

# 10 | Public Sector Enterprises

## National Aluminium Company Ltd

10.1 National Aluminium Company Ltd (NALCO) was incorporated in January, 1981 as a Public Sector Undertaking. Presently, Govt. of India holds 87.15% share in NALCO. The Company is an integrated and diversified mining, metal and power producer and achieved annual sales of Rs. 5,474 crores in financial year 2008-09. The primary operations are located in Orissa and the Company enjoys major market presence in alumina and aluminium. It has bulk shipment facilities at Vizag port, besides utilizing the facilities at Paradeep and Kolkata Ports.

10.2 Revenue from alumina and aluminium export accounts for approximately 40% of turnover and business with more than 30 countries in recent past. NALCO is the First Company from India in the aluminium sector to be registered with LME in May 1989. The Company is listed in Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). Besides, ISO 9001, ISO 14001 & OHSAS 18000 certification, the Company has also been accorded SA 8000 International Standards, for Corporate Social Accountability.

10.3 In addition to existing operations, NALCO has drawn ambitious plans for extensive brown field and green field expansion projects at estimated cost of Rs. 30,000 crore in the country and abroad. Further, the Company has taken up steps for commissioning of a coal block (Utkal-E in Orissa) and is taking action for acquiring new bauxite mines in Andhra Pradesh and in Orissa besides setting up some forward and backward integration projects.

10.4 Leveraging the technical collaboration with Aluminium Pechiney (now Rio Tinto Alcan) since 1982, NALCO has continued to add value and is poised to

grow further. NALCO has signed a strategic alliance agreement with Rio Tinto Alcan, which shall facilitate both the companies to share information to identify potential projects to create value for each other.

## Bauxite Mine

10.5 Bauxite is the primary raw material used to produce alumina and aluminium. The bauxite mine is situated at Panchpatmali hills in Damanjodi, Koraput, in the State of Orissa. This plateau bauxite deposit is mined by a fully mechanized system at a capacity of 4.8 million tonnes per year being upgraded to 6.3 million tonnes per year under 2<sup>nd</sup> phase expansion. The capacity of mines is being further upgraded to 6.8 million tonnes per year under the upgradation project. Approximately 90% of the bauxite from the mine represents gibbsitic alumina, also called tri-hydrate alumina, a property which allows it to be digested at a relatively low temperature and at atmospheric pressure during the alumina refining process.



Bauxite Reclaiming at Alumina Refinery

10.6 Bauxite occurs over the full length of the Panchpatmali plateau, which spans over 18 kms.

### Alumina Refinery

10.7 Alumina refinery plant is located at Damanjodi, Orissa, approximately 14 kms. from the bauxite mine. The bauxite is transported to refinery by a 14.6 kms. long single flight multi curve 1,800 tonnes per hour (TPH) capacity cable belt conveyor. The alumina produced is transported to aluminum smelter plant and Vizag port storage and handling facilities by rail.

10.8 The present capacity of alumina refinery is 1.575 million tonnes per year, which is by way of three production lines of each of 525,000 metric tonnes per annum. The capacity is being augmented to 2.1 million tonnes per annum under 2<sup>nd</sup> phase expansion with addition of one more stream. The capacity of alumina refinery is being further enhanced to 2.275 million tonnes per annum under an up-gradation project. Alumina produced is used first to meet own alumina requirements for production of primary aluminum. The alumina that remains after internal consumption is sold to third parties primarily in the export markets.

10.9 The salient features of the refinery are a high throughput capacity, use of temperature atmospheric digestion technology, production of sandy calcined alumina and co-generation of power.

### Aluminium Smelter

10.10 The aluminum smelter plant is located at Angul, Orissa, which is approximately 699 kms. from the refinery plant, 5 kms. from the captive thermal power plant, 564 kms. from Vizag port storage and handling facilities, 194 kms. from the Paradeep port and 551 kms. from the Kolkata port, respectively. The aluminum produced at aluminum smelting plant, Angul is transported to Vizag, Kolkata and Paradeep ports by rail for export.

10.11 The aluminum smelter entered into production progressively from 1987. Presently, the aluminum



Potroom activities at NALCO Smelter, Angul (Orissa)

smelter is producing about 425,000 tonnes per annum and is poised to achieve 460,000 tonnes per annum by December, 2009 after completion of ongoing expansion project.

10.12 Alumina is converted into primary aluminum through a smelting process using electrolytic reduction. From the pot-line, the molten aluminum is routed either to casting units, where the aluminum can be cast into ingots, sow ingots, billets, wire rods, cast strips and alloy ingots, or to holding furnaces at flat aluminum products unit where the molten aluminum can be rolled into various cold-rolled products or casted into aluminum strips.

### Technological Collaboration

10.13 The aluminum smelter operates on one of the modern electrolysis technology, namely the AP-18 provided by Aluminum Pechiney, which is being upgraded from time to time. The Company has also adopted the technology provided by Aluminum Pechiney in refinery.

### Captive Power Plant

10.14 Aluminum smelter plant and coal based captive thermal power plant at Angul are strategically located. Captive thermal power plant is located approximately 5 kms. away from aluminum smelter plant. The

Company has constructed captive thermal power plant adjacent to smelter plant to enable it to access to low cost electric power and minimize transmission losses.

10.15 The location of captive thermal power plant at Angul is also strategic to the coal availability and supply. The Company sources major coal requirement for captive thermal power plant from the Talcher coalfields, located approximately 15 kms. from Angul. The 18.5 kms. captive railway system links captive thermal power plant to the Talcher coalfields, enabling transport of the critical and bulk requirement of coal at relatively low cost.

10.16 The captive thermal power plant commenced operations in 1986. Presently, the captive thermal power plant has an electric power generation capacity of 1080 MW by way of nine turbo-generators, each rated at 120 MW. Another unit of 120 MW capacity is likely to be commissioned by March, 2010. While the captive thermal power plant provides entire electric power requirement of aluminum smelter, it also provides for approximately 35% of the electricity requirement of alumina refinery plant besides supplying some surplus power to State grid occasionally.

**Table 10.1**  
**Physical Performance of NALCO**

Product	Unit	2007-08	2008-09	Target 2009-10 (RE)	2009-10 (Actual up to Dec.'09)*	Anticipated from 1 <sup>st</sup> January, 2010 to 31 <sup>st</sup> March, 2010
Bauxite	MT	4,684,684	4,700,027	4,800,000	3,362,174	1,437,826
Alumina	MT	1,575,500	1,576,500	1,575,000	1,185,600	389,400
Aluminium	MT	360,457	361,262	4,35,000	318,742	116,258
Net power	MU	5,609	5,541	6,510	4,617	1,893

\*Provisional

**Table 10.2**  
**Financial Performance of NALCO**

(Rs. in crore)

Sl. No.	Details	2007-08	2008-09	Estimate 2009-10(RE)	Actual upto Dec.'09*	Anticipated from 1 <sup>st</sup> January, 2010 to 31 <sup>st</sup> March, 2010
1.	Income	5,575	5,631	5,327	3,835	1,492
2.	Operating Cost	2,822	3,427	4,048	2,927	1,121
3.	Interest & Transaction Loss	2	4	-	2	—
4.	Depreciation & Amortization	285	273	353	231	122
5.	Net Profit before Tax & Dividend (PBT)	2,467	1,927	926	675	251
6.	Net Profit after Tax but before Dividend (PAT)	1,632	1,272	611	441	170

\*Provisional

**Table 10.3**  
**Sales Performance of NALCO**

(In tonnes)

Items	Unit	2007-08	2008-09	Target 2009-10 (RE)	2009-10 (Actual up to Dec.'09)*	Anticipated from 1 <sup>st</sup> January, 2010 to 31 <sup>st</sup> March, 2010
Aluminium Export	MT	101,723	82,317	153,720	108,074	45,646
Domestic Aluminium Sale	MT	251,612	271,274	281,280	208,896	72,384
Total Aluminium Sale	MT	353,334	353,591	435,000	316,970	118,030
Total Alumina/ Hydrate Sale	MT	887,276	889,523	727,470	519,044	208,426

\*Provisional

Note: (1) The Aluminium metal sales includes Rolled Product (RP) but excludes internal consumption and Alumina/Hydrate sales doesn't include sale of Zeolite-A.

However the above estimates would depend on the quantity produced and market scenario.

**Table 10.4**  
**Evaluation of Memorandum of Understanding of NALCO**

SI No.	PRODUCT	UNIT	FY 2006 - 07		FY 2007 - 08		FY 2008 - 09	
			MoU Target	Actual	MoU Target	Actual	MoU Target	Actual
<b>A.</b>	<b>PRODUCTION</b>							
1	Bauxite	MT	4,800,000	4,623,278	4,800,000	4,684,684	4,900,000	4,700,027
2	Alumina Hydrate	MT	1,575,000	1,475,200	1,575,000	1,575,500	1,590,000	1,576,500
3	Aluminium Cast Metal	MT	345,000	358734	348,500	360,457	355,000	361,262
<b>B.</b>	<b>SALES</b>							
1	Alumina /Hydrate Sale	MT	885,000	795,566	855,000	887,276	865,000	888,581
2	Total Metal Sale	MT	345,000	356,616	348,000	353,334	345,000	353,589
<b>C.</b>	<b>FINANCE</b>							
1	Gross Sales Turnover	Rs. Crs.	4,936.75	6,514.51	5,687.74	5,474.45	5,000	5,531.06
2	Gross Margin	Rs. Crs.	2,214.84	3,963.94	2,919.17	2,749.20	2,244	2,204.09
3	Net Profit Before Tax	Rs. Crs.	1,907.08	3,620.40	2,632.47	2,466.59	1,917.15	1,927.16
4	Net Profit After Tax	Rs. Crs.	1,253.97	2,381.68	1,737.39	1,631.52	1,250.51	1,272.27
<b>D</b>	<b>MoU rating achieved</b>							
			Composite score/ Grade		Composite score/ Grade		Composite score/Grade	
			1.40/Excellent		2.18/Very good		1.78/Very good	

### On Going Projects

#### Utkal-E Coal Block

10.17 Mineable Reserve: 67.49 million tonnes and targeted output 2 million tonnes/annum.

NALCO has been allocated "UTKAL-E" Coal Block for its expansion units by Department of Coal, Ministry of Coal & Mines, Govt. of India in August, 2004.

10.18 The coal block is located at south central part of Talcher coalfield in Angul District of Orissa. The block

is approximately 41 kms. away from captive power plant of NALCO by proposed railway route.

10.19 The Company Board in its meeting held on 26.06.2007 accorded investment approval with coal & over burden outsourcing at a capital cost of Rs.214.89 crores (at October, 2006 price level) based on the R&R policy 2006 of the Govt. of Orissa.

10.20 In December, 2009, Ministry of Environment & Forest (MOEF), Govt. of India, has accorded the environmental clearance. Other activities like acquisition of Government, private and forest land, forest clearance, etc. are in progress.

**Table 10.5**

**Revised action plan for coal production which is likely to start by June, 2012**

Items	Anticipated
Environment clearance	10.12.09 (Received)
Forest clearance	30.11.10
Land acquisition	31.12.10
Overburden removal	31.10.11
Coal production	30.06.12

**Expansion & Diversification**

**Status of 2<sup>nd</sup> Phase Expansion:**

10.21 The Company's 2<sup>nd</sup> phase expansion project at estimated cost of Rs. 4,402 crore (at November, 2008 price level) is nearing completion in smelter and power complex. The mines & refinery expansion plants are likely to be commissioned by January, 2011.

**Table 10.6**

**Present capacity of the various project segments and the capacity after 2<sup>nd</sup> phase expansion**

Project Segment	Present Annual Capacity	Annual Capacity after 2 <sup>nd</sup> Phase Expansion
Bauxite Mine	4.8 million tonnes	6.3 million tonnes
Alumina Refinery	1.575 million tonnes	2.1 million tonnes
Aluminium Smelter	0.345 million tonnes	0.46 million tonnes
Captive Power Plant	960 MW	1,200 MW

10.22 All 240 pots of aluminium smelter have been commissioned in December, 2009. Similarly, one 120 MW unit of CPP has started commercial operation since August, 2009 and another 120 MW unit will be commissioned by March, 2010.

In mines and refinery complex, major works pertaining to technology, detail engineering and manufacturing, supplies, etc. are over. Construction activities are in advance stage.

**Table 10.7**  
**Overall Physical Progress**

(in %)

Sl. No	Project segment	Cumulative up to December, 2009 Actual
1.	Mines & Alumina Refinery	94.3
2.	Aluminium Smelter	98.7
3.	Captive Power Plant	96.1

**Upgradation of Mines & Refinery:**

10.23 The Upgradation project of stream-4 of alumina refinery from 0.525 million tonnes per year (MTPY) to 0.7 MTPY, thereby enhancing the capacity of alumina refinery to 2.275 MTPY and that of mines from 6.3 MTPY to 6.825 MTPY at an estimated cost of Rs. 409 crores has started since August, 2008. The project is scheduled to be completed in 33 months i.e. in 2011. Various activities for technology, detailed engineering, tendering, etc. are in progress.

**10.24 Green Field Growth Projects in India**

i) NALCO's proposal to build a 0.5 MTPA aluminium smelter and 1260 MW CPP near Brajaraj Nagar in Orissa at an estimated investment of Rs. 16,500 crore, has been given conditional approval by Govt. of Orissa. In this connection, NALCO is participating in preparation of Regional Environmental Management Plan (REMP) based on carrying capacity study for Sambalpur - Jharsuguda area. The location for the proposed project is expected to be finalised on the basis of study.

- ii) NALCO plans to set up a mines & refinery complex in Visakhapatnam district of Andhra Pradesh involving an investment of Rs. 5600 crores. The proposed complex will have a 4.2 MTPY bauxite mines and 1.4 MTPY alumina refinery. The refinery would be based on the bauxite reserve of Gudem and KR Konda blocks in Andhra Pradesh. Ministry of Mines, Govt. of India has approved for allotment of the mining leases in favour of NALCO. The Pre-feasibility report for the project has been prepared. Exploration drilling of the mining blocks is being taken up through MECL.



NALCO's Rolled Product Unit at Angul (Orissa)

### Abroad

- i) NALCO had signed an MoU with the Government of South Sumatra, Indonesia to set up a 0.5 MTPA smelter and a 1250 MW CPP in Indonesia. Government of Indonesia has approved the foreign investment proposal. Feasibility study for the project has been done. The estimated investment is Rs. 16,500 crore. NALCO has signed MoU with Ras Al Khaimah Mineral and Metal Investments (RMMI) offering minority equity partnership in the proposed smelter and power plant. NALCO is exploring East Kalimantan as the alternate location for the project. This location is considered based on coal mines of RMMI of UAE. Feasibility report has been prepared for the new location. Due diligence of RMMI and its project activities are being done.

- ii) In Iran, an MoU has been signed with Kerman Development Organisation (KDO) to set up a 0.31 MTPA aluminium smelter and 750 MW gas based power plant in two phases as a joint venture with ALPHA Co. in which KDO is the major partner at an investment of Rs. 9000 crores. Techno-economic Feasibility Report (TEFR) has been prepared. Due Diligence of ALPHA has been done.

### Diversification

NALCO has signed an MoU with Nuclear Power Corporation of India (NPCIL) for setting up of Nuclear Power Plants in India in Joint Venture for generating and selling electric power. The Joint Venture Company will be formed where in NPCIL will have minimum 51% equity and NALCO will have minority shareholding which may be maximum up to 49%.

### New Schemes

NALCO has entered into an agreement with Bharat Earth Movers Limited (BEML) for the production of aluminium rail wagons. A prototype wagon has been made ready by BEML.

Orissa Industrial Infrastructure Development Corporation (IDCO) and NALCO have signed a MoU to form an SPV to set up an Aluminium Park at Angul, Orissa for development of ancillary and downstream industries.

### Energy Conservation

Various energy conservation measures that have been adopted for optimal utilization of energy resources in different units of the Company during the period under review are given below:

### Mines

- Preliminary energy audit on consumption pattern of high speed diesel, lubricants and electrical energy for illumination purposes carried out through Petroleum Conservation Research Institute.
- Replacement of conveyor system main synchronous drive & apron feeder- 2 DC drive with variable frequency drive, commissioned.

- Turbo charger, fuel pump & acceleration pedals were changed in komatsu loader No- 17 & 18 to reduce fuel consumption.
- Recycling /life extension of lubricants, engine oil and hydraulic oil used in heavy earth moving machinery equipments are under implementation.

### Alumina Refinery

- Reduction in specific fuel oil consumption in calciner by operating hydrate bypass system in continuous mode.
- Reduction in specific coal consumption in hydrate circuit by taking necessary measures like operating excess air control in auto mode and improving milling system output.
- Optimizing, use of street lights and replacement of conventional indication lamps to light emitting diode in 11 KV switch gear panels.
- Reuse of lubricants of mill, primary air fan, forced draught fan, boiler feed pump and voith couplings of induced draught fans after centrifuging during boiler overhauling.
- Pumps in evaporation area have been suitably modified for reduction in power consumption by reducing the pump speed.
- Reduction of oxygen in flue gas of boiler to 3.7% from operating level of 4.2% in all running boilers.

### Smelter

- Optimization of operating voltage in identified high tension transformers.
- Reduction in operating voltage of lighting circuit in the lighting transformers.
- Re-setting of the minimum fuel flowing to Ingot casting machines furnace in cast house-B.
- Optimizing the temperature setting of furnaces in cast house-A .

### Captive Power Plant

- Reduction in De-mineralized water consumption due to improved operation & maintenance.

- Adopting on line testing (Trevi Test) of safety valves of boiler drum & main steam line through simulation.
- Installation of variable frequency drives in cooling tower fan.
- Replacement of cooling tower grass reinforced plastic fan blades with fiber reinforced plastic blades.
- Installation of soft touch radial seals at the hot end of air pre-heaters.
- Improvement in specific power consumption in re-circulating cooling water pump by providing energy efficient coating on the impeller and inner casing.
- Recycling of industrial drain water resulted in saving in raw water by 29.2 lakh M<sup>3</sup> in a year.
- Use of STP treated water for gardens and maintaining green belt around plant.
- Replacement of HPMV lamp with high pressure HPSV lamp.



Visit of Ms. Santha Sheela Nair, Secretary (Mines) to Captive Port Facilities of NALCO at Vizag

### 10.25 Computerisation Activities Including Enterprise Resource Planning (ERP)

Like all progressive organizations, NALCO from its inception has taken the approach of leveraging on Information and Communication Technology (ICT) to strengthen and boost its business processes so as to

deliver its strategic business objectives to increase sales, maximise operational efficiency, reduce operational risks and improve productivity. NALCO is in the process of implementing the SAP application, along with add-on modules like Supply Chain Management (SCM), Supplier Relationship Management (SRM) and Customer Relationship Management (CRM) for all its functions and processes, across the organization, including the Sales Offices. This will provide a strong centralized information base integrating all functions and business processes of the Company and a knowledge base to assist the managers with appropriate dashboards for monitoring all the processes and to be pro-active in their decision making. Further down the line, knowledge management will be implemented to harvest from the rich data warehouse so developed from the ERP. To assist and strengthen housekeeping and work flow processes, document management system will also be implemented in a collaborative environment.

10.26 Towards e-governance, e-tendering applications have matured, with regular tenders for investment of surplus funds. Similarly, e-tendering for export sales has been implemented with security measures like Server secure socket layer certificate and end user digital certificate. With the go-live of SAP application, additional processes like materials procurement, service tenders, and recruitment processes shall go the e-way.

10.27 To support the IT applications, a state of the art data center with 24x7 conditioned power supply and air conditioning along with the usual safety measures and monitoring systems has been setup at the corporate office. This will be followed by setting up the disaster recovery site of the data center, to implement business continuity plan for the IT based processes.

10.28 NALCO has strengthened its data pipelines both to the Internet and to the Works Locations with fault tolerant high bandwidth links, to ensure uninterrupted data connectivity. This also enables tele-presence activities between corporate office and works locations. Shortly the local area networks (LAN) at all

the works sites and corporate office will be replaced with high bandwidth and fault tolerant state of the art networks, which will support data as well as broadband applications.

### Enterprise Resource Planning

10.29 The ERP Project N'vision from implementing SAP has started from July, 2008. It covers materials, sales & distribution, production planning, quality, finance and human resource management modules. Additional modules of SAP such as supplier relationship management (SRM), advanced planning & optimization (APO), document management system (DMS), business intelligence (BI) and employee self service (ESS) are also being implemented. The comprehensive project comprising SAP, ERP, IBM hardware with CA Unicentre EMS, Data Centre with Honeywell BMS and SAP Implementation Services is valued at Rs. 16 crore. Around 500 core functional users and 2000 ESS users shall be using the system. A team of 50 core team members and consultants are working full time on this project. After completion of the business blueprint, the solution configuration and development is under final stages of testing. Senior management presentation for validating the solution has been completed. Key user and end user training for each module is under progress, at all sites. Master data is ready for use. Software scripts and methodology for cut-over data is ready. The data centre and all hardware is operational. The ERP shall be operational after completion of training and cutover and is slated for go-live during January, 2010.

### Pollution Control & Environment

10.30 During the financial year 2009-10, the performance of the Company with respect to pollution control & environment management activities are satisfactory. As on date the followings have been achieved:

#### 10.31 Obtaining Consents/Clearances and Environment Management System (EMS)

- i) All the five major units have valid consent to operate under Air & Water Act.

- ii) All the 5 units are certified for EMS as per ISO-14001:2004.
- iii) MoE&F has granted environmental clearance to NALCO Panchpatmali bauxite mines for 6.825 MTPY and to Utkal-E-coal block for 2.0 MTPY capacity.
- iv) Company has obtained temporary work permit from MoE&F, New Delhi for a period of one year w.e.f. 20.07.2009 for operating the Panchpatmali bauxite mines (South Block) against renewal of forest clearance under Forest Conservation Act 1980.
- iv) New sewage treatment plant at CISF Colony, Angul has been commissioned & is operating under trial run.

### 10.34 Solid Waste Management/Ash/Hazardous Material Management

- i) Two major units have valid authorization to handle hazardous waste materials.
- ii) Both the hospital of Damanjodi and Angul complex have valid authorization for handling bio-medical wastes.
- iii) Damanjodi Township is having valid authorization for handling urban solid waste material.
- iv) Construction of secured engineering landfill for safe storage of hazardous wastes at smelter plant is in progress.
- v) Vermi-composting system for treatment of urban solid waste generated in the township has been provided in NALCO Nagar Township, Angul.
- vi) NALCO has initiated action for disposal of ash by lean slurry disposal system in abandoned coal mines void at Bharatpur (South), MCL, Talcher, Angul.

### 10.32 Steps to reduce air pollution

- i) Eco-friendly semi mobile crushing unit along with multi curved single flight conveyor is under installation to reduce the pollution load at Panchpatmali bauxite mines.
- ii) Systematic plantation of reclaimed area of bauxite mined out was backfilled over 20 hectare.
- iii) On line emission analyzer are installed in all the stacks at alumina refinery, Damanjodi.
- iv) For control of emission of suspended particulate matter (SPM), CPP unit has obtained the permission for use of ammonia flue gas conditioning system. The system has been designed indigenously & installed in unit I, III, IV & VI. The system is successfully working on continuous basis.

### 10.35 Research and Development Activities

- I. Specific areas in which research & development(R&D) activities carried out by the Company are:

#### (A) In-house R&D Activities

##### (a) Alumina Plant

- i) Additional effluent pond in alumina refinery has been completed & interconnection with existing ponds is in progress.
- ii) On line monitoring system has been installed for measuring the Fluoride level of surface water in smelter.
- iii) On line flow meter has been installed for measuring flow of surface water in smelter.
- Development of RP analyzer control system to replace the imported control system.
- Studies related to M2M Technology for recovering alumina from settler underflow mud.
- Study on the effect of lime from various sources on the quantity and quality of aluminate liquor output and CaO content in the product.
- Studies to establish the effectiveness of green

liquor filter aids on the clarity and specific filtration rate of aluminate liquor.

- Development of a process for preparation of high temperature resistant resin for sodic condensate polishing.
- Studies related to alternate flocculant and defoamer development.
- Utilisation of flyash to make quick settling cement.
- Neutralisation of sodic condensate for economically utilizing the available condensate.
- Development of an innovative process for preparation of sodium aluminate from alumina hydrate.

#### (b) Smelter Plant

- Plant scale trial with anodes of deeper stub hole depth (+20mm) with and without 10mm increased pin length to reduce pin to carbon voltage drop.
- Metallographic studies of cast products for quality improvement.
- Inclusion analysis of molten metal.
- Vendor development for cathode block.

#### Mathematical modeling

- Simulation studies at different amperage levels.
- Simulation study for optimum metal height at different amperage.
- Simulation studies to predict pin & clad temperatures at various anodes cover heights.
- Simulation of Billet casting and Wire rod casting process.

#### Anode bench scale studies:

- Impact of varying percentage of pitch on anode quality.

- Impact of permuting cycle in baking furnace on anode quality.
- Bench scale studies on utilization of rejected ramming paste in anode paste completed.
- Bench scale studies on blending of fines of two types coke completed.
- Characterisation of baked anodes for process monitoring.
- Testing samples of ramming paste with the anode bench scale set up carried out.
- Revision of specification of CP coke proposed. Discussions were held with the existing coke suppliers to improve the quality of supplied material & were appraised about quality implications & future quality requirements.
- Large scale plant trial of additive in anode manufacturing to improve oxidation behaviour successful.
- Heat balance study carried out in anode baking furnace.
- Pots started with alternate supply of cathode blocks, reprocessed rejected paste, partially damaged cathode blocks & indigenously developed ramming paste are being monitored.
- Laboratory scale trial for using SPL Carbon portion for electrode paste manufacturing is successful.
- In house study carried out to optimize boric acid addition in pots.
- Monitoring of the improvement in anode quality due to improvement in grain to sand ratio.

#### (B) Collaborative R&D Activities

- Pilot scale development of constructional blocks, bricks & chips from Red Mud in collaboration with JNARDDC, Nagpur.
- Establishing empirical relationship between physical properties of alumina through computer simulation and modeling in collaboration with SIT, Bhubneshwar and its implementation in plant.

- Pilot scale optimization of extraction of alumina from partially lateritic khondalite (PLK), collaborative project with MESIS, Russia.
- Preparation & certification of reference material for selected ores in collaboration with JNARDDC, Nagpur.
- Plasma smelting of Red mud for production of pig /cast iron and Alumina rich slag in collaboration with IMMT, Bhubneshwar.
- Infra Red Thermography studies with JNARDDC, Nagpur.
- Evaluation of grain refining efficiency of commercially available grain refiner alloy in collaboration with JNARDDC, Nagpur.
- Preparation of TEFR for extraction of Nickel from chromite over burden. The IRR was not found to be encouraging, hence closed.
- Development of high speed extrusion alloys for Indian Industries in collaboration with JNARDDC, Nagpur.
- Characterisation of various casting & rolling defects of strip cast aluminium alloys at NALCO RP in collaboration with JNARDDC, Nagpur.

## II. Benefits derived as a result of the above R&D (In-House & Collaborative):

- Development of an indigenous RP meter has resulted in savings to the tune of Rs.5 crore.
- Use of filter aids results in improved specific filtration rate and hence production as well as reducing lime consumption.
- Patent has been filed for the high temperature resin development process and is under commercialization. Use of the high temperature resin results in conservation of water and energy.
- Use of high efficiency flocculant results in better control on mud washing.
- Sodid condensate neutralization in addition to

environmental protection helps in energy conservation and soda recovery from red mud pond water.

- Reduction in the cost of production of Zeolite has been addressed.
- Fly ash utilization has been increased.
- Implementation of higher grain to sand ratio in GAP2 has resulted in improvement optimisation of boric acid addition in pots has resulted in reduced consumption of boric acid to the tune of approximately 5MT/month i.e. saving of approximately Rs 2 lakh/month. of anode density by .005- .01 gm/cc.
- Usage of reprocessed rejected paste has helped in a saving of approximately 27 lakh for 10 pots lined with this material.
- Trials with indigenously developed ramming paste will help in development of indigenous vendors.
- Studies conducted in anode bench scale plant and regular characterizations of anodes have helped in process and anode quality improvements.
- Optimisation of boric acid addition in pots has resulted in reduced consumption of boric acid to the tune of approximately 5MT/month i.e. saving of approximately Rs. 2 lakh/month.
- Higher stub hole depth anodes reduces voltage drop across anode carbon to pin.
- Inclusion analysis and metallographic studies improve product quality.
- Mathematical modeling enhances process understanding and optimization of process parameters.

## III. Future Plan of Action:

- Setting up of a world class research & technology centre at Bhubaneswar.
- Pilot scale production of construction bricks from red mud for commercialization.

- Commercialisation of few R&D processes.
- Pilot scale development of a process for extraction of alumina from PLK.
- Implementation of Bayer process simulation package for better process control and reduction in cost of production.
- Use of CAIS as filter aid in kelly filtration to improve filtration.
- Reaction kinetics study for optimizing the process parameters.
- Reaction kinetics study for precipitation for improving productivity with minimal impurity occlusion.
- Salt removal studies to prevent scale formation in equipments and pipelines.
- Industrial implementation of medium pressure digestion for better extraction of alumina and productivity.
- Industrial implementation of atmospheric double digestion for reducing raw material consumptions.
- Use of high chrome grinding media and liner in ball mills for improved availability of mills and higher grinding capacity.

#### New Projects:

- Developing green liquor filtration aid.
- Implementation of high resistance resin for condensate recovery.
- Optimisation of quantity of butts in anode matrix.
- Trials with higher percentage of  $AlF_3$  in pots to optimise pot parameters.
- Plant level trials by blending of different types of cokes.
- Trial with indigenous tepid ramming paste in pots.

#### 10.36 Corporate Governance Plan of NALCO

Good governance means adoption of best ethical business practices which also ensure the Company to be within the regulatory frame work. The adoption of such corporate practices ensures accountability of the persons in charge of the Company on one hand and brings benefits to investors, customers, employees and the society at large on the other. The Company believes in such business practices and places prime importance on providing reliable financial information, maintaining transparency and compliance of the laws in letter and spirit.

10.37 NALCO's corporate governance philosophy is based on the Gandhian principle of Trusteeship and accepts the inalienable right of the shareholders as true owners of the Organization and their role as trustees of the shareholders as well as of other stakeholders. It believes in its commitment to values, ethics, good business practice and distinction between personal and corporate interest in managing the affairs of the Company. NALCO, in its pursuit to excellence, has been practicing good Corporate Governance ever since it was incorporated. The thrust is always given in attaining maximum level of transparency, accountability and equity in all facets of its operations and in interaction with all segments of stakeholders.

10.38 As part of good Corporate Governance, the Company has voluntarily got the Secretarial Audit carried out for the year 2007-08 as well as for the previous years and will continue to do so for the years to come. For the past 29 years, NALCO has consistently stood for integrity, values, ethics and quality. NALCO has been a pioneer in benchmarking its corporate governance practices with the best in the Country.

10.39 The Government of India has conferred NAVRATNA status on NALCO on 28<sup>th</sup> April, 2008. It is considered that dilution of equity will further unlock the value and provide better Governance structure. At present the Govt. of India, is holding 87.15% of share after disinvestment of earlier 13.85% of its share.

10.40 As part of the commitment to follow best global practices, Corporate Governance guidelines and best practices have evolved over a period of time. Over the years, the Company has formulated corporate governance guidelines to help to fulfill Company's corporate responsibility to various stakeholders. These guidelines ensure the Board will have the necessary authority and processes in place, to review and evaluate Company's operations when required. The type of investment and expansion envisaged calls for better Governance. Adherence to sound principles of corporate governance, through a system of checks and balances and personal accountability is vital to protecting NALCO's reputation, assets, investor confidence and customer loyalty.

### Hindustan Copper Limited

10.41 Hindustan Copper Limited (HCL) was incorporated on 9<sup>th</sup> November, 1967, under the Companies Act, 1956. It was established as a Govt. of India Enterprise to take over all plants, projects, schemes and studies pertaining to the exploration and exploitation of copper deposits, including smelting and refining from National Mineral Development Corporation Ltd.

10.42 The Government of India nationalised the only copper producing company in the private sector, Indian Copper Corporation Ltd. at Ghatsila in Jharkhand in March 1972 and handed over its management and ownership to Hindustan Copper Limited.

10.43 The Smelter Plant at Khetri Copper Complex (KCC) in Rajasthan with capacity of 31000 tonnes was dedicated to the nation on 5th February 1975.

10.44 In November 1982, Malanjkhand Copper Project comprising of a large and fully mechanised open pit mine and Concentrator plant was dedicated to the nation.

10.45 The Continuous Cast Copper Rod plant at Taloja Copper Project of Hindustan Copper Ltd. was commissioned in December, 1989 with an installed capacity of 60,000 tonnes. The Company has selected Southwire SCR-2000 technology for the plant and using natural gas as fuel.

**Table 10.8**  
The capital structure of the Company as on  
31<sup>st</sup> December, 2009

S.No	Authorised Capital:	Amount (in crores)
1	180 crore Equity shares of Rs.5/- each	Rs. 900
2.	20 lakh Preference shares of Rs.1000/- each	Rs. 200
	<b>TOTAL</b>	<b>Rs. 1100</b>

### Issued, Subscribed and Paid-Up Capital

92,52,18,000 equity shares of Rs.5/- each	Rs. 462,60,90,000/-
---	---------------------

**Table 10.9**  
Present capacities of HCL's Mines and Smelters

### Mines

S.No	Location of Mines	Ore Capacity (Lakh tonnes per annum)
1	Khetri Copper Complex, Rajasthan	12.00
2.	Malanjkhand Copper Project, Madhya pradesh	20.00
3.	Indian Copper Complex, Jharkhand	4.00
	<b>Total</b>	<b>36.00</b>

### Smelters

S.No	Location of Smelters	Metal Capacity (tonnes per annum)
1	Khetri Copper Complex, Rajasthan	31,000
2.	Indian Copper Complex, Jharkhand	20,500
	<b>Total</b>	<b>51,500</b>

### CC Rod Plant

S.No	Location of Plant	Capacity (tonnes per annum)
1	Taloja Copper Project, Maharastra	60,000

**Table 10.10**  
**Physical Performance of HCL**  
**Production of ore, metal in concentrates, refined copper (cathode) and wire rod**

Product	Unit	2007-08	2008-09	Target for 2009-10	2009-10 (upto Dec.,2009)	2009-10 (Anticipated)
Ore Production	('000MT)	3245	2983	3600	2279	3150
Metal in Concentrate	(MT)	31378	27589	35000	19570	28300
Refined Copper(Cathode)	(MT)	44734	30036	18500	12260	17300
Wire rod	(MT)	58223	51777	57000	34744	42700

**Table 10.11**  
**Financial Performance of HCL**

(Rs.in crore)

Sl No	Details	2007-08	2008-09	Target for 2009-10	2009-10 (upto Dec.2009)	2009-10 (Anticipated)
1.	Income	1993.48	1344.27	1284.48	1099.77	1414.75
2.	Operating Cost	1581.08	1258.25	1173.80	945.08	1160.83
3.	Interest and Transaction cost	28.01	6.82	5.30	1.34	2.00
4.	Depreciation and Amortization	81.89	73.72	93.72	51.96	77.03
5.	Net Profit/(Loss) before Income Tax	302.50	5.48	11.66	101.39	174.89
6.	Net Profit/(Loss) after income tax & dividend	246.46	(10.31)	7.70	65.91	124.63

### Sales Performance of HCL

10.46 The Company has achieved total sales of 25,214 MT of copper upto December, 2009. The anticipated sales during 2009-10 would be around 30,000 MT without procurement of copper cathode from outside. If copper cathode is procured from outside (which depends on economics), production of CC Rod and consequent sale would increase accordingly.

**Table 10.12**  
**Restructuring Proposal of HCL**

Item	Status
Financial Proposals	Implemented
Enhancement of superannuation age to 60 years	Implemented
Filling up of post of Director (Mining)	Implemented

### Energy Conservation

10.47 HCL continues to give priority for energy conservation measures at various stages of process from mining of ore to extraction of copper metal and other by-products. Recommendations arising out of energy audits done by the consultant (PCRA) appointed earlier have largely been implemented. Energy audit cells that were set up at each of the units are constantly monitoring energy consumption at the mines, plants and townships to achieve overall reduction. Suitable measures are also being initiated to improve power factor further. Installation of high-tech Central Jet Distribution (CJD) burner at ICC Smelter has significantly reduced energy consumption.

**Table 10.13**  
**Overall consumption of Power and Fuel during 2009-10 (upto December,2009)**  
**and previous three years.**

Physical consumption	2009-10 (upto Dec.,2009)	2008-09	2007-08	2006-07
Power(Lakh KWH)	1445	2135	2405	2316
Fuel(Kilo liters)	*6331	20722	26413	25311
Natural Gas('000 NM <sup>3</sup> )	1912	2507	2657	2341

\* KCC Smelter not in operation since December, 2008.

### Science & Technology/R&D Activities

10.48 Company has collaborated with the Institute of Minerals & Materials Technology (IMMT), Bhubaneswar to develop bio-heap leaching technique at MCP. The project has been approved by the department of Science & Technology (S&T) Govt. of India. Upon successful completion of experimental trials, the technique can be commercialized to recover copper from low grade sulphur- bearing ore. The project is progressing as per schedule.

- To improve the concentrate grade and recovery at KCC, where the ore has inherent adverse characteristics and mineralogy, bigger capacity floatation cells of 300 cft have been installed in the scavenger and cleaner sections of the concentrator plant with encouraging results.
- An agreement has been signed with M/s. Nuclear Industry Yantai Tongxing Industrial Co. Ltd. China for design, supply, erection and commissioning of 2. Ceramic Vacuum Filters, one each at MCP and KCC for reducing moisture percentage in copper concentrate (11% to 8%) in ore beneficiation plants of MCP and KCC.
- During major shutdown, de-bottlenecking jobs were also taken up at ICC Smelter in 2008-09. New CJD Burner, modified cooling elements and Oxygen enrichment system have been installed which has improved ICC Smelter plant operation as well as Smelter capacity has been enhanced to 20,500 MT per annum.

- Accreditation for ICC's R&D laboratory has been obtained from National Accreditation Board for Testing and Calibration of Laboratories (NABL) for analysis of impurities in copper cathode by optical emission spectrometer.

### Computerisation

10.49 Besides regular operations of all on-going applications at Head office, Units and Sales offices of the Company, following specific activities were taken up with reference to IT related Jobs during the period under review:

- Company has implemented Enterprise Resource Planning (ERP), Oracle 12i ERP solution integrating all functional areas for faster information flow and efficient decision making and gone live on 1<sup>st</sup> Oct,2008.
- Centralised data centre has been set up at Head office by installing high-end servers, Data storage area and Wide area communication equipments with high security features by installing Firewall and routers. The operations are smooth and working fine.
- Data Communication Links with units & sales offices has been commissioned for ERP, Mailing and Internet solutions with Multi-protocol Label Switching Virtual Private Networks (MPLS VPN) circuits linking Head Office and other offices to establish reliable and consistent communication links for smooth flow of data within the organization.

- d) Company website (both in English & Hindi version) is re-designed for better content and look.
- e) Property return has been computerized through ERP and implemented for Executives.

### Pollution Control and Environment Management Efforts

#### 10.50 Air Pollution Control Measures

The ambient air quality is regularly monitored at mines, process plants and residential areas at all units as per pollution control board guidelines/standards. Environmental audits have also been carried out at all plants through an independent outside agency. The agency has given recommendations that would assist the Company to further improve the existing environmental management plans. The environment cell of the Company is in the process of implementing these recommendations in phases taking into account the availability of the funds.

10.51 The range of air quality around the various mines of the Company is well within the standards and limits as prescribed by the pollution control board.

#### Water Pollution Control Measures

10.52 Effluent treatment facilities installed at the units of the Company have been working satisfactorily during the year and meeting regulatory norms as prescribed by the Pollution Control Boards. Discharged process water is being recycled after treatment thus conserving the water. As water availability is scarce at KCC and operation of the plant is affected due to inadequate availability of water, total recycling of water is practiced.

10.53 For further improvement in water availability and conservation of water resources, consultants were engaged for detailed study at KCC and MCP for suggesting ways and means for increased availability of water from existing resources and identifying new resources. The final reports have been obtained for

KCC and MCP and recommendations are under implementation phase wise. A High Rate Tailing Thickener (HRT) has also been installed and commissioned at KCC Concentrator plant for disposal of thickened slurry and also to have better recovery of water from the tailings.

10.54 Solid waste from plants and hospitals are also safely disposed off or stored as per the guidelines prescribed by the pollution control boards.

### Afforestation

10.55 Company promotes several environment friendly activities by planting trees, improving housekeeping, cleanliness, hygiene and safety through several programmes round the year. The Company has planted about 657 acres of land with different types of flora around the mining areas at different units thus maintaining the green environment. Various species are: Acacia nilotica (Babul), Dabergia Sissoo (Shisham), Amaltas, Pipal and Bargad.

**Table 10.14**  
**MoU Ratings Achieved By HCL**

Year	Grade
2003-2004	Very Good
2004-2005	Very Good
2005-2006	Very Good
2006-2007	Very Good
2007-2008	Very Good
2008-2009	Fair (Provisional )

### MoU performance analysis for the year 2008-09

Achievement of financial parameters during 2008-09 was lower than MoU targets. Financial performance was affected due to lower LME average in 2008-09 (US\$ 5864) compared to the targeted MoU average LME price (US\$ 6250) and lower than targeted Mine production. As LME copper price determines price

realization for HCL, all financial parameters were adversely affected.

Excavation work at Malanjkhand Copper Project (MCP) was 103% of target. Ore and Metal-in-Concentrate (MIC) production during 2008-09 were 86% and 80% of the target respectively. Non-availability of ore at MCP, both in tonnage and grade, resulted into lower ore production & low ore availability reduced MIC production.

Net revert generation at KCC Smelter, acceptance percentage of CC Rod at Taloja Copper Project (TCP), customer satisfaction to achieve complaint free quality standards, Employee Training and motivation-achievements in all these parameters were higher than target and were under 'Excellent' Category.

#### Mineral Exploration Corporation Limited

10.56 The Mineral Exploration Corporation Limited (MECL) since its inception in the year 1972 is carrying out mineral exploration activities. MECL is the premier exploration agency in the country and carries out its exploration activities under Promotional programme funded by Government of India and contractual programme on behalf of other agencies including Public & Private Sector and State Governments on agreed terms and conditions. So far, it has added 137443 million tonnes of mineral reserves to National Mineral Inventory (upto 31-12-2009), out of which, Coal accounts for 91659 million tonnes.

10.57 Work on behalf of Ministry of Mines – MECL is continuing its detailed exploration programme of various minerals as per national priorities identified in the Five – Year Plan and potentiality of the prospect. Accordingly, detailed exploration schemes are formulated and after due approval of Standing Committee on Promotional Projects (SCPP) and Ministry of Mines, projects are executed. Since its inception, MECL has carried out detailed exploration for ferrous, non ferrous, precious, industrial and other minerals on behalf of Ministry of Mines and a total of 3787 million tonnes of reserves has been established.

10.58 Work on behalf of Ministry of Coal – MECL is also engaged for regional exploration of coal & lignite on behalf of Ministry of Coal. Schemes of exploration are being finalized by the Core Group of Committee on Energy Minerals and Resources, Group-V of Central Geological Programming Board (CGPB). So far, a total of 40885 million tonnes of Coal and 27275 million tonnes of lignite reserves have been established by MECL on behalf of Ministry of Coal.

10.59 The authorised share capital and paid up equity of the company are Rs. 125.00 crores and Rs. 119.55 crores, respectively. The equity is fully held by Government of India.

10.60 The Company's registered office is at Nagpur in Maharashtra. To facilitate the prompt maintenance of plants and machineries deployed at various projects, three Regional Maintenance Centres at Ranchi, Nagpur and Hyderabad are being operated. Technical guidance to the projects, finalisation of geological reports, close liaisoning with the clients and looking for new business opportunities are being carried out through the Zonal Offices located at Ranchi, Nagpur, Hyderabad and Margherita (Assam). The commercial activities of the Company are being looked after by Business Development and Planning Division. In addition, two Business Development Centers are in operation at New Delhi and Kolkata.

10.61 In addition to mineral exploration activities, MECL has taken up diversification programme(s) in the field of slim hole drilling for CBM, coal sampling and analysis as a referral agency and supply of ballast stone to Railways.

#### Physico - Financial Performance 2009-10

10.62 The physical performance in drilling, developmental mining and geological reports for 2007-08, 2008-09, 2009-10 (upto December, 09) is given in **Table 10.16** and the financial performance is given in **Table 10.17**.

**Table 10.15**  
**Physical Performance of MECL**

Details	2007-08 Actuals	2008-09 Actuals	2009-10 MoU Target	2008-09 Upto Dec.'08 Achmt.	2009-10 Upto Dec. '09 Achmt.	2009-10 Anticipated upto 31.03.10
Drilling (Mtrs)	2,05,860	2,21,847	2,40,000	1,53,110	1,83,099	2,40,000
Mining (Mtrs)	6,640	5,900	8,200	4,394	4,493	8,200
Final Geological Reports (Nos.)	34	32	30	22	24	30

**Table -10.16**  
**Financial Performance of MECL**

(Rs. in crores)

Details	2007-08 Actuals	2008-09 Actuals	2009-10 MoU Target	2008-09 Upto Dec.'08 Achmt.	2009-10 Upto Dec. '09 Achmt.	2009-10 Anticipated upto 31.03.10
Gross Revenue	94.46	105.90	128.00	70.59	89.86	128
Operating Cost	81.62	99.54	103.00	61.86	74.09	103
Interest	–	–	–	–	–	–
Depreciation and amortisation	3.28	2.93	5.02	2.70	2.45	5.02
Net profit After Taxes	6.11	1.24*	13.08	3.87	8.79	13.08

\* After making provision of Rs. 15.30 crores towards wage revision for executives w.e.f 1-1-2007 and non-executives w.e.f. 1-4-2007.

### Monitoring System

10.63 For effective monitoring of the projects, management level meetings are being taken regularly to review the performance of projects and actions are initiated for implementation of remedial measures at projects. Each project is being closely monitored on day-to-day basis and corrective measures are taken to achieve the set monthly targets. Further, all the units of MECL have been well connected through effective communication system.

### MoU Performance

10.64 MoU score-Excellent Category: The MoU composite performance for the year 2007-08 was rated under the "Excellent" category by the Ministry of Heavy Industries & Public Enterprises.

### Energy Conservation

10.65 The core activities of Mineral Exploration

Corporation Limited comprise exploratory drilling, exploratory and developmental mining and associated geological and laboratory studies. These works are carried out through temporary industrial establishments located in various parts of the country.

### Promotional work on Non-ferrous Minerals

10.66 During the year 2009-10 upto December,2009, MECL has carried out exploration in Parasi Ph-II (Gold) in Jharkhand, Rewara (Base - metal), Ganeshpura (Lead-Zinc), Bajta North (Copper), Wari block (Copper), Dhol-ki-Patti (Phosphorite) in the state of Rajasthan and Jiajuri friable quartzite (silica sand) in the state of Assam. The brief account of exploration by MECL is as under :

#### ❑ Rewara Base Metal Block, District Chittorgarh, Rajasthan

MECL commenced the physical work in September,

2008 and completed in March, 2009. A total of 2300 m of drilling was carried out in 8 number of boreholes along with associated geological and laboratory work. MECL submitted the detailed geological report in August, 2009 wherein a total of 2.65 million tonnes of resources with 4.46% TMC were estimated over 900 m strike length and 250 m depth. The resource has been placed under 332 of UNFC.

□ **Ganeshpura Lead-Zinc Block , District Ajmer, Rajasthan**

Exploration proposal in Ganeshpura block was approved in 19<sup>th</sup> SCPP held on 10-9-08 with 1040 m of drilling in 5 number of boreholes with associated geological & laboratory work.

MECL commenced physical work in December, 2008 and completed in March, 2009. During the period, 1067 m of drilling in 5 no. of boreholes with matching geological and laboratory work was completed. Detailed geological report of the block was submitted in October, 2009.

MECL has estimated a total of 0.973 million tonnes of ore resources with 1.33% Pb and 1.44% Zn over 300 m strike length upto 200 m depth. The resource has been placed under 333 of UNFC.

□ **Bajta (North) Copper Block, District Ajmer, Rajasthan**

Exploration proposal in Bajta (North) block was approved in 19<sup>th</sup> SCPP held on 10-9-08 with 600 m of drilling in 3 nos. of boreholes with matching geological & laboratory work.

MECL commenced physical work in March, 2009 and completed in June, 2009. During the year 2009-10 (upto December, 09) 608 m of drilling was carried out. Since inception a total of 859 m of drilling with associated geological and laboratory work was completed in the block.

Detailed geological report of the block was submitted in December, 2009. MECL has estimated a total of 1.24 million tonnes of copper ore reserves with 0.70%

Cu, 0.35% Pb and 0.56% Zn at 0.50% Cu cut off. The resource has been placed under 333 of UNFC.

□ **Wari Copper Block, District Chittorgarh, Rajasthan**

Detailed exploration proposal was approved in 20<sup>th</sup> SCPP held on 18-2-2009. The work involves 4020 m of drilling in 23 number of boreholes with matching geological and laboratory work.

MECL commenced physical work in July, 2009. A total of 2123 m of drilling has been done upto December, 2009. Thickness of mineralised zone as intersected in boreholes vary from 2 – 4 m with +1% Cu based on visual estimates. The work is under progress.

□ **Dhol-ki-Patti Rock Phosphate Block , District Udaipur, Rajasthan**

Detailed exploration proposal of the block was approved in 20<sup>th</sup> SCPP held on 18-2-2009, involving 2155 m of drilling in 24 number of boreholes along with matching geological and laboratory work. Field work was commenced in June, 2009, and upto December, 2009, 841 m of drilling has been carried out in 8 number of boreholes. Significant phosphorite zone has been intersected in boreholes based on visual estimates. The work is under progress.

□ **Parasi Central Gold Block Phase-II, District Ranchi, Jharkhand**

Exploration proposal in Parasi Central block for gold, Phase-II was approved in 19<sup>th</sup> SCPP held on 10-9-2008 involving 1500 m of drilling in 6 number of boreholes with matching geological and laboratory work.

MECL has completed Phase-I work in the block. A total of 2806 m of drilling with matching geological and laboratory work was completed. Detailed geological report of the block was submitted in November, 2009. MECL has estimated 3.486 million tonnes of gold ore reserves with 1.05 g/t of Au at 0.50 g/t cut off over a 700 m of strike length. The resource has been placed under 331 of UNFC.

The physical work of Phase-II was commenced in September, 2008 and completed in June, 2009. During the year 2009-10 (upto December, 2009) 429 m of drilling was carried out. Since inception a total of 1963 m of drilling in 8 number of boreholes with matching geological and laboratory work was completed, second phase work has proved the depth continuity of mineralised zone with good thickness (3 – 5 m with 2 -3 g/t of Au) in boreholes. Detailed geological report is under progress.

#### ❑ **Jiajuri Friable Quartzite (Glass Sand) Block Ph-II, District Nagaon, Assam**

Detailed exploration proposal was approved in 19<sup>th</sup> SCPP held on 10-9-2008 involving 600 m of drilling in 10 boreholes.

MECL commenced field work in March, 2009, after getting forest entry permission and completed the same in June, 2009. During the year 2009-10 (upto December,2009), 529 m of drilling was carried out. Since inception a total of 655 m of drilling in 9 number of boreholes was carried out. The sampling and analysis work is under progress. Good quality of quartzite has been intersected in boreholes. Thickness of silica sand vary from 40 – 60 m with 85 – 90% SiO<sub>2</sub>. The detailed geological report is under progress.

#### **Sale of Reports**

10.67 MECL conducts promotional exploration for metallic minerals using promotional grants made available by Ministry of Mines. The prospecting reports are available for sale to intending entrepreneurs. MECL is making all possible efforts for sale of reports of promotional projects completed on behalf of Ministry of Mines. MECL participated in an exhibition during the meeting of Central Geological Programming Board (CGPB), held on 11<sup>th</sup> & 12<sup>th</sup> September, 2009 at Vigyan Bhawan, New Delhi and in Metex India 2009, Mining-Exploration Convention and Trade show from 16<sup>th</sup> to 18<sup>th</sup> September,2009 at Bangalore. MECL also participated in the exhibitions organised at “Investors meet and conference of development of mineral resources and mineral bound industry in North Eastern

Region” held on 6<sup>th</sup> – 7<sup>th</sup> November, 2009 at Guwahati. In all the exhibitions, soft copies and hard copies of executive summaries of exploration reports for sale were displayed. Some companies have shown interest and picked up the executive summaries of the reports and enquired about the same. So far, 10 geological reports have been sold.

10.68 In order to attract investors for purchasing of MECL reports, the pricing policy of sale of MECL report has been revised w.e.f. 8.12.2009, according to which initial charges of MECL reports are only 5% of total exploration cost ( TEC) for category ‘A’ prospects (UNFC 221 & 331), 3% of TEC for category ‘B’ prospects ( UNFC 332 ) & 2% of TEC for category ‘C’ prospects ( UNFC 332). The balance cost is recovered in two stages, i.e at the time of approval of mining plan and at the time of approval of mining scheme through the Indian Bureau of Mines. Category ‘D’ prospects will be given free of cost. Details of category ‘A’ and ‘B’ reports available with MECL are given in **Annexure 10.1** along with cost of report. With this revised policy, investors may purchase reports of promising prospects for investment decision. MECL has approached most of the mineral rich states for their help to find out investors from the respective states for purchase of MECL reports.

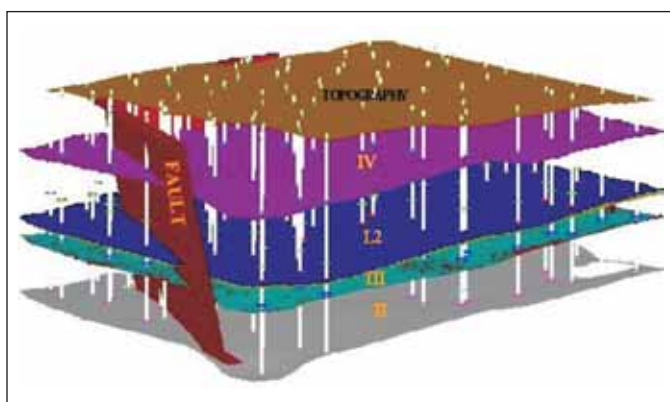
#### **Action taken on abatement of pollution and environment**

10.69 The exploration activities of MECL do not cause any significant pollution. However, as a part of exploration work , MECL is carrying out environmental studies to generate baseline environmental data such as : geology & geomorphology, meteorology, air quality, noise monitoring, land use / land cover studies, soil quality, biota, water regime & socio-economic studies.

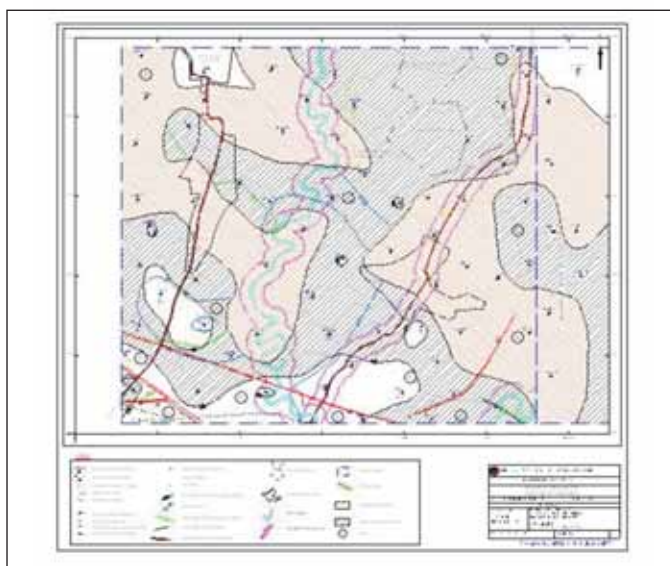
10.70 For helping the exploration agencies to plan measures for abating possible pollution and Environmental Impact Assessment (EIA) in various exploration projects, a report on the same is included as a part of geological report of various exploration projects.

## Information Technology (IT)

10.71 Geological data processing of 20 exploration blocks explored by MECL, were carried out. This includes 6 nos. of coal, 4 nos. of lignite, 3 nos. of base metal, 2 nos. of iron, 2 nos. of CBM exploration and 1 no. each of manganese ore, limestone and gold exploration. The work includes computerised database creation – both numerical and map database (map database was created using scanning & digitising surface features, contours, geological features & litho-contacts, administrative boundary, mine workings, section line etc. from geological and topographical plans), generation of graphical & numerical outputs etc.



3-D view of Coal System



Seam folio Plan of Coalseam model

10.72 Digital conversion of analog geophysical logs of 96 boreholes pertaining to lignite blocks and 43 boreholes pertaining to coal block have been done. This converted data and the digital data generated directly from geophysical logging units are brought into uniform format by using in-house developed utility interface. These geophysical logs are then plotted along with exploratory boreholes using indigenously developed software.

Exploration data processing for 2 reports of CBM blocks (North Karanpura & Bokaro on behalf of ONGC) were completed.

Exploration data processing for 1 report of Nandini limestone deposit on behalf of SAIL was completed.

Geological modelling for Shahpur east & Shahpur west blocks, for M/s NMDC was completed. This includes Modeling of coal seams intersected in the boreholes. The 2D plans viz-floor contours, seamfolios, isopachytes of overburden and over & inburden geological cross sections etc. were generated from the model.

Maintenance and updation of MECL website were carried out. The following work was done during the period:

- Assisting in uploading of tenders, "Suppliers Bills Status", "Career", "Vigilance", "Reports for Sale", RTI, Annual Reports, whenever required.
- Quarterly updating of information of physical performance since inception.
- Designing and uploading of latest executive summaries in "Reports for Sale" as desired by Ministry of Mines.

10.73 New IBM Blade Server, LAN, IBM External Storage, Firewall were installed in MECL, CHQ Building. Satisfactory commissioning of these equipments by the party was monitored and technically evaluated by I.T. Centre. The software like SURPAC, GEMCOM, MINEX, GDM etc were upgraded during the year and use of these upgraded version of software in preparation of geological report

has resulted in using recent technology particularly in fault modelling.

### Business Development Activity

10.74 Through business development group, vigorous efforts are being made to obtain work from both private and public sectors through competitive bidding and a series of technical discussions. As a result during 2009-10 upto December, 2009, a total of 26 number of work orders were received valued at Rs. 13.73 crores.

### Diversification Activity

10.75 MECL diversified its activities in the following fields.

- i. Deep slim hole drilling for Coal Bed Methane (CBM) studies on behalf of ONGC and other organisations.
- ii. Remote sensing and environmental studies.
- iii. Coal sampling and analysis.
- iv. Supply of ballast stone to SE Railway.
- v. Deep drilling for hydrological investigation / evaporites.

Further, MECL plans to enter in the following new areas for its growth & business development :

- Drilling for geo-thermal energy & geo-technical studies.
- Production support drilling for mine services.
- Production well drilling for CBM assessment.
- Drilling for underground coal gasification.
- Lumpsum turnkey project implementation.
- Production mining of minerals and their marketing.
- Services of work over rig.

### Manufacturing Unit

10.76 MECL has a well equipped central workshop and manufacturing unit at Nagpur to cater to the needs

of drilling and developmental mining projects and to provide engineering support to field operations. It carries out repairing/ overhauling of drilling and mining equipments and light/heavy vehicles. It manufactures TC bits and spares & accessories for coring and non-coring drill machines. Also, it has sophisticated CNC lathe machine for the manufacturing of drill tubulars. During 2009-10, upto December, 2009, a total of 9612 items were manufactured, which include 2672 Nos. of TC bits and 1797 Nos. of other drill accessories and 5143 Nos. threading / re-threading of drill rods & casings.

### Coal sampling and analysis

10.77 As a third party agency, MECL continued coal sampling and analysis work on behalf of various coal companies, steel plants, thermal power plants and electricity board. In all, three projects are in operation at different coalfields and a total value of work carried out during the year upto December, 2009 amounting to Rs. 21.16 lakhs.

### Bharat Gold Mines Limited (BGML)

10.78 The Bharat Gold Mines Limited (BGML) having registered office at Kolar Gold Fields was incorporated as a public sector company under the Ministry of Mines on 1st April, 1972. It was engaged in mining and production of gold from its captive mines. The company was referred to the Board for Industrial and Financial Reconstruction (BIFR) who gave its verdict in June, 2000 to wind up BGML in public interest. The verdict of BIFR was upheld by Appellate Authority for Industrial and Financial Reconstruction (AAIFR). The company was closed after the Ministry of Labour, accorded permission for closure of BGML w.e.f. 1st March, 2001. After prolonged litigation, the Division Bench of High Court of Karnataka in its order dated 26<sup>th</sup> September, 2003 has also upheld the winding up/closure orders passed by BIFR/AAIFR and Ministry of Labour. The High Court had made certain recommendations which were considered by the Government.

10.79 The Government, on 27.7.2006, had approved a proposal regarding Special Terminal Benefit Package

(STBP) for BGML ex-employees, sale of houses to the ex-employees of BGML at nominal rates, calling of global tender for sale of assets and giving purchase preference to the Employees' Co-operative Society/ Society's Company subject to the approval of the High Court of Karnataka (Company Court) and viability of the project. Company Application has been filed in the Hon'ble High Court of Karnataka (Company Court) which is being pursued.

10.80 As per the Government decision, STBP amount had been distributed to the ex-employees of BGML and allotment of the houses at the rates suggested by the High Court of Karnataka(Company Court) are under process. An Inter-Ministerial Group(IMG) was also constituted to oversee the tendering process of BGML. A consultant was appointed for assets valuation of the company, preparation of global tender documents and assisting in global tendering process

etc. The Consultant had submitted draft global Tendering documents which were placed by BGML before the Hon'ble High Court of Karnataka (Company Court) for approval.

10.81 The tender documents have been approved by the Company Court on 3.7.2009 with directions to make some amendments. The matter was placed before the IMG whether to amend the tender documents or to file appeal/review. As per the decision taken in the Inter-Ministerial Group (IMG) and advice of the Deptt. Legal Affairs (DLA), review petition was filed by BGML on 20.8.2009 in the Hon'ble Court for consideration of certain amendments to bid documents. The review petition came up for hearing on 11.9.2009. Hon'ble judge refused to re-consider the orders passed by her. As the revision petition has been turned down, BGML, has filed appeal before the Double Bench of the High Court on 20.10.2009.



Environment friendly Captive Power Plant of NALCO