

# Supply Chain Optimization of Zinc Industry: Opportunities, Strategies and Challenges

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## Abstract

**Purpose:** The contemporary manufacturing and manufacturers competitive priorities and leadership serves customers who are demanding customized products with squeezed lead time. Detailed study on supply chain management in Zinc Industry have been limited. The Industry has been active only during the last decade. The supply chain management and logistics management in Zinc Industry had been largely confined to distribution activities i.e. outbound logistics as the part of inbound logistics is limited. The present paper focuses on the framed part, mainly considering zinc refiners and their respective customers i.e. Galvanizers, die casting companies. Such model excluded secondary zinc producers, who generally act independent of other factors and the customers they supply. The concentration of production of non ferrous metal ores raises the important issue of supply vulnerability.

**Keywords:** Downstream, Mines, Reserves, Raw Materials, Supply Chain, Zinc

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## 1. Introduction

Zinc is an abundant component of the earth's crust; it is estimated that the amount of zinc in the first mile of the earth's crust under dry land is 224,000,000 millionmt. In the Oceans and sea bed the amount of zinc is 15,000 millionmt. Zinc ore deposits are widely spread throughout the world. Zinc ores are extracted in more than 50 countries. Zinc occurs normally associated with lead and other metals including copper, gold and silver.

Zinc was recognized as metal in India, the eighth known metal to human at that time. Historically zinc was used in brass. With improvement in technology, Refined zinc is supplies in the form of Ingot. These ingots are typically 25 Kg blocks, however steel mills prefer to use jumbo ingots in order to reduce dross and optimize productivity. Currently, the dominant end uses for zinc in India are Steel Galvanizing, Rubber, die casting, Pharmaceutical, cosmetic and Fertilizers Moreover zinc is mixed copper to make brass, which is big industry in India. Moreover per capita consumption of Zinc is only 0.5 Kg per person, which is one of lowest in the world. With infrastructure development taking place in all the big and small cities, consumption is going up. India has coast line of 8000 Km and lot of development is taking place in and around coastal towns.

Unfortunately, this area is more prone to corrosion and hence usage of zinc in coastal town is more than compared to non corrosive area.

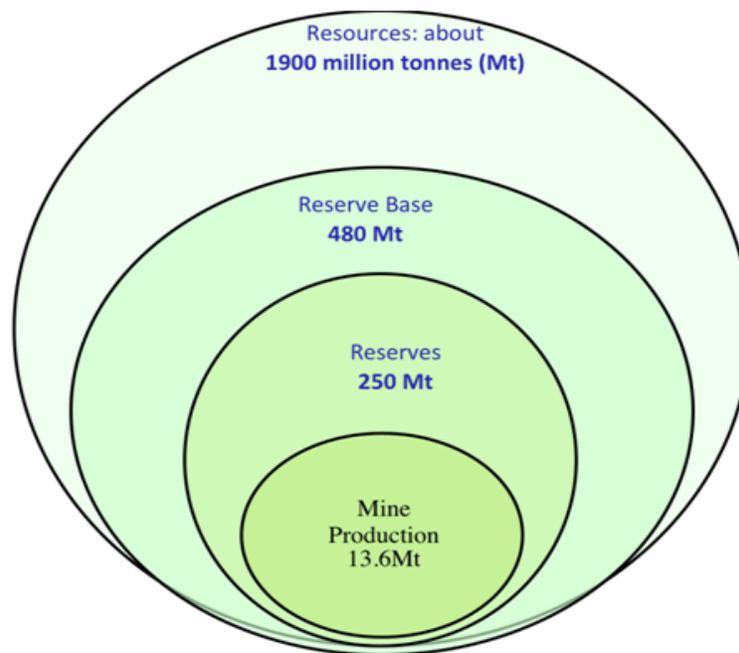
### 1.1 Zinc: Mines

Largest zinc mines: Rampura Agucha - India (6.15million tonnes (Mt) of annual capacity, contained metal), Red Dog - USA (5.60Million metric), Century - Australia (510 Mt), and Mount Isa - Australia (350 Mt).

The term resource, Reserve Base and Reserves are very critical for Industry as these increases confidence of other stakeholders for that industry. Stakeholders are the members of a value chain that include supplier, manufacturer, wholesaler, retailer and customer<sup>23,24</sup>, (Ross 2000), but also third parties involved in the flow of good along a supply chain

A resource is the identified concentration of a mineral in the Earth's crust in such form and amount that economic extraction is currently or potentially feasible.

Reserve base is that part of an identified resource that meets specified minimum criteria related to current mining and production practices – it thus reflects current knowledge, technology and prices.



**Figure 1.** Total Zinc Reserves and Resources.

Source: ILZRO

Reserves refer to the portion of the reserve base which has been measured and which is, or may become in the close future, available for production. The term reserves need not signify, however, that extraction facilities are in place and operative.

Base metal ores are moderately abundant in the earth's crust. While more abundant than many other minerals, these are not concentrated enough to make them easily exploitable economically. Some of the major end uses for zinc include galvanizing of steel, automotive applications, die castings, fertilizers, medicine, cosmetic, paint industry, rubber and batteries.

Domestic demand for zinc was estimated at 7,50,000 tons per year, with global production around 14,000 kt in 2014. World demand is projected to rise at an CAGR of 5%.

The supply risk for zinc ore, for example, is much larger in countries like India, as maximum zinc is produced from Rampur Agocha mine (Rajasthan) may not be the same as that for Aluminium due to the multiplicity of potential sources.

In business today, metal companies cannot ignore environmental issues. Increasing government regulation and stronger public mandates for environmental accountability have brought these issues into the executive suite, and onto strategic planning agendas. At the same time, companies are integrating their supply chain processes to lower costs and better serve customers. These two trends are not independent; companies must involve suppliers and purchasers to meet and even exceed the environmental expectations of their customers and their governments.

The environment has become a important and critical issue in business today. In the 1960s and 1970s business houses hardly considered environmental compliance to be a important issue which elicited little discussion at executive levels. Since then, several highly visible environmental disasters (e.g., Love Canal, Three Mile Island, Exxon Valdez) have demonstrated the importance of having a comprehensive environmental strategy in place. As is true of Total Quality Management (TQM), environmental strategies must be conceived and supported by top management, but business today, companies cannot ignore environmental issues.

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In Zinc industry often customization is possible only to a certain extent for example shaping ingot as per design provided by customer or customizing weight as per the demand of the customer. Many researchers came out with findings stating that cost savings are a major reason for global sourcing. In recent years China, Korea and Iran has emerged as major supplier of zinc metal into Indian market. Also India and Korea concluded landmark free trade agreement. In 2011 resulting in less import tariff from Korea. These bilateral agreements affect the sourcing decisions and Indian zinc producers have to realign prices and supply strategy. Sometimes sourcing from foreign countries can be costly<sup>1</sup>. An enterprise key resources are related to their core competence(s) and sometimes discussed in the context of outsourcing decisions to try to ensure they are not undermined<sup>2-5</sup> (Zhang *et al.*, 2006). Manufacturing companies are developing methodology that reduces risk of damaging a company's key resources and abilities<sup>6</sup>.

## 2. Overview of the Indian Zinc Industry Supply Chain

Detailed study on supply chain management in Zinc Industry have been limited. The Industry has been active only during the last decade. The major thrust had been in the area of developing adequate production capacity as part of import substitution and to generate demand for zinc coated sheets and alloys as 77 % goes in galvanizing. The supply chain management and logistics management in Zinc Industry had been largely confined to distribution activities i.e. outbound logistics as the part of inbound logistics is limited. Zinc being a commodity is not directly purchased by end consumer. The literatures available are therefore not on supply chain management and logistics management in Zinc Industry. Lately, Zinc Industry have started taking services of many consulting firms to focus on improving supply chain management and to improve efficiency.

Raw Materials constitute a major cost for the industry. Moreover other cost like water, electricity, labor depends on geographical location and type of industry. In metal industry electricity is a vital cost. The value of materials cost can go to 60% of overall cost, whereas production cost can go upto 30%<sup>18,19</sup>.

Based on the literature available on supply chain and zinc industry, broadly a Zinc supply chain recognizes three distinct stages.

1. Upstream, consisting of the mining of Zinc Ore (Spherite), and the delivery of the raw materials as concentrate to the Zinc Smelters.
2. Midstream, where zinc concentrate is converted into metallic zinc in smelters and Ingot is produced. It includes key

processes such as planning and scheduling and inventory management.

3. Downstream, consisting of the transfer of the zinc ingot produced to the customer i.e. Steel Mills, Hot Dip Galvanizing plants, Alloy makers, Pharmaceuticals company, fertilizers company, Tyre Manufacturers etc

In recent years, a lot of focus has been paid to the upstream stage because of many reasons like environment degradation, increased mining costs and depleting reserves. This has lead to new pricing and market mechanisms for raw materials. Moreover Zinc companies are evolving strategies to counteract these trends are surely justified. Now Zinc producers are pursuing optimization strategies in all three stages to restore the industry to sustainable profitability. This paper will focus on supply chain of Zinc industry as companies are under pressure to perform. This paper will also cover on optimization of resources and how it can be fully realized as part of a broader transformation that includes optimization of the industry structure through increased concentration.

## 3. Major End Uses and Applications

The first step in mapping the market is to delineate the value chain. To analyse the value chain a complete mapping of market is recommended by

Jon Hellin and Madelyn Meijer (2006) 'Guidelines for Value Chain Analysis.' To understand zinc customers *vis-à-vis* the source of supply then we need to know about the external origin factors that might influence the value chain. This is the way, we can know about the market. Market mapping helps us in identifying policy issues that may be obstructing or enhancing the functioning of the value chain and also the stake holders providing the services (e.g. market information, competition products, product life cycle and quality standards) that the different chain stake holders make in order to make better informed decisions.



Figure 2. Zinc Ingot.

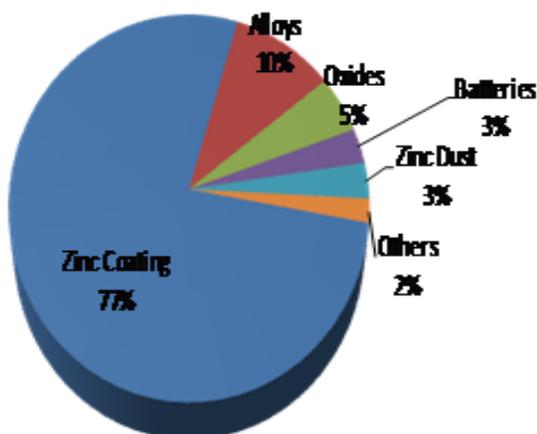


Figure 3. Zinc metal: End uses in India.

## 4. Demand for Zinc

The demand for mineral commodities is a derived demand which differs from consumer goods demand. The relationship between strategic purchasing and concurrent engineering has not been explored either conceptually or empirically. Minerals are used as inputs for the production of goods and services. Consumers have no direct need for the commodity itself as a consumer good. The demand for zinc metal is derived from the production of their end use products, such as Galvanized steel sheet, Faucets, zinc based supplement food, door handles, locks, tyres etc. strength of the demand of the final products for which they are inputs. An increase in the demand for the final product will lead to an increase in demand for Zinc metal. There is a slight difference between an derived demand and induced demand. In the case of derived demand, when prices rise, the extent to which the quantity of a material declines depends largely on the degree to which its price increase can be passed on to the final consumer, as well as the proportion of the final good's price that is accounted for by the mineral/metal commodity. That is, it might depend on the amount of Zinc used per unit of output. While induced demand is generated by replacement of competition material for the same application for commodities that are characterized by derived demand, the demand conditions for the final consumer goods to which they contribute are key factors. The major variables that determine the growth in demand for consumer /industrial goods are price and income growth.

As new mine production are under development phase, simultaneously old mines are getting closed or output has been reduced to such a level that it is not economically viable to operate them, several forecasts show that there will likely be shortfalls

of mines output than metal demand, but this is not true, as world zinc reserves are sufficient to meet the demand for next 35 years and also recycling of metal is increasing everywhere.

Although huge production and processing capacity for zinc metal currently exists in India, but that is sufficient to meet the domestic demand for next few decades. Also domestic players are ramping up their capacity continuously in India and abroad.

World production is also expected to grow as China and South American countries are continuously increasing their mining output. Chinese and Korean producers are also seeking to expand their production capacity or seek long-term supply agreements in areas around the world, particularly in Asia and Europe. There are many trusted exploration companies that develop the resource, and because of long lead times needed from discovery to refined elements, sometimes supply constraints are visible in the short term and this can be easily sensed by LME prices.

## 5. Supply Chain Issues

The supply chain for zinc metal generally consists of mining, separation, refining, alloying, and manufacturing (by products). A major issue for zinc die casting alloy ingot (ZAMAK and MAZAK) in India is the lack of refining and alloying capacity that could elevate zinc die casting industry. Because of lack of quality producers of zinc die casting alloy, many multinational companies from Korea and Australia are supplying ZAMAK and MAZAK alloy to Indian die casting industry. The growth of foreign suppliers is primarily because they are using virgin metal and better refining facilities at their overseas manufacturing facilities.

Many researchers in the field of manufacturing strategy talked about the necessity of aligning strategic decisions, in different areas – structural and infrastructural – with the competitive priorities emphasized by the company. For example, Hill<sup>8</sup>, Kleindorfer and Partovi<sup>9</sup>, and Safizadeh et al.<sup>10</sup>, most experts have predicted where new mining capacity for zinc is likely to come onstream, but it is just as important to know where new downstream capacity (processing, refining, and metals alloying) is being built or likely to be built in the world as well as the likely investors in downstream capacity for zinc metal. Also new steel mills coming up and capacity expansion in new mills further adds to the growth of zinc demand.

Recent supply chain developments by HZL include the acquisition of Anglo American Mining reserves in Africa. Also closure of Vishakapatnam smelter has initially raised doubts about metal scarcity. One concern voiced by critics of this decision is that zinc mining and manufacturing has concentrated in western and Northern India.

Metals such as arsenic, gallium, indium, and the rare-earth elements. Most of the world's supply of these materials is produced as byproducts from the production of aluminum, copper, lead, and zinc.

## 6. Evolution of the Zinc Industry Supply Chain - Post Liberalization (1992)

The geographic placement of production facilities, godowns, and sourcing points is the basic things in creating a supply chain. The manufacturing location involves a commitment of resources to a long-term plan. After analyzing the size, number, and location of these are determined, than the product flows to the final customer. These decisions are most critical to the industry as they represent the basic strategy for accessing customer markets. Moreover in long run they have considerable impact on revenue, cost, and level of service. Every industry before setting up a manufacturing locations considers production costs, local and central taxes, excise and custom duties and duty drawback, tariffs, local content, distribution costs, production limitations, raw material cost, etc.

The importance of low cost materials for increased savings to the company have been talked by Damodara<sup>21</sup>.

Zinc industry was working in monopolistic environment. Post liberalization when import start hitting the market, zinc companies started focusing on their supply chain and fundamental trend in the zinc industry which is prevailing since last decade is on its value compression, measured as difference in price of total cost of raw material and existing zinc prices in the market. It's beyond argument that, the prices of raw materials have increased faster and more than the price of Zinc ingot. The main reason for the increase in price of raw materials are: growth in demand exceeding growth in supply; entry of major global players dealing in raw material supplies; and significant excess of global zinc capacity. Although cost savings are found by many researchers to be major reason for outsourcing from China, the actual cost savings may not be as great as expected<sup>7</sup>.

Dobler *et al.*<sup>20</sup> mentioned that manufacturing can be divided into typical five categories. The following are the five categories.

- Raw materials
- Purchased parts
- Manufactured Parts
- Work in Progress (WIP)
- Maintenance, Repairing and Ordering (MRO) supplies

Supply chain optimization is a key success factor for all the zinc manufacturing companies, based on the following strategies:

- Expanding company-specific spread by investing in captive raw materials and by driving innovation in customer relationships: that is, by optimizing their upstream and downstream supply chains.
- Improving the efficiency of their conversion of raw materials to finished products to capture more of the available spread to their bottom line; that is, by optimizing their midstream supply chains.

A model was developed for manufacturing strategy analysis, where authors emphasized on a series of predatory models, that considers annual product output from raw material vendors via intermediate plants and distribution in a pattern to the final customers<sup>14</sup>.

We will now discuss each of the three supply chain stages, focusing on opportunities, strategies and challenges for optimization

## 7. Upstream Supply Chain Optimization: Zinc Ore

Zinc Ore Concentrate (Zn) is traded in powder form, direct from the mines to the Smelters. Integrated plants use most of their produced concentrate to produce Ingots. But it also depends on the LME prices, prevailing domestic prices and international concentrate prices. There are other factors also which generally govern zinc ore prices like duty tariff with a specific country. As market place widens up and competition increases because of globalization, customers press to manufacturers to increase their quality, flexibility and lenient terms of trade, while maintaining competitive costs<sup>15</sup>. Hence, firms are now looking at securing cost, quality, technology and other competitive advantages as strategies to pursue in a globally competitive environment. Currently, one popular route to competitive advantage is to add value for customers by performing supply chain activities efficiently. As a result, many manufacturers are focusing on their supply chain management practices (Goh and Pinaikul, 1998). There has been enough indicators showing that global supply/demand balance for traded zinc has improved drastically since 2010, as new capacity additions in zinc mines and smelters has improved metal balance position.

Many new players after global acquisitions has scaled up activity in India. New players prices are high because of ore quality, distance to markets, and/or large-scale infrastructure investments, thus limiting the price fluctuation in Indian market.

As zinc ore availability is increasing, India will consume large volumes of domestic ore mined by HZL, whose high zinc content (upto 42%) and low costs will also help maintain a price basis for the global market. Having said that, efforts by Indian Zinc producers to acquire stakes in overseas mines, and new

Government's thrust on improving infrastructure. Many projects which have taken on priority are rural electrification, National Highways development and other infrastructure projects will be the key drivers for high usage of zinc in India. The advantages to zinc producers lie not only in the potential for lower delivered costs, but also in having a more stable and consistent supply, which can lead to both operational and commercial advantages.

There are three important things worth mentioning:

Zinc companies should work to micro level in order to value the mining assets and should not overpay for mineral reserves. Valuations always reflect the quality and quantity of the underlying reserves, plus the market's expectation of the future prices, adjusted for the costs and risks of developing and maintaining output. As external atmosphere is very competitive, because of other external factors like land acquisition for mines, statutory environment clearance etc surrounding any zinc ore company or mine sale, there is a strong chance that companies will overpay in anticipation. Even with little costs of capital overpaying can offset the benefits of supply chain ownership.

Utmost care should be taken in valuation of essential resources. Some times investing in overseas mining resources is not always a profitable proposition as costs can scale up because of project delays. Also brownfield expansion in a working mine is always difficult, costly and risky proposition. Establishing best practices for project monitoring, managing and optimizing overseas capital investment is must.

Many global zinc producing companies are now focusing on Indian market. It is also evident that imports from countries like Korea (Korea Zinc), Australia (Nystar) is gradually increasing. Because of global trade, imports will be an interesting balancing force, but it will not fundamentally restructure the market nor will it substantially address the industry's profitability challenge since this amount will likely represent only 15 to 20 percent of the domestic zinc demand, the balance of which will be sourced at market prices. Nonetheless, zinc companies (Global Trading companies) that execute this strategy more effectively than others—by not overpaying and by carefully controlling the development costs—will achieve important competitive advantages. But in the absence of any new domestic emerging company in zinc business, these advantages may not be spread resulting in a sub-optimized upstream supply chain. Globally major zinc companies are either acquiring other players or entering new markets so that they can tactical advantage.

## 8. Downstream Supply Chain Optimization

Zinc producers have traditionally viewed their supply chains as ending at their plant gate, once the product is loaded onto a

truck for shipment. This perspective ignores the significant value that can be created by extending their reach to include the additional value added products like die casting alloys, Brass etc and transferring technology that are sometimes provided by supply chain intermediaries. By focusing on their downstream supply chain, zinc companies can realize higher margins, thus helping to recover some of the profits lost in the market spread compression. A major structural problem facing the Zinc industries in its pursuit of sustainable profitability is the large number of traders and other intermediaries operating in the downstream supply chain (zinc alloys), together with the high percentage of the market they control. It compares the percentage of the zinc alloy consumption in different countries supplied by different channels: Domestic Zinc producers, Companies Traders, Imports, Recycling and independently-owned distributor or trader.

In India approx. 80 to 85 % of total Ingot manufactured are supplied to value adders directly and balance 15% is routed through trade route.

Chopra and Meindl<sup>16</sup> has mentioned that supply chain consists of several stages involved, directly or indirectly, in meeting customers request. The supply chain essentially includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. Each organization has internal the supply chain that includes all functions involved in fulfilling customer's request. These functions also include, but are not restricted to, new product development, operations, marketing, finance, IT, distribution and customer service.

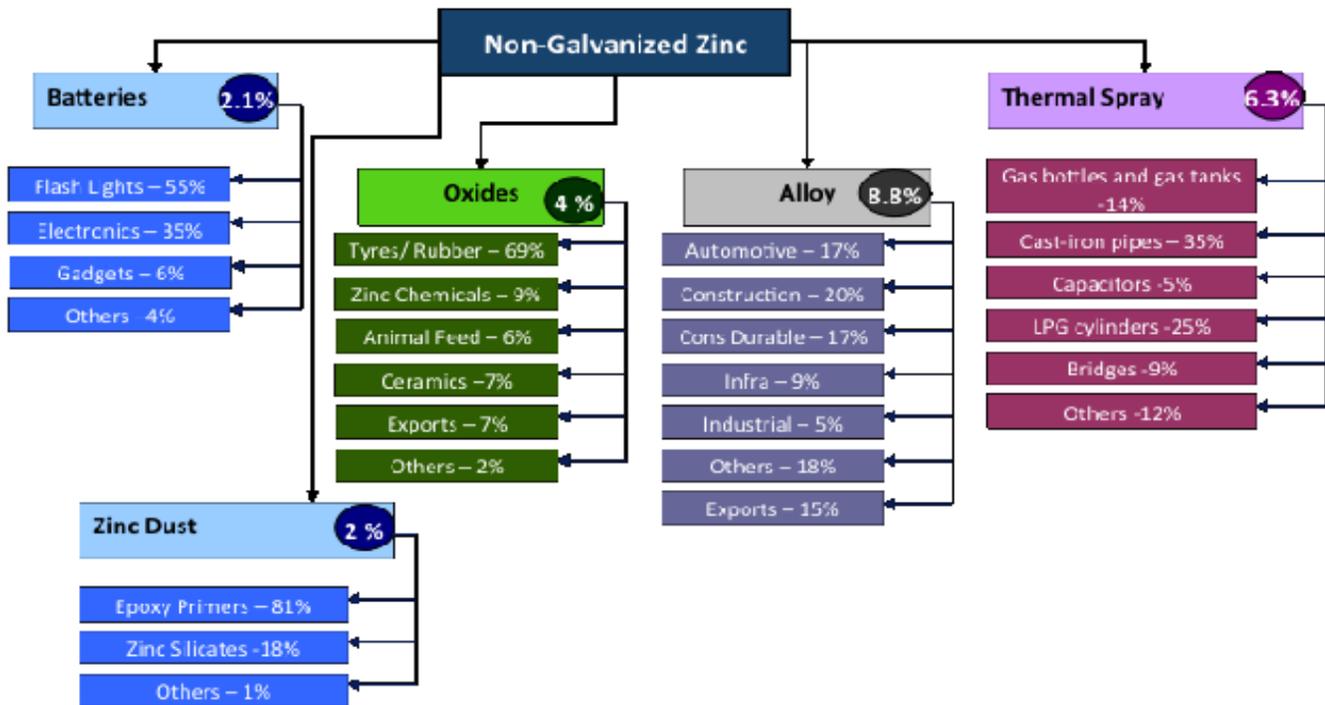
LME Volatility leads to speculation and as a result intermediaries build or reduce inventories based on speculative expectations of future price movements rather than real demand trends.

Zinc price Volatility Creates major inefficiencies in the overall physical and financial resource allocation due to the massive amount of redundant inventories held by competing intermediaries and to excessive or indirect movement of material.

For individual Zinc companies:

Mutes real demand signals from the market, thus affecting their planning and scheduling. In the absence of direct interaction between zinc producers and customers, it makes more difficult to understand their exact requirements and to foresee opportunities for new product development.

Reduced margins because of pricing pressures from intermediaries and on the loss of potential margin on services and processing. As a matter of fact, ownership of major distribution channels is both an essential strategy for zinc producers and a necessary step in the optimization of the entire downstream supply chain. However, expanding downstream is not simply a matter of acquiring intermediary companies or building new distribution centers. To operate downstream successfully, zinc companies need to implement new business models, capabilities



**Figure 4.** India Non-galvanized market segmentation.

Source: India non galvanized zinc market segment (source: Frost and Sullivan, 2014)

and technologies. The following are some key learning's and leading practices based on our work with alloy making companies that operate downstream successfully:

Using extended supply chains to get closer to the final customers, to better understand customer requirements and to develop new products and services that improve profits.

Not using downstream warehouses as dumping grounds for excess zinc production since inventory carrying costs would erode the margin benefits of higher value sales.

As most of the major manufacturers have switched over to Enterprise resource planning and advanced information technological tools to enable new operating model and capabilities. This has increased visibility in their operations; scheduling and advance planning, network and logistics optimization; and customer profitability index. Companies which have successfully implemented downstream integration strategies leveraging both hysical asset and technology investments can enjoy higher market shares, margins and business turnovers. While actual scheduling and planning should be done after considering market conditions and precise market intelligence plays a big role in accurate planning. However the benefit that zinc industry can realize through downstream integration will be limited if the overall industry downstream supply chain is not deeply restructured. Moreover, as many large zinc companies control a higher percentage of their downstream supply chains (around 40 to 50 percent) than

the industry as a whole, this is not enough to deliver adequate profitability. Individual downstream supply chains optimization goes along with the overall industry supply chain optimization, which also goes along with industry consolidation.

## 9. Midstream Supply Chain Optimization

Proper Planning makes businesses less vulnerable to the unpredictable fluctuations in demand for zinc. The risks of making financial decisions based on forecasted demand are always greater. Minimizing environmental impact while maximizing return on capital employed requires integrated supply chain optimization. Technology has helped in optimizing against most unique key performance indicators and constraints.

There are two aspects of midstream supply chain optimization that needs importance for better industry profitability. The first important issue is of many activities and processes that take place within an company where the goal is to optimize the use of a company's physical, financial and human resources to convert raw materials into finished products as efficiently as possible so as to increase profitability. The second important issue of the organization of physical production units within an industry across companies to achieve sustainability and industry-wide

efficiency, which can be addressed by way of industry associations involved in transfer of technology and expanding market for these companies.

Handfield<sup>17</sup> mentioned the importance of information rather than flooding warehouses with inventory, supply chain management is the integration of external and internal activities that also include inventory management, vendor relationships and logistic services. The ultimate goal is to substitute inventory with information to provide visibility and transparency, so that finished goods and raw materials can be replenished without delay and arrive at customer's place in smaller lot sizes, in just on time

Discussing further on the first aspect about the individual companies', there is concern about midstream activities and processes. It can be further discussed on following points.

(A) Midstream supply chain processes are very important and thus provide the mechanism for a company to integrate the upstream and downstream supply stages and thereby optimize the entire enterprise. Many companies in zinc industry are utilizing ERP services which helps them in Centralized planning and scheduling and linking upstream (procurement) with downstream (sales and transportation management). The proficiency to operate the upstream, midstream and downstream as a single, integrated supply chain is a key characteristic in successful zinc company that distinguishes it from non performing companies and allows them to realize higher profits.

(B) Optimizing the midstream supply chain and implementing new operating functional models, leading practices, and IT tool scan generate greater returns, in short span, either upstream or downstream investments. The midstream supply chain transformation produces significant improvements in order lead times, work-in-process and finished inventories and overall plant yields.

Dejonckheere *et al.*<sup>22</sup> mentioned that bullwhip effect happens when individual players in the supply chain sometimes order more to their suppliers than the actual demand from customer side. Further they mentioned that the bullwhip effect in supply chains can be controlled effectively through proper design and re-engineering of supply chains.

(C) Building a strong supply chain in an organization is a critical success factor for effective midstream supply chain optimization, which is independent of both the production and commercial functions. Still many organization in zinc industry run on the old operating model in which the supply chain function is a subservient department within either the commercial or production organizations. An independent supply chain is essential for different parts of the company as balanced planning, scheduling and resourcing decisions optimize the entire enterprise rather than individual production units or constituencies.

## 10. Conclusion

Zinc industries has made truly remarkable gains over the past decade, not only in its growth in size, but also in its advancements in product quality, process technology and development of people. However, the Zinc manufacturers continues to lag the rest of the global industry in terms of profitability, a situation which is not sustainable. While the Indian Zinc alloy manufacturing industry shares many of the same challenges facing the global industry as a whole, it also faces unique challenges that derive from speed and manner of its recent growth among other factors. To restore profitability and become sustainable, the zinc alloy makers faces three key imperatives:

It must pursue upstream supply chain optimization through the appropriate acquisition and diligent development of mines.

It must pursue downstream supply chain optimization through the restructuring of the trading and distribution sector to support greater control over the primary market channels.

It must pursue midstream optimization through industry consolidation. These imperatives are interconnected and interdependent; the industry will not be able to achieve success in one area without significant progress in the other two. Companies that succeed in upstream or downstream optimization will attain competitive advantages, which will give them the stronger position in merger and acquisition negotiations. Yet without strong merger integration capabilities, they will not succeed in maintaining that leadership. And larger, financially stronger industry leaders are essential for the upstream and downstream supply chains to be optimized in the next few years. While optimization in all three supply chain stages is the goal for most zinc companies, the reality is that not all companies will have the resources or skills to prevail in all three stages. Individual companies may be better suited to focus on either upstream, downstream or midstream optimization as the primary path for restoring profitability. From the overall perspective, identifying and promoting specific areas of capabilities among zinc companies and guiding the consolidation process along these more "natural" paths will enable the Indian Zinc industry to more rapidly reach its goal of an optimized, sustainable and global-leading industry.

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