



Recycling of zinc waste from hot-dip galvanizing

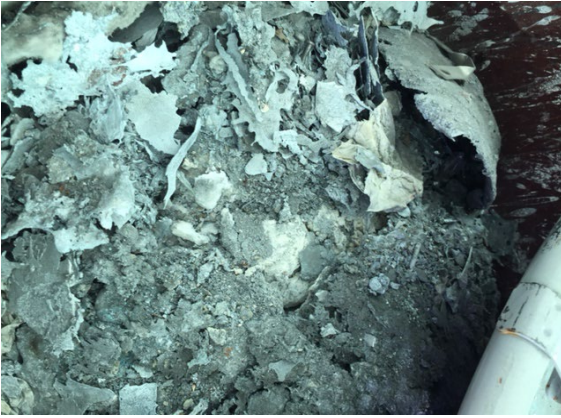
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Agenda

- ▶ Hot-dip galvanizing waste and its optimization.
- ▶ What is hot-dip galvanizing waste used for?
- ▶ Zinc recycling and the role played by traders.



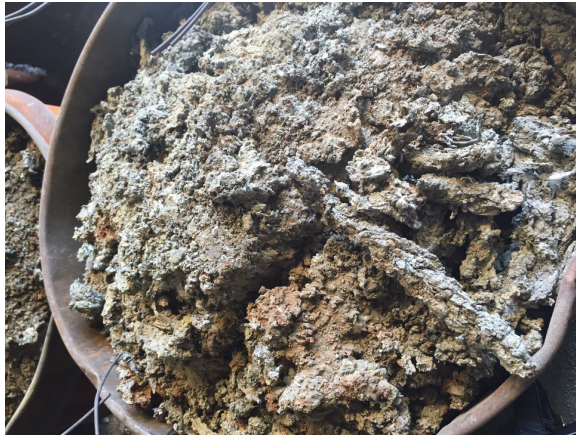


Hot-dip galvanizing waste and its optimization.



What are the residues of hot-dip galvanizing?

- ▶ Ashes named “Skimmings”
 - ▶ Contain a higher metal content ~ 75-85% Zn total.
 - ▶ They do not pass through a mesh or are sifted/treated in any way, nor they are burned.
- ▶ Ashes named “Fine ashes”)
 - ▶ Zinc content 60-75%.
 - ▶ Passed through a mesh to separate the metal from the oxide.
 - ▶ Reworked on the kettle surface.
 - ▶ Burned in a rotary furnace.



What are the residues of hot-dip galvanizing ?

- ▶ **Hardzinc / bottom dross**
 - ▶ Typically 95% Zn + Fe that comes from the usual process of cleaning the bottom of the kettle affecting the viscosity of the zinc bath and the quality of the galvanizing.
- ▶ **Bottom of the kettle**
 - ▶ When changing the kettle or reinstalling it, the zinc is emptied, and what remains underneath is a kettle bottom, it can contain much more iron and lead.
 - ▶ Lower quality than bottom dross.



What are the residues of hot-dip galvanizing?

- ▶ Filter zinc dust
 - ▶ Dust collected from the filters above the kettle.
 - ▶ Many countries prohibit the dispersion of these dusts into the air.
 - ▶ It contains between 25-35% zinc and has a negative value, but it can be accepted by zinc chloride producers who sell them their Flux.



How to optimize the price of your wastes ?



- ▶ The value of your waste is based on the following :
 - ▶ The zinc content that the buyer can extract and optimize in his recovery process, in the case of ash the value also depends on its moisture (if it was stored indoors and hermetically from its production until the day of loading).
 - ▶ The physical appearance (ingot or unshaped) and the packaging used.
 - ▶ The price of zinc according to the LME (London Metal Exchange).
 - ▶ The supply and demand of this waste at regional and global level, and the distance from your plant to that of the final consumer of the waste.

How to optimize the price of your wastes ?



- ▶ Hardzinc / Bottom dross
 - ▶ Shape your bottom dross, buy a mould to make it easier to load and / or stack and be able to load more weight per truck / load.
 - ▶ Compact the bottom dross well while it is hot - the more solid, the less space for air to enter, this also helps for zinc recovery.



Vs.



Vs.



How to optimize loading for export ?



- ▶ Small mistakes can turn into big losses.
- ▶ Load in double stowage.
- ▶ Secure/fix cargo near the door.
- ▶ Optimize use of container cubic meters.



How to optimize loading for export ?



► Examples to follow...



Capacity up to 4 barrels per pallet



Possibility to use 1 to 2 pallets between big bags depending on the weight



Self-palletized ingots with forklift mold can go without pallets



Jumbos with handle can go without pallets

Lead: How does it affect waste ?

- ▶ Lead is not an element that the customer who processes and refines this waste is looking for.
- ▶ The higher the lead contained, the lower the price paid, especially in the bottom of the kettle.
- ▶ The lead in the kettle can come from the use of remelted zinc (98.5% Zn and 1% Pb) added to the SHG zinc (99.995%) in order to lower costs or to give a "flower pattern" to the galvanized metal. It can also come from protecting the bottom of a new kettle by lead ingots.
- ▶ In Europe there is talk of passing a law to almost eliminate the presence of lead in the metal industry, possibly replacing it with bismuth.

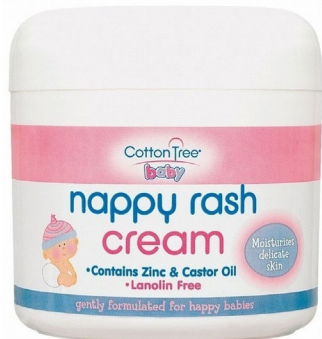
SHG vs. Remelted Zinc

- ▶ Remelted zinc, apart from being less pure, also produces more waste in its galvanizing process as it typically contains from 0.05-0.10% Fe (commercial grade) to 0.50% (quality recycled by burning ashes in a small furnace) and Fe accelerates the production of bottom dross.
- ▶ If zinc of 98.5% purity or higher is used, it does not affect the commercialization of the waste generated but may affect the price of the waste.





What galvanizing waste is used for ?



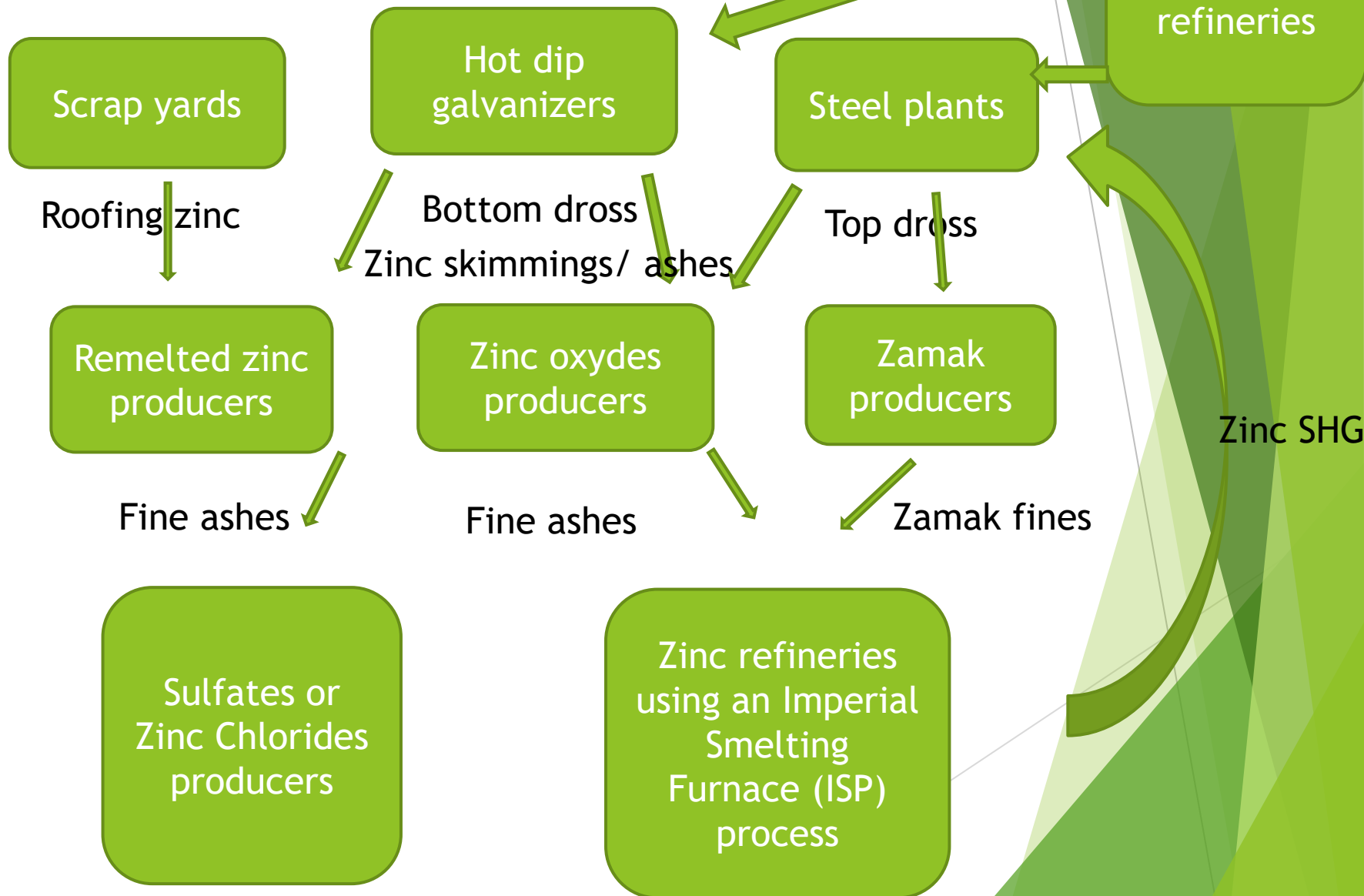
From the galvanizing kettle to your car tires...

What is done with galvanizing waste ?

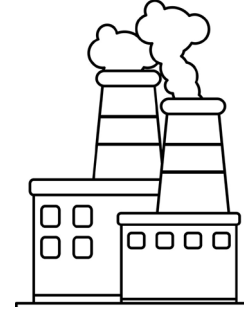
- ▶ Which industries use zinc secondary inputs ?
 - ▶ Zinc oxides (rubber, ceramics, cosmetics, pharmaceuticals, etc.)
 - ▶ Zinc sulphates and nitrates (Petrochemical industry)..
 - ▶ Zinc chloride (flux bath for galvanizing, chemical synthesis, manufacture of clothing).
 - ▶ Zinc powders for alkaline paints and batteries.
 - ▶ Alloys - Zamak for the automotive and construction industry.
 - ▶ Primary zinc (SHG).



Zinc Recycling Cycle



How bottom dross is processed ?



There are different ways to process zinc oxide :

► French process

Zinc oxide is prepared by isolating metallic zinc from the concentrate. The metal is vaporized and burned in an electric arc furnace at 1200°C .

► American process

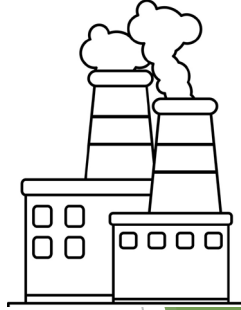
Zinc oxide is produced from a zinc sulfide mineral concentrate roasted with a single pass through a moving grid. The ore concentrate is heated with coal (coke) which forms zinc vapor that burns in the air to form zinc oxide.

► Distillation

It is treated with a caustic solution that precipitates $\text{Zn}(\text{OH})_2$. $\text{Zn}(\text{OH})_2$ is converted to ZnO during the drying process.



How zinc skimmings are processed ?



- ▶ Good quality unprocessed skimmings have approximately 80-85% zinc in total.
- ▶ After grinding (ball milling) ~85% zinc is obtained ~73% zinc granules and the rest will be fines. The zinc granules are melted in a furnace that produces ~55% Zn, ~4% of zinc remains as melting dross and the balance is fine zinc from the oven.
- ▶ The granules are used to make ingots and the fine to enrich animal food, for fertilizers,

Zinc fines can be found in	How zinc fines help
	Feed supplement to aid animal health
	Can increase crop yields or benefit zinc-deficient soil
	Extraction of zinc metal from our co-products

Zinc granules

Zinc fines

Source - US Zinc





Zinc recycling and the role of traders



Zinc recycling in the world

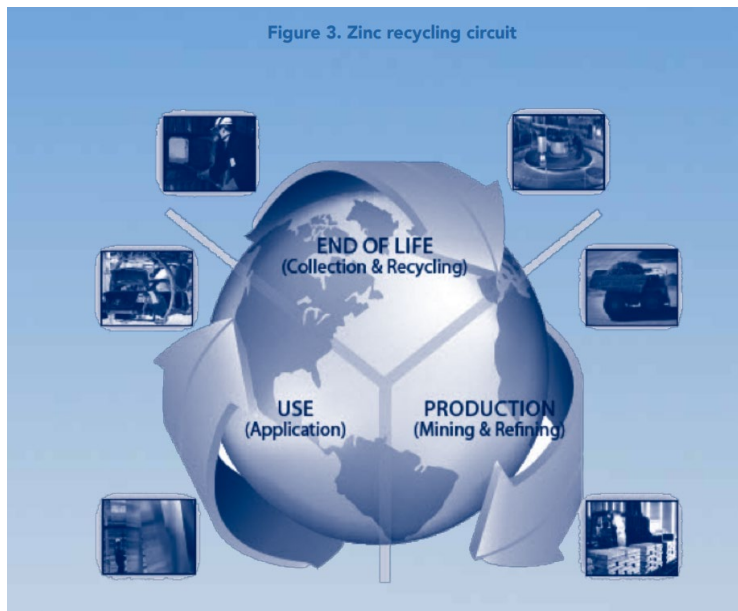


- ▶ Approximately 70% of the zinc produced worldwide originates from extracted minerals extracted and the other 30% comes from recycled or secondary zinc.
- ▶ Globally, approximately 45% of available zinc at his end of life is recovered and recycled.
- ▶ Depending on the composition of the scrap or waste that is recycled, can be remelted or returned to the refining process or use for the manufacture of chemicals.

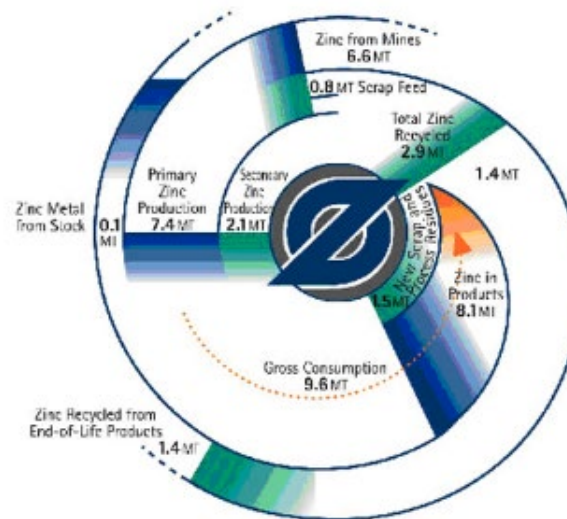


Zinc recycling in the world

Figure 3. Zinc recycling circuit

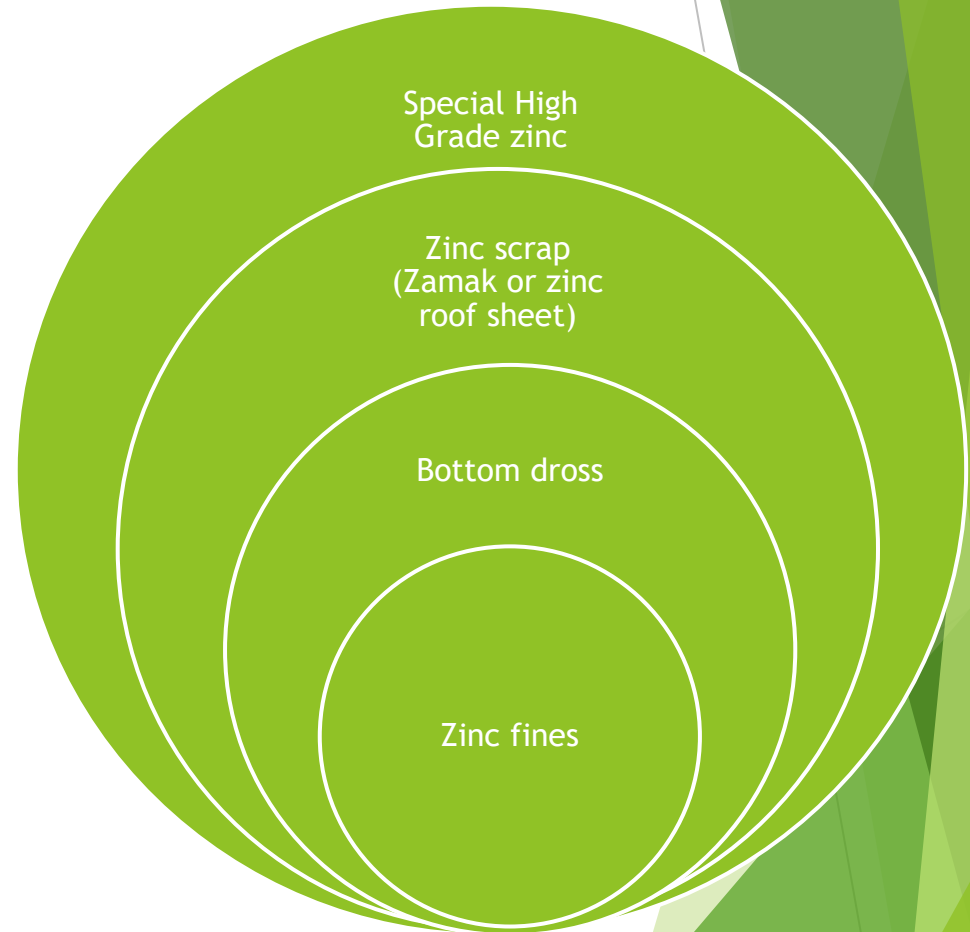
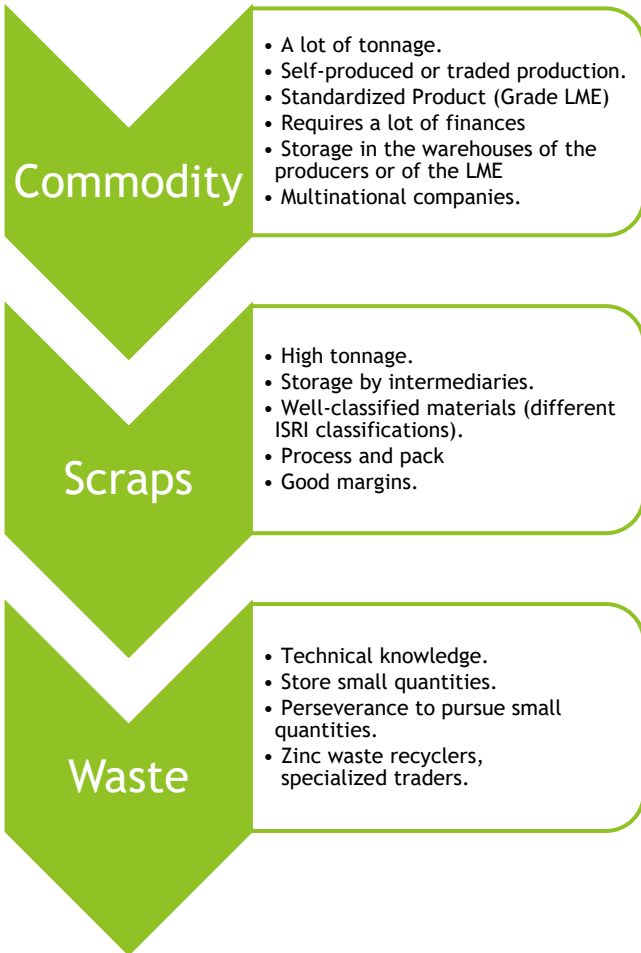


The Zinc Recycling Circuit

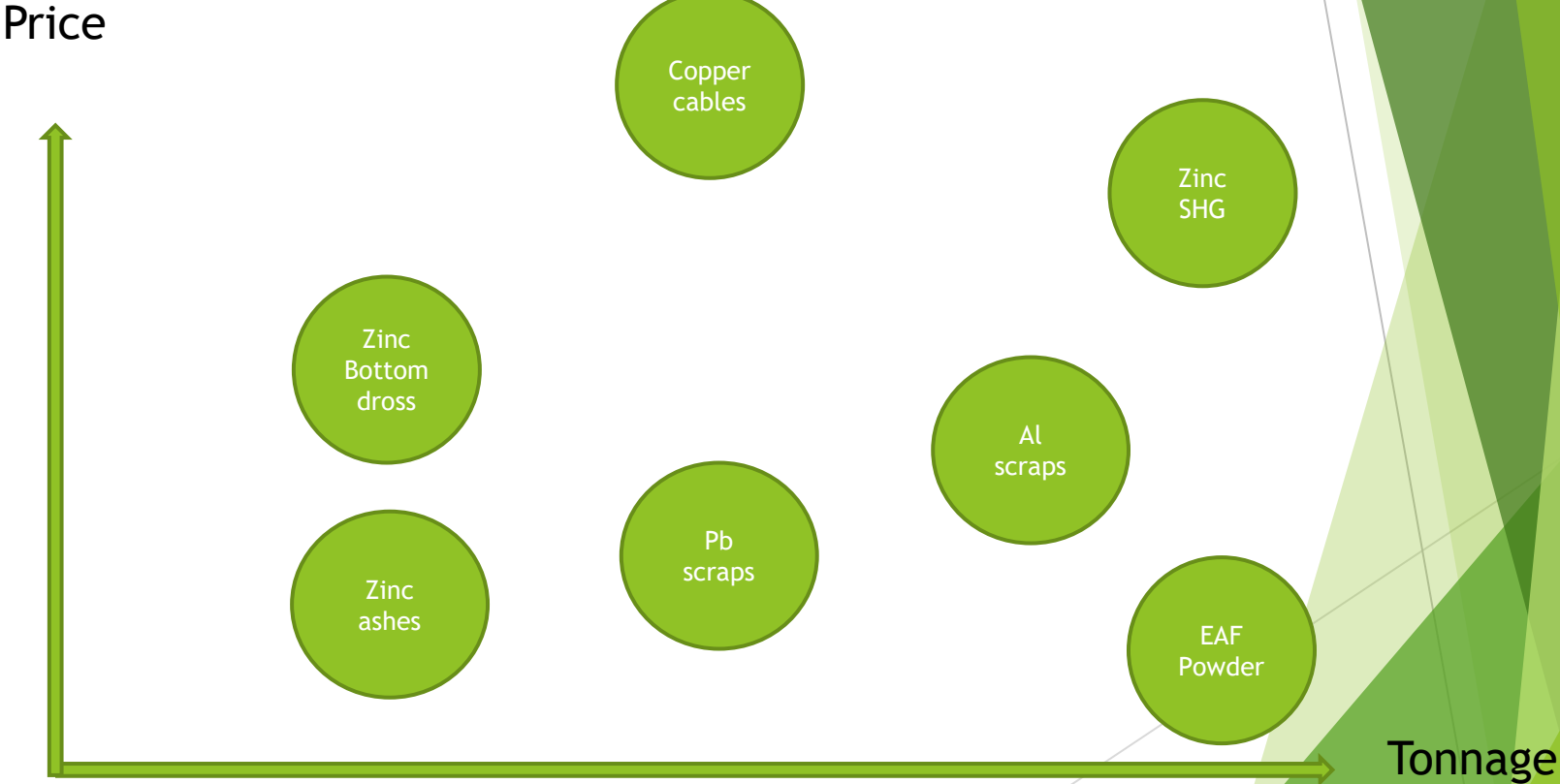


Source : International Zinc Association

From commodity to waste



Tonnage factor / Price of some residues



Advantages of working with a Trader

- ▶ **Access to the information** : Understanding and correct use of market information in real time (LME “live feed”).
- ▶ **Market and product knowledge** : Invaluable in interpreting complex market information.
- ▶ **Good relations** : Necessary to ensure availability and immediate delivery.
- ▶ **Attention to detail** : Critical point to efficiently execute an order (You can define the profit or loss in a business due to low margin).
- ▶ **Financing** : Provide financing to companies with cash flow deficits.
- ▶ **Organize** : transport, storage, insurance, financing/credit.
- ▶ **Manages risks**, is flexible and generates competition in the market.

Physical traders are an integral part of the
Zinc supply chain

Positioning of commodities traders

GLENCORE
INTERNATIONAL plc

 **METAL TRADING**


DERICHEBOURG

Multinationals

- Large volumes of standardized commodities.
- Significant financial strength to finance your operations / inventories.
- Global footprint.

Traders specialized in specific products

- Specific knowledge.
- Dedicated customer support.

Regional or global scraps dealers

- Scrap handling.
- Storage capacity.
- Flotation plants, shredders, balers.

Who is Metal Trading ?

- ▶ Non-ferrous metal traders based near Paris.
- ▶ Sister company Pan American Zinc in Miami, Florida.
- ▶ We focus on Zinc SHG and lead, industrial waste, and non-ferrous scrap.
- ▶ We have more than 75 years experience in the zinc industry in Europe.
- ▶ We buy and sell 50,000T per year in Metal Trading and 50,000T per year in Pan American Zinc.
- ▶ Strong network - we buy and sell in more than 70 countries.



Sales of SHG 99.995%

- ▶ Quality : Zn SHG.
- ▶ Full loads of 25 tons.
- ▶ Incoterm: CIF, DAP...
- ▶ Premium : EUR.

Producer Price + Handling costs + Freight + Financing.

- ▶ LME trading period : fixation Spot or unknow in the future.
- ▶ Payment terms.
- ▶ Type of contract : Spot, Monthly, Yearly.
- ▶ Other materials available : lead, bismuth, tin, nickel powder, zinc alloys, zinc granules, etc...

Refined Metals

Zinc

Special high Grade (SHG)

High grade (HG)

Gob (Prime Western)

Remelted zinc

Lead

Soft lead 99.97% Alloy

type E

Antimonial lead

Bullion



Industrial residues

- ▶ Qualities - any residues containing more than 40% zinc , brass, aluminium, lead.
- ▶ Full loads or mixed loads.
- ▶ Incoterm: EXW, FOB, CIF.
- ▶ Prices - % del LME.
- ▶ LME trading period : mutual agreement between both parties.
- ▶ Payment before loading or as part of delivery of SHG 99.995%.
- ▶ Type of contract : spot, monthly, yearly.

Industrial Waste

Zinc

Zinc Dross, Galfan, Galvalume, Zamak
Kettle zinc
Skimmings, ashes
Zinc or Zamak powders
Off-grade zinc oxide
EAF dust, MZR ashes

Aluminum

Aluminum Dross
Aluminium Alloys

Lead

Lead Dross
Lead Alloys
Lead Ashes

Non ferrous scraps

- ▶ 3 traders dedicated strictly to the purchase / sale of scrap metals.
- ▶ Mixed loads with up to 3 qualities per container.
- ▶ Sales to Asia and Europe.



Scrap

Zinc

Zamak, carburetors, old plates, molds, shavings, etc.

Aluminum

Tense, taint/tabor, radiators, 6061/6063 profiles, cables, UBC, pucks, Zorba, Zurik, etc.

Lead

Plates, tubes, batteries, etc.

Copper

Cathodes, radiators, mixed brass, Birch cliff, Berry, Honey, Milberry, granules, etc.

Our commercial team dedicated to zinc ... we are always at your disposal !



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Thank you very much!