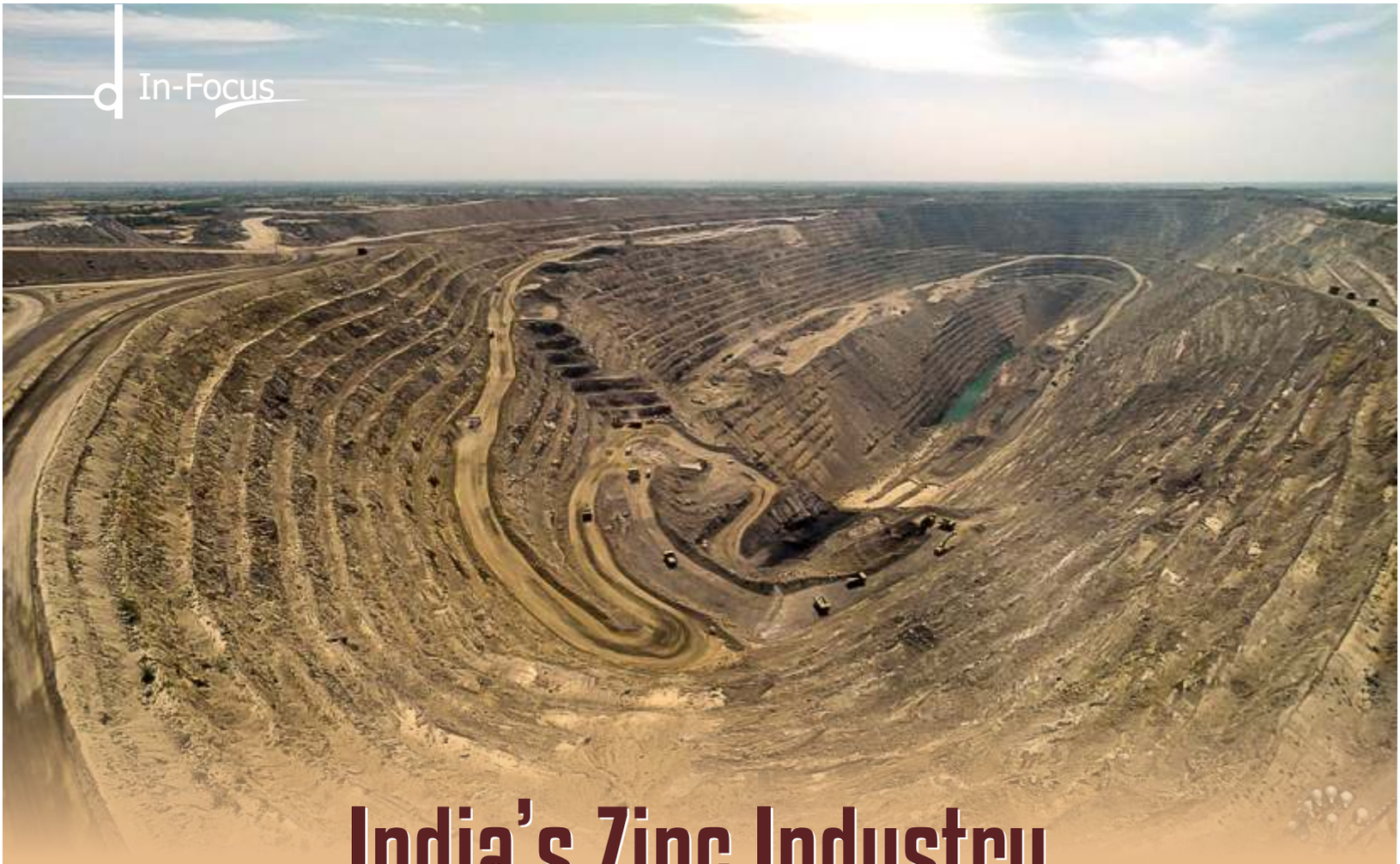

# India's Zinc Industry

## Stepping ahead of self sufficiency

**- Metalworld Research Team**

Zinc itself is a common non-ferrous metal, which can combine many other non-ferrous metals to form alloys, the main alloys being brass and die-casting alloys. Zinc and its alloys are mainly used for iron and steel, metallurgy, machinery, the electrical and chemical industries, light industry, military applications, medicine and some other fields. Around 80% of zinc mines are underground, 8% are of the open pit type and the remainder is a combination of both. However, in terms of production volume, open pit mines account for as much as 15%, underground mines produce 64% and 21% of mine production comes from the combined underground and open pit mining. Zinc is found in the earth's crust primarily as zinc sulfide (ZnS). Rarely is the ore, as mined, rich enough to be used directly by smelters; it needs to be concentrated. Zinc ores contain 5-15% zinc. To concentrate the ore, it is first crushed and then ground to enable optimal separation from the other minerals. Typically, a zinc concentrate contains about 55% of zinc with some copper, lead and iron. Zinc concentration is usually done at the mine site to keep transport costs to smelters as low as possible.

Zinc is the fourth most widely used metal globally after steel, aluminium and copper. The global refined zinc usage has grown at a compounded annual growth rate (CAGR) of 3 per cent during 2012 to 2016. A majority of this growth primarily came from China and India, due to the respective government's efforts to boost investment in real estate and infrastructure. United States, the second largest zinc consuming country, has seen stagnation in consumption. China, which accounts for 47 per cent of the global demand, remains an important factor in zinc consumption. The subsequent pick-up in manufacturing activity in China has helped in a healthy growth in galvanized steel production, the single largest consumer sector of zinc.

Zinc smelting is the process of converting zinc concentrates (ores that contain zinc) into pure zinc. The most common zinc concentrate processed is zinc sulfide, which is obtained by concentrating sphalerite using the froth flotation method. Secondary (recycled) zinc material, such as zinc oxide, is also processed with the zinc sulfide. Approximately 30% of all zinc produced is from recycled sources. There are two methods of smelting zinc: the pyro-metallurgical process and the hydrometallurgical process (over 90% of

hydrometallurgical process is in electrolytic plants using electrolysis process). Both methods are still used. Both of these processes have the same first step: roasting.

**Uses of zinc**

With good calenderability, abrasive resistance, corrosion resistance, castability, and room temperature mechanical properties, zinc can be made into various alloys with many other metals. Mainly in the form of galvanization, zinc-based alloys and zinc oxide, it has applications in the automobile, construction and shipbuilding industries, light industry, machinery, household electrical appliances, batteries and other industries. Currently, its consumption among non-ferrous metals is second only to aluminium and copper. As in moist air, a protective layer is easily produced on the surface of zinc, which prevents further atmospheric corrosion. zinc is widely used in the galvanization industry. Galvanization is primarily used in steel and surface coatings on steel structures (eg. galvanized sheet) for automobiles, construction, shipbuilding, light and some other industries. Examples include: coatings containing zinc powder; zinc spelter, used in connections (eg. steel components connecting ships, bridges and offshore oil and gas derricks), roofing made of galvanized iron sheet; and steel strip hot-dip galvanization. At present, galvanization accounts for half of all zinc consumption.

Though the intensity and hardness of zinc are not good, it has valuable mechanical properties, and when combined with aluminum and copper to form zinc alloys, its intensity and hardness improve greatly. In particular, the comprehensive mechanical properties of zinc-copper-titanium alloy are close, if not equal to, those of aluminum alloy, brass or gray cast iron; moreover, creep resistance is improved substantially. Therefore, zinc alloys are widely used in the production of many components and die-casting fittings in automobile manufacturing and the mechanical industry, thanks to its superior superplasticity. In addition, printing zinc plates, powder corrosion photographic plates and offset printing plates can be made of zinc plate, consuming less lead, cadmium and other elements. Currently, zinc alloy makes up around 20% of zinc applications. However, in western countries, they have realized that zinc alloy can be directly used as the covering material for roofs, extending the service life from 5-10 years to 120-140 years- what's more, the material can be recycled. Thus, in the long run, when it comes to zinc consumption, the ratio of galvanization will decrease, while that of zinc alloy will gradually increase. Zinc can be used to make batteries, such as zinc-manganese batteries and zinc air batteries.

In addition, zinc has good electromagnetic field resistance properties. In the case of radio frequency interference, zinc plate is a very effective shielding material. And as zinc is non-magnetic, it is suitable for making components and covers of instruments and meters. Since zinc produces no sparks, either alone or in collision with other metals, it is suitable for making explosion-proof equipment. Zinc fertilizer (eg. zinc sulfate and zinc chloride) can promote plant cell respiration and carbohydrate metabolism. Zinc powder, lithopone and zinc chrome can be made into pigments. Zinc oxide can also be used in the pharmaceutical, rubber, paint and other industries.

**Major end use of Zinc**

| Sector | Uses' share in demand (%) |
|---|---|
| Galvanizing | 50 |
| Diecasting | 17 |
| Brass and bronze | 17 |
| Rolled zinc | 6 |
| Chemical | 6 |
| Miscellaneous | 4 |

***Source:*** International Lead and Zinc Study Group

**India's share in global zinc production**

India shares a mere 5 per cent with 10 million tonnes in global reserves of zinc ore of 200 million tonnes. During 2011-12 to 2016-17, demand for zinc has grown at a CAGR of only 3 per cent mainly because of a surge in imports of galvanised steel. The demand is based on the growth of the steel market which accounts for 70 per cent of the total demand, mainly used in galvanising and coatings of iron and steel to protect it from corrosion.

Demand for primary Zinc in India is based on the growth of the steel market which accounts for 70 per cent of the total demand. It is mainly used in galvanising and coatings of iron and steel to protect it from corrosion. During 2011-12 to 2016-17, demand for Zinc has grown at a CAGR of only 3 per cent mainly because of a surge in imports of galvanised steel. In order to control imports, the government has imposed

minimum import duty on certain steel products, in addition to safeguard duty and anti-dumping duty. In 2016-17, India's import of galvanised and coated steel has reduced by 47 per cent compared to the previous year owing to these supportive government policies. Other government initiatives such as 'Smart Cities', modernisation of railways, and the construction of highways is expected to boost the infrastructure industry which uses galvanised steel for durability and endurance. This is likely to pave the way for increased Zinc consumption in India in the coming years.

**Demand-supply of primary zinc in India (million tonnes)**

| Financial year | Demand | Supply |
|---|---|---|
| 2012 | 0.57 | 0.8 |
| 2013 | 0.61 | 0.7 |
| 2014 | 0.65 | 0.8 |
| 2015 | 0.65 | 0.7 |
| 2016 | 0.67 | 0.8 |
| 2017 | 0.66 | 0.7 |

***Source:*** KPMG study September 2017

**Per capita consumption of zinc**

| Country | Quantity (kgs) |
|---|---|
| Western Europe | 9.5 |
| Germany | 6.5 |
| USA | 6.5 |
| China | 5.2 |
| India | 0.5 |
| World average | 1.9 |

***Source:*** International Lead and Zinc Study Group

**Zinc in India V/s Hindustan Zinc Ltd**

Anil Agarwal-controlled Hindustan Zinc has become synonymous to zinc production in India. The company reported mined metal production in October- December quarter of 2017 up 10% sequentially (July – September 2017 quarter) at 240,000 due to higher ore treatment. The year-on-year decrease was 13% driven primarily by decline in overall ore grades due to mine mix and lower production from Rampura Agucha open-cast mine, even as total ore treated was higher. For the nine-month period, mined metal production was up by 16% to 693,000 tonnes from a year ago due to higher ore production from underground mines, partly offset by lower open-cast mine production. Integrated zinc metal production was 200,000 tonnes, 4% higher sequentially and 3% lower year-on-year. Integrated lead metal production was 46,000 tonnes, 20% higher quarter-on-quarter and 18% higher year-on-year. This was in line with availability of mined metal and smelters. The company posted a total revenue during the quarter at Rs. 5,846 crore, an increase of 12% on quarterly basis and 10% on yearly basis. The yearly increase was due to higher lead and silver volume and strong zinc & lead London Metal Exchange, partly offset by lower zinc volume and rupee appreciation. For the nine-month period, revenues were up by 35% on yearly basis driven primarily by higher metal volumes and prices.

The cost of production before royalty (COP) for zinc during the quarter was at Rs. 66,118 per MT ($1,022), up 4% in Indian rupee (INR) and US dollar (USD) terms, compared to the previous quarter and up 14% y-o-y in INR and 19% in USD terms. The y-o-y increase was primarily on account of about 25% increase in prices of metcoke & imported coal and other commodities, and lower overall grades. For the nine-month period, COP was higher by 12.0% in INR and 17% in USD at Rs. 64,079 ($994) primarily due to over 50% increase in prices of metcoke & imported coal and other commodities.

Future growth of Hindustan Zinc

Capital mine development increased by 55% y-o-y and was flat q-o-q to 9,685 meters during the quarter across all mines. For the nine-month period, capital mine development was 28,126 meters, up 69% as compared to corresponding prior period. Rampura Agucha underground mine achieved the highest ever mine development for the quarter at 5,958 meters, 11% higher than the previous best. The underground mine has crossed ore production run rate of 2.0 mtpa. The main shaft hoisting system was commissioned during the quarter and is now in operation for waste hoisting. South primary ventilation system is progressing on fast track and expected to commission by end of January 2018. Off shaft development is on track and production from the shaft is expected to start as per schedule from Q3 FY2019. Sindesar Khurd mine achieved mine development of 4,527 meters during the quarter. It crossed 4.5 mtpa run-rate for ore production during the quarter. Main shaft equipping is progressing as per schedule and on track for completion in Q4 FY2018, with production from the shaft expected to start as per schedule in Q3 FY2019. Civil and structure erection for the new 1.5 mtpa mill is going on at full swing and expected to commission in Q2 FY 2019. Zawar mine achieved mine development of 6,555 meters during the quarter. Post completion of the Zawar mill debottlenecking to 2.7 mtpa, detailed engineering and site construction work for the new mill of 2.0 mtpa has commenced. The new mill is expected to commission in Q3 FY 2019. Kayad and Rajpura Dariba: The Expert Appraisal Committee of MoEF has approved expansion of ore production at Rajpura Dariba from 0.9 to 1.08 mtpa and at Kayad from 1.0 to 1.2 mtpa. This will pave the way for higher production from these mines in the near future. Fumer project at Chanderiya is progressing as per schedule. Civil construction work is 70% complete and the project is on track to get commissioned by mid-FY 2019.