



**DRAFT DIAGNOSTIC STUDY OF
IRON, STEEL & MACHINING CLUSTERS OF ROURKELA**



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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 on sponge iron, foundry products and machining and fabrication.

2.0. GLOBAL SCENARIO

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.

Global Iron and Steel demand is rising on the back of accelerated infrastructure activity in China, CIS and India, housing boom in USA, and consumer goods resurgence in Europe. In India, China and other Asian countries the demand is led by emphatic investment activities in Infrastructure. Russia and other CIS nations are also witnessing strong internal demand. Iraq reconstruction work is expected to fuel further demand for Iron and steel products over the coming months. China is consuming iron and steel like never before for its infrastructure with investment such as Three Georges project on Yangtze as well as part of its build up to the Beijing Olympics in 2008 and the Shanghai Expo in 2010. The increase in Demand for sponge iron is further fuelled by scarcity as it is being used as an alternative for metallic scrap .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 USD64.12 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 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. (KRISHNAN PLEASE QUOTE THE REFERENCE HERE)

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 seventies saw the emergence of small scale secondary Iron and steel producers in the private sector to bridge the gap between 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 Gujarat (give names) which is gas based. The Rourkela (i.e. Sunderghad district) stand third in production in India, but first in coal based production.

In the foundry sector India produced a total of 4.04 million (which year) 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.

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 Bhubaneswar, is well connected by road and rail with other part of the country. 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 number of small scale industries and ancillary units in and around Rourkela began to concentrate and create an industrial complex.

Thanks to encouragement provide by state policies, large number of sponge iron, 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. The annual turnover of the cluster is estimated to be about Rs.700 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 their 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 seen to be 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 their work to smaller machining units within 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:

S. No	Number of Units	Turnover
01	10	Above Rs. One Crore
02	25	Above Rs.50 Lakhs to less than Rs. One Crore
03	50	Above Rs.25 lakhs to less than Rs.50 lakhs
04	100 plus	Less than Rs.25 lakhs

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 and ingot manufacturers and consumers in other states. They operate on individual capacity without any establishment. Quite often they also arrange for Raw materials- 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.

Insert cluster map

7.0 ANALYSIS OF BUSINESS OPERATION AND ISSUES

7.1 Sponge Iron

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* (add a footnote here detailing what is the meaning of coal linkages) for one or two kilns. Rest of the units depend upon traders or e-auction for the supply of coal and have 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. Additionally no further attempt seems to have been made by the entrepreneurs to explore value added products from sponge iron fines.

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 effect 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, 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.

Most of the sponge iron units are classified as polluting units. Although most of the Units have installed pollution control equipments, more steps need to be taken 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.

7.2. FOUNDRY:

7.2.1 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 overheated market cools down this will be an issue.

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. In this process 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, high cost of labor and staff.

7.2.2. 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. 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 and distributes the order proportionately. These seven units are out of the 11 quoted above?????

Few units (how many???) are manufacturing Ingot moulds which are 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 few 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. This is in which group???

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, most of the units (how ...11 units making media balls are dependent upon govt) are dependent on Govt. Supplies where there is no escalation clause in purchase order for final products.

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.

Technology and working practices: Cast Iron units are using old technology of Cupola. The cupola is fabricated locally. These Cupolas consume more coke and they are not able to go for 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.

Some of the contributing factors that were identified for poor energy performance

- 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 factors which contribute to low productivity in the units are

- Rejection rate is high
- 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 will ultimately reduce 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.

7.2.3 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 make sufficient inventory of **...one.....month requirements** (Deccan Swami to check this) . 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. There is intense mistrust between the units.

They also cater to Medium scale unit's this is not clear. They participate in tender and supply as per the delivery schedule.

Though market exists for other type of centrifugal castings, they 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 exposes melt deck workers to the dangers of metal splash from charge materials hitting the molten bath. Materials are dropped into the furnace leading 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. The units employ oil furnace for melting, where there is no system for regulating oil flow and melt temperatures, leading to more energy consumption per melt. Manual pouring of metal into moulds leads to spillage and wastage of costly material.

7.3 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. Retail branch of RSP also supplies in small quantity through their retail branch. Special steels and stainless steel is procured from Kolkata 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: There are more than 200 Machining and fabrication units-some only into machining and many a combination of both. Most of the units 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 their 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, NTPC orders. Large consulting firms like EIL and Daniel Consultant get some of their fabrication and machining of export items at Rourkela. However no direct exports are reported from the sub cluster.

Capacity of small and tiny units 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 their 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 at Rourkela.

Due to use of old machines which are not maintained properly, quality suffers. They 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.

7.4 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.

8.0 VALUE CHAIN ANALYSIS

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

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

The assumptions should figure with the diagram

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
- The prices are driven by overall consumption and production figures
- Sponge iron is High Profit High Risk Industry
- Power usage per day is 0.48 lakhs. 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.

8.2 Ferrous and Non Ferrous Foundry:

Annexure 4 depicts the Value chain analysis for Grinding Media balls . This is one of the main outputs for large number of foundries in the cluster.

- Raw material constitutes the major cost of the final product.
- The units have to depend on traders for coke and scrap.
- 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
- This needs to be discussed.

8.3 MACHINING and FABRICATION:

(Please see annexure 5)

- 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.
- Late receipt of payment. The profit margin varies between 20 to 30 % due to poor negotiation skills and fear of not getting order.

Let us discuss this.

9.0 INSTITUTIONAL LINKAGES:

9.1 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 there 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.

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.

9.2 DISTRICT INDUSTRIES CENTRE, ROURKELA

The DIC helps the industry in getting provisional and permanent registrations and gives necessary feedbacks to public sectors for vendor enlistment. It also guides the new entrepreneurs to set up industries. It is in the process of setting up a single window system. **Expand this paragraph with more information**

9.3 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. **Are units happy with this arrangements ?**

9.4 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 are underutilized. **Are these facilities based upon latest technology?**

9.5 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 is not supplied in small quantity by SAIL. They have a godown at Rourkela Industrial Estate.

9.6 GOVERNMENT TESTING LABORATORY

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.

9.7 ORISSA STATE FINANCIAL CORPORATION

Credit provisioning is made available by OSFC which has provided term loan assistance to majority of units in Foundry **what about sponge iron and fabrication units** for acquiring fixed assets. Headed by Dy. General Manager, it has stopped giving loans for the time being due to accumulation of Non Performing Assets. Presently the corporation is active in recovery of bad loans.

9.8 TECHNICAL INSTITUTIONS

National Institute of Technology (NIT), premier technical institute is located at Rourkela. They have 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 Machine 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????????**.

Dalmia Institute of Scientific and Industrial Research, Rourkela is a self sustaining organization for research in cement and refractory areas. They have now slowly expanding their research work into other areas. Govt. of India, Dept of Science and Technology, recognizes the Institute **in what way????**

9.9 ORISSA INDUSTRIAL INFRASTRUCURE DEVELOPMENT CORPORATION,

IDCO: They provide and maintain existing infrastructure (Industrial estates) and have an office at Rourkela headed by a project manager. They collect property tax from the units and arrange to provide water supply, road to units arrange sheds for lease or sale for prospective entrepreneurs. **Any issues with them????**

10.0 ASSOCIATIONS

10.1 ROURKELA CHAMBERS OF COMMERCE AND INDUSTRY.

Most of the units in Rourkela are members of RCCI. This apex chamber has 600 odd members. The chambers have their own infrastructure **please elaborate...what infrastructure** . The units are grouped into category (foundry and engineering, iron and steel, trading etc) and each group is headed by a general Secretary. It espouses

the issues of Industries to the State and Central Governments. It releases a yearly bulletin named VICHAR.

10.2 ORISSA YOUNG ENTERPRENUERS ASSOCIATION (OYEA)

OYEA – Rourkela chapter has a membership of 160 units. The association has its own building and meeting hall at Rourkela Industrial Estate. Its role is dormant. **IS It a product association...perhaps no...any breakup available for 160 members – product wise**

10.3 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.

10.4 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 there office at DIC and takes up issues related to, policy with the concerned Govt. Departments.

All the above association are in the vendor committee of RSP. The vendor committee is a representative of all vendors.

10.5 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. **What are its activities ?**

11.0 SWOT ANALYSIS

11.1 Sponge Iron Units:

11.1.1 STRENGTH

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

11.1.2 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.

11.1.3 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.

11.1.4 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.

11.2 Foundries

11.2.1 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 there are technocrats managing the units.

11.2.3 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 .
- Lack of technological development.
- Use of low quality raw material
- Lack innovation capability
- Incapable to adapt easily to the changing market conditions. Let us discuss this.
- Absenteeism of work force.
- Lack of marketing skills
- Non-Ferrous and Casting units concentrate only on rough casting seems to be repetition!!!!!!
- Non-adoption of scientific foundry practices.
- Lack of standardization and testing procedure.
- High rework.

11.2.4 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.

11.2.5 THREATS

- Dependence on only one or two customer and single product. This is already reported in weakness!!!!
- Technological advancements and alternative materials shrinking the share of the units.

11.3. Machining & Fabrication Units

11.3.1 STRENGTHS

- Easy availability of raw material, power, 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

11.3.2 WEAKNESS

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

11.3.3 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. Please explain this term as a footnote.

11.3.4 THREATS

- Slowdown in infrastructure activities will adversely affect the units.

12. 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.

13.0 STRATEGY:

13.1 Sponge Iron:

- Collective efficiencies and better networking with technical institutions
- increased usage of BDS
- Building the capability to establish and manage common infrastructure
- Identifying and implementing cost saving measures.
- Work towards cleaner development mechanisms (CDM).
- Forward integration and value addition of products for exports.
- Improving the working conditions of plant employees for enhancing productivity.

13.2. Foundries:

- Better foundry practices
- Technological up-gradation
- Moving in to value added castings.
- Diversification in products and customers.

13.3 Machining and fabrication:

- Networking among the cluster actors.
- Transformation from a protected market to emerging free market.

- Upgrade SME,s catering to PSU's to product manufacturers using BDS intervention.
- Building the capabilities of association like pro-active industrial associations and to foster mutual learning and help them to undertake initiatives that individual firms cannot undertake.
- Technology up-gradation.

Synergy between Foundry and Machining cluster will help to transact business within the sub cluster. This is possible by identifying products that can be made like Oil Expellers, Sugar plants and Special purpose machines where combination of casting and Fabrication and machining parts are involved.

We will have to rewrite the strategy when you are with us on 2nd.

14.0 ACTION PLAN:

14.1 Sponge iron:

14.1.1 Short term:

- Fostering common vision amongst the entrepreneurs

- Exposure visits/seminars for awareness creation on Captive power plant, other common infrastructure, clean development Mechanisms/safe working practices
- Propagation of Energy savings measures
- Common procurement of spares
- Change in ITI training schedule to suit the needs of sponge iron units
- Initiation of dialogue between traders and sponge iron manufacturers to sort out mutual issues and institutionalizing it.

14.1.2 Long term:

- Certifications
- Common equipment for pollution monitoring
- Common machinery for maintenance of kiln
- Captive mining blocks in India
- Implementation of clean development mechanisms
- Common infrastructure for transportation and treatment of water
- Common procurement for Captive power plant
- Taking on lease mining block overseas
- Diversification in to powder metallurgical products
- Product development by using waste (Dol char)

14.2 Foundries

14.2.1 Short term

- Fostering common vision amongst the entrepreneurs
- Exposure visits / seminars for awareness creation on best foundry practices; safety systems; need for technology up gradation; certification
- Propagation of Energy savings measures
- Common purchase of inputs

14.2.2 Long term

- Development of alternative products like steel grinding media balls / oil expellers/sugar plant equipment, Etc.
- Common marketing
- Usage of BDS for productivity improvement
- Certification of units

14.3 Machining & Fabrication:

14.3.1 Short term

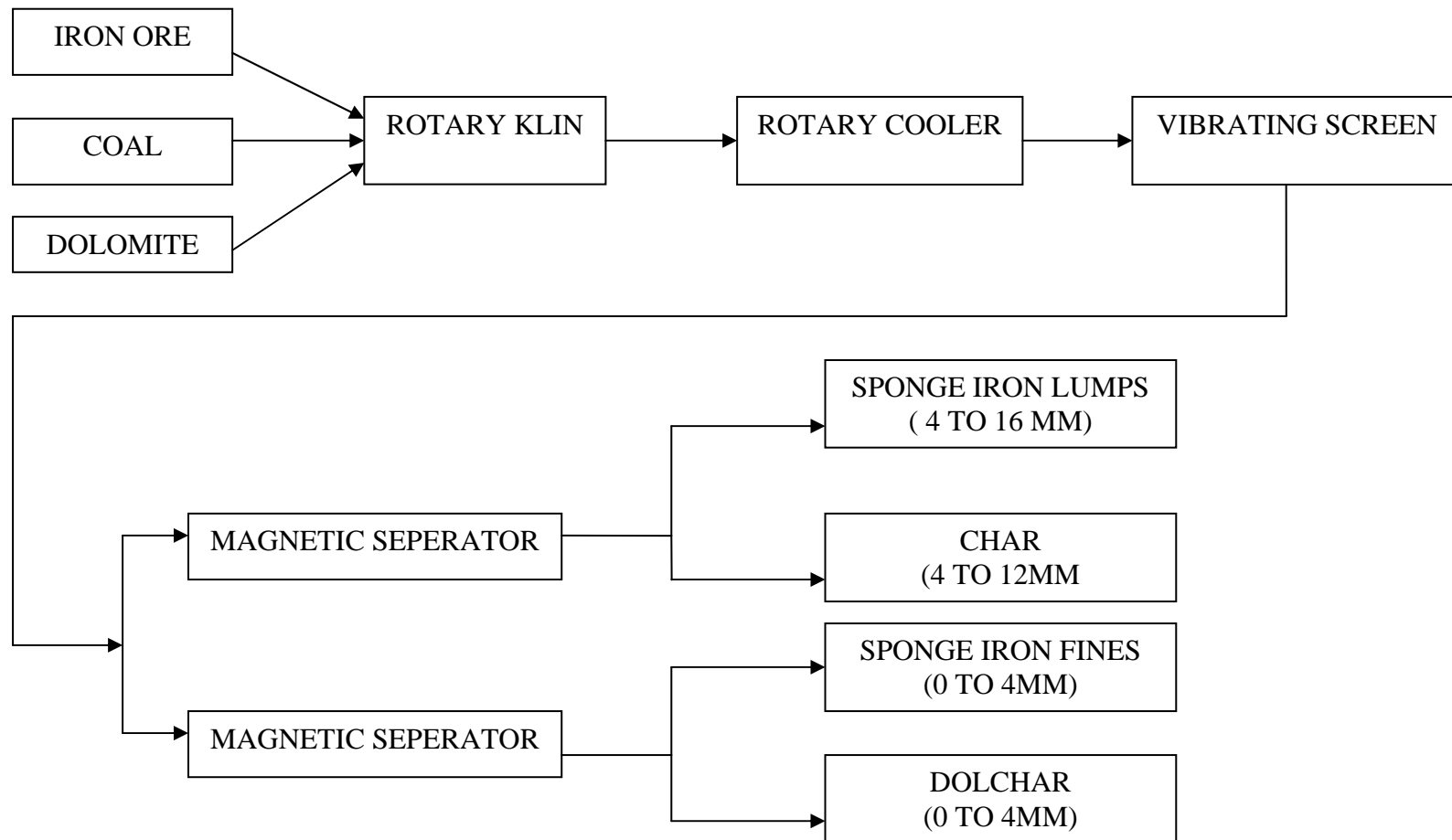
- Fostering common vision amongst the entrepreneurs
- Exposure visits/seminars for awareness creation on product diversification & Precision engineering.
- Usage of tools and fixtures; e- procurement; certification; Joint participation in Technology exhibitions.
- Initiation of dialogue between fabrication units and mother plants mainly RSP for mutual benefits.
- Credit linkages between tiny units and bankers

14.3.2 Long term

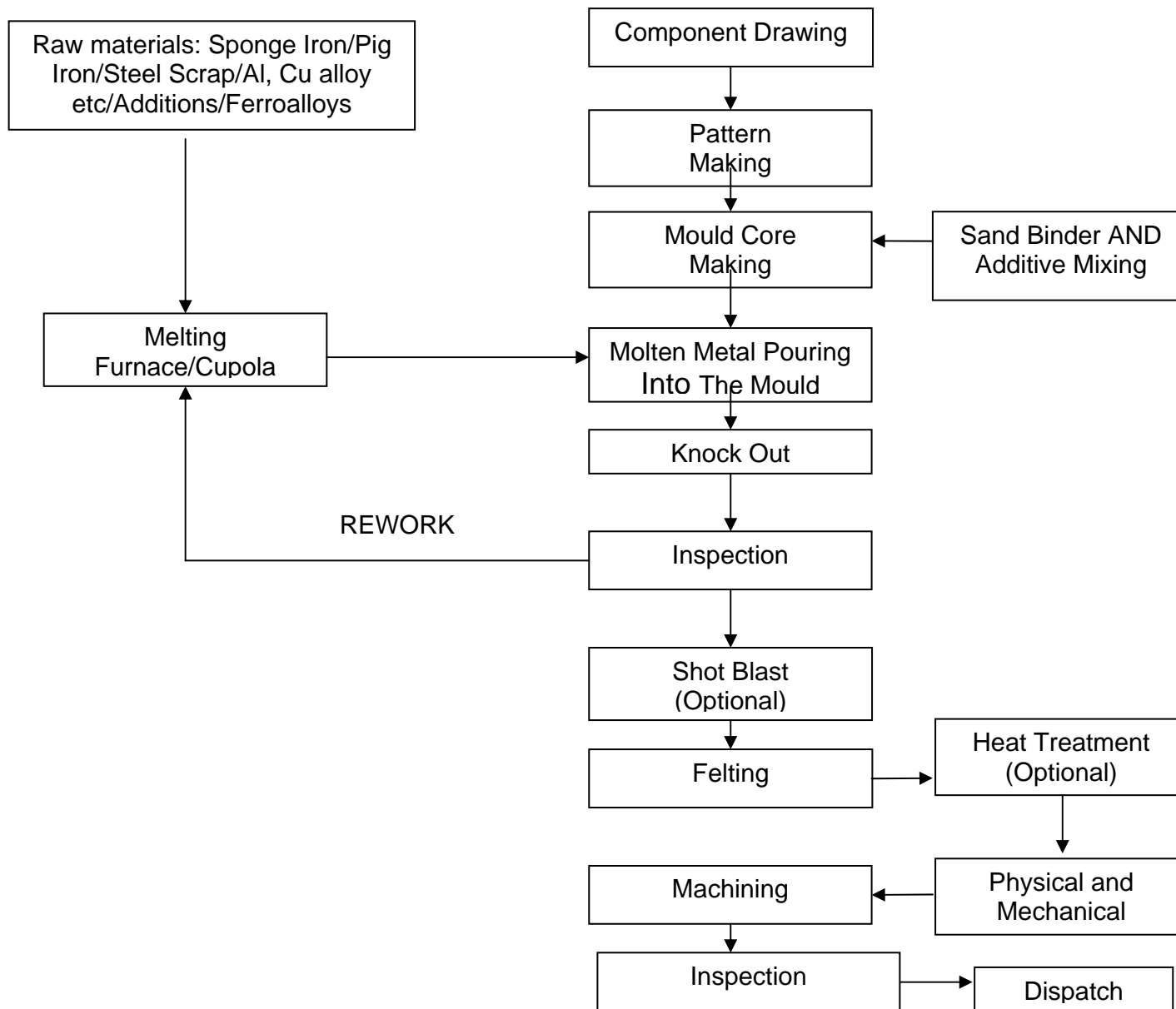
- Product diversification
- Usage of BDS for productivity improvement
- Networking between units and new projects like Tata Steel, Jindal steel, Mittal steel etc. for increased business
- Common procurements.
- Certification of units
- Export of new products developed- oil expellers, Agro Machineries Etc.
- Establishment of tool room facility

LET US DISCUSS AND FINALISE THIS WHEN YOU ARE HERE!!!!!!

SPONGE IRON PRODUCTION FLOW CHART

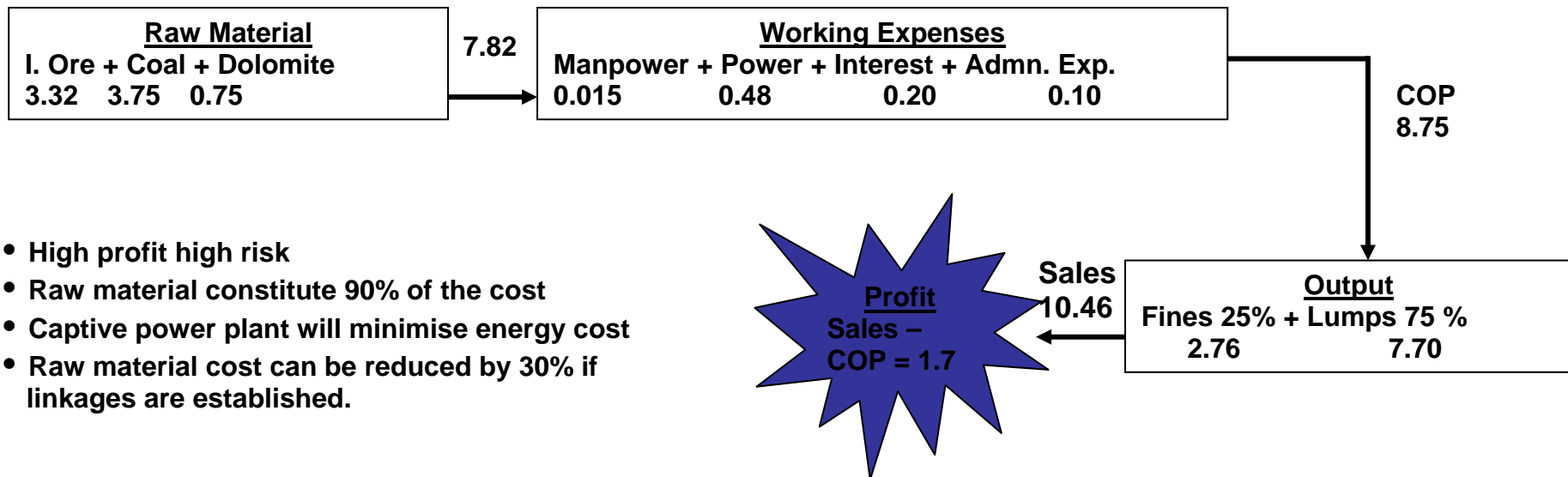


FERROUS AND NON-FERROUS FOUNDRY FLOW PROCESS CHART



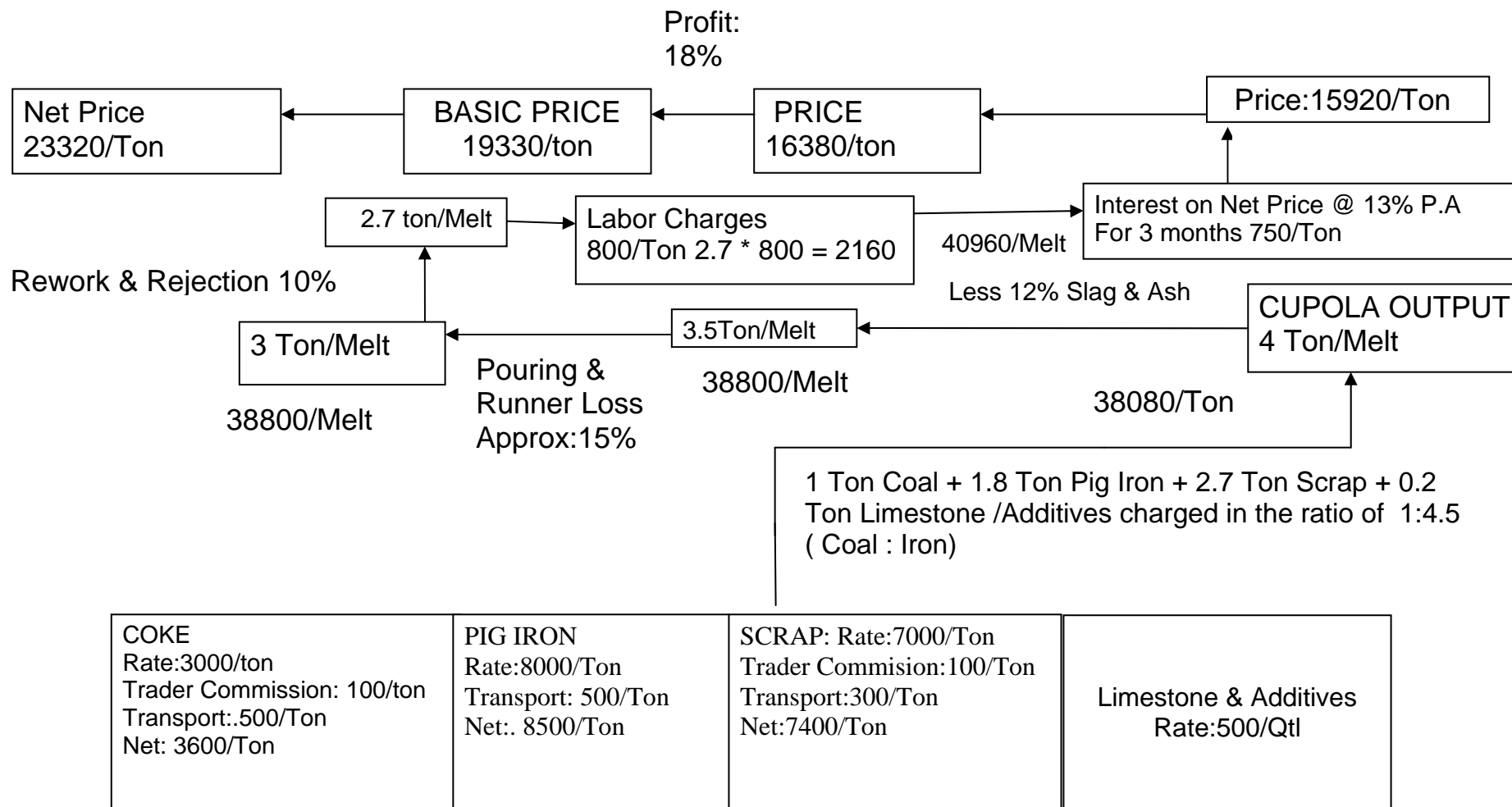
VALUE ANALYSIS

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



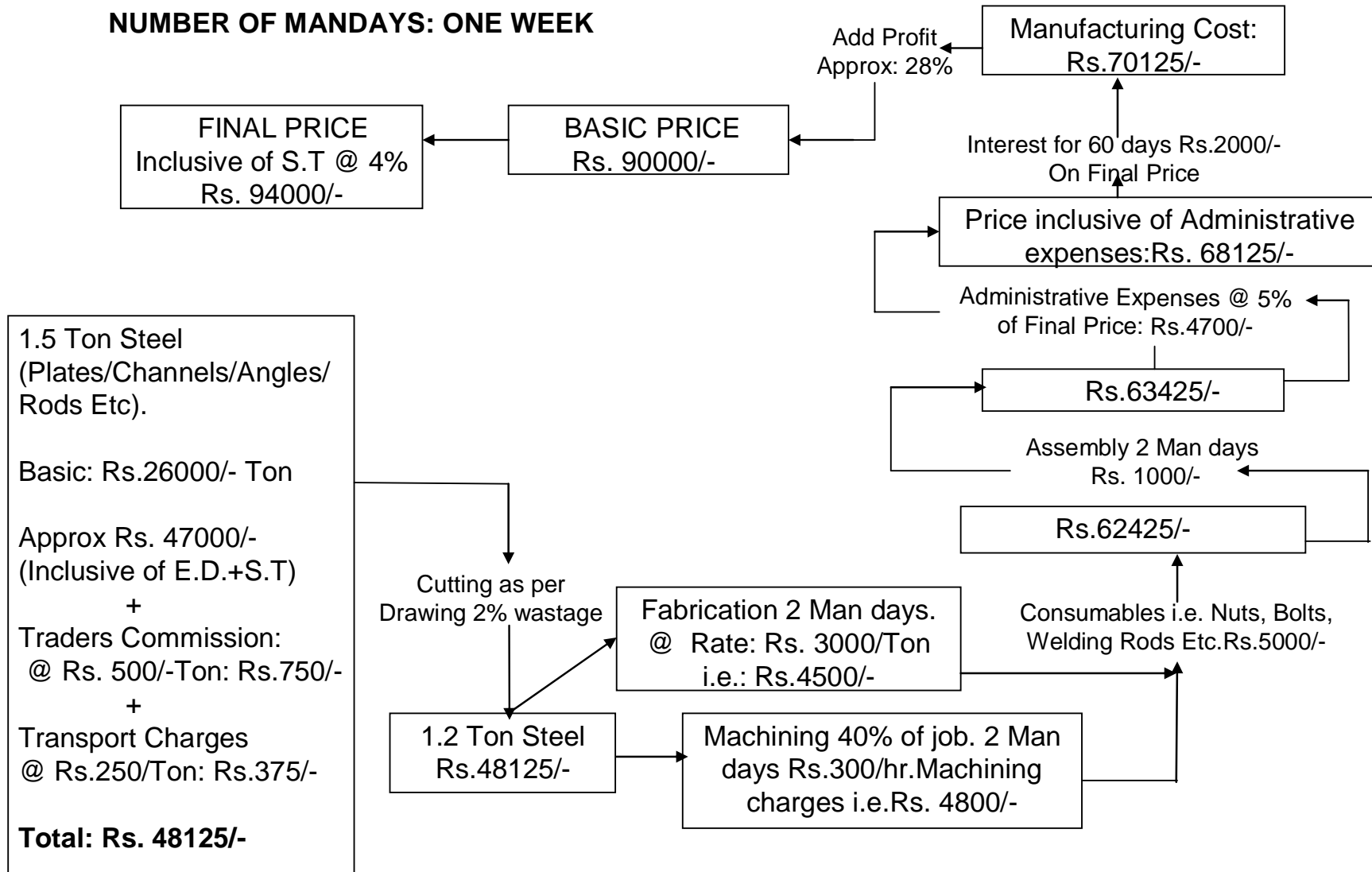
- High profit high risk
- Raw material constitute 90% of the cost
- Captive power plant will minimise energy cost
- Raw material cost can be reduced by 30% if linkages are established.

VALUE CHAIN ANALYSIS OF GRINDING MEDIA BALLS



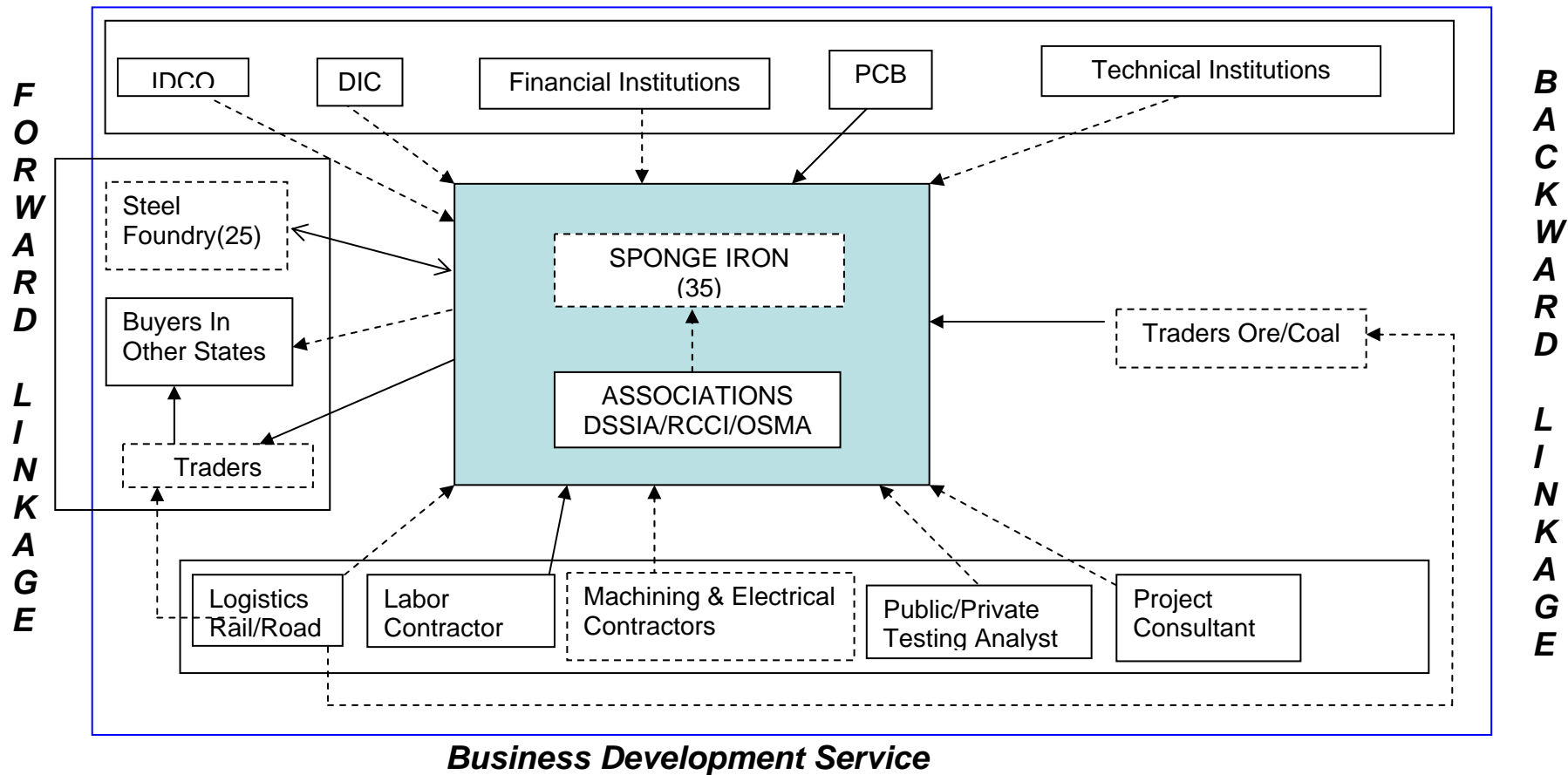
VALUE CHAIN ANALYSIS OF MACHINING AND FABRICATION JOB

BASIS: ONE TON JOB
NUMBER OF MANDAYS: ONE WEEK



SPONGE IRON SUB-CLUSTER MAP

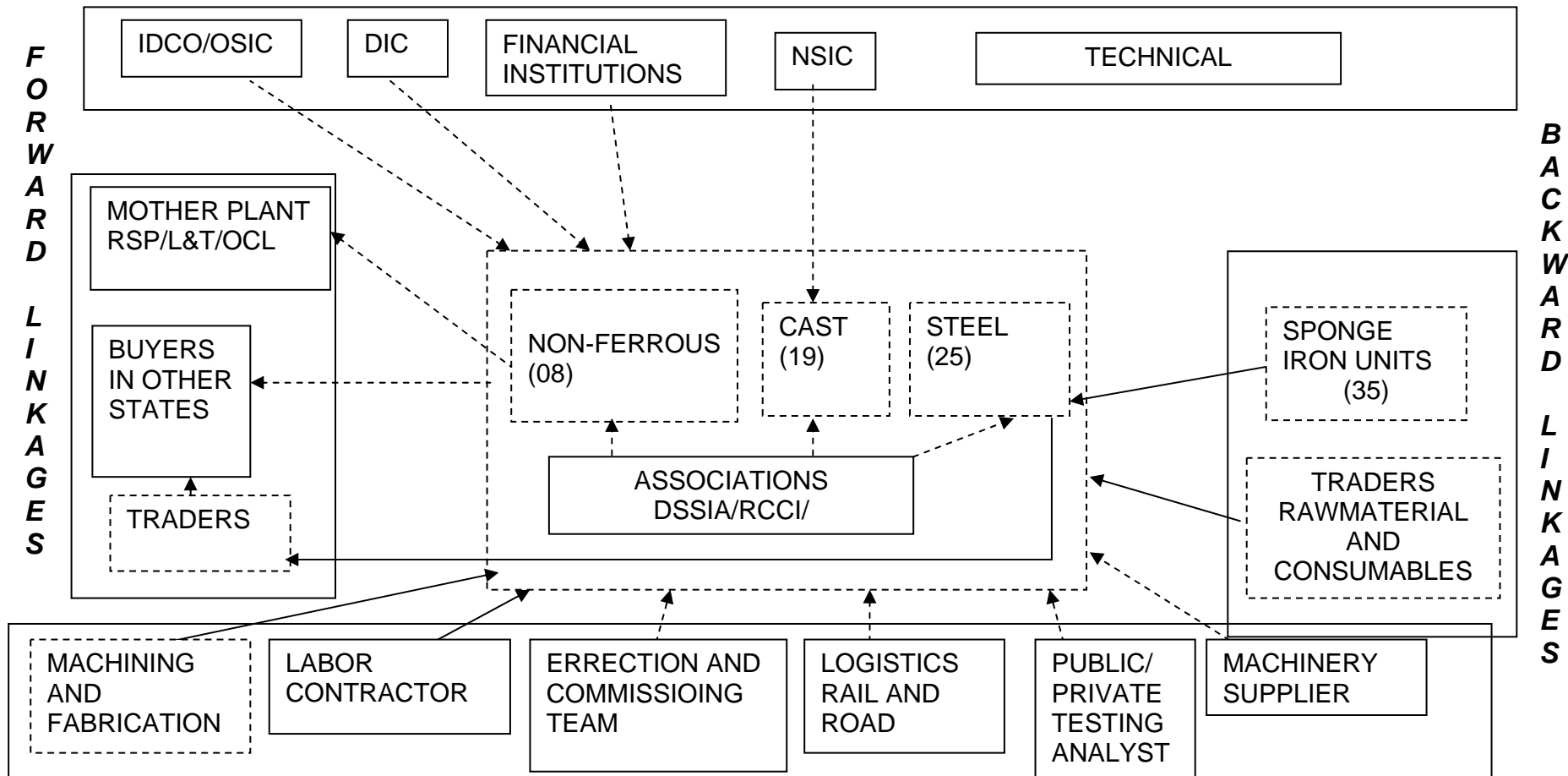
Support



PCB: Pollution Control Board; DIC: District Industries Centre; IDC0: 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



Business Development Service

ROURKELA MACHINING AND FABRICATION SUB-CLUSTER MAP

