

# EXECUTIVE SUMMARY

## 0.1

### INTRODUCTION

Earthmoving is the planned, progressive modification of the natural earth surface to give it a profile matched to a proposed engineering structure or use the material for processing.

While this is the more macro view of earthmoving and its importance to mankind, more specifically, the term Earthmoving is related to construction (dams, roads, etc.) land clearance; making of canals; mining and quarrying, etc.

Machines deployed for earthmoving and covered under this report are -

- Dump Trucks
- Tipping Trucks
- Hydraulic Excavator
- Loaders including excavator loaders
- Dozers
- Crawler Tractors
- Scrapers
- Motor Grader

## 0.1.1

### PRODUCT PROFILE

#### a) Dump Trucks

Dump Trucks are exclusively meant for hauling various materials to a large distance.

#### b) Rear Dump Trucks

As the name suggests, the dumping of the material (load) is done over the rear by tilting the body using hydraulic cylinders.

#### c) Bottom Dump Trucks

If trucks are used to haul materials, such as sand, gravel, reasonably dry earth, coal etc. which flow easily, the use of bottom dump trucks will reduce time.

#### d) Articulated Dump Trucks

These kind of trucks facilitate better maneuverability .

- e) **Tipping Trucks**  
Tipping trucks are smaller version of dump trucks.
- f) **Tractors**  
Tractors can be divided into two major types :
1. Crawler
  2. Wheeled
- g) **Bulldozer**  
A tractor fitted with a blade in front of it either cable- operated or hydraulically-operated, and capable of only tilting but not angling.
- h) **Dozers**  
A dozer is essentially to excavate the ground to a lower depth and push in front of itself the excavated material.
- i) **Crawler Loader**  
Crawler loader is a material loading equipment mounted on tractor type crawlers. Loading of materials is accomplished by a hydraulically operated bucket in the front.
- j) **Wheeled Loader**  
Where ground conditions permit, the wheeled loaders is finding increasing favour on the construction site. Articulated version offset the reduction in maneuverability of the larger models which might otherwise limit their use on the more congested site.
- k) **Wheeled Loader/backhoe**  
The purpose-designed and built loader/backhoe has its origin in the agricultural tractor to which was added a front bucket controlled by ropes and a winch.
- l) **Scraper**  
A large bowl mounted on pneumatic tyred wheels towed by a crawler or wheeled tractor which is capable of digging, loading, hauling over a considerable distance and spreading
- m) **Motor Grader**  
The Motor Grader is a self propelled vehicle, of which the bearing chassis rests on at least two sets of wheels, and having an adjustable levelling blade, normally called mouldboard situated between these sets of wheels, used for fine finishing, battering and ditching (Refer IS 4988/Part 5).

## 0.2 INDUSTRY PROFILE

### 0.2.1 Size of the Industry

The total production of earthmoving machinery (excluding Tipping Trucks which is part of the Transport Equipment) is estimated at about 3000 units per annum spread over about 12-14 companies. Out of these, the products under study cover about 1500-2000 units. One of the major manufacturer of these machines is in the public sector which makes all the products covered in this study except for the excavator loader. All others are public limited companies in private sector. Currently the overall sale value of the products under study is about Rs.1200 crores annually.

### 0.2.2 Manufacturing and Design

Almost all earthmoving machinery manufacturer in the industry have one or the other collaboration with an overseas manufacturer. At present some of these collaborations may have expired.

Earthmoving machinery manufacturers are generally engaged in indigenisation of imported technology to suit local needs.

Table below gives the details of the manufacturers of products under study at a glance.

PRODUCT	COMPANY	LICENCED* CAPACITY	INSTALLED** CAPACITY	MODELS	COLLABORATION	
					Company/Country	Current Status
DUMPER	H M (E.E.D)	-	-	HINDUSTAN 1025 HINDUSTAN 1035 HINDUSTAN 773 HINDUSTAN 777	Indigenous design Based on Terex R35 Caterpillar Licence Caterpillar Licence	-  Active Active
	BEML	514	514	HAULPAK 35 HAULPAK 50 HAULPAK 85 D HAULPAK 120 HAULPAK 140 HAULPAK 170 HD 785-2 BEML 25	WABCO, USA	Expired
TIPPER	TELCO	-	4210	SK	Indigenous	
	ASHOK LEYLAND	-	-	COMET HIPPO BEAVER ALAD 25/35	Indigenous	

PRODUCT	COMPANY	LICENCED* INSTALLED**		MODELS	COLLABORATION	
		CAPACITY	CAPACITY		Company/Country	Current Status
	SWARAJ MAZDA*	-	-	WT-48, T-3500		Active
	DCM - TOYOTA*	-	-	DYNA		
	EICHER MITSU* BISHI	-	-	CANTER 2750 mm CANTER 3350 mm		
	MAHINDRA* ALLWYN	-	-	CABSTER 2500mm CABSTER 3320 mm		
	CUMMINS* DIESELS	-	-	BHEEM 3100 mm		
WHEEL LOADER	BEML	134	134	3035 G 1420-2 WA 200 WA 400	KOMATSU, JAPAN	Expired
	H.M (E.E.D)	-	-	HINDUSTAN 2021 HINDUSTAN 2071 HINDUSTAN 966E	Based on TEREX®72-21 Based on TEREX®72-71 Caterpillar Licence	Active
	MARSHALL ESCORTS	50 250	50 250	AR 61 II L 700/1000 430 3C/3D	J C BAMFORD, UK	
	L&T	250	250	W 20 W 36	JI-CASE, USA	
	TELCO	-	-	TWL 3036	Indigenous	
EXC LOADER	ESCORTS-JCB	500	300	3C/3D	J C BAMFORD, UK	Active
	L&T	250	125	580	JI-CASE, USA	Active
DOZER	BEML	1090	1090	D 355A, D 155, D 120 D 80, D 50 A D 65-E, D 31-17	KOMATSU, JAPAN	Expired
	H.M.(E.E.D)	-	-	HINDUSTAN D6H	Caterpillar Licence	Active
SCRAPER	BEML	156	156	229 H, 229F	WABCO, USA	Expired
GRADER	BEML	14	14	GD-605 R1,440	KOMATSU, JAPAN	

Source : Survey

\* Under the Industrial Policy announced in July'91 all items, falling under the category of Earthmoving machinery, have been delicensed.

\*\* Under the broad banding scheme of the Government, there is no specific installed capacity for each product. Each manufacturer is

allowed to manufacture any product under broad banding category of Earthmoving machinery within the overall approved licensed capacity.

# These Companies manufacture only trucks and use tipping attachment manufactured by some other Company.

@ Collaboration with TEREX no longer existent. TEREX was formerly division of General Motors Corporation USA and I.B.H. Germany.

### 0.2.3 HISTORICAL GROWTH OF THE INDUSTRY

Being capital intensive and high cost industry, the growth has been rather slow in number of units, but over the period of time the value of total annual production has been going up.

#### PAST PRODUCTION FOR EARTH MOVING MACHINERY

Unit : Nos.

PRODUCT	YEAR						
	85-86	86-87	87-88	88-89	89-90	90-91	91-92
LOADER	366	375	353	371	383	332	488
DOZERS	329	357	423	467	360	311	333
DUMPERS	553	538	508	412	564	418	571
SCRAPERS	15	10	N.A.	N.A.	N.A.	N.A.	7
MOTOR GRADERS	39	56	37	42	35	N.A.	41
EXCAVATOR-LOADER	91	98	93	162	184	290	425
GRAND TOTAL	1393	1434	1414	1454	1526	1351	1865

Source : DGTD & Survey

### 0.2.4 Likely Demand of Equipment

The table below gives the demand projection of the 8th plan by DGTD for various equipment.

Unit : Nos

PRODUCT GROUP	YEAR			
	93-94	94-95	95-96	96-97
DUMPERS	787	852	930	1014
EXCAVATOR WHEEL LOADERS	501	638	750	815
FRONT END LOADERS	508	533	565	615
DOZERS	461	470	565	615
SCRAPERS	14	16	18	20
MOTOR GRADERS	55	59	65	70
TOTAL	2326	2568	2893	3149

Source : DGTD

## **0.2.5 STATUS OF TECHNOLOGY OF PRODUCTS COVERED UNDER THE STUDY**

### **0.2.5.1 DUMPERS**

There are three manufacturers of Dumpers with a licenced capacity of 750 units per year. HM (Earthmoving Equipment Division) manufactures 4 sizes of dumpers in the payload range of 25-85 tonnes. Two of their products i.e. 773 and 777 are Caterpillar licenced while the others 1025 and 1035 are their own design or derived from formerly collaborated design. BEML manufactures Dumpers in collaboration with WABCO. Ashok Leyland manufactures Articulated Dumpers of 25 tonne capacity with indigenous technology.

### **0.2.5.2 Tippers**

There two major manufacturers of this product namely TELCO and Ashok Leyland who are making tippers of 10-15 tonnes class.

M/s. Usha Telehoist Ltd. (UTL), WIPRO (Fluid Power Division) are manufacturers of Tipping gear units which are used by various body builders on chassis for making Tippers.

### **0.2.5.3 Wheel Loaders**

There are seven Companies who manufacture Wheel Loaders with capacity range of 0.5 Cu.m to over 6.0 Cu.m. The total licenced capacity for this product is almost 1000 nos. of various capacities. The wheel loaders manufactured by all the manufacturer are articulated type except Escorts(I.E.D.) who manufacture fixed frame type loaders based on a tractor chassis.

### **0.2.5.4 Dozers**

There are two manufacturers namely BEML and HM who are manufacturing this product. HM has current collaboration with Caterpillar - U.S.A., while BEML used to have collaboration with Komatsu of Japan which has since expired. The capacity of dozers manufactured are from 35 HP - 400 HP.

### **0.2.5.5 Scrapers**

These are manufactured by BEML currently. There is no current collaboration. However, BEML had a collaboration with WABCO - U.S. Earlier HM was also manufacturing scrapers but now they have stopped production.

### 0.2.5.6 Graders

There is only one manufacturer namely BEML manufacturing Motor Graders which had collaboration with Komatsu of Japan.

### 0.2.6 ANCILLARY INDUSTRY

The study has indicated that apart from tippers, dumpers and to a limited extent dozer and loader manufacturers, ancillary units have hardly been developed. The activities in these direction are mainly been concentrated towards major sub-assemblies like engine, under carriage, components and some of the electronic and rubber items.

Again the activity is more in the form of bought-out finished goods rather than development of ancillary for components. In fact one of the major manufacturer has gone in for hydraulic component manufacture instead of exploring the possibility of off-loading the hydraulic components through ancillaries.

The study has also brought out that the components are either made in-house or, in the case of high technology items, are imported. It is further pertinent to note that one of the main reasons of non development of ancillaries is low rate of off- take of these equipments. Small quantity are uneconomical for manufacture by ancillary units.

#### 0.2.6.1 Diesel Engine

Most of the manufacturers are adopting one or the other locally available diesel engines.

Major source of diesel engines used on the products are -

- 1) Dumpers - Kirloskar Cummins, BEML (Komatsu) and HPL (INTAC).
- 2) Tipper - Ashok Leyland, TELCO, DCM-TOYOTA.
- 3) Wheel Loaders- Ashok Leyland, KOEL, Kirloskar Cummins, BEML (Komatsu) and HPL (INTAC).
- 4) Dozers - BEML (Komatsu), HPL (INTAC), Kirloskar Cummins.
- 5) Scraper - Kirloskar Cummins, HPL (INTAC).
- 6) Motor Grader- Kirloskar Cummins.

### **0.2.6.2 Hydraulic Components**

The technology and manufacturing base for hydraulic components used in these equipment is now available within the country. Components like cylinders, pumps, hoses, valves, etc. are available within India. Some of the Companies have in-house facilities for making these components for captive use. Ancillary Industry is also well developed to cater all hydraulic components needed for the various machines covered under the study.

However, the users of these equipment, who had past experience of using imported components, have reported that the life expectancy of indigenous components is less than imported components.

BEML and L&T have in-house facilities for manufacturing pumps, valves, cylinders and hydraulic motors. Other manufacturers are using hydraulic components manufactured by hydraulic component manufacturers who too have one or other foreign collaborations.

### **0.2.6.3 Under-carriage and Track Parts**

Present manufacturers TENGL and TPI are able to meet requirement of under-carriage and track parts. This is in addition to in-house capabilities of BEML. The local manufacture of the same will not be cost effective. Technology available is quite in line with the advanced technology available abroad.

## **0.2.7 MARKETING, AFTER SALES SERVICE SUPPORT AND EXPORTS**

### **0.2.7.1 Marketing**

Most of the products under study are being marketed directly by the manufacturers. However, in case of smaller equipments like tippers from TELCO and Ashok Leyland, these are marketed through a wide network of dealers. All the Companies have well qualified and competent personnel for direct sales promotion and sales management.

### **0.2.7.2 After Sales Service**

All Companies have adequate after sales service backup though the quality differs from one manufacturer to the other. Some Companies do not have after sales service set ups widely distributed thus affecting quality of after sales service. In general spare part supply do not seem to be adequate.

### **0.2.7.3 Exports**

Due to quality as well as price considerations the export of these equipments is not as high as desired specially in the light of the technology level of the products. Companies like BEML have tried to



give a high thrust to export but the results are far from satisfactory. Even the exports done by Companies like TELCO for tippers is confined to under-developed/developing countries.

The market for these products, within India, has reached a level of stagnation (or is increasing very slowly). In order to increase the production it is necessary to explore export possibilities which implies technological improvement to a very great extent.

#### **0.2.7.4 TRAINING**

The manufacturers get the basic requirement of their personnel for design, shop floor, sales and service as well as for research and development from the Engineering Colleges, I.I.Ts, Polytechnics.

The re-training of these engineers is generally done by the employers through in-house in plant training and in many cases by Institutions and professional bodies like Institution of Engineers, Industry Associations, Indian Institutes of Technology etc. The manufacturers having foreign collaborations depute their personnel to their collaborators abroad for specialised training.

#### **0.2.8 CUSTOMERS VIEWS**

Based on replies received to the questionnaire, general comments are as under:

- Product range is sufficient to meet their demand.
- Unfortunately due to postponement of the 8th plan by two years, availability of funds could not be finalized for undertaking development projects.
- The life expectancy of hydraulic components is less than comparable to imported products.
- High spare part prices and long lead time for imported spare parts.
- Since hydraulic cylinders used have imported hydraulic seals, seals non-availability results in considerable downtime.
- Manufacturers training facilities for workers and operators need improvement.
- Utility of 60-65% which reflects two/three shift operations.
- Return on investment is low and therefore, reluctance to buy new machines.

#### **0.3 INTERNATIONAL MARKET SCENARIO**

The table below gives the estimated World Sales for earth moving machinery (excluding the sales in the erstwhile Soviet Union and Socialist

Eastern Block Countries which were part of Comecon) for the year 1989/90. The data is based on the inputs received from a leading manufacturer of Earth Moving Equipment.

**SALES OF ALL TYPE OF CONSTRUCTION MACHINES WORLDWIDE  
(EXCLUDING ERSTWHILE USSR AND EASTERN BLOCK COUNTRIES)**

<b>PRODUCT</b>	<b>1989/ US\$ Billion (Estimated)</b>
1. Wheel Loaders, Dozer, Backhoe loaders, skid steer loaders	7.45
2. Hydraulic Excavator	7.80
3. Bulldozers, Crawler loaders	4.31
4. Rollers and Compactors	2.69
5. Compressors	1.44
6. Dump cars	1.61
7. Hydraulic cranes/Rough terrain cranes	1.50
8. Crawler cranes, Truck cranes	1.37
9. Others	1.62
<b>Total</b>	<b>29.78</b>

Source: International Construction 1991 Issue and other issues

**0.4 TECHNOLOGY DEVELOPMENT, R&D EFFORTS, STANDARDISATION AND TECHNOLOGY GAPS IN EARTHMOVING MACHINERY SECTOR**

**0.4.1 TECHNOLOGY DEVELOPMENT**

Almost all the companies manufacturing one or other range of products covered under the study had or have one or other foreign collaboration. Also, the Companies which manufacture these products are fairly large and have very long experience in the field of engineering industry.

Major manufacturer of earthmoving machinery in public sector M/s. Bharat Earth Movers Limited has been established under the Ministry of Defence (Production) and had the advantage of acquiring possible governmental support for both acquisition of technology as well as for manufacturing equipment.

**0.4.2 R&D ACTIVITIES**

All the companies who are making the products covered under the study have well developed in-house R&D facilities. Also, wherever there are bought out proprietary items like engine, hydraulic components, etc., the R&D efforts have been often off-loaded to these suppliers/ancillary manufacturers.

All the major manufacturers of the products covered under the study have well established in-house R&D Facilities and have recognition of DSIR.

On an average all these Companies spend between 1.2 -1.5% of their turnover on R&D.

In spite of this encouraging scenario, so far the R&D activities have been mostly limited to reverse engineering or indigenisation of imported technology.

#### **0.4.3 NATIONAL R&D EFFORTS**

The UNDP Assisted R&D Facilities at Bharat Earth Movers for Development of Earthmoving Machinery Components can effectively be termed as a major national R&D effort. These facilities can also be utilized by other manufacturers on cost sharing/ project assignment basis. This is because there are no separate government institutions doing research on absolute basis for earthmoving machinery.

Need for establishment of National Test House is felt as on the lines of Automotive Research Association of India, Pune or Central Farm Machinery Testing and Training Institute, Budni for certifying performance parameters of different manufacturers. In fact Companies like Coal India, Central Water Commission, National Hydro Power Corporation and other major users are strongly in favour of such an authority.

#### **0.4.4 STANDARDS**

The standardisation is done by the sectional committee of Bureau of Indian Standards (BIS) Heavy Mechanical Engineering Department (HMD). Bulk Handling Equipment sectional committee: HMD 07. The sectional committee undertakes: Standardisation of terminology, general design and construction, classifications, rating and leading dimensions, and testing and inspection methods of mechanical, pneumatic and hydraulics bulk handling equipment for loose bulk material including fluid material and unit loads (other than those covered by other sectional committee EDC:61).

Also, this sectional committee coordinates work with ISO/TC 127 Earth Moving Machinery.

#### **0.4.5 TESTING FACILITIES**

Individual manufacturers have well developed testing facilities for engines, transmissions, material, hydraulics etc. As mentioned in the preceding paragraphs, BEML has one of the best testing facilities.

However, there are no testing facilities which qualify the parameters as are indicated by various manufacturers in their sales catalogues. As stated above, there is a strong need for creation of National Test House for testing the performance parameters of the equipment.

#### **0.4.6**

#### **TECHNOLOGY ABSORPTION**

The products under study are mainly medium technology products. This fact itself has contributed to the fact that all the manufacturers have successfully and completely absorbed the technology for these products after long periods of collaborations.

Almost all Companies (except in case of running collaborations) have indigenised components to the maximum extent. All manufacturers have successfully developed indigenous substitutes for original imported components. They have also made special design changes to suit local prime movers, local availability of steel sections and other raw materials.

All manufacturers have successfully improved production techniques to give better quality equipment. BEML, L&T and TELCO even use fully Computerized manipulators for welding of structural Components.

In general product improvement have been limited to components and special assemblies only and not on design/innovations.

#### **0.4.7**

#### **TECHNOLOGY GAPS**

Although being medium technology products, these equipments have hardly received any specific research thrust from Indian manufacturers. The efforts towards improvement has been only towards either import substitution or minor component improvement. Any new technology has been as a result of new collaboration only.

One of the important areas of the gap in quality standards of foreign make machines and the Indian ones is in the area of workmanship. It has been found that in the fields like welding, painting, fitting etc. major improvements need to be made by the Indian manufacturers. These gaps, however, may be due to the lack of standardized and robotic procedures and techniques which are prevalent in advanced countries. Judicious use of robotics and appropriate technology can improve the workmanship and thereby increase the life and general quality of the equipment.

#### **0.4.9**

#### **THRUST AREAS**

In view of the prevailing conditions the thrust areas for technological improvement can be some of the following:

- Development of multi fuel Engines which can run on other fuels, for application on earth moving machines.
- Improvement in application engineering as a positive step towards better utilisation of available equipment on scientific basis.
- Development of central authorities to monitor the performance of the equipment.
- Development of Wheel Loaders with totally hydrostatic transmission for short turning capabilities for Utility Applications.
- Development of improved Tipping Units.

0.5

## CONCLUSIONS

- 1) There are ten companies manufacturing earthmoving equipments which are covered under this study. These are Ashok Leyland, BEML, Escorts, Escorts- JCB, H.M., L&T, Marshall, TELCO, Usha Telehoist and Wipro. Range of manufacturers of these products are as under :

**DUMPERS**                      Three companies manufacture Dumpers namely H.M, BEML and Ashok Leyland.

**TIPPERS**                      Two companies manufacture Tippers namely TELCO & Ashok Leyland. M/s Usha Telehoist, Wipro Ltd. (Fluid Power Division) manufacture tipping units suitable for adaptation on all types of truck chassis.

Other Companies supplying truck chassis on which tippers are built are :

- (a) Swaraj Mazda
- (b) DCM - Toyota
- (c) Eicher Mitsubishi
- (d) Mahindra Allwyn
- (e) Kirloskar Cummins.

**WHEEL LOADERS**                      Six companies manufacture Wheel Loaders namely BEML, H.M., Marshall, Escorts, L&T and TELCO which are articulated type, while Escorts (I.E.D.) manufacture loaders which are fixed frame type.

**EXCAVATOR LOADERS**                      Two companies manufacture Excavator Loaders namely Escorts-JCB and L&T.

**DOZERS**                      Two companies manufacture Dozers namely BEML and H.M.

**SCRAPERS**            One company manufacture Scrapers namely BEML, and

**MOTOR GRADERS**        One company manufactures Motor Graders namely BEML.

2) Table below gives the number of models productwise:

<u>PRODUCT</u>	<u>NO. OF MODELS</u>
Dumpers	14
Tippers	6
Wheel Loaders	13
Excavator Loaders	3
Dozers	8
Scrapers	3
Motor Graders	2

Source : Survey

- 3) The market for the industry in the past decade has experienced a healthy growth of about 7-9% per annum. However, this growth rate is for the whole earthmoving industry. The actual average growth rate for the products under study has been about 3 - 3.5% per annum.
- 4) Under the broad banding scheme of the Government, there is no specific installed capacity for each product. Each manufacturer is allowed to manufacture any product under broad banding category of Earthmoving machinery within the overall approved capacity.
- 5) The demand forecast shows that with present level Government investments, the present installed capacity is adequate to meet the demand of the sizes of machines currently manufactured by the six manufacturers till the end of VIII Plan period.  
  
However, with liberalization of the industrial policy and delicensing of the manufacturing of earthmoving machinery, new entrants may enter the market
- 6) The market of the earthmoving machinery is oligopolistic in nature.

- 7) Technology acquired in the field is from the world renowned manufacturers.
- 8) All the companies have adequately absorbed and adapted the technology to suit local raw materials and customers needs. Companies having long experience in these type of products, prefer to go for foreign collaboration so as to avoid the risk of high cost of development and long lead time for the low volumes of demand.
- 9) All companies have in-house research and development department which is either a full fledged department or an extension of product engineering department which is supposed to be developing new products/ technologies but at this stage, the same is being utilized for technology absorption and to very limited extent for development of new products and technology(ies). However, a few companies have made fairly successful attempts at indigenous design and development for some products.
- 10) According to users, the indigenous Engines used on the earthmoving machinery are not meeting the life expectancy and are one of the main causes of service/ field problems. Customers have reported far more failures of indigenously produced engines compared to the imported engines which were being used earlier.
- 11) Hydraulic components like pumps, motors, valves and cylinders are available in the country. Both L&T and BEML are manufacturing some of these in-house. However, high pressure filters and seals for cylinders are imported as there is no reliable source for supply of these items.
- 12) For under-carriage and trackparts, technology available with local manufacturers is adequate to meet the requirement of almost all makes of machines.
- 13) All the manufacturers are concentrating on meeting local demand. Export are almost negligible.
- 14) The training facilities, specially for the training of operators and mechanics have a large scope for improvement. HMEED (Hindustan Motors - Earthmoving Equipment Division) has excellent training facilities.
- 15) The standardization efforts are restricted only to standardization of terminology, bucket capacities and general parameters. Performance certification is not being done.

However, there is need for standardization of components and sub-systems to avoid continuous out-go of foreign exchange.

- 16) Prices of spare parts are high and in particular, imported components are very high and have long delivery period.
- 17) Industry has matured and will continue to grow with the need of increasing productivity in mining sector as well as building a national irrigation and water distribution network, construction and infrastructure base for the growth of the country.
- 18) Most users complain that when a part/ sub-assembly is indigenised, the same is not adequately type tested for life expectancy. In most cases, they find the life expectancy of locally introduced parts reduces and more often than not, they are required to pay the cost of indigenisation.

## **0.6 RECOMMENDATIONS**

### **1. STANDARDIZATION AND PERFORMANCE CERTIFICATION**

- a) Bureau of Indian Standards should identify specific components like bucket capacity, engine performance parameters, operation cycle time, total digging/ excavator efficiency etc. of different manufacturers for performance evaluation at autonomous test house.
- b) BIS and other agencies, put together, should standardize not only equipment parameters but also the formats of equipment specifications by manufacturers.
- c) A study can be undertaken to evaluate performance parameters and productivity parameters of earthmoving machinery.

### **2. IMPORT COMPONENTS DUTY REDUCTION FOR SPARES**

Import duty anomalies for components which exists, when components are imported as part of earthmoving machinery or otherwise as a part under different subhead should be rectified.

### **3. TECHNOLOGY IMPORT FOR INCREASING EXPORT**

Technology support can be provided to existing engine manufacturers for upgrading their technology for fuel efficient and cost effective engines. The other areas of improvement are the noise levels, vibration levels and material inputs for increasing life expectancy.



## **THRUST IN EXPORT**

- a) The manufacturers should lay special emphasis on exports. The convertibility and the revaluation of Rupee can help make the prices competitive of Indian product internationally.
- b) Earthmoving Machinery can be included as an item for export under "Bilateral-trade-Agreements" and other government to government purchases. However, the exporting Government agency can inform all the manufacturers of earthmoving machinery about such orders.

## **LEASING OF EARTH MOVING EQUIPMENT**

Leasing of earthmoving equipment is fast catching up in the country. More and more buyers take the equipment either on lease basis or on hire-purchase basis. This field needs further encouragement by making major banks to enter the field through fiscal incentives.