

Productivity of Bharat Coking Coal Limited: An Economic Analysis

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ABSTRACT In 1972 the coking coal industry in Indian economy was nationalized which ultimately formed Bharat Coking Coal Limited at Dhanbad. For the first time, a concentrated effort was put in the Industry for an integrated development of the mines and the worker's welfare was taken up after the formation of Bharat Coking Coal Limited. This study is highly essential because it is an "Economic Analysis" highlighting the performance of Bharat Coking Coal Limited since its inception. This research study is an attempt to high light the behaviour of the Economic parameters of Bharat Coking Coal Limited, through which a clear picture can be achieved about the nature of performance of this public sector since its inception. Therefore, the fundamental objective of the study is to analyse the nature of the performance of different economic parameters analysis can be highlighted and future policies of the management can be formulated relating to Bharat Coking Coal Limited. In this study, time series data will be collected from 1975 to 1998. The data will be collected relating to production, productivity, employment, wage price, welfare measures and profit/loss of Bharat Coking Coal Limited. The trend will be fitted with the help of the equation. Annual rate of change (%) =
$$\frac{(Y_t - 1) - (Y_t) * 100}{Y_t}$$

Where,

Y_{t-1} = Variable of Base Year
 Y_t = Variable of Current Year

After studying the trend of growth of each economic parameter, attempt will be made to study the nature of there relationship among these economic parameters. While studying the nature of Inter-dependence among the economic parameter, the *Econometric Model* will be fitted with the help of *Co-relation, Analysis and Regression Analysis*. Thus, with the help of econometric modeling, a complete economic analysis relating to the performance of Bharat Coking Coal Limited will be prepared through this research study.

INTRODUCTION

The Public sector company, Bharat Coking Coal Limited, a subsidiary of Coal India Limited, came into being with nationalization of 214 number of coking coal mines and 182 Non-Coking Coal Mines in 1972 and 1973 respectively

which have now been reorganized into viable 94 units in Jharia Coalfield, 8 units in Raniganj Coalfield, as a measure to integrate the entire coalfield for Scientific and rational exploitation of precious Coking Coal property. These are at present controlled through 13 number of administrative areas headed by Chief General Manager/General Manager as follow :

1. Barora area, 2. Govindpur area, 3. Katras area, 4. Sijua area, 5. Kusunda area, 6. Kustore area, 7. Bastacola area, 8. Lodna area, 9. Chanch – Victoria area, 10. Pootkee – Balihari area, 11. Block – II area, 12. Eastern Jharia area, 13. Western Jharia area

At the corporate level, these mines and areas are monitored and administered by two Director i.e. Director (Technical) operation where as Director (Technical) Project and Planning is the Director-in-charge of all the Projects and Mines which would ultimately be devoted into projects as per reconstruction plan of Jharia Coalfield, the basic concept determining the future of this Coalfield, mining area. The Jharia Coalfield, the only, prime store house of coking coal property in India, is situated in the District of Dhanbad (Jharkhand) and is a part of famous Chotanagpur Plateau. The demarcation of boundary of Jharia Coalfield is slated by the beautiful rivers and mountains having religious and geological importance. The entire north is decided by Parasnath hill, having the historical Parasnath temple at its top. Damodar, one of the holy river referred in Vedas for the finy character is situated at the southern side of the coalfield. The Eastern side is determined by the river Barakar, which also separates the landed property between the stated Jharkhand and West Bengal.

The River Jamunia is more or less the western boundary line of Jharia Coalfield as well as the District of Dhanbad and Bokaro. The other main operative areas of BCCL called Chanch Victoria starts from eastern side of the river Barakar, on area of Raniganj Coalfields in the District of Burdwan and is spread over about 32 sq.km.

The Bhojudih washery is situated in Purulia district (West Bengal) at the South Bank of River Damodar.

The Dugdha Washeries (Coking Coal and Non-Coking Coal) Damodar mines are situated Riven Jamunia, with in the District of Bakaro in Jharkhand.

PRODUCTION AND PRODUCTIVITY

Production of Coal: Coal produced from opencast or underground may be coking and non-coking depending upon its property. We describe here the nature of trend of production of all type of coal produced by BCCL.

Production of Coal from Opencast Mines: Total production of coal from opencast mines from the year 1974-75 to 1997-98 is shown in table 1.

From table 1, it is clear that production in opencast mines had always an increasing trend except year 1976-77, 1983-84, 1985-86 and 1996-97. In 1997-98, the production in opencast is almost 9.74 times that 1974-75. Opencast mining

Table 1: Total production of coal from open cast mines

Year	Opencast production (Million Ton)	Index Number (1974-75 = 100)	% of Total Produc-tion by Open-cast Mines
1974-75	2.13	100.00	12.01
1975-76	3.21	150.70	15.98
1976-77	2.54	119.25	12.28
1977-78	2.73	128.17	13.51
1978-79	3.63	170.42	18.41
1979-80	4.82	226.29	24.01
1980-81	6.26	293.89	29.23
1981-82	7.30	342.72	31.71
1982-83	8.99	422.07	37.46
1983-84	7.58	355.87	35.04
1984-85	8.50	399.06	38.92
1985-86	8.16	383.10	38.71
1986-87	10.25	481.22	42.69
1987-88	11.30	530.52	45.01
1988-89	11.95	561.03	45.44
1989-90	13.32	625.35	50.04
1990-91	14.41	676.53	54.34
1991-92	14.93	700.93	55.27
1992-93	16.51	775.11	58.86
1993-94	17.31	812.68	59.61
1994-95	17.21	807.98	59.88
1995-96	17.69	830.52	63.61
1996-97	17.10	802.82	63.01
1997-98	20.74	973.71	67.08

dominates the coal production due to a number of favourable factors like economic viability, better safety, higher conservation of coal, ease in mass production, higher productivity, low gestation period etc. In view of above favourable factors, modern trend of management is to increase production from opencast projects.

The reasons for downward trend of production in sub period 1982-83 to 1985-86 are given below:

- (1) Many projects were held up at ministerial level due to environmental clearance.
- (2) Depth of mines were increased. That's why more overburden have to removed.
- (3) Many HEMM had taken long lead time for supply.
- (4) Due to delay insaction of the projects (includes all patch OCP's), financial support could not given.
- (5) Due to wrong selection of HEMM, equipment were depreciated much before their matured life.

During subperiod 1985-86 to 1997-98 performance of open cast mines improved significantly (Table 2). This is due to the fact that a large number of HEMM are diesel operated and the impact of power failure in the opencast was, therefore, less pronounced.

Table 2: The average annual rate of change (%) for opencast production of BCCL

Sub-Period	Average annual rate of change for production (%)
1974-75 to 1982-83	21.61
1982-83 to 1985-86	- 2.51
1985-86 to 1997-98	8.37

Production of Coal from Underground Mines

Total production of coal from underground mines from 1974-75 to 1997-98 of BCCL is given in Table 3.

It is clear from the table 3 that the trend of production of underground mines is going down. The valid reason for the poor show of underground mines may as follows:

1. BCCL is still carrying the burdens inherited from the pre-nationalised indiscriminate mining.
2. There has been restrictions on account of possible subsidence effects and shortage of stowing materials forcing to develop more than depillar.

Table 3: Total production of coal from under ground mines from 1974-75 to 1997-98 of BCCL

Year	Opencast production (Million Ton)	Index Number (1974-75 = 100)	% of Total Production by Opencast Mines
1974-75	15.61	100.00	87.99
1975-76	16.88	108.14	84.02
1976-77	18.14	116.21	87.72
1977-78	17.48	111.98	86.49
1978-79	16.09	103.07	81.59
1979-80	15.26	97.76	75.99
1980-81	15.16	97.76	70.77
1981-82	15.72	100.70	68.29
1982-83	15.01	96.16	62.54
1983-84	14.05	90.01	64.96
1984-85	13.34	85.46	61.08
1985-86	12.92	82.77	61.29
1986-87	13.76	88.15	57.31
1987-88	13.81	88.47	54.99
1988-89	14.35	91.93	44.56
1989-90	13.30	85.91	49.96
1990-91	12.29	78.73	45.66
1991-92	12.08	77.38	44.73
1992-93	11.54	73.92	41.14
1993-94	11.73	75.14	40.39
1994-95	11.53	73.86	40.12
1995-96	10.12	64.83	36.39
1996-97	10.04	64.32	36.99
1997-98	10.18	65.21	32.92

3. The average depth of working has increased and so has the complexity from continuous, multiple thick seams.
4. Many of the mines in Jharia and Rani-ganj fields are now forced to work small distance patches with extensive old working around.

Table 4: The average annual rate of change (%) for production of underground mines of BCCL

Sub-Period	Average annual rate of change for production (%)
1974-75 to 1976-77	7.80
1976-77 to 1985-86	-3.65
1985-86 to 1988-89	3.59
1988-89 to 1997-98	-3.64

During sub-period 1974-75 to 1976-77, the annual rate of change of production has an increasing trend. The reasons were:

- (1) Mobilisation of resources in the new projects.
- (2) New projects were formulated and implemented.

- (3) More area/production faces are developed/opened
- (4) Overhead expenses of the entire industry were less.
- (5) Wages and salaries were comparatively much less.
- (6) Coal price was comparative higher (on % basis) that the inputs required to achieve the production.
- (7) Production was made available at nearer faces.

During sub-period 1976-77 to 1985-86, the annual rate of change of production had a decreasing trend (Table 4). The reasons were:

- (1) Reorganisation in the corporate level e.g. Change in management style.
- (2) Production used to achieve from higher depth as well as from long distance faces.
- (3) Development of the faces of coal were not available.
- (4) Investment for production were comparatively less in comparison with previous year.
- (5) Changes in mining practice (method of mining)
- (6) Encouraging various types of mining methods.
- (7) Tendency for having more overburden on the industry.

During sub period 1985-86 to 1988-89, the annual rate of change of production had an increasing trend. The reasons were :

- (1) As the production from underground mines were going down, BCCL implemented wage incentive scheme. This cause rise in production.
- (2) Stoppage of further investment on loosing mines.
- (3) Better style of management.
- (4) Responsibilities were disintegrated.
- (5) More number of areas were formed.
- (6) Less number of mines under the control of an area.

During sub period 1988-89 to 1997-98, the annual rate of change of production had a decreasing trend. The reasons were :

- (1) Power failure
- (2) Severe financial crunch
- (3) Investment would not made available due to financial stringency at actual production generating locations.
- (4) More burden of overhead.

Total Production of Coal

The total production of coal of BCCL with respect to year is shown in Table 5.

To achieve the target production, BCCL has not only expended the opencast mines, but stress has also given to improve the production from underground mines. For this, intermediate technology like Side Discharge Loaders (SDLs) and Load Haul Dumpers (LHDs) have been introduced in BCCL mines for getting coal depillaring area and development area. The purpose of introducing these machines was to quicken the face operation and also to dispense with human presence at front as the immediate face is more prone to the danger of roof fall accidents.

Table 5: The total production of coal of BCCL with respect to year

<i>Year</i>	<i>Total production (Million Ton)</i>	<i>Index Number (1974-75 = 100)</i>
1974-75	17.74	100.00
1975-76	20.09	113.25
1976-77	20.68	116.57
1977-78	20.21	113.92
1978-79	19.72	111.16
1979-80	20.08	113.19
1980-81	21.42	120.74
1981-82	23.02	129.76
1982-83	24.00	135.29
1983-84	21.63	121.93
1984-85	21.84	121.11
1985-86	21.08	118.83
1986-87	24.01	135.34
1987-88	25.11	141.54
1988-89	26.30	148.25
1989-90	26.62	150.06
1990-91	26.70	150.51
1991-92	27.01	152.25
1992-93	28.05	158.11
1993-94	29.04	163.70
1994-95	28.74	162.00
1995-96	27.81	156.76
1996-97	27.14	152.99
1997-98	30.92	174.29

From the above table, it is clear that from 1974-75 to 1976-77 production of coal had a continuous increasing trend. After that upto 1978-79, production of coal decreased. After 1978-79 production of coal gradually increased upto 1982-83. It is due to the excavation of new open cast mines. But after 1983-84 the production seems to be decreased, it is because of decrease in production by underground mines, so incentive scheme were implemented for underground mines in 1984-85 which

improved production after 1985-86. However, after 1985-86 there was marginal reduction in production of coal in underground mines but significant rise in opencast mines. This has caused increase in total production of raw coal.

By studying the sub period 1974-75 to 1982-83, it was noted that annual growth rate was 3.97% (Table 6). This was due to opening of new opencast mines as well as good production from underground mines etc.

Table 6: The average annual growth rate (%) of total production

<i>Sub-Period</i>	<i>Average annual rate of change for production (%)</i>
1974-75 to 1982-83	3.97
1982-83 to 1985-86	-4.13
1985-86 to 1993-94	4.16
1993-94 to 1996-97	-2.23
1996-97 to 1997-98	13.93

During the sub period 1985-86 production from both opencast as well as underground mines was a decreasing trend which had reduced the growth rate by 4.13%.

During the sub period 1993-94 to 1996-97, the average annual rate of change of production was 2.23% i.e. production from underground as well as Opencast had declined. It happened because of change of government policy and liberlisation and no financial assistance had been given by government to BCCL and pass an instruction regarding managing their own resources. At that time BCCL has also gone under BIFR. But in the year 1997-98, there is a significant growth rate i.e. 13.93% due to various revival steps taken by BCCL management for survival of the company and BCCL ultimately came out from BIFR and is now having a favourable economic performance.

Production of Coking and Non-Coking Coal of BCCL

BCCL is producing coking and non-coking coal from their opencast as well as underground mines.

From the table 7 it is clear that the % production of coking coal decreasing from 1974-75 to 1997-98 except the year 1979-80, 1988-89, 1994-95, 1996-97. At the beginning, the % production of coking coal was 63.19% in 1974-75 which has been reduced to only 28.0% in 1997-98. The decrease in coking coal production

Table 7: The proportion of coking and non-coking coal produced from BCCL mines

<i>Year</i>	<i>Coking coal production (Million Ton)</i>	<i>Non-coking coal production (Million Ton)</i>	<i>Total Production (Million Ton)</i>	<i>% Coking coal production</i>	<i>% Non-coking coal production</i>
1974-75	11.21	6.53	17.74	63.19	36.81
1975-76	12.52	7.57	20.09	62.32	37.68
1976-77	12.72	7.96	20.68	61.51	38.49
1977-78	12.29	7.92	20.21	60.81	39.19
1978-79	11.57	8.15	19.72	58.67	41.33
1979-80	12.36	7.72	20.08	61.55	38.45
1980-81	12.55	8.87	21.42	58.59	41.41
1981-82	10.98	12.04	23.02	47.70	52.30
1982-83	11.07	12.93	24.00	46.13	53.87
1983-84	10.09	11.54	21.63	46.65	53.35
1984-85	10.26	11.58	21.84	46.98	53.02
1985-86	9.82	11.26	21.08	46.58	53.42
1986-87	10.53	13.48	24.01	43.86	56.14
1987-88	10.52	14.59	25.11	41.90	58.10
1988-89	11.19	15.11	26.30	42.55	57.45
1989-90	10.10	16.52	26.62	37.94	62.06
1990-91	9.56	17.14	26.70	35.81	64.19
1991-92	9.62	17.39	27.01	35.62	64.38
1992-93	9.78	18.27	28.05	34.87	65.13
1993-94	10.16	18.28	29.04	34.99	65.01
1994-95	10.36	18.38	28.74	36.05	63.95
1995-96	8.89	18.92	27.81	31.97	68.03
1996-97	8.74	18.40	27.14	32.20	67.80
1997-98	8.71	22.21	30.92	28.17	71.83

happened due to exhaust of good quality of coking coal. More thrust has been given on production of coal from opencast mines which are maximum having non-coking coal or weakly coking coal. The production of underground mines is also costlier. So uneconomical underground mines are being closed. Also due to some adverse mining conditions in underground mines, the production of coking coal has gone down.

Trend of Productivity

We discuss here the trend of productivity of opencast mines, as well as underground mines and overall productivity of BCCL.

Productivity of Opencast Mines

The trend of productivity of opencast mines of BCCL from 1974-75 to 1997-98 has been highlighted in the Table 8.

The productivity e.g. output per man shift was 0.6 ton in 1974-75 which had gone upto 3.16 in 1997-98. The increase in opencast productivity is 5.27 times. This remarkable growth in productivity had been achieved by using Heavy earth moving Machineries like Drag line, Dozer, Grader, Shovel, Drill scrapper etc.

Table 8: The trend of productivity of open cast mines of BCCL from 1974-75 & 1997-98

<i>Year</i>	<i>Average Productivity (OMS)</i>	<i>Index Number (1974-75 = 100)</i>
1974-75	0.60	100.00
1975-76	0.77	128.33
1976-77	0.44	73.33
1977-78	0.49	81.66
1978-79	0.77	128.33
1979-80	1.04	173.33
1980-81	1.14	190.00
1981-82	2.03	338.33
1982-83	2.09	348.33
1983-84	1.52	253.33
1984-85	1.33	221.66
1985-86	1.63	271.66
1986-87	1.59	265.00
1987-88	1.80	300.00
1988-89	1.92	320.00
1989-90	1.86	310.00
1990-91	1.92	320.00
1991-92	2.10	350.00
1992-93	2.16	360.00
1993-94	2.54	423.33
1994-95	2.64	440.00
1995-96	2.63	438.33
1996-97	1.08	180.00
1997-98	3.16	526.66

The trend of growth rate during sub period 1974-75 to 1982-83 and 1984-85 to 1997-98 was positive (Table 9). During the above sub periods, the production from opencast mines had a rising

Table 9: The average annual growth rate (%) of opencast productivity for different sub periods

<i>Sub-Period</i>	<i>Average annual growth rate (%)</i>
1974-75 to 1982-83	22.46
1982-83 to 1984-85	(-) 19.89
1984-85 to 1997-98	15.72

trend except the year 1985-86, 1994-95 and 1996-97. However, the employment in opencast mines was almost constant (during 1974-75 to 1982-83) and even decreasing trend. This had caused significant rise in opencast productivity. The trend of growth during 1982-83 to 1984-85 was negative. The reason was that there was marginal reduction in production from opencast as well as sharp rise in manpower.

Productivity of Underground Mines

The trend of productivity of underground mines of BCCL from 1974-75 to 1997-98 has been highlighted in the Table 10.

Table 10: The trend of productivity of underground mines of BCCL from 1974-75 to 1997-98.

<i>Year</i>	<i>Average Productivity (OMS)</i>	<i>Index (1974-75 = 100)</i>	<i>Number</i>
1974-75	0.44	100.00	
1975-76	0.54	122.73	
1976-77	0.58	131.82	
1977-78	0.57	129.55	
1978-79	0.53	120.45	
1979-80	0.51	115.91	
1980-81	0.49	111.36	
1981-82	0.51	115.91	
1982-83	0.47	106.82	
1983-84	0.45	102.27	
1984-85	0.43	97.73	
1985-86	0.45	102.27	
1986-87	0.48	109.09	
1987-88	0.47	106.82	
1988-89	0.50	113.64	
1989-90	0.48	109.09	
1990-91	0.45	102.27	
1991-92	0.44	100.00	
1992-93	0.45	102.27	
1993-94	0.46	104.55	
1994-95	0.49	111.36	
1995-96	0.44	100.00	
1996-97	0.44	100.00	
1997-98	0.46	104.55	

The output per manshift during the period 1974-75 to 1976-77 was high because there was more production with the same resources.

Table 11: The average annual rate of change (%) for underground mines productivity

<i>Sub-Period</i>	<i>Average annual growth rate (%)</i>
1974-75 to 1976-77	15.07
1976-77 to 1994-85	(-) 3.61
1984-85 to 1988-89	3.65
1988-89 to 1997-98	(-) 0.79

During the sub period 1976-77 to 1984-85 and 1984-85 to 1988-89 on average basis, the output per manshift was almost constant. During 1988-89 to 1997-98, the OMS had decreasing trend.

By studying the Table 11, it is observed that there had been a steady decline in underground OMS which come down to 0.44 in 1996-97 from 0.56 in 1976-77. The OMS found constant (approx.) during the period from 1993-94 to 1997-98. The reasons for downward trend in productivity from underground mines of BCCL were as follows:

- (1) Adverse mining conditions due to presence of fires, long distance workings, heat and humidity due to deep working conditions.
- (2) Aging of mines/loaders resulting in reducing efficiency and non-employment of fresh loaders/miners during the period.
- (3) Inadequate power supply and interruption of power.
- (4) Inadequate stand supply for stowing mines.
- (5) There is shortage of funds due to change of government policy because no assistance has been given by government since 1990-91.

Overall Productivity

The trend of overall productivity of BCCL mines from 1974-75 to 1997-98 has been highlighted in table 12.

The overall productivity (output per manshift), which was 0.45 in 1974-75 had gone up to 1.07 in 1997-98 (e.g. 2.38 times). This happened due to the existence of higher contribution from opencast mines.

The reason for downward trend of productivity during the sub period 1982-83 to 1984-85 was less production from opencast and underground mines during that period.

Table 12: The trend of overall productivity of BCCL mines from 1974-75 to 1997-98

<i>Year</i>	<i>Average Productivity (OMS)</i>	<i>Index Number (1974-75 = 100)</i>
1974-75	0.45	100.00
1975-76	0.57	126.67
1976-77	0.56	124.44
1977-78	0.56	124.44
1978-79	0.56	124.44
1979-80	0.57	126.67
1980-81	0.59	131.11
1981-82	0.67	148.88
1982-83	0.67	148.88
1983-84	0.59	131.11
1984-85	0.58	128.88
1985-86	0.62	137.77
1986-87	0.67	148.88
1987-88	0.68	151.11
1988-89	0.75	166.67
1989-90	0.76	168.89
1990-91	0.77	171.11
1991-92	0.75	166.67
1992-93	0.85	188.88
1993-94	0.89	197.77
1994-95	0.94	208.88
1995-96	0.93	206.67
1996-97	0.92	204.44
1997-98	1.07	237.77

Table 13: The annual rate of change of overall productivity (%) is represented

<i>Sub-Period</i>	<i>Average annual growth rate (%)</i>
1974-75 to 1982-83	5.47
1982-83 to 1984-85	(-) 6.82
1984-85 to 1997-98	4.98

The comparative analysis of production, productivity and manpower strength of the company reveals that although there had been sharp increase in production ($30.92/17.74 = 1.74$ times), productivity ($1.07/0.45 = 2.38$ times), yet total manpower strength had come down from 1,77,458 as on 1st April'75 to 1,35,398 as on 1st April'98. In this way, we may conclude that BCCL has eliminated the unnecessary expenses in salary and wages. Now, there is still surplus manpower and BCCL is trying to reducing it by implementing various scheme like VRS transfer to other subsidiaries of CIL etc.

Suggestions for Improving Production and Productivity

PRODUCTION

- (i) Reduction of idle time of equipment due to various factors.

- (ii) Change from conventional mining method to new technology through the training and upgradation of skills of existing manpower.
- (iii) Shifting of villages and buildings/market in the vicinity of mines.
- (iv) Introduction of "Hot Seat Change" by means for 8 hours overlapping for major equipment like Shovel and Draglines in order to avoid idling of equipments.

The above could be achieved by active participation and help from the workers representatives in the consultative committee at unit/area and head quarter level.

PRODUCTIVITY

- (i) Introduction of "All-Man-All-Jobs" system. To meet the requirement of modern technology as well as for improving production and productivity, it is deemed to necessary to switch over to "All – Man – All – Jobs" system for development of face workers or introduction of multi job concept for them.
- (ii) Training programme are required to be formulated so that necessary trained personnel are available and geared to the task of "All – Man – All – Job" concept and the higher skills needed for future mechanization.

CHECK ON ABSENTEEISM

Active co-operation of the unions and workers is needed to check the high rate of absenteeism among the miners and loaders. While the management feel that there – introductions of qualifying period of attendance for earning attendance bonus will check absenteeism trade union representative feel that provisions of better housing and welfare amenities and education to be to the workers will reduce the same.

COAL HANDLING PLANT

In order to reduce the manpower engaged in surface, coal handling plants with coal handling facilities should be introduced. Male wagon loaders surplus due to mechanized loading will be diverted to underground as minor loader. Co-operation of 'Union' in this respect is required.

MULTI SKILL CONCEPT

- (i) The development of multi skill concept will help in reduction of man hour exposure at the place of work and thus automatically cater for improvement in safety. This may be introduced in conventional development and depillaring operations apart from long wall working. The workman should be trained for all types of works they will be expected to do. It may be necessary to redesignate and enlarge the existing job content to suit new technology.
- (ii) While formulating the programme for mechanization of mines, utilization and grainful deployment of existing manpower would be taken into consideration.
- (iii) Engagement of Sunday/Holiday should be regulated by fixing norms for deployment of manpower on Sunday/Holiday for mine maintenance, safety etc.
- (iv) Quality Circle Concept is to be initiated and adopted soon. Some workshop/Seminar are being arranged and this will lead to educate people.

Steps to be Taken for Achieving Above Improvement

Action to be taken for attaining the level of performance in respect of underground mines are indicated below :

(a) *Face Mechanisation/Eliminating Basket Loading*: A number of districts have to be taken up for mechanization through provision of scrapers, chain conveyors, side discharge loaders and load haul dumpers. Some of the SDL's are working in Bera, Simlabahal, Begunia etc. and LHD's are working in Jealgora, Hurriladih etc. Scrappers are working in East Katras and Murulidih 20/21 pits. Chain conveyors for direct shoveling there on are in Phularitand and Dahibari.

Action to be taken in this regard is summarized below:

- (i) Scraper hoist in conjunction with scraper chain conveyor at various mines.
- (ii) Introduction of SDL's in conjunction with scraper chain conveyors .
- (iii) Introduction of LHD's
- (iv) Introduction of scraper chain

conveyors for direct shoveling there on.

(b) *Improvement in Loaders Output Per Manshift*: Action to be taken for improvement of loaders OMS are as under:

- (i) Removing the transport bottlenecks
- (ii) Providing the required numbers of coal tubs.
- (iii) Improving ventilation to the required extent.
- (iv) Rationalisation and leveling of loaders strength.
- (v) Identification of bare minimum requirement of materials.
- (vi) Making a time bound programme for the development activities.

(c) *Injection of New Technology*: Successful trials have been taken up with blasting gallery method. These techniques are conducive to high OMS and their wider application ultimately would bring about significant improvement in the long term perspective.

Action to be taken for improvement in system capacity utilization in opencast mines are indicated below :

(a) *Critical Study of Low OM Opencast Mines*: A critical study has to be undertaken in opencast mines with low OMS. Action is to be taken to remove the deficiencies identified in the study. Some studies are being carried out also.

(b) *Target Setting Commonsurate with Capacity*: Based on in depth study of capacity vis-à-vis constraints realistic target for coal and over burden has to be set up and actual performance against this is to be monitored intensively.

(c) *IED Study for Identification of Bottlenecks*: IED studies have to be initiated in selected opencast mines to identify inherent weakness in the system leading to low utilization which ultimately effect OMS. Studies have already been carried out in GOCP, KOCP, Block-II areas etc.

(d) *Action Teams*: Action teams are to be constituted in mines/areas from among the machine operators, maintenance personnel and supervisors and they are being imparted job oriented training for improvement in work performance and work technique. They would form a nucleus in each mine/area and would disseminate the knowledge gained by them among the broad spectrum of workmen.

Focus for Future Development

Future development should focus on gaining overall control of the situation and put BCCL in an "Action Mode" building on the positive features of the personnel and environment profiles. The following need special attention.

(a) *Clarity Roles and Modify Delegation*: Take all steps like clarifying roles, introducing participative forum, empowering local group to take initiative for action etc. to promote team work at all levels. Form special empowered group to clear back log of employee grievance.

Take a close look at the systems and review the staff performance in personnel to seek improvement.

(b) *Promotee Officers*: Impart proper training to promotee officers and ensure that they are transferred from their original nexum. Bring HRD and training department under one General Manager. Improve the quality of staff through proper incentive for attracting talent. Make a training plan relevant to needs. Give emphasis to supervisory development, promotee officers development, content for skills for team work, inputs for improved work culture.

(c) *Integrated HRD and Training*: Training function should be strengthened by attracting available internal talent through proper incentives and brought under a unitary command covering HRD and training. Development of promotee officers should receive greater attention in training efforts in team of both professional and general management competence. Technical trainees should spend full six months in the training division. Introduce cross functional training.

(d) *Technological Bottlenecks – Crash Programme*

Implement a crash programme of clearing technological bottlenecks and improving facilitations for safety and ventilation.

CONCLUSION

The trend of production and productivity of

BCCL from 1974-75 to 1997-98 have been studied. Trend of production from Opencast Mines is continuously going upward except marginal fall in few years. However, the trend of production from underground coal mines is going down. But the interesting observation in this paper is that the total cost production in BCCL has an increasing trend between the year 1974-75 to 1997-98.

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