audit, DSWM, Nashville
Bobby Morrison, Waste Activity Audit, DSWM, Nashville

EXHIBIT 13

Recycling Zinc

Products made from zinc or coated with zinc are very durable. Thus the interval between the use of zinc for manufacturing a product and its return into the recycling circuit as scrap may be longer than a century.

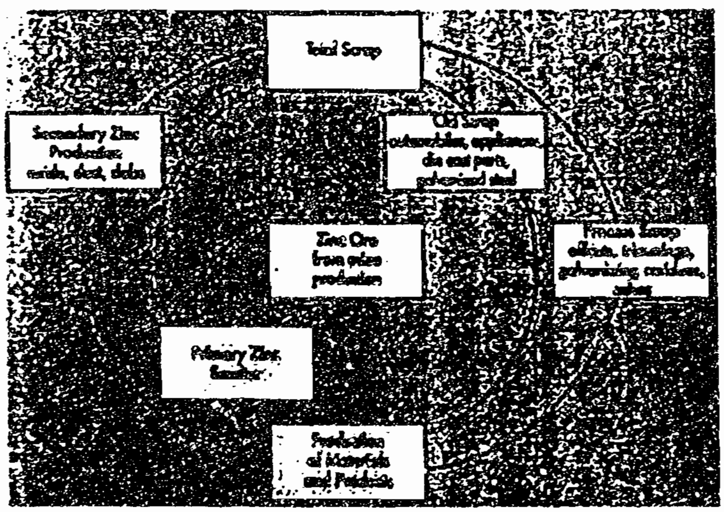
1 - Zinc is completely recyclable without any loss of its physical or chemical properties.

2 - 80 % of the zinc available for recycling is currently recycled.

3 - 36% of the world's zinc supply - nearly 2.8 million mt - comes from recycled zinc. The remaining 64% originates from zinc ores.

4 - Brass recycling alone recovers over 600,000 mt of zinc each year.

5 - The supply of zinc-coated steel scrap is expected to increase by more than 50% over the coming ten years.



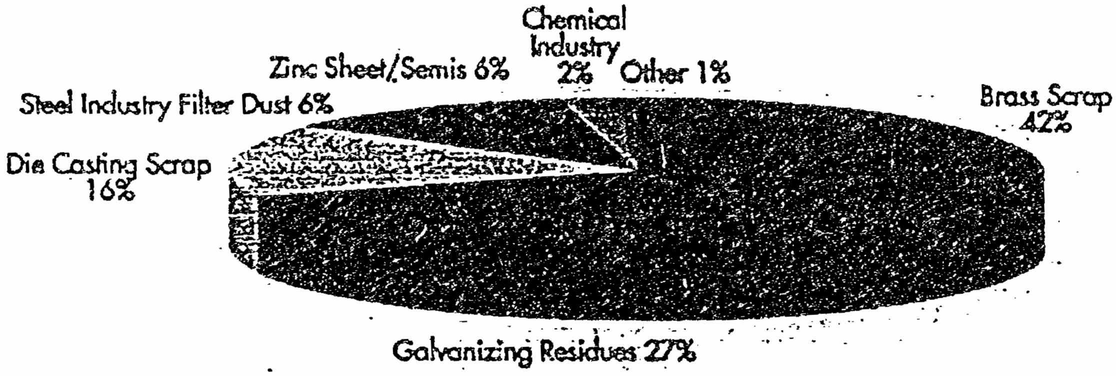
6 - Due to the long life span of most zinc products, which in some cases may last maintenance-free for over 100 years, much of the zinc produced in the past is still in use, constituting a valuable and sustainable resource of zinc for future generations.

7 - Zinc is recycled

- from manufacturing and processing operations ("process scrap" or "new scrap") such as zinc sheet and galvanized steel offcuts and trimmings, galvanizers residues, die casting foundry returns, brass machining scrap, steel recycling.

- from discarded products ("post consumer waste" or "old scrap") such as automobiles, tyres, household appliances, electronics components, street furniture, galvanized parts from buildings, dismantled zinc roofs and guttering, etc.

Main Sources of Zinc for Recycling



Typical Life Cycles for Zinc-Containing Products

Product	Uses	Life cycle (years)
Zinc sheet	Roofing	100 +
	Cladding	200 +
Brass products	Vast range	10 +
Die castings	Cars - appliances - hardware - tools - etc	10 - 15 +
Galvanized coatings	Cars - roofing and cladding for buildings	10 - 50 +
Fabricated products	Wide range of structures : industry - road - rail and power installations	25 +
Zinc compounds	Tyres	1 - 5

Source: IZA - Europe

ZINC - RECYCLED FOREVER

Automobile shreddings shown in this picture yield top-quality new zinc

Zinc occurs naturally throughout the earth, in plants and animals and in the foods you eat. Zinc is also an essential raw material in thousands of products including automobiles, paint, golf clubs, cameras, vending machines, cosmetics and jewelry.

Extensive markets for recycled zinc products have existed for decades, fuelled by an active recycling infrastructure. Coupled with Zinc's ability to be recycled over and over again with no loss of its valuable properties this means Zinc can be recycled forever.

Over 6.5 million metric tons of zinc slab, oxides, powders and dust are consumed each year in the Western World, two million of which come from recycled zinc. In the United States, the Bureau of Mines estimates that with enhanced recovery, recycled zinc will account for 40% of total consumption by 2000.

Zinc recycling offers both environmental and economic benefits by:

- reducing volumes of material that end up in landfills,
- saving energy by reducing the need for mining and smelting,
- relieving environmental impact on the land and water, and conserving zinc ore.

Zinc is a valuable commodity in the marketplace because, unlike many other materials, zinc can be recycled again and again and still maintain its physical and chemical properties.

This means that much of the zinc you use today was first used years ago. As an example, the automobile you drive contains recycled zinc in its zinc-coated body panels, brass tubing and other parts. And when you discard your automobile , all those are readily made into new parts of identical quality. Even the zinc oxide used to cure your tires is removable to make new tires.

This process will be repeated over and over again.

For decades, Zinc has been recoverd during product manufacturing and also after Zinc-containing products have been discarded by consumers.

During Manufacturing

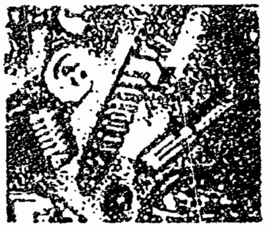
Using zinc for die casting or coating steel, like all processes, produces by-products. With zinc, these have value, which is why more than half a million tons of zinc processing residues are recycled annually in the Western World.

When bridge girders are dipped in molten zinc to protect the steel from rusting, residues form on the top and button of the zinc bath. These are left to harden, broken into chunks, sold and remelted to product new zinc products. Zinc die cast scrap, residues, and slag from smelting ores are also recovered and either returned to production or sold for reuse.

Scrap Autos

More than 9 million vehicles are recycled annually at North America's 204 automobile shredders. About 40 pounds of zinc are in a typical North American automobile - 19 pounds in zinc castings, 18 pounds for zinc coatings and 3 pounds in brass, zinc oxide in tires and solder. In the next decade, the amount of zinc recovered from scrapped automobiles will increase significantly as a result of growing use of zinc-coated steel and rust protection.

After Discarding



Intricate zinc die-cast parts are easily recycled into new parts with no loss of quality.

Millions of products that contain zinc are discarded each year in the United States. These include:

- appliances
- electronics components
- automobiles
- children's toys
- highway guardrails and signs
- HVAC ductwork
- other galvanized parts from razed buildings, bridges, and tires.

While zinc-containing products have a long life - from about five years for tires to more than 200 years for zinc sheet cladding - they all eventually wear out. Zinc is removed from these products, known as "old scrap," and put back into the marketplace at a current rate of 1.2 million tons annually in the Western World.

Brass, found in buildings, lamps, doorknobs, and bric-a-brac, is a major source of recycled zinc, accounting for 32% of total zinc recovery.

Recycling Steel And Zinc

- A growing source of recycled zinc is the steel industry's electric arc furnaces, where zinc is recovered from the flue dust produced when scrap steel - much of which is zinc-coated is melted for recycling.
- Zinc particles, which can make up to 40% of the dust, are collected and put back into production rather than expelled into the atmosphere, benefiting industry and the environment.

Recycled Zinc Markets

Zinc recycling is fuelled by a thriving and diverse market for reusable Zinc. More than 120,000 metric tons of slab zinc are produced annually in the U.S. from recycled Zinc.

Most ingots - or slabs - of zinc are melted and used to coat steel, protecting it from rust. Slab zinc is also melted, rolled and flattened into sheets. Ninety-eight percent of the U.S. penny is made from zinc sheet, with a copper plating. These sheets also end up as countertops and building down spouts and finishings.

Over 35,000 metric tons of recycled zinc oxides are produced annually in the U.S.. They are the healing ingredient in diaper-rash ointments, soaps, shampoos, and other skin creams. Zinc oxide is also a fortifying mineral in cereals and fertilizers. And, since it is required for curing rubber, it's found in every tire.

Recycled zinc is used to make zinc dust, an ingredient providing corrosion protection in many paints. It is also found in chemicals and lubricants and is employed in gold recovery. And zinc powder is a component in dry-cell batteries. Alloyed with other metals, like copper or aluminum recycled zinc is cast into precision parts for appliances, hardware, electronics and toys.

How is Zinc Used?

- Zinc's dominant use is as a coating on steel to protect it from rust, extending the life of automobiles, bridges and other steel structures.
- Because zinc has a low melting point and is light weight , it is easily die cast into components for appliances, automobiles and children's toys. And zinc combines with copper to make brass.
- Zinc oxide is also a necessary ingredient in rubber products and is used in pharmaceuticals, including dietary supplements and healing creams.

Back