WASTE AND OVER BURDEN MANAGEMENT IN MEGA OPENCAST PROJECT

PROBLEMS & TECHNICAL OPTIONS

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Govt. of India

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Ministry of Labour

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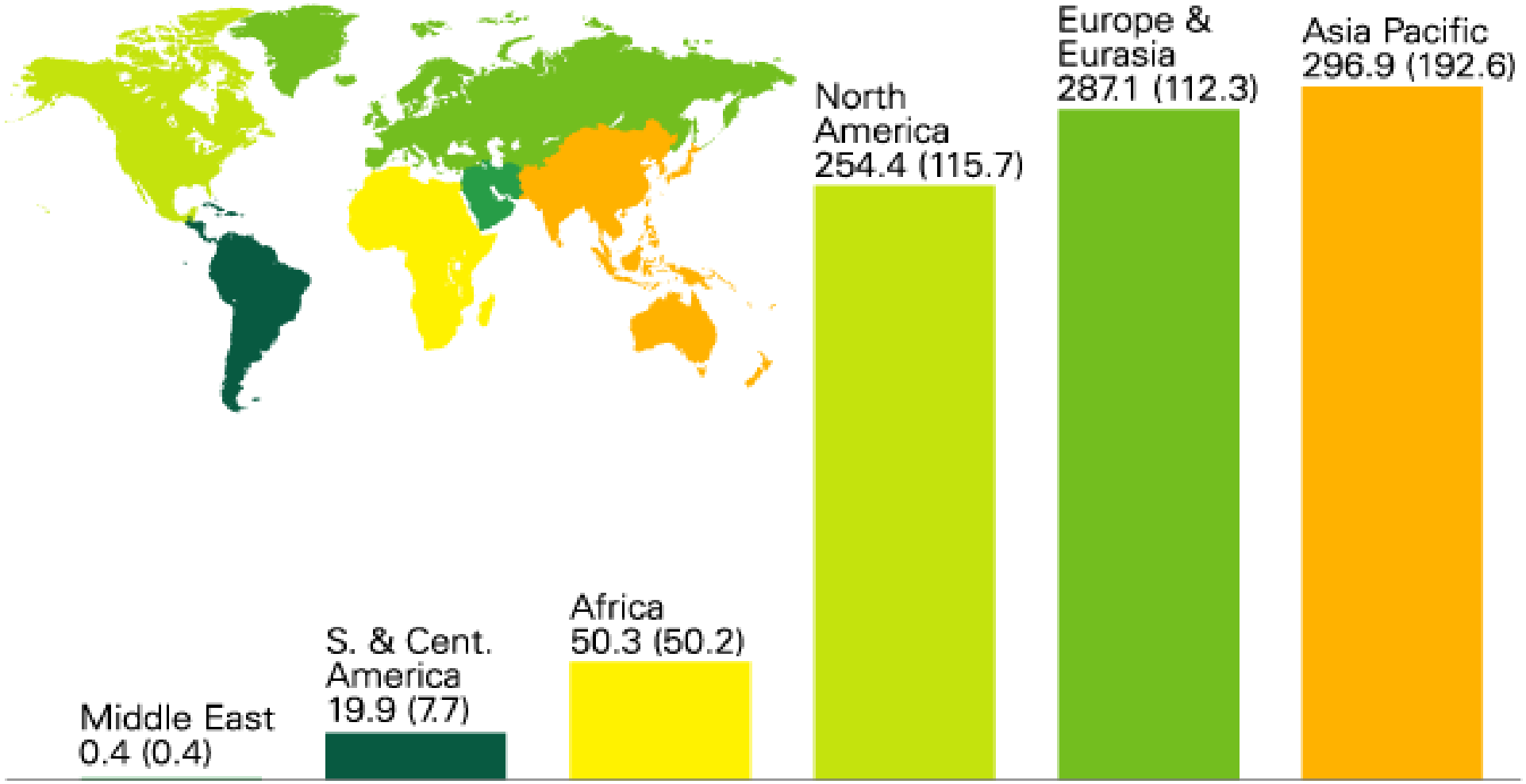
Directorate-General of Mines Safety

WORLD ELECTRICITY GENERATION(% By Fuel-2005)

Consumption by Fuel	India (%)	World (%)
Oil	32	37
Natural Gas	8	24
Coal	54	27
Nuclear Energy	1	6
Hydro-Electric	5	6
Total	100	100

Proved coal reserves at end 2004

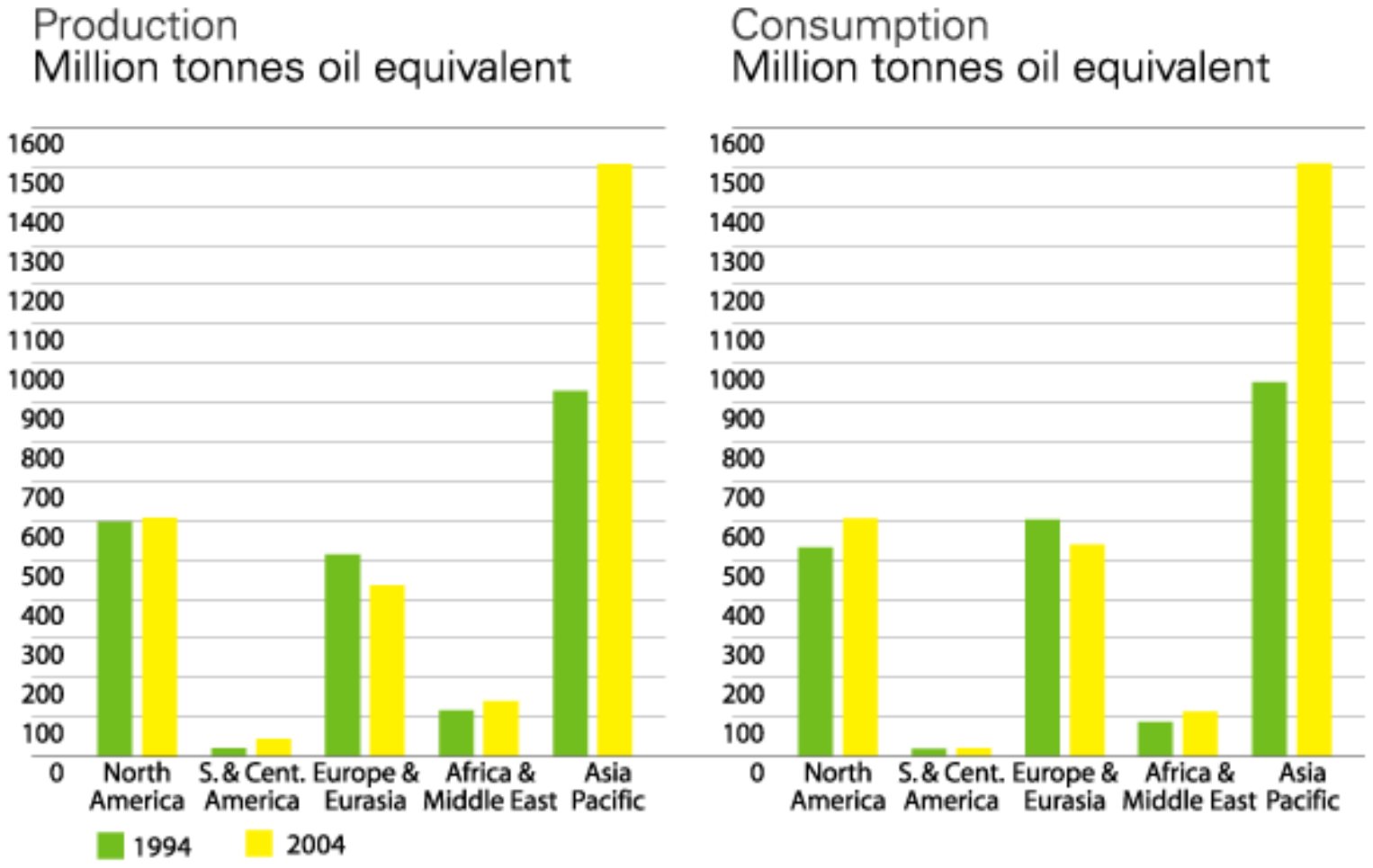
Thousand million tonnes (share of anthracite and bituminous coal is shown in brackets)



Global demand of Coal has shoot up due to unprecedented increase in Oil Prices in the international market during the past two years.

The resurgence of Asian Pacific economy is another factor influenced pressure on the high demand of energy causing sudden increase in demand of coal. The table below depicts the scene.

Coal production - Coal consumption



Coal consumption and production experienced another robust year in 2004, although growth moderated from the very strong rates seen in 2003 as prices rose. Growth was strongest in the Asia Pacific region, with China alone accounting for nearly 75% of global consumption growth.

INDIAN SCENARIO World Electricity Generation - % by Fuel-2005

Consumption by Fuel	**India (%)**	**World (%)**
Oil	**32**	**37**
Natural Gas	**8**	**24**
Coal	**54**	**27**
Hydroelectric	**01**	**06**
Nuclear	**05**	**06**
Total	**100**	**100**

The coal reserves in India are depicted in the table below:

Depth (m)	Proved (Million Tonne)	Indicated (Million Tonne)	Inferred (Million Tonne)	Total (Billion Tonne)	%
0 – 300	**71**	**66.5**	**15**	**152.5**	**61.5**
300 – 600	**6.5**	**39.5**	**17**	**63**	**25**
0 - 600	**14**	**0.5**	**-**	**14.5**	**6**
600 - 1200	**1.5**	**10.5**	**6**	**18**	**7.5**
Total	**93**	**117**	**38**	**248**	**100**

Demand and Supply of Coal

- Coal accounts for 63% of Country's energy needs.
- Coal based thermal power generation capacity presently stands at 61,476MW and a capacity addition of around 60,000 MW has been targeted in next 7 years.
- Total annual hard coal production in India is about 373.79 million tonnes (2004-05) out of which nearly 80% is from Opencast Mines.

Projected Demand of Coal

- There was a gap in demand and supply to the tune of 40 million Tonnes (2004-05) which is expected to increase to 157million tonnes by the year 2011-12 at the expected demand of 707 million tonnes with production of 550 million tonnes.

- Thus there is need to enhance production of coal to the tune of 175 million tonnes in the next five years. But if the total demand has to be met, the extra production requirement will be around 332 million tonnes.

Mining Scenario

With ensured demand of coal for the near future and requirement to meet the same, there is tremendous pressure on the existing and proposed system of mining and mining projects to meet the need. As evident from the data that if the enhanced demand is to be met within short span of five years, the only option left to the mining engineers and mine planners is to go for enhanced production from the existing projects by deployment of Mega Size HEMMs as well as to extract the coal seams at higher Stripping Ratios. The seams which were left unworkable due to high stripping ratio in the past are being worked now profitably. Projects are being planned to work at 1:12 to 15 Stripping Ratio with the use of Large and Medium size equipments. As the production from the opencast mine is going up at higher stripping ratio, the problems of over burden dumps and accommodation thereof have posed another challenge, that need attention.

TECHNOLOGY OPTIONS

Underground Technology such as Longwall or Continuous Miner-Shuttle Car Technology has potential to produce more coal from underground but it has uncertainty which retards continuous production. At the same time the equipment's life and the operational costs are far more behind the life and operational costs of opencast equipments.

Opencast Technology with use of the following equipment is, therefore the immediate need to Redress the problems of mass production requirement:

TECHNOLOGY OPTIONS

i) Dragline ii) Larger Size Shovels & Dump Trucks
iii) BWE with Beam Stage Loader/Spreader & Reclaimer
iv) Surface Miners (v) Steel cord Conveyor

This system of Opencast Technology has an added advantage.

- **Possible to extract contiguous seams being rendered un-extractable or the seams having geological disturbances being left un-mined by underground methods;**
- **The seams on Fire can be extracted;**
- **Possible to ameliorate thin seams of high grade coal which are being left un-extracted; and**
- **The coal locked in developed pillars and the barriers on the boundaries which could not be extracted in the past are being and can be extracted without any problems.**

TECHNOLOGY CONSTRAINTS

i) Over Burden or Waste Dump Management

ii) Mass Blasting and Associated Ground Vibration Problems

iii) Environment Management and Reclamation

iv) Ground/Rain Water Management

v) Infra Structure Development and Training on Technology Adoption

OVER BURDEN & WASTE MANAGEMENT

☼ **Over Burden/Waste generated during extraction of coal are being dumped both In-Pit as well as On External Dump. In-Pit Dumping is the most economical and environment friendly Waste Dump Management being adopted in Mega Opencast Projects. But it has certain limitations and inherent dangers of Dump Slides posing operational and Safety threats.**

☼ **When the mines are being planned for production from 300m depths at stripping ratio upto 1:15 even for D or F Grade Coal, the problems of Dump Slide and Dump Failure have to be managed.**

With increased dump heights, it is inevitable to study and monitor Over Burden Dump Stability. A number of cases have been reported when the major Dump Slides and Failures have caused substantial damage and interruption on the production circuit. The Design of OB Dump and the system of retaining the stability of the OB Dump have to be looked into.

STRATA SECTION

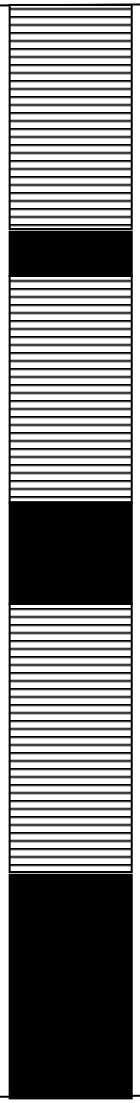
Sandstone OB 2 to 5 benches , Each of 15m Bench Height

Top Seam 2 to 5m

2 Shovel – Dumper benches

Bottom Seam 9 - 12m

10/70 Dragline in top 12 – 15m bench
24/96 Dragline in bottom 35m Bench
Bottom Most Seam 20m, in15m bench+ 6m floor digging



Cover at Top Seam
25m in East & 90m in West Section

2 to 5m
Sandstone parting
22m in East & 25m in West section

Exists in both sections

Sandstone parting
55m in East & 57 – 60m West Section

NOT TO SCALE

Maximum Depth 134m in East & 184 m in West Section

Dragline Mining Section

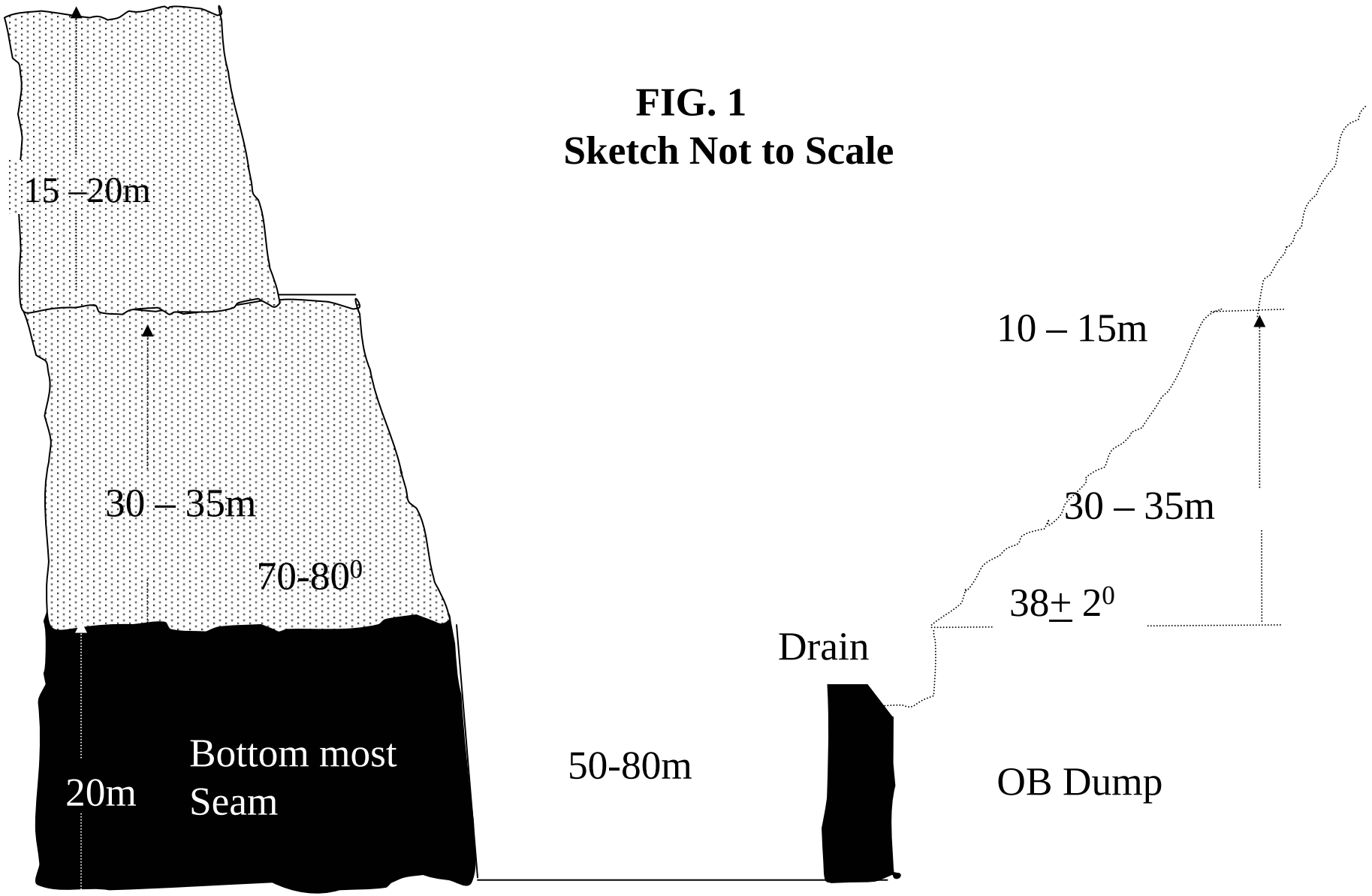
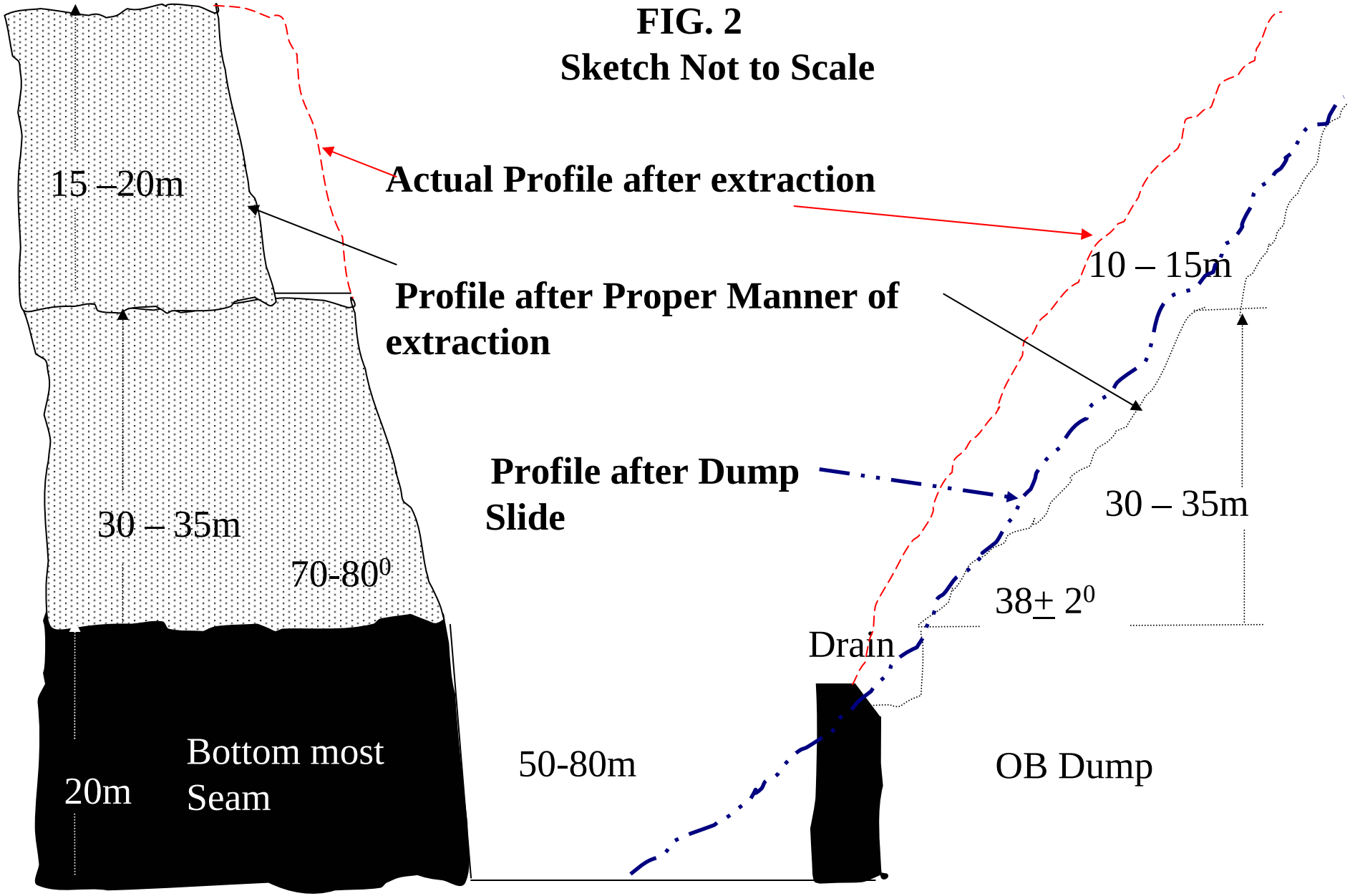


FIG. 1
Sketch Not to Scale

Case of Dump Slide Section



Dump Stability Parameters

- Gradient of the Seam
- Ground Water Regime
- Nature of Over burden Rock
- Presence of clay and Soil layers and their properties
- Angle of Repose of the broken Over burden rock
- Cohesion of the Over burden Rock materials
- Height of OB Dump in one stretch
- Ultimate Height and Slope of Waste Dump

Strip/Cut Width and Depth – Limited by the dimensions & size of the excavation machinery.

Rib of Coal and its strength – In case of Rib to be left against the OB Dump.

Pit Slope Stability while using Mega Draglines in Horizontal as well as Vertical Tandem also need focused attention and detailed planning in advance with technical detailed studies.

Mass Blasting and Associated Ground Vibration Problems

In High capacity Opencast Projects, the rate of OB removal is the key parameters which control over all efficiency of the project. Therefore there is constant requirement of high volume of blasted material for machine to handle. Mass Blasting using high volume of explosive is thus inevitable. Deep holes upto 65m and high charge of explosive upto 1000 Tonnes blasting at a time require special studies and attention to ensure safe level of vibration and required fragmentation for the machine. This is another important subject to deal with very cautiously and scientifically.

Environment Management and Reclamation including Ground/Rain water Management is an on going work which have to be addressed concurrently.

Infra Structure Development and Training on Technology Adoption

Infra Structure Development and Training on Technology Adoption is the key to success of the technology. This needs expert advice and opinion with high level of experience and exposure.

TECHNICAL OPTIONS

In USA also the larger share of their production comes from Opencast Mines using high capacity machines like Dragline, Shovels, Dump Trucks, Surface miners etc. It is reported that there are mines producing 80 million tonnes per annum of coal from a single Opencast mine and there are projects planned to produce 110m million tonnes. All type of equipments and conditions are existing in mines of USA which require to be studied and implemented in the projects in India. They have the expertise and exposure to such technology which would be very essential and needful for us to plan and manage efficiently.

CONCLUSION

In view of the scenario explained above, it is required that we collaborate with US Expert on the subjects cited above before we move forward.

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DGMS