ROURKELA GENERAL ENGINEERING CLUSTER

DIAGNOSTIC STUDY REPORT

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Cluster Development Programme

CONTENTS

1.0 INTRODUCTION:

Iron and Steel is crucial to development of any modern economy and is considered to be the backbone of the human civilization. In fact level of per capita consumption of iron and steel is treated as one of the important indicators of socio-economic development and living standard of the people in any country. All major industrial economies are characterized by the existence of a strong iron and steel industry and growth of many of these economies, at least in their initial stages of development has been largely shaped by the strength of their Iron and Steel industries.

Products of Iron and Steel Industry are Pig Iron, Sponge Iron, Flat Steel Products, Long Products, Alloy Steel products, foundry products Etc. Major consumers of steel products are engineering application, automobiles, construction and Consumer durables. The Rourkela cluster has sub clusters of sponge iron, foundry products and machining and fabrication.

2.0. GLOBAL SCENARIO

Global Iron and Steel demand is rising on the back of accelerated infrastructure activity in China (mainly due to the Three Georges project on Yangtze, build up for the Beijing Olympics in 2008 and the Shanghai Expo in 2010), CIS and India, housing boom in USA, and consumer goods resurgence in Europe. Iraq reconstruction work is expected to fuel further demand for Iron and steel products over the coming months.

Total output of Sponge iron in the world was 54.6 Million tons (Year 2004), an increase of 10% over the previous year. The three biggest producers in the world are: India (9.4MT); Venezuela (7.8 MT) and Iran (6.4MT). These four countries together account for around 40% of the global trade. China is the biggest consumer of sponge Iron. Exports from India are less than 10% of its production, while there is a marginal premium in exports along with the duty draw back facilities. Mainly the large size gas based production units of Gujarat and Maharashtra are presently exporting. The increase in Demand for sponge iron is further fuelled by scarcity as it is being used as an alternative for metallic scrap, as is the case of the Indian sub-continent. The demand supply gap in Iron and steel Products and Machined parts is expected to increase and even the global industry is not prepared for this demand onslaught. For these reasons it is expected that Iron and Steel prices, as a whole, will continue to firm up.

As far as castings are concerned, the major producers of castings, ferrous and non ferrous are as depicted in the table.

Country	Castings(Million Tons)				Operating Foundries (Numbers)	Productivity/metal casting plant (Thousand Tons/Year)
	Iron	Steel	Non-ferrous	Total		
CHINA	14.83	1.77	1.55	18.15	12000	1.5
U.S.A	8.26	0.99	2.86	12.11	2620	4.0
JAPAN	4.47	0.24	1.41	6.12	1713	3.5
GERMANY	3.68	0.18	0.86	4.72	651	7.0
INDIA	3.24	0.47	0.33	4.04	4500	0.6

India is the third leading nation in the production of Grey Iron and cast steel casting after China and U.S.A. India has exported graded castings worth USD152.05 Million and sanitary casting worth USD 64.12 Million in 2003-04 mainly to USA and Europe. This has been strengthened and supported by closure of some foundries in Europe due to global environmental concerns. In fact lot of foundry work has been shifting to low labor cost centers like India and Eastern Europe.

On the machining front, Germany, U.S.A, and U.K have dominated the industry. Of late some Asian countries have also emerged as a major force both in terms of production and consumption further fuelling demand and driving growth of the industry. One of the key factors for growing stature of the Asian countries is price competitiveness and availability of skilled manpower.

The machining and fabrication sector, which includes the global engineering projects, including auto component industry, was expected to touch $1.9 trillion by 2015, of which around 40% ($700 billion) was potentially expected to be sourced from low cost countries like India. Of the total global trade of $185 billion, India's share is merely 0.4% while China accounts for 1.2% and Mexico 5.9%. It is expected that the present sourcing of Engineering projects and auto components from low cost countries (LCCs) worth $65 billion may actually reach $375 billion by 2015. (*Reference: ASSOCHAM study dated April 8, 2005*)

3.0 INDIAN SCENARIO

The Indian Iron and Steel Industry is nearly a century old with Tata Iron and Steel Co (Tata Steel), the first integrated Steel plant coming up 1907. At the time of independence in 1947, India already had a small but viable Iron and steel capacity of around 1 million ton per annum. Today India is the 10th largest producer of steel.

The initial period in the industry was dominated by bigger units. However 70's saw the emergence of small scale secondary Iron and steel producers in the private sector to bridge the gap between the rising demand and stagnating supply from the existing integrated plants. During the 90's Sponge iron industry has been specially promoted so as to provide an alternative to steel melting scrap which was increasingly becoming scarce.

Today, India is the largest producer of sponge iron in the world accounting for 12% of the global output. Total production of sponge iron for our country was less than 5.6 million tons as recently as 2001, and has skyrocketed to nearly 9.4 million tons in 2004, an increase of 68% in only three years. The year on year increase over 2003 was 22%. Indian demand and production are likely to further firm up as explained earlier. The biggest sponge iron unit in India is M/s. Jindal Sponge Iron Ltd, at Raipur. SMEs contribute 9.4 million tons (40%) to the national output. The major clusters for sponge iron production are in Hazira, Bhandara at Gujarat, and are gas based. However, in the eastern part of the country, the plants are coal based, owing to the local availability of coal. The Rourkela cluster (i.e. Sundergarh district) is the highest producer of the eastern region but stands third in India.

In foundry sector India produced a total of 4.04 million (*Ref: 38th Census of world casting production-2004*) tons, increasing close to 8 lakh tons over last year. 90 % of the foundries in India are in SSI sector. Major clusters for foundries in India are Howrah, Coimbatore, Belgauam, Bangalore, Agra, Rajkot, Kohlapur, Hyderabad, and Panipat.

In the machining and fabrication sector, despite stiff competition from countries like China and Mexico, India is increasingly becoming a sourcing base for engineering projects and auto majors seeking completely built-up units (CBUs) as well as outsourcing of components. India's advanced tooling and machining industry has enabled indigenization of capital equipment and reduced capital costs In addition, Indian manufacturing sector has the potential of continuously improving capabilities and operational excellence.

4.0. ROURKELA IRON, STEEL AND MACHINING CLUSTER

4.1 Geographical Location

Rourkela, the industrial capital of the state is situated in the north western part of Orissa, in the mineral rich (iron ore, coal, manganese, limestone, dolomite mines) district of Sundergarh. Rou-re-kela means your village in local Sadri dialect. Rourkela located at a distance of 350kms from state capital of Bhubaneshwar, is well connected by road and rail. It lies on the trunk rail route for Calcutta – Mumbai.

4.2. Evolution

The establishment of cement factory OCL at Rajgangpur in 1951 and the Hindustan Steel Limited (Now Rourkela Steel Plant) in 1955 were mainly responsible for rapid industrial development in this area. During the past few decades large, medium and small scale industries and ancillary units in and around Rourkela began to concentrate and create an industrial complex.

Cast Iron Foundries were in operation in large number due to availability of scrap (known as skull) from Rourkela Steel plant. After the modernisation of RSP, during the 90's, due to non availability of scrap (skull), the foundries units operating at Rourkela became unviable and had to shut down. Presently there are less than 13 cupola based units, in operation.

Thanks to encouragement provide by state policies, large number of sponge iron, steel foundry (Ingot) Re-Rolling and machining units came up in and around Rourkela, catering to the need of not only large and medium scale but also small individual customers. Most of the units are located at Rourkela Industrial Estate, Kalunga Industrial Estate, Kormanda, Rajgangpur and Bisra area.

4.3 Product

Approximately 30 sponge iron units, 50 foundry units and more than 200 machining units manufacture Sponge Iron, Steel Ingots, Ferrous and Non-Ferrous Castings including Alloy Castings, and Machining and Fabrication for large and medium scale customers. The annual turnover of the cluster is estimated to be about Rs.725 Crore.

5.0 CORE CLUSTER ACTORS

5.1 Sponge Iron Units

Sponge iron, also called as Direct Reduced Iron (DRI), is a metallic product formed by direct reduction of iron ore at temperatures just below the fusion point of Iron. The name sponge iron is derived due to its porous nature. Sponge iron is an alternative to steel melting scrap. Most of the 30 sponge iron units are 3 years old and are in the medium scale. The production capacity varies from 50 TPD to 400 TPD. Investment varies from 6 crores to 12 crores with all units having their own land and sheds.

The manufacturing of sponge iron is a continuous process. Each unit employs about 50 to 100 workers majority of them working under a contractor. Majority of the Marwadi entrepreneurs, though having good financial and business acumen, have little knowledge about technology and process. They are from varied background from trading in Iron and Steel to pulses and cement. They have set up these units motivated by the present boom in the steel sector. All the sponge Iron units are located outside Rourkela town in the Kormanadala, Rajgampur and Kalunga industrial estates. The turnover of this sub cluster is approx.Rs.400 Crores. (Please see annexure 1 for flow process chart).

5.2 Foundry

The distribution of foundry units in the cluster is as given below:

GROUP	NUMBER OF UNITS	PROCESS	CUSTOMER	RAW MATERIAL
Steel	25	Induction furnace	Mainly Re-rolling mills	Sponge iron- , Steel grade pig iron , scrap, ferroalloys,
Cast iron	20	Cupola/Induction furnace	HCL, RSP, Railways, Local market and Neighboring states.	foundry grade pig iron, scrap, coke and limestone
Non-Ferrous	06	Oil Furnace, Pit furnace	RSP, Bhilai and local machining units.	Copper, Brass, Tin, zinc, Bronze and flux

The approximate turnover of this sub-cluster is Rs.250 crore.
(Please see Annexure 2 for flow process chart)

5.2.1 *Steel foundry*

Majority of 25 Steel units are in Steel ingot manufacturing- their capacity of Induction furnace varying from 500kgs to 7 tons. Four of these units have been set up by sponge iron manufactures as part of forward integration. Again Most of these units have come up in last 3 years.

These units employ about 60 workers each, majority of them on contract. The units are power intensive. Majority of the entrepreneurs are from Marwadi community and

have little knowledge about technology and process. However the units are manned by technically qualified people. The units have there own land and shed. The ingot manufacturers mainly supply to re- rolling mills of Orissa and neighboring states.

5.2.2 Cast iron foundry

They are the oldest industry in the cluster, which were previously making C.I. Pipes and fittings, manhole covers etc. With the advent of plastic products and their markets dwindling, these SSI units have diversified into making grinding media balls, general castings and Ingot Moulds. Majority of the units use cupola for charging. Units which supply to Railways and manufacture graded castings use induction furnace.

The entrepreneurs in the casting sector are mainly 2nd generation entrepreneurs having fairly good knowledge about the casting business. Contract labor is extensively used in *these* foundries. The prevailing Contract labor charges are approx.Rs.700 to Rs.800 Per ton in cast iron units.

A consortium of 7 units promoted by NSIC is active in the cluster. It caters to NSIC procured orders.

5.2.3 Non ferrous foundry

Majority of the SSI units (turnover ranges from Rs 60 lakhs to Rs. 1 Crores) make copper alloy castings for RSP, Bhilai steel plant and local engineering industry. All the units have there own machining facilities. Most of the units have oil furnace and pit furnace with some of them having capacity to make up to 2 tons casting per single piece. The units restrict themselves to RSP and Bhilai steel plants and are not marketing outside the state.

5.3 Machining Units

More than 200 machining and fabrication units (app turnover Rs 75 crores) in Tiny and small scale sector present in the cluster do ancillary work of machining and fabrication to RSP, L&T and OCL. Machining units do job works as well as produce product as per design given by the customer. Generally the precision skills are very poor. Additionally units also cater to the needs of Small and Medium Sponge iron, Casting units for their maintenance requirements. Some of the medium machining units off load there work to smaller machining units with in the cluster. Most of the units are spread across Kalunga Industrial Estates, R.I.E, Rajgangpur and Commercial areas of Rourkela. Most of the tiny machining units are operating from rented sheds.

The spread of units based on turnover is tabled below:

TIER	Number of Units	Turnover
1	25	Above Rs. 50 Lakhs
2	50	Above Rs.15 lakhs to less than Rs.50 lakhs
3	100 Plus	Less than Rs.15 lakhs

Tier 1 units take up bigger jobs and go beyond the regional boundary for orders. They have contacts with one or two package providers and consulting firms in addition to PSU's. Few units take up turnkey jobs.

Tier 2 units are mainly dependent on RSP jobs and local medium industry. They mainly take up supply of spares.

Tier 3 units are the most populated ones with most of them unregistered. They depend on Tier 1 and Tier 2 for orders. Most of them are skilled owners and work on the machines employing one or two helpers. Majority of the units are in machining works.

The entrepreneurs in the machining and fabrication sector are mostly from North India and are qualified by experience (though not by formal technical education), and have basic technical background.

6.0 OTHER CLUSTER ACTORS

6.1 Traders: They are an important link between the sponge iron manufacturers and their customers in the other states. Similarly traders are matchmakers between ingot manufacturers (steel foundries 0 and customers outside the state. They operate on individual capacity without any establishment. Quite often they also arrange for Raw materials for units - being registered traders for supply of Iron and Steel to Machining and fabrication units.

6.2 Labor Contractors: They arrange for workers for the cluster units - most of them being local people. The contractor gets weekly payment from the units.

6.3 Project Consultant: There is one project consultant M/s. Popuri consulting having office at Rourkela, providing consultancy service to sponge iron units. They also take up complete operation of the plant on contract.

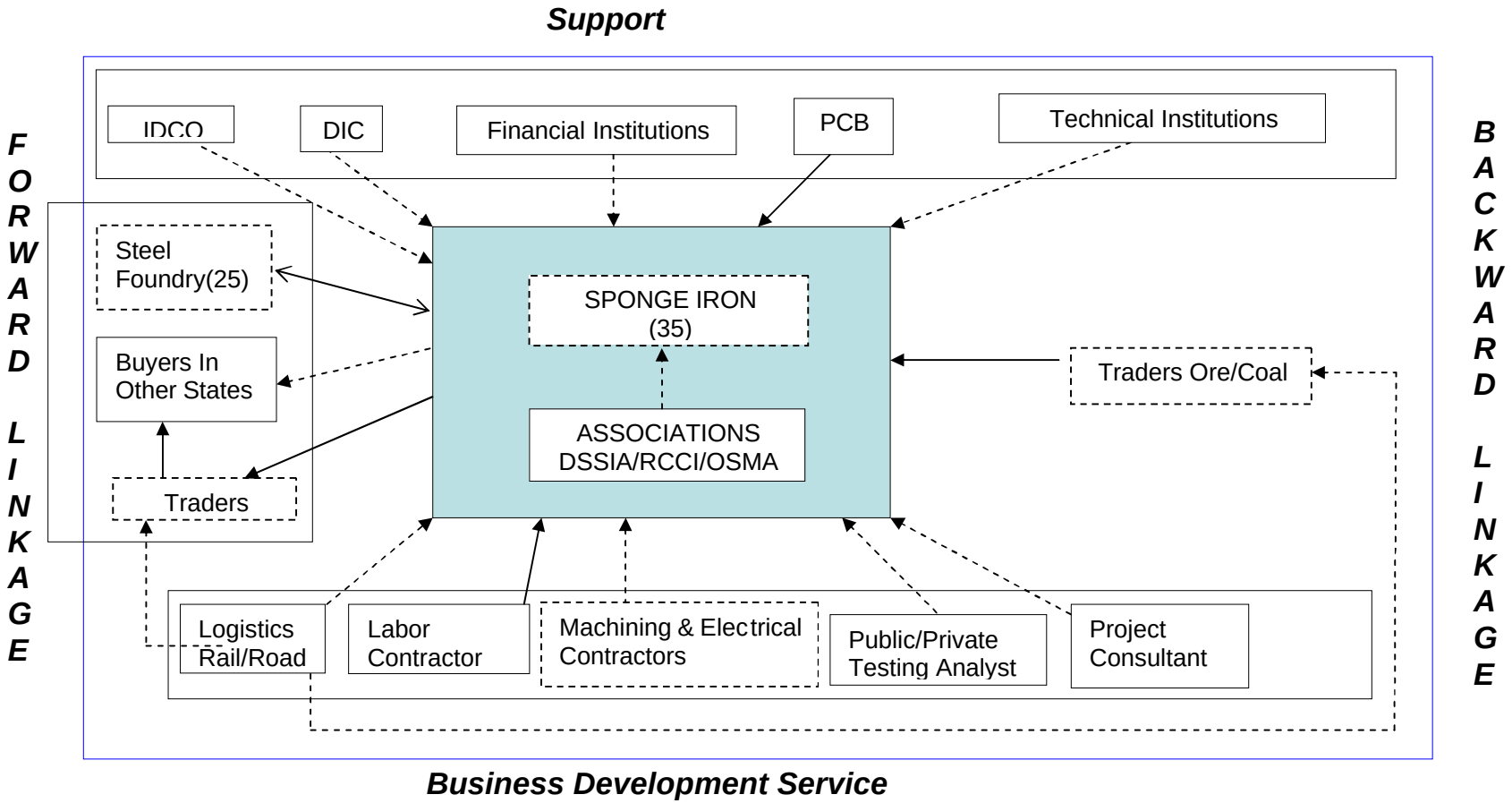
6.4 Private Testing Laboratory: There are two private testing laboratory recognized by Steel Plant. Operations are limited to analyzing the composition of material only.

6.5 Machinery Suppliers: One induction furnace manufacturer has established sales and service office in the cluster. Local fabricators are available for fabricating the cupolas. There is one erection and commissioning team for steel foundry.

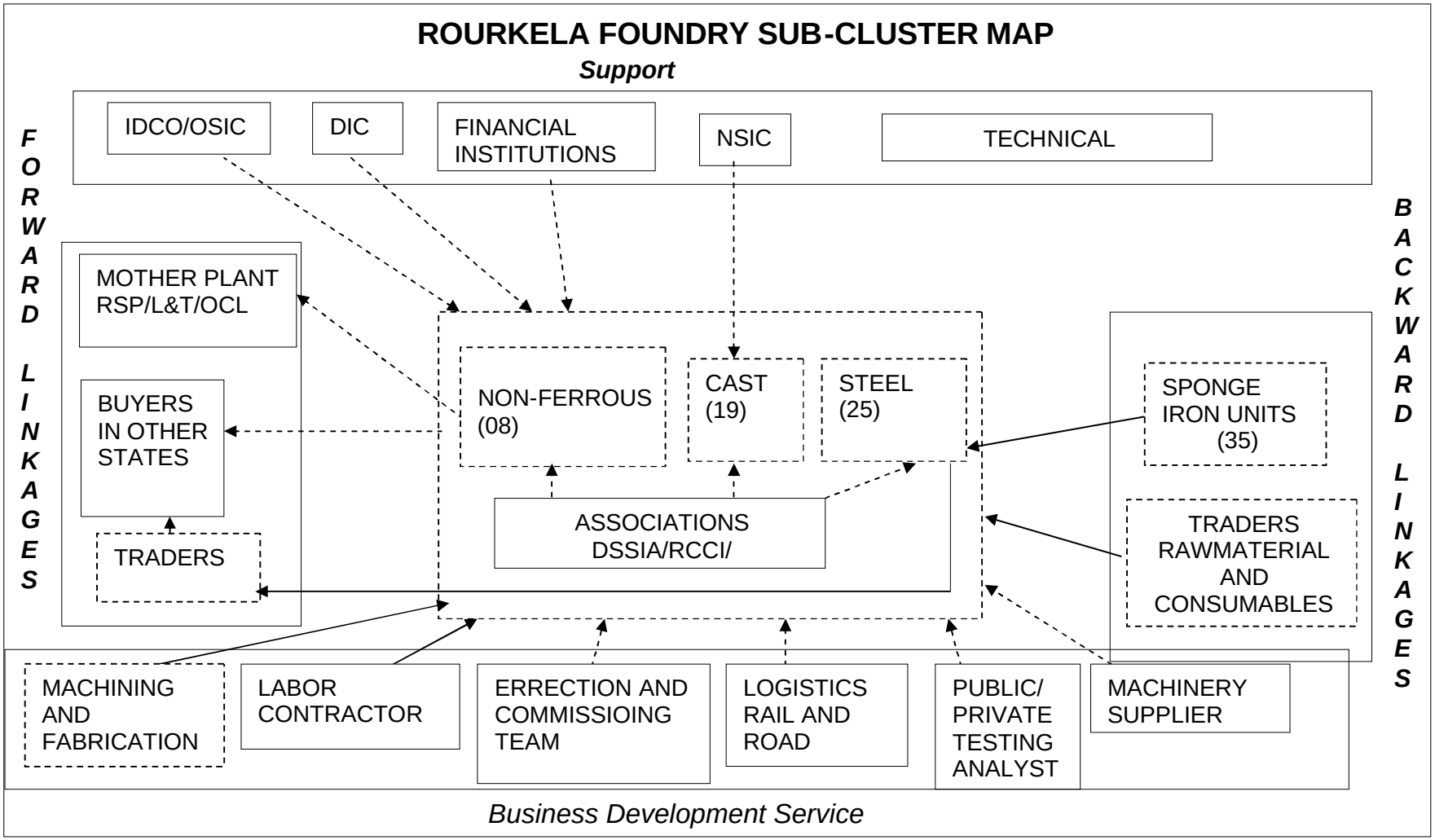
6.6 Mother Plants: RSP, L&T, and OCL provide forward linkages to the machining and fabrication units in the cluster

7.0 Cluster map: The cluster map for three sub-clusters of sponge iron, foundries and machining and fabrication unit is as below

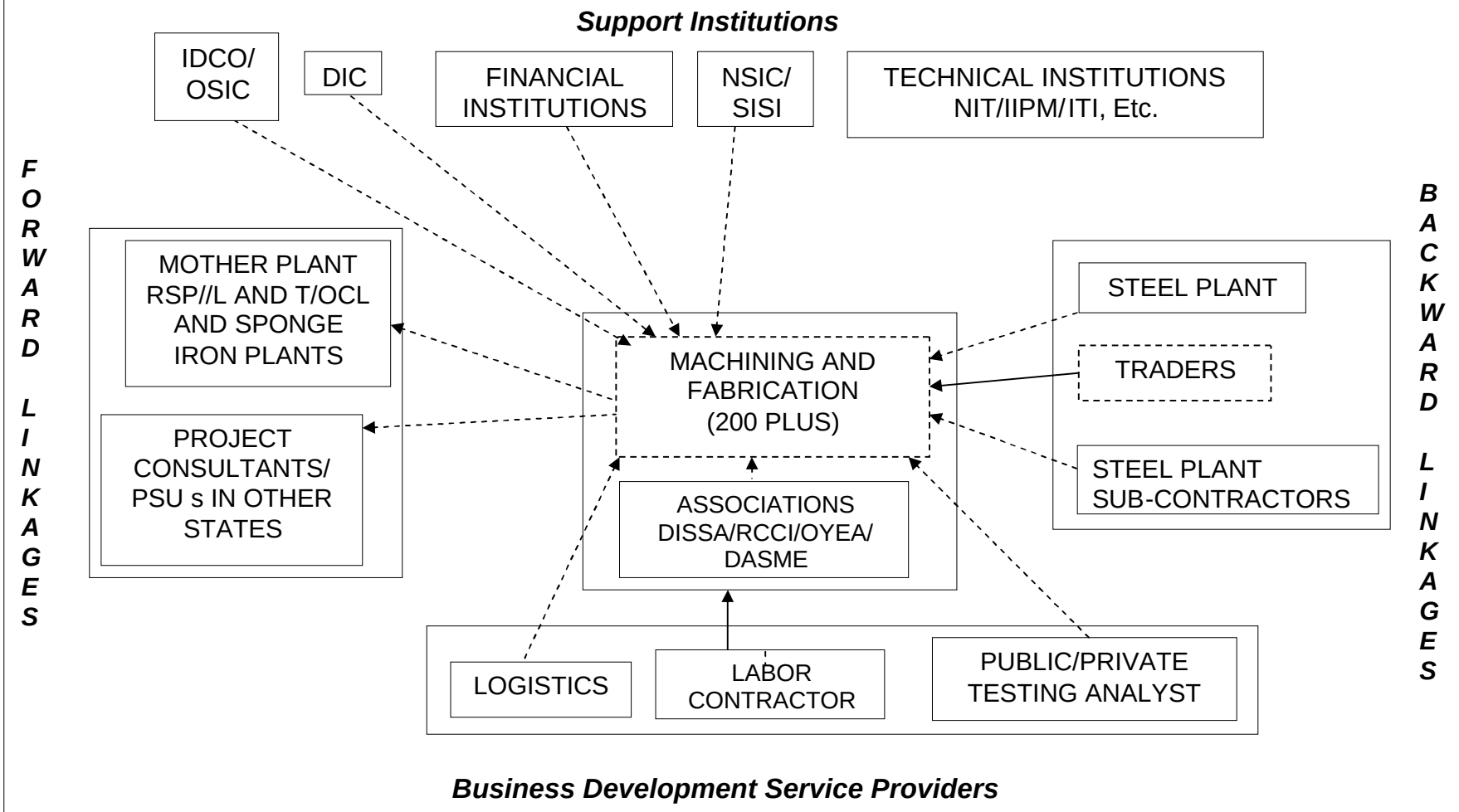
SPONGE IRON SUB-CLUSTER MAP



PCB: Pollution Control Board; DIC: District Industries Centre; IDCO: Orissa Infrastructure Development Corporation; DSSIA: District Small Scale Industries Association; RCCI: Rourkela Chamber of Commerce & Industry; OSMA: Orissa Sponge Iron Manufacturers' Association


ROURKELA FOUNDRY SUB-CLUSTER MAP
Support
IDCO/OSIC
DIC
FINANCIAL INSTITUTIONS
NSIC
TECHNICAL
FORWARD LINKAGES
BACKWARD LINKAGES
MOTHER PLANT RSP/L&T/OCL
BUYERS IN OTHER STATES
TRADERS
NON-FERROUS (08)
CAST (19)
STEEL (25)
ASSOCIATIONS DSSIA/RCCI/
SPONGE IRON UNITS (35)
TRADERS RAWMATERIAL AND CONSUMABLES
MACHINING AND FABRICATION
LABOR CONTRACTOR
ERRECTION AND COMMISSIOING TEAM
LOGISTICS RAIL AND ROAD
PUBLIC/ PRIVATE TESTING ANALYST
MACHINERY SUPPLIER
Business Development Service

ROURKELA MACHINING AND FABRICATION SUB -CLUSTER MAP



8.0 ANALYSIS OF BUSINESS OPERATION AND ISSUES

8.1 Sponge Iron- process and issues

Raw material: Iron ore, non coking coal and dolomite are the main raw materials used. Iron ore is procured from Badbil mines and in the absence of any mining rights procurement is most often through traders. Non-Coking coal is procured from Mahanadi Coal Ltd Brijrajnagar. Only about 10 units have coal linkages* for one or two kilns. Rest of the units depends upon traders or e-auction for the supply of coal and has to pay a much higher price. The quality of coal is poor and contains high ash content. Poor quality inputs lead to poor output in sponge iron. Sometimes Blending of coal is resorted to which leads to other problems like accretion of ash etc in the kiln further leading to low output.

Some bigger capacity units also import coal when the price difference between imported and local coal is marginal. However most often the import is not viable.

Products and market: Sponge iron is used as alternate to scrap for melting. The demand for sponge iron is on the increase with the boom in infrastructure development. The units enjoy a steady market locally as well as in other parts of the country. Quite often the prices vary – being influenced by demand and supply. The prices are fixed at Mandi Gobindgunj in Punjab.

25% of output of the cluster is sold to local units directly. For rest of 75% of output which is sold to outside markets, traders are an important link between sponge iron units and Induction furnace units (consumers of sponge iron) in other states. Traders negotiate the requirement and price between the supplier and buyer and establish linkage between them. They, quite often, pay advance to the sponge iron units much before the payment comes from the consumer. The fact that the sponge iron has limited shelf life of about 40 days increases dependence upon traders for marketing.

The brokers/traders control the market dynamics and are interested to enter only such markets where less marketing efforts are involved and maximum commission is received. Not much effort seems to be made by traders for exploring new markets. Similarly no attempt has been made to explore market in neighboring countries. Simultaneously no attempt seems to have been made by the entrepreneurs to explore value added products from sponge iron fines (0-3mm).

The competition emerging from other clusters coming up in Karnataka and Jharkahand is on the increase and unless productivity and issues of cost are addressed, the competition may adversely affect the cluster.

Technology and production process: Each Module of production consists of rotary kilns 40mts long with 3 meters diameter and rotary coolers with a length of 20mts and 2.1 meters diameter. It is supplemented by storage bins for raw materials,

*The linkages of coal are demand is primarily done with the objective of planning of coal supplies, keeping in view indigenous coal resources as well as the need to supply fuel of appropriate quality to the consumers and at the same time making the most economic use of the available capacity for production of coal.

products, conveyor belts, magnetic separators, vibrating screens and screw compressors.

Iron and Coal along with predetermined proportion of dolomite are charged in a rotary kiln. Coal plays the dual role of acting as a redundant as well as a fuel for providing heat to maintain the requisite temperature inside the kiln at 950-1050C.

The reduction process occurs in solid state. The crucial factor in this is the controlled combustion of the coal and its conversion to carbon monoxide to remove oxygen from the iron ore. The overall process requires duration of approximately ten to twelve hours inside the kiln during which iron ore is optimally reduced and discharged to a rotary cooler for cooling below 120 degree centigrade, before coming out into the finished product circuit. Sponge iron unit's process is fully automated.

Longer Maintenance Period: The plant is shut down for 4 to 10 days for maintenance after running for 30 to 40 days to remove ash and impurities from kilns. Good scope exists for reduction of production cycle and lower inventory level of finished product.

Pollution and safety: Most of the sponge iron units are classified as polluting units. Although most of the Units have installed pollution control equipments, usage is very limited and more steps need to be taken up for this issue. Further the units find it difficult to dispose dhar coal, and ash generated during process. Further the production system is prone to accidents due to lack of safety features.

Infrastructure: All units have their own generation of power (Diesel generation sets) to meet the power requirement for continuous process during power cuts. Some of the units are planning for steam based captive power plant. But unavailability of water near the units is the main bottleneck. Water is available at about 10 km distance. Units also stated that facility of railway siding in Kalunga, Kormanda and Rajgavpur is not available. In absence of the same the loading and unloading has to be done at Rourkela.

8.2. Foundry

8.2.1 Steel Foundry- process and issues

Raw material: The main raw material for steel foundry units using induction furnace to manufacture ingots and alloys casting is sponge iron, steel grade pig iron, scrap and additives. Sponge iron is easily available in the cluster. Two manufacturers of pig iron are also located near the cluster (M/s. Kalunga Iron Ltd and M/s. Neelachar Ispat Nigam Ltd).The alloy casting units procure manganese ,chrome etc through traders mainly in Calcutta.

The steel units claim that the quality of sponge iron supply is not optimal. Although the supplier sends the supply accompanied by a test report, the same is disputed by the Steel foundries. There is variation in price of sponge iron on a day to day basis and most of the units do not have holding capacity when the price comes down. And when the prices move up, the sponge iron manufacturer does not supply (despite advance payment having been received from the foundry) unless foundry pays the

difference. In the process the foundries are a loser on prices fluctuations on either side. This reflects unbalanced market position between sponge iron manufacturers and steel foundries.

Products and market: Majority of the induction furnace unit manufacture steel ingots, which are used by re-rolling mills to produce flats, rods, angles etc. Due to the present infrastructure and brisk construction activity in the country the units have ready market within Orissa, North India and neighboring states. However overdependence on brokers for outside market has its own pitfalls.

Whenever the price of the ingots falls in the market, the units add more carbon content through scrap so as to reduce the power consumption in the melting process. Though the units are able to protect their margins, the quality suffers. Since there is so much market pull, what ever is manufactured is sold. However once the overheated market cools down this will be an issue for steel foundries to handle.

Technology: Induction Furnace is composed of a refractory container, capable of holding the molten bath, which is surrounded by water cooled helical coil connected to a source of alternating current. The energy consumption is very high for these units (one ton steel output consumes 800 units).The furnaces are supplied by M/s Inductotherm, Electrotherm, GEC, Megatherm etc. A couple of Furnace units have their service engineers stationed at Rourkela.

Manual charging , the practice prevalent in most of the units, damages furnace lining if heavy charge materials are dropped into the furnace thus gouging or cracking the wall or bottom refractory. Additionally the furnace operator has to withstand higher temperatures.

Working environment: As is the case with the foundry industry, the workers are demotivated and absenteeism is the major area of concern. The workers and staff working in the steel foundry plant are prone to accidents, injuries and respiratory problems due to heat and bad working conditions. This in turn leads to low productivity, high labor turnover, and consequent high cost of labor and staff.

8.2.2. Cast Iron Foundry- process and issues

Raw Material: The main Raw material is Foundry grade pig iron, C.I. Scrap, Limestone and Hard coke. The raw materials other than pig iron are available locally and pig iron is procured from M/s. Kalinga Iron Works and M/S. Neelachal Ispat Nigam Ltd, near Rourkela on advanced payment. The units get coal and scrap from traders and steel plants. Quality of coal is not very good. Over and above this the industry faces frequent fluctuation in the prices of raw material. Units complain of high prices of coal and pig iron.

Products and Market: Cast iron units are catering to different spectrum. 11 units are dependent on orders of M/s. Hindustan Copper Limited for the supply of Grinding Media balls. NSIC participates in M/s. HCL tender for supply of grinding media balls, on behalf of seven units out of 11 cast iron units and distributes the order proportionately.

Five units are manufacturing Ingot moulds which is a consumable product for the manufacture of steel ingots. These units supply on 15 days credit mainly to the local market and neighboring state. There are three units which manufacturers S.G. Grade Casting. They participate in tender and supply the material as per the delivery schedule. The suppliers to Railways are ISO Certified cast iron units.

The casted materials supplied to Govt. and Public sector units are on 30 days credit terms, but they get the payment after 90 days. Although the cost of Raw material varies, Eleven units are dependent on Govt. Supplies where there is no escalation clause in purchase order for final products.

No of cast iron units	Product	Customers
11	Grinding media balls	HCL
5	Ingot moulds	Steel foundries
3	SG Graded castings	Railways

Most of the cast iron units depend on one product, one market. There is no diversification in products or in customers. There is business conflict between NSIC consortium members and a group of four units making grinding media balls and the matter is in courts.

Most of the cast iron units are running at less than 50% percent capacity due to lack of orders and competition from major Howrah cluster.

Technology and working practices: Cast Iron units are using old technology of Cupola. These locally fabricated cupolas consume more coke and are not able to produce ductile casted products or S.G. Grade Casting. Only few units are using sand mullers and moulding machines. Ingot moulds manufacturers have there own machining facilities in addition to cupola.

Most of the units have poor energy performance due to following reasons

- Incorrect blast rate.
- Poor operating and maintenance practices.
- Poor control of feed material (Shape, Size, weight, and Sequence).
- High charge coke percentage.
- Turbulent entry of air into the cupola.

Other issues facing the cast iron foundry units are

- High Rejection rate
- Problem in slag and sand disposal.
- Emission of toxic metals and metal sludge.
- Poor quality of casting (Mostly Rough casting)

Only one export oriented unit has constructed Divided Blast Cupola in addition to induction furnace, which has better melt to coke ratio, high conversion, high and uniform temperature which ultimately reduces rejection rates.

A high level of rejection rate owing to poor foundry practices has pushed the cast iron units to operate at high volume and low margin segment which do not demand quality. Casting units have low level of mechanization and have high dependence on labor force. Absenteeism is one of the major areas of concern.

8.2.3 Non ferrous Foundry – process and issues

Raw material: Non – ferrous units get their raw material of Cu, Al, brass, bronze and scrap from traders. Most of the traders give credit up to 15 days. In absence of many sources of supplies, the units have to keep sufficient inventory of approximately one month requirements. Raw material used is mostly scrap not virgin material leading to poor quality of final product.

Products and Markets: Units are mainly dependent on RSP, NALCO and BHILAI orders. They also cater to Medium scale units like M/s.Hari Machines, East India Engineering etc. The units participate in tender and supply as per the delivery schedule.

Though market exists for other type of centrifugal castings, the non ferrous units are unable to execute due to lack of technological know-how. Again a high level of rejection rate owing to poor foundry practices has pushed the Non ferrous units to operate in low margin and quality unconscious segment.

Technology and working processes: Units use pit furnace and oil furnace. Charging is done manually which not only exposes workers to the dangers of metal splash but also leads to cracking of bottom refractory lining and frequent shutdowns.

Non-Ferrous casting units have low level of mechanization and have high dependence on labor force. Absenteeism is the major area of concern. Absence of system for regulating oil flow and melt temperatures leads to more energy consumption per melt. Manual pouring of metal into moulds leads to spillage and wastage of costly material.

8.3 Machining and Fabrication units - Process and Issues

Raw Material: Machinery and fabrication units buy their material i.e. steel rods, sheets and plates locally and through dealers. Retails branch of RSP also supplies in small quantity. Special steels and stainless steel is procured from Kolkota and Mumbai. Sometimes inventories have to be maintained for such items. Orissa Small Industries Corporation is also supplying to the small units as it gets its discounted supply from RSP. Its services are not fully utilized by the units due to procedural problems.

Products and Markets: More than 200 Machining and fabrication units- some only into machining and many a combination of both - depend on RSP, NALCO, NTPC, L&T, OCL and Bhilai plants for orders. RSP is procuring about 25% of their requirement from these units. The units have to get registered with them to participate in there tendering process. However with the modernization of RSP at its final stages, units are getting fewer orders and are going for NALCO, Bhilai Steel Plant, and NTPC orders. Large consulting firms like EIL and Daniel Consultant get

some of their fabrication and machining of export items done at Rourkela. However no direct exports are reported from the sub cluster.

Capacity of small and tiny units (tier III) are underutilized as they do not get sufficient orders. As a whole the machining units lack market intelligence and expertise to bid for large machining and fabrication works which they are capable to execute.

The units were having sufficient work few years back due to emergence of number of sponge iron plants. With the present hold on setting up new sponge iron plants, some of the machining and fabrication units have to close shop.

The units feel that even though prices of raw materials and inputs have gone up they are getting the same rate for there jobs which they used to get 5 years back. The delay in payments worsens the situation.

Technology and working practices: Most of the units are using general purpose machines, Drilling, Vertical boring machines, Lathes, and Shaping machines mostly purchased from Punjab. Some units have installed imported 2nd hand machines. There is no CNC or SPMs to be seen at Rourkela.

Due to use of old machines which are not maintained properly, quality suffers. The entrepreneurs continue to use tools, jigs and fixtures which have outlasted their service life. Poor housekeeping further hampers their work.

Improper shop floor layouts, lack of best manufacturing practices and lack of multi skill of the workforce makes the productivity low. Safety measures are often ignored which causes frequent injuries and loss of man days.

Labour: Both contract labor and regular workers are employed in the machining and fabrication units. The rate for machining a job varies from Rs.300 to Rs. 400 per hour. Fabrication contractors charge approx.Rs.3000/ton for fabrication work. Contractual labour is not properly trained. There is shortage of skilled manpower.

8.4 Other Common Problems in the Cluster

Absence of Operation Systems: No records or systems are in place to keep track of the production, labor, maintenance etc. The units do not have the knowledge of batch costing, which is necessary to exercise control when the next batch is taken for production.

High Employee Turnover: Process engineers, Production supervisors, Mechanical and electrical supervisors, fabricators etc. are in demand. They frequently change jobs for higher salaries. Absenteeism is the major area of concern in the unskilled and semi skilled categories.

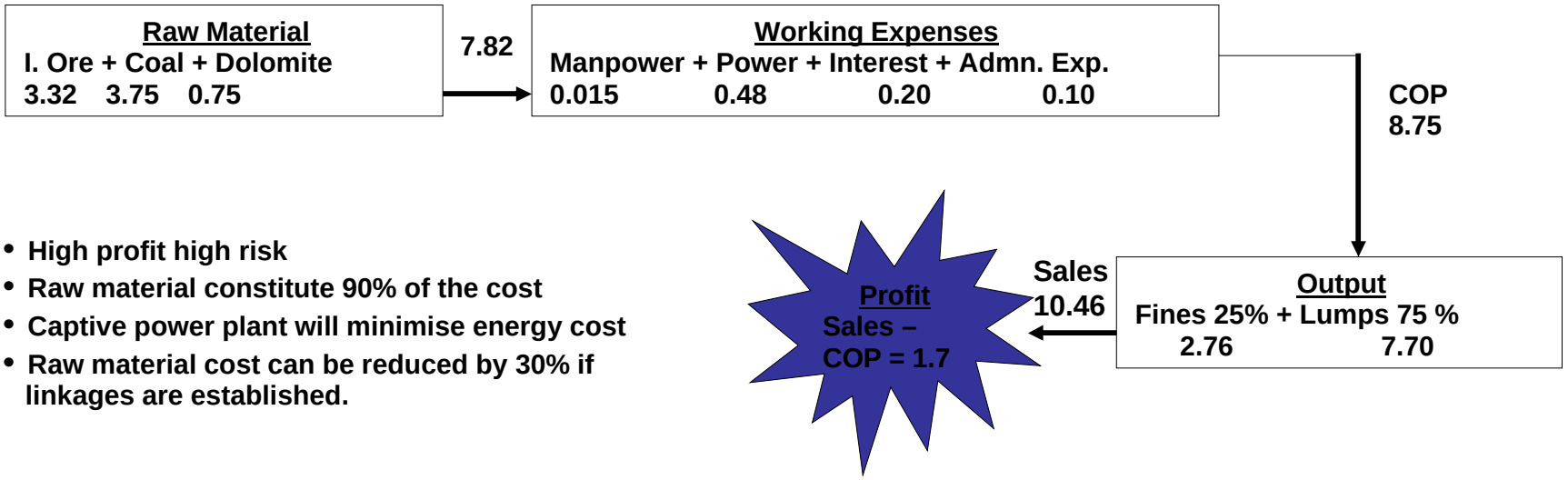
Poor distribution Infrastructure in power sector: The units face problems in implementing technological up-gradation (Ex. for setting up induction furnace units which are power intensive) due to poor transmission and distribution system, which delays in getting additional power connection

9.0 VALUE CHAIN ANALYSIS

9.1 Sponge iron: Annexure 3 carries a value chain analysis for 100 TPD sponge iron plant

VALUE ANALYSIS

Sponge Iron – 100 TPD plant – output 93 tons/day (Rs. In lakhs)



- **High profit high risk**
- **Raw material constitute 90% of the cost**
- **Captive power plant will minimise energy cost**
- **Raw material cost can be reduced by 30% if linkages are established.**

The above calculations have been done on the following assumptions:

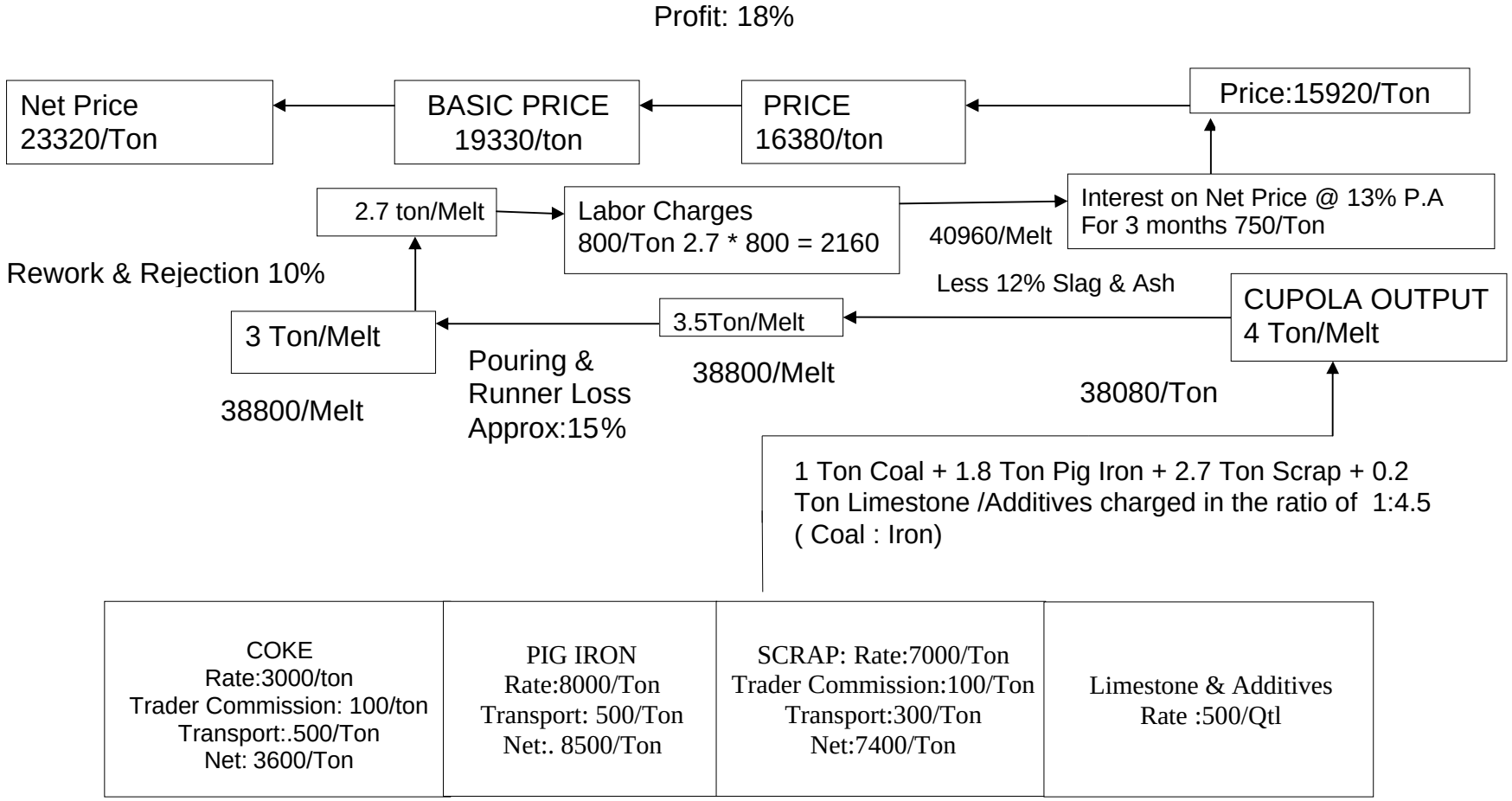
Kiln: 100 TPD.
Per day Sponge iron out put: 93 Tons/Day
Price of Sponge Iron Lumps: Rs.11000/ Ton
Price of Sponge Iron Fines: Rs.12000/Ton.
Raw Material prices FOR destination: Iron Ore: Rs.2300/-
Coal (Rs per ton) : Rs.2500/-
Dolomite (Rs. Per ton) : Rs.1500/-
Salary of Plant Manager: Rs.30000/- per month
3 Head of Dept are involved in production @ Rs 22000 per month
40 Fitters/Electricians are involved in production @Rs 3000 per month
45 Labour and Workers are involved @:Rs.100/day

From the value chain analysis it can be concluded that:

- Raw materials constitute 90 % of the cost.
- There is frequent fluctuation in prices of raw material and prices of sponge iron posing a risk to profitability of the plant. Thus Sponge iron is High Profit High Risk Industry
- Power usage per day is 0.48 lakhs which is ……% of cost of production. . Setting up of captive power plants will minimize energy cost. (Cost of power can be brought to Rs.1.75ps per unit).
- Raw material cost can be reduced by 30 % if coal and iron ore linkages are established. This can lead to long term sustainability of the units.
- Variable cost can be brought down by initiating good management practices and implementing ERP packages.

9.2 Ferrous and Non Ferrous Foundry: Diagram below depicts the Value chain analysis for Grinding Media balls. This is one of the main outputs for large number of ferrous foundries in the cluster.

VALUE CHAIN ANALYSIS OF GRINDING MEDIA BALLS

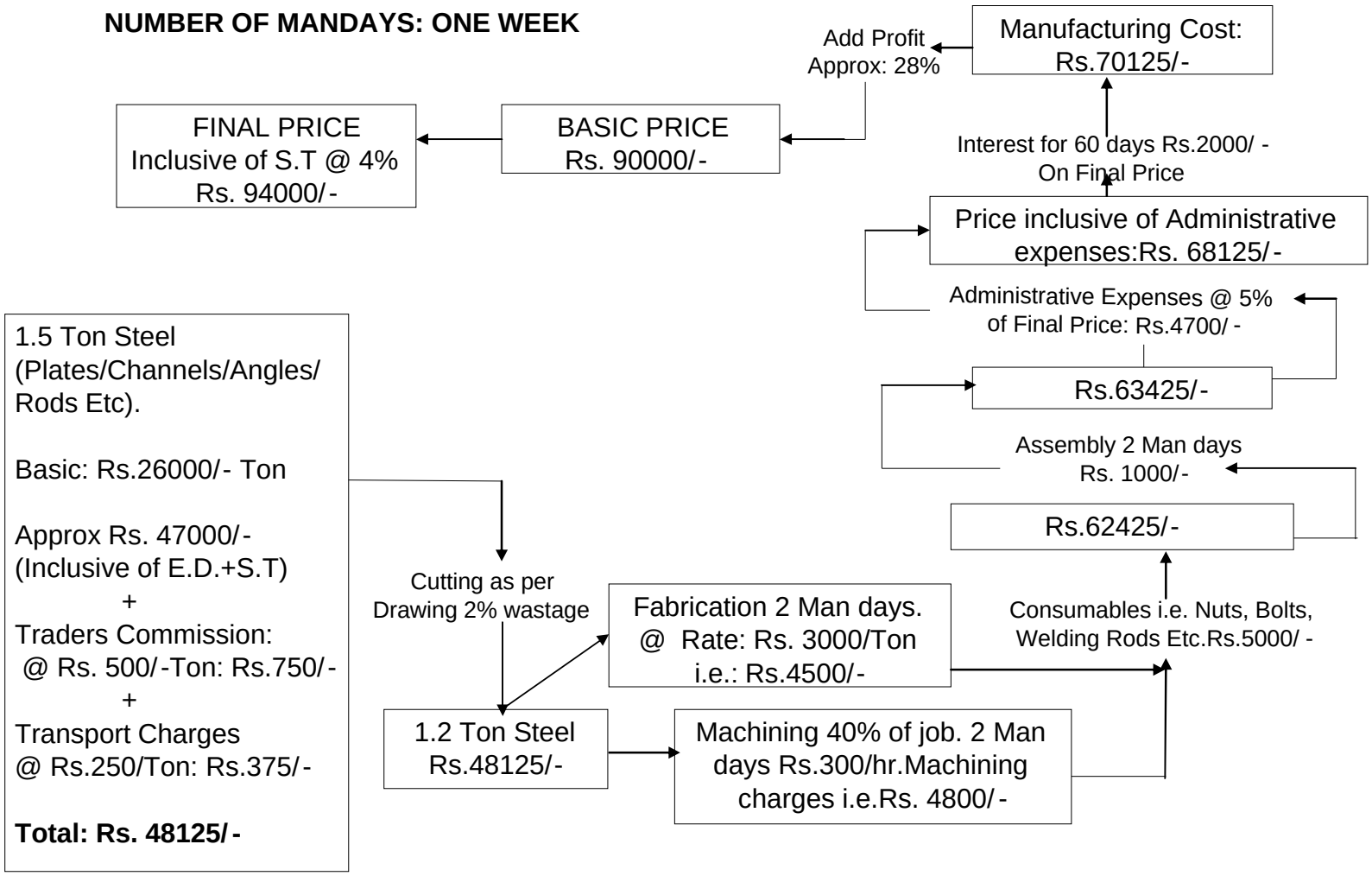


- Raw material constitutes the major cost of the final product.
- The units have to depend on traders for coke and scrap leading to high input costs.
- Least energy efficient cupola being used. Charge coke consumption is 22% (Coke: Metal ratio of 1:4.5) and poor quality coal.
- High rate of rejection.
- Poor operating and maintenance practices.
- Profit margin below industry standards.
- They are able to generate marginal profit only because rejections, pouring and runners can be reworked due to low labor cost.
- Delayed payments.
- Good scope exists for technology improvements and to make value added Products. Example: Decorative casting price Rs.27000/ton

9.3 MACHINING and FABRICATION:

VALUE CHAIN ANALYSIS OF MACHINING AND FABRICATION JOB

BASIS: ONE TON JOB
NUMBER OF MANDAYS: ONE WEEK



- Raw material constitutes the major component of the product.
- The man days required to complete the job is more; this is due to the fact that old general purpose machineries are used in operation.
- Administrative expenses(Inspection, Order and payment follow up and procurement of special items from Calcutta /Mumbai Etc) is high as most of them cater to Public Sector.
- The profit margin varies between 20 to 30 % due to poor negotiation skills and fear of losing order.

10.0 INSTITUTIONAL LINKAGES

10.1 Financial Institutions: Most of the units are financed through term loan and working capital from banks and entrepreneurs equity. Though SBI is the lead bank in Rourkela, all major banks have set up their branches. Each bank has its own assessment about the sector and is cautious in loan disbursement. One banker (Allahabad bank) has taken a decision to stop financing new sponge Iron units as it believes that the business is too risky in the present turbulent market conditions.

Two bankers (Canara bank and Andhra bank) are cautious in financing Induction furnace units manufacturing Ingots, as they feel the industry has reached the level of saturation.

However most of the bankers are willing to finance cast iron units depending on the viability of the proposal.

NSIC is providing bill finance to seven units which are supplying Grinding Media Balls to M/s. HCL.

10.2 District Industries Centre, Rourkela

The DIC helps the industry in getting provisional and permanent registrations, assists large organizations like EIL, NALCO, and SAIL etc. to identify units for enlistment as vendors. They are also active in grounding PMRY projects. DIC networks between entrepreneurs and SISI, NSIC, OSIC and financial institutions. It also guides entrepreneurs to set up industries. A single window system is in the process of being set up in the local IC office.

10.3 National Small Industries Corporation Limited-NSIC

The prime aim of NSIC is to foster growth of small scale industries in India through various developmental activities such as hire-purchase and leasing, raw material assistance, marketing support, tender marketing, export development finance, composite term loan and single point registration scheme. NSIC has taken up Rourkela Foundry Cluster development program and helped the cast iron cluster in tender marketing for marketing grinding media balls to Hindustan Copper Limited. NSIC participates in the tender of M/s. HCL on behalf of seven SSI units and the order is distributed proportionately to the units .The units supply the material directly to M/s .HCL and get 70% immediate payment from NSIC. The balance 30% is paid after getting payment from M/s HCL with deductions for interest and service charges of NSIC.

10.4 Small Industries Service Institute-SISI-Rourkela

The local SISI office in Rourkela has a machining section with eight staff, having lathe drilling, milling, shaping machine and heat treatment facility to cater to the needs of SSI units. The facilities available are general purpose machines. Few machines are not in fully operational condition and are underutilized. SISI Rourkela also conducts six month practical training workshop for fitters and turners.

10.5 The Orissa Small Industries Corporation

OSIC- a Govt. of Orissa Enterprise is allotted a fixed quota by SAIL to trade in Iron and Steel. They supply to SSI units who require material in small quantity, which otherwise in not supplied in small quantity by SAIL .They have a godown at Rourkela Industrial Estate.

10.6 Testing Laboratories

A Senior Scientific Officer heads the testing lab under Govt. of Orissa situated at Industrial estate of Rourkela. The equipments are in bad shape and the laboratory is run by a skeletal staff.

A lab under RITES LTD (under ministry of Railways) is functional in the cluster and is managed by an inspecting engineer. The lab is well equipped and most of the tests carried out are chemical composition of material tests.

NIT, Rourkela also assists in testing of materials. Additionally there are two private testing lab recognized by RSP, Rourkela.

10.7 Orissa State Financial Corporation

Credit provisioning is made available by OSFC which has provided term loan assistance to majority of units in foundry and fabrication units for acquiring fixed assets. It has stopped giving loans for the time being due to accumulation of Non Performing Assets. Presently the local office of corporation (headed by a Dy. General Manager) is active in recovery of bad loans.

10.8 Technical Institutions

National Institute of Technology (NIT), premier technical institute is located at Rourkela. It has a separate department for sponsored research and Industrial Consultancy and continuing education. The institute has done little on the technological front for Iron and Steel and Machining Cluster of Rourkela. The institute has well qualified faculty and laboratory but is not utilized because of there preoccupation in there academic pursuit. Additionally there are two private Eng. Colleges and polytechnic institutes.

There are about 20 Industrial Technical Institutes which imparts training and education in the field of Mechanical, Electrical and Electronics. The students passing out of the institutes have to be trained again on the job. The Govt. ITI is well equipped and has two CNC Machines which are not in use.

Indian Institute of Production Management (IIPM), Kansbahal near Rourkela is a leading institute whose activities are Training, Technical Consultancy Services, Education and Management Consultancy for Managers, Supervisors and Technicians. They have till date catered to only large organizations like L&T, OCL, RSP, ACC, ITC and Reliance etc.

Dalmia Institute of Scientific and Industrial Research, Rourkela is a self sustaining organization for research in cement and refractory areas. They have now slowly expanded their research work into other areas. Dept of Science and Technology, GoI recognizes the Institute to do research in cement and refractory by providing grants and collaboration

10.9 Orissa Industrial Infrastructure Development Corporation, IDCO: IDCO provides and maintains existing infrastructure (Industrial estates) and has an office at Rourkela headed by a project manager. The organization collects property tax from the units and arranges to provide water supply, maintains road and arrange sheds for lease or sale for prospective entrepreneurs. However entrepreneurs feel that IDCO has done little on the infrastructure development.

11.0 ASSOCIATIONS

11.1 Rourkela Chambers of Commerce and Industry (RCCI)

Most of the units in Rourkela are members of this apex chamber. With a membership of has about 600, the chamber has its own chamber office, hall, conference room and administrative staff. The members are classified into different categories y (foundry and engineering, iron and steel, trading etc) and each group is headed by a general Secretary. The chamber espouses the issues of Industries to the State and Central Governments. It also releases a yearly bulletin named VICHAR. It conducts workshops on taxes and awareness Programmes on govt. supports to industries.

11.2 Orissa Young Entrepreneurs Association (OYEA)

OYEA – Rourkela chapter has a membership of 160 units. Most of the SSI units of Sundergrah district are members. The association has its own building and meeting hall at Rourkela Industrial Estate. Its role is dormant.

11.3 District Small Scale Industries Association (DSSIA)

With a total membership of 120 spread around the district of Sundergarh, DSSIA is operating from DIC office of Rourkela. It does not play any active role. Majority of the members are engineering industries.

11.4 Orissa Assembly of Small and Medium Enterprise (OASME)

This association of 60 (Most of them machining and fabrication) units is a locally based organization. They have their office at DIC and take up issues related to, policy with the concerned Govt. Departments.

All the above associations are in the vendor committee of RSP- a representative body of all vendors to RSP.

11.5 Orissa Sponge Iron Manufacturers Association

The association takes up Issues related to sponge iron industry with the state and central Govt. There are 60 members in the local chapter of the association. It espouses the issues of industries to the state and central government.

12.0 SWOT ANALYSIS

12.1 Sponge Iron Units

12.1.1 Strength

- Units located at the heart of raw material zone, Power surplus and water resource district of Orissa. Well connected by road and rail.
- Comparatively young workforce and lean manpower.
- Cordial and amicable labor relationship.
- Ability of the entrepreneurs to mobilize funds for expansion and diversification.
- Demand for the product is on the increase.

12.1.2 Weakness

- Non availability of quality raw material at market price.
- Infrastructural bottlenecks like Weak power transmission and distribution system, unavailability of rakes for loading etc. limits expansion and setting up of new firms
- Unethical business practices in purchase, sale.
- Entrepreneurs lack technical knowledge.
- High turnover of workforce at Supervisory level.
- Low productivity level

12.1.3 Opportunities

- Good scope for forward integration
- Opportunity exists for technology improvement to increase the yield.
- Opportunities exist for reducing power consumption by installing power plant from waste heat.
- Opportunities exist for value added products for export like sintered products, high purity iron etc.

12.1.4 Threats

- Business operates on speculative market. The prices of sponge iron are ever fluctuating.
- The growth of the steel consumption is dependent upon growth of the economy in general. Slow down will adversely affect the units.
- Lack of Rail, Road, Power and water infrastructure and insufficient raw material linkages will force the units to migrate.

12.2 Foundries

12.2.1 Strengths

- Proximity to the source of raw material.
- Units situated in power surplus, sufficient water resource and skilled manpower area.
- Existence of educational institutions like ITI, Diploma and Engg Colleges.
- Entrepreneurs ability to mobilize resources
- Cordial Labor relationship
- Entrepreneurs are mostly experienced in the foundry line and in some cases technocrats are managing the units.

12.2.2 Weakness

- The market for the units is undifferentiated with no specialization. Most of the Units follow each other and virtually manufacture almost same items resulting in undercutting of price. Units also lack marketing skills. Incapable to adapt easily to the changing market conditions. Let us discuss this.
- Usage of outdated technology.
- Non-adoption of scientific foundry practices.
- Lack of standardization and testing procedure.
- High rework.
- Use of low quality raw material
- Lack innovation capability
- Absenteeism of work force.
- Non-Ferrous and Casting units concentrate only on rough casting

12.2.3 Opportunity

- Advantages related to the area lend scope to become the most cost effective production centre in the whole country.
- Good scope for export of foundry products to other countries provided value added casings can be made.

12.2.4 Threats

- Technological advancements and alternative materials shrinking the share of the units.
- Competition from other foundry clusters may marginalize the foundry sub cluster in Rourkela.

12.3. Machining & Fabrication Units

12.3.1 Strengths

- Easy availability of raw material, power, and workforce.
- Existence of undergraduate and graduate technical institutions, including one of high repute.
- Proximity to mother plants.
- Entrepreneurs are experienced in there core area of machining and fabrication.
- Cordial labor relations.
- .Financial institution's willingness to fund viable projects

12.3.2 Weakness

- Low technology levels.
- Dependence on one or two customers coupled by lack of market information
- Lack of marketing skills.
- Absenteeism of workforce
- Lack of guidance in cost management. Let us discuss this.

12.3.3 Opportunities

- Increased infrastructure activity within and outside the country gives good scope for executing large projects
- Expertise of machining and fabrication of Sponge iron plants can be put into maximum use in emerging sponge iron clusters in other states.
- Opportunity exists for common procurement of raw materials, consumables and joint marketing.
- Opportunity exists for becoming a competitive fabrication and machining centre for automobiles and engineering projects due to 3M advantages[•]. .

12.3.4 Threats

- Slowdown in infrastructure activities will adversely affect the units.

13. 0. CLUSTER VISION:

A competitive source for Iron, Steel and engineering projects, centre for new product development and an emerging global out-sourcing centre in eastern part of our country in the next 4 years.

[•] Manpower, Material and Money.

14.0 STRATEGY:

The three sub-clusters of fabrication, sponge iron and foundries will need to take different strategies for future growth. The fabrication units have three segments and strategy for each would also vary.

The tier 1 in machining and fabrication units are mainly subcontractors for package providers presently utilizing nearly full capacity. The units can be made to graduate in to package providers either providing direct service to big customers or providing back up support to the existing package providers through consortium approach. The impending expansion of RSP and other such units can thus be converted in to an opportunity of growth for these firms. This would require installing additional capacity, technological upgradation, certifications (ISO, IBR etc) to respond better to the market challenges. These units will also be helped to diversify to take up power plant fabrications which again requires IBR certification, quality welding etc.

Tier 2 of machining and fabrication units are presently eligible only for smaller contracts from RSP etc and would have to be grouped together in small consortia for being able to bid for higher value of contract . These units would also be helped to diversify in to fabricating new products like coal injector machines and pollution nozzle for power plants. This will require credit facilitation for these units and market support from NSIC and OSIC. This will also help the units to avoid long term dependency on job works and develop some portion of their installed capacity for a stream of continuous orders.

Units in Tier 3 who are mostly in to machining jobs with some capacity for fabrication would be helped to emerge as strong sub contractors for tier 1 and tier 2. This would be driven through credit facilitation, technological upgradation, and improvement of shop floor practices.

The foundries operate in three different areas of steel, cast iron and non ferrous. Each of these groups lacks critical mass and external economies of scale may not be achievable in such a scenario. However foundries would be exposed to better working practices, certification like ISO-9000, efficient energy practices, technological improvements to save raw material cost and better inventory management.

The sponge iron sub clusters is largely facing the core issues of poor infrastructure and high input costs. The issues of infrastructure would be addressed by bringing units together on a common platform and help develop a common vision of building common infrastructure on a PPP mode Additionally they can be helped to optimize there plant operations to bring down there process cost .

15.0 ACTION PLAN

15.1 Machining and Fabrication

- **Sensitization of unit on cluster approach:** Individual and group meetings with the units of the cluster will be conducted to sensitize the units about the cluster approach.

- **Fostering common vision**: Exposure visit to other developed cluster and common meetings will help to drive trust among the units. Sub cluster will be helped to slowly evolve a common vision. A product association will be formed to drive the cluster activities.

- **Awareness creation**: Specialized Inputs on product diversification, precision engineering, quality improvement, productivity and Management development programs in collaboration with local and outside BDS would be planned for the cluster.

- **Formation of consortia:** After identification of common needs, consortia of like minded firms would be facilitated. These consortia would be exposed to successful consortia in other clusters and helped to evolve a common business plan. Slowly capacities of these consortia would be built.

- **Credit linkages**: Smaller units of less than Rs. 40 lakhs per annum turnover will be focused for assessing credit from financial institutions. If need be linkages with MFIs would also be explored.

- **Market development**: All the three tiers of firms would be helped to build linkages with new markets. For this visit of firms to potential customers and vice versa will be planned. Marketing brochures, marketing CDs and other relevant tools will be deployed. Consortia will evolve appropriate marketing channels as the needs emerge.

- **Product diversification**: To help firms reduce their dependency on job working new products would have to be developed and marketed by the cluster. For this suitable BDS would be used and activities would be driven on consortia platforms.

- **Improvement in production efficiencies:** Firms will be assisted to improve their production efficiencies by improved welding, better shop floor practices, better inventory management, joint procurements etc.

- **Design development centre**: To take up turnkey projects a common testing and design development centre will be created in public private participation.

- **Manpower development**: To overcome the shortage of skilled manpower, the cluster would jointly contribute resources to ITI, diploma institutes to train manpower as per the cluster requirements. SISI training centre will be upgraded

- **Sub contracting relationships between the three tiers**: Attempts would be made to develop sub contracting relationships between the three tiers by constant dialogue and addressing needs of the upper tier firms.

Sponge Iron

- **Propagation of energy saving measures:** Awareness would be created on the importance of energy conservation and suitable BDS would be hired for diagnosis of the issues and their implementation.

- **Common infrastructure:** Networking would be facilitated between the units to establish common water pipeline, common water treatment plant and other common infrastructure in public private partnership. This would be achieved through exposure visit and hiring of suitable BDS.

- **Productivity improvements**: Inputs on preventive maintenance, quality circle, cost reduction practices, housekeeping, working conditions will be organized. Wherever feasible, common procurements will be resorted to. Manpower shortages would be addressed through better linkages with local technical institutions.

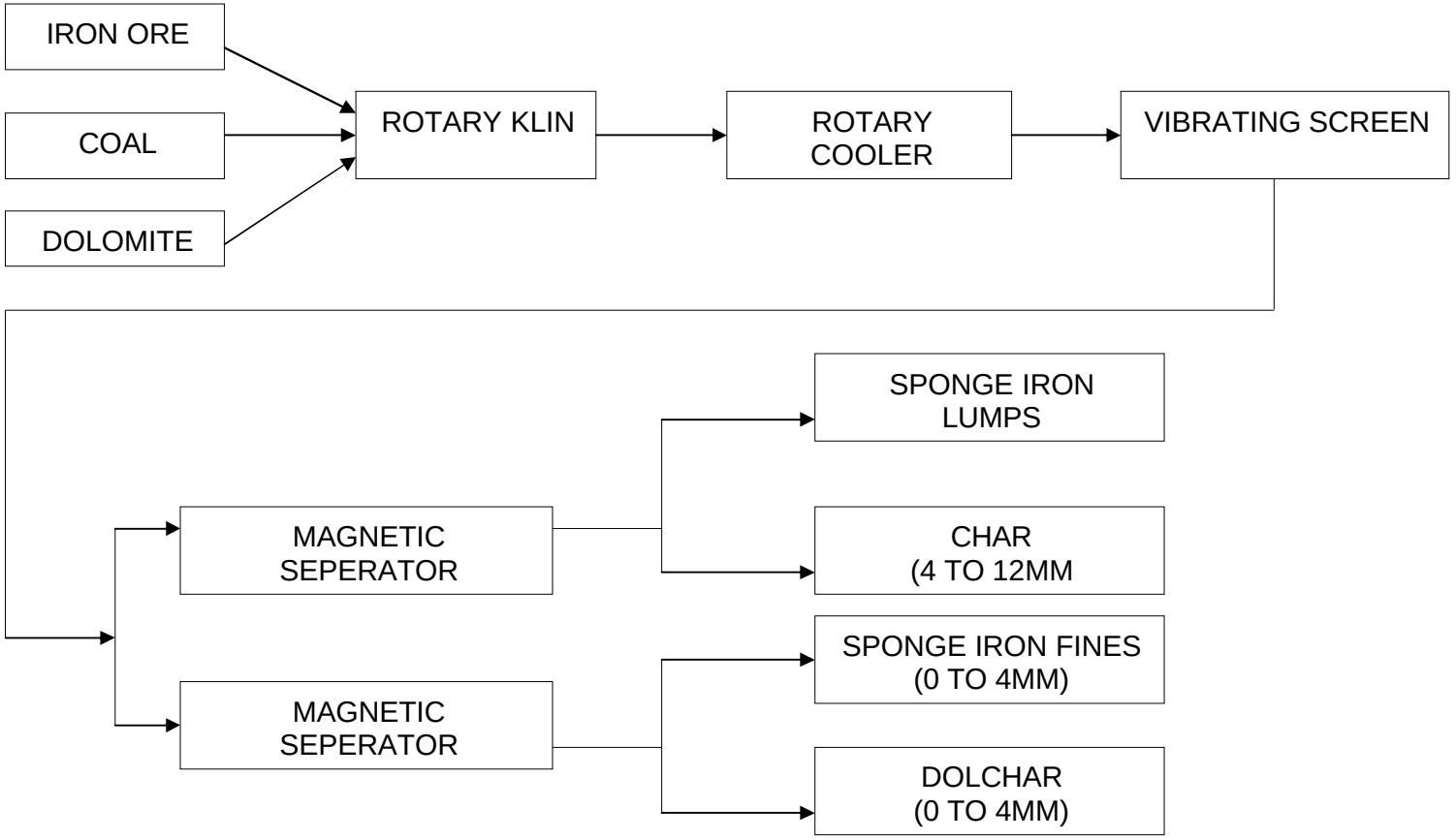
15.2 Foundry:

- **Propagation of energy saving measures:** Awareness would be created on the importance of energy conservation and suitable BDS would be hired for diagnosis of the issues and their implementation.

- **Productivity improvements**: Inputs on better shop floor practices, exposures to better foundry clusters, exposure to new technologies, better housekeeping will be organized. Willing units would be helped to get certified.

Annexure 1

SPONGE IRON PRODUCTION FLOW CHART



FERROUS AND NON –FERROUS FOUNDRY FLOW PROCESS CHART *Annexure 2*