

Indian Railways on the fast track of modernization

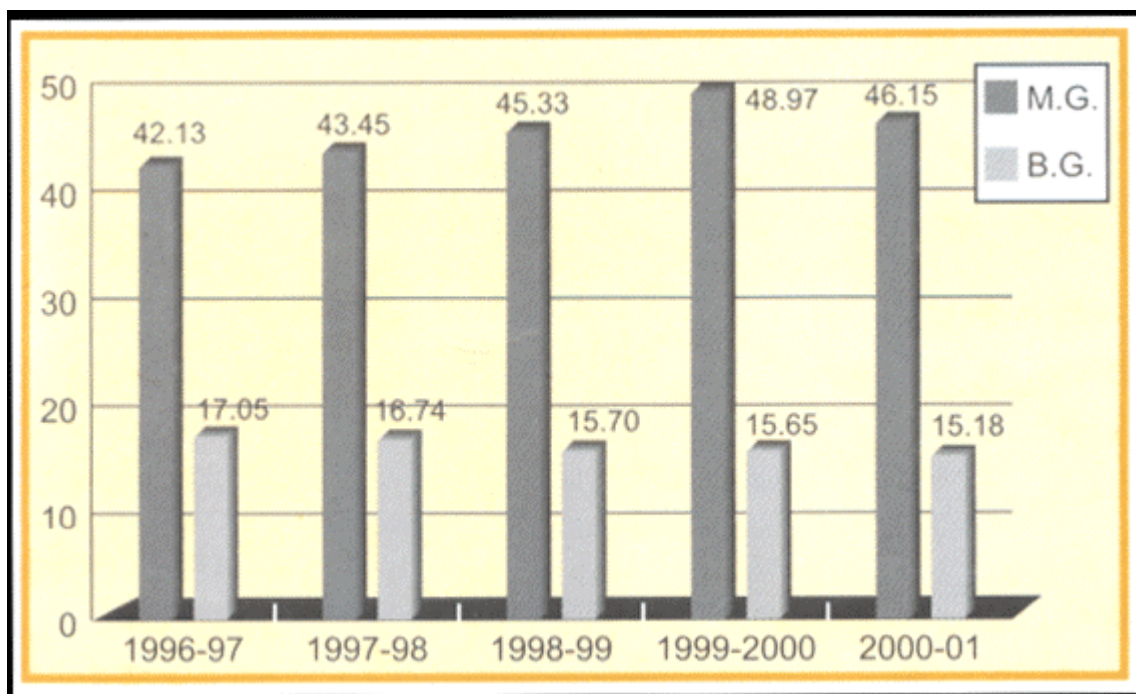
Modernization of Diesel and Electric Traction

Indian Railways (IR) are taking a number of measures to modernise and upgrade their fleet of diesel and electric locomotives. The conventional diesel locomotives are also being technologically upgraded at the rebuilding stage itself at the Diesel Component Works, Patiala, Punjab. Besides increasing the horsepower (HP) of the locomotives from 2,600 HP to 3,100 HP, superior features such as roller suspension bearing traction motors, fuel efficient turbochargers, traction alternators, etc, are being provided for reliability and enhanced schedule interval, resulting in higher availability on line.

Diesel multiple Units (DMU) services are proving to be an efficient and cost-effective solution for meeting the requirements of short distance commuter services. Twenty DMU sets manufactured by ICF, Chennai, were aquired during 2000-01, thus raising the total number to 100 DMUs.

State-of-the-art, computer-controlled, energy-efficient, three-phase traction motor-driven electric locomotives were introduced in 1995-96. The first indigenously manufactured hi-tech locomotive was used in 1998-99.

Figure 1: Energy Consumption (in coal equivalent) and Goods Services (kg of coal/1,000 Gtkms)



During 2000-01, eight such locomotives were introduced, increasing the total number of locomotives to 56. These locomotives, besides possessing various superior features such as vigilance control device, are fitted with regenerative brakes which increase energy efficiency level by 20 per cent. Three-phase 6,000 HP passenger locomotives are currently hauling the prestigious Rajdhani and Shatabdi Express trains. Three-phase freight locomotives are capable of hauling heavy freight trains 4,700 tonnes at higher speeds.

Table 1: Comparative Analysis of Fuel/Energy Consumption

Energy	Quantity Consumed			
	For traction purposes		For other than traction (including manufacturing units)	
	1999-00	2000-01	1999-00	2000-01
Electricity (Million kWh)	7,746.80*	7,932.65	2,216.13	1,975.86
HSD Oil (Million litres)	1,983.43	1,999.26	31.46*	32.33
Coal (Million tones)	0.010	0.004	0.028	0.026

Electrical Multiple Units (EMUs) with state-of-the-art three-phase technology have been introduced in Mumbai area as per the phased plan for conversion of the area from 1,500 V DC to 25 KV AC traction. These inherently energy-efficient EMUs are fitted with regenerative brakes that save about 30 per cent energy. Mainline Electrical Multiple Unit (MEMU) services were introduced from July, 1994 to achieve fast intercity service for commuters in congested sections. Because of high acceleration and deceleration properties, the MEMUs soon replaced slow loco hauled passenger trains, and became highly popular.

Technology, Research and Development

The pace of technological upgradation has been maintained with thrust on improving efficiency, increasing throughput, increasing average speed of trains, reducing asset failures, and consequently costs. Some of the technological developments have been:

- Thirty-six state-of-the-art 6,000 Hp AC three-phase electric locomotives being manufactured at the Chittaranjan Locomotive Works with technology transfer from ABB of Switzerland.
- 4,000 Hp diesel locomotives are being manufactured at the Diesel Locomotive Works in Varanasi with technology transfer from General Motors of USA.
- Light-weight coaches with anticlimbing feature are being manufactured in the Rail Coach Factory at Kapurthala with technology transfer from LHB of Germany.
- State-of-the-art high-speed SPURT cars are being procured for testing rails to determine flaws and reduce accidents caused by rail breakages
- A pilot project for the European Train Control System (ETCS) is in progress on the Mathura-Palwal section, which will enhance train movement safety.
- Freight wagons fit to run at speeds up to 100 km/h are now being developed and manufactured indigenously, which will help improve average speeds of freight trains and optimum utilisation of capacity especially on saturated sections.

To give a thrust to R&D, the RDSO is being restructured to segregate R&D from routine inspection and design functions. RDSO is also actively participating in projects being executed by UIC (the International Union of Railways) based in Paris, under which a world-class test track will be developed for R&D activities.

Freight Business-Loss of Market Share

The Railways, as a means of transport, are more suitable for carrying bulk load, which is mainly offered by the core sector. The percentage of traffic for seven major commodities constituting the core sector and carried by the Railways is illustrated in Table 2.

The decline in the Railways' share of transport in cement, petroleum, and iron and steel has largely been due to the Railways' competitive weakness in the face of challenges from other modes of transport, viz road, pipeline, coastal shipping, etc. The change in the economy's profile has also contributed to this decline.

The following strategies have been formulated to win back traffic to the Railways:

- Marketing for non-bulk, non-block rake, and high value traffic.
- Flexibility in rating by way of innovative variations in the schemes for station to station rates and volume discounts.
- Facilitating participation of the private sector in creating warehousing at existing railway terminals.
- Formulating schemes for terminal service providers at railway goods sheds.

Table 2: Percentage of Traffic Transported by Railways

Year	Coal	Iron Ore	Cement	Food Grains	Fertilisers	POL	Iron & Steel
1991-92	63.9	66.1	57.0	16.4	66.6	52.9	71.9
1992-93	66.2	70.6	56.2	15.2	67.8	51.1	70.81
1993-94	67.9	65.3	56.1	14.5	71.7	50.7	69.38
1994-95	64.98	63.66	49.52	10.79	71.56	43.57	63.71
1995-96	64.97	65.15	47.45	13.76	69.15	40.16	58.30
1996-97	65.95	66.68	46.42	14.85	70.23	37.47	45.38
1997-98	66.37	69.72	44.93	13.51	74.58	37.52	44.04
1998-99	63.99	65.63	41.80	13.38	75.77	37.66	40.90
1999-00	65.67	66.97	43.42	14.78	78.60	35.96	39.70
2000-01 (Prov.)	67.67	72.93	43.10	13.57	74.17	37.49	34.44

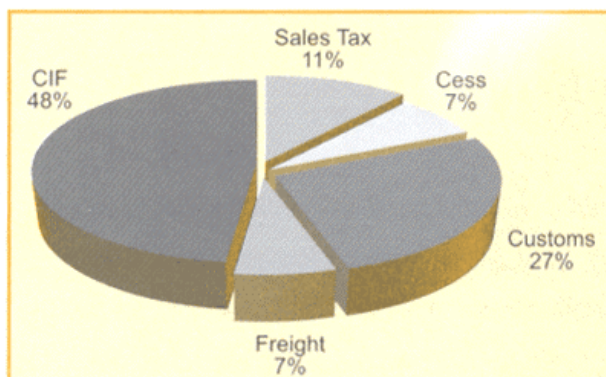
Energy

A break-up of the price paid by the Railways for HSD oil indicates that out of every rupee spent on fuel, only 48 p is the intrinsic value of the oil. The remaining 52 p is made of taxes, such as customs, cess, sales tax and other local taxes (see Fig 2). In addition, some of the state governments, such as of Gujarat, Karnataka and Andhra Pradesh have imposed hefty entry taxes on inter-state movement of HSD oil, which have put further burden on the fuel bill.

Technically, the Railways must get preferential treatment as they are bulk consumers of electricity and excellent paymasters. However, State Electricity Boards (SEBs) charge two to three times the rates at which they purchase power from Central generating agencies (such as NTPC) for electricity they supply for railway electric traction. Currently, railways carry almost 60 per cent of freight traffic on electric traction.

As a mode of transport, railways are four to eight times more energy efficient in freight traffic when compared to roads. A study by the Asian Institute of Transport Development clearly illustrates this advantage. Disproportionately high electricity tariff, however, nullifies this advantage to a great extent.

Figure 2: Price of HSD Oil



On August 13, 1996, the Gol Cabinet decided to enforce the condition of prepayment for coal consignments booked for thermal power plants in the context of mounting outstanding dues against SEBs and powerhouses. This condition was applied on Badarpur Thermal Power Station on January 1, 1997. But despite these measures, dues outstanding against powerhouses are about Rs. 1,865 crore, which is a matter of concern.

Other issues of concern are should the SEEs be allowed to overcharge the Railways, the most eco-friendly mode of transport? And should the SEEs be allowed to withhold payments to the Railways, which adversely affect their finances?

Market Borrowings

The Indian Railway Finance Corporation (IRFC) was created as a financing arm of IR to bridge the investment gap. IRFC has been investing market funds for the procurement of rolling stock.

The level of annual investment by IRFC in rolling stock assets has risen steadily from Rs 770 crore in 1987-88 to Rs 2,823 crore in 2000-01. Cumulative value of IRFC funded assets stood at Rs 21,707 crore at the end of 2000-01. This entailed an annual lease payout of Rs 2,748 crore, that is 7.9 per cent of gross traffic receipts (GTR) in 2000-01 and Rs 2,942 crore, that is 7.8 per cent of GTR (RE) in 2001-02. Increasing resort to this option is not considered sustainable in the long run.

Source: Indian Railways Year Book 2000 – 2001 and Status Paper on Indian Railways: Issues and Options, Government of India, Ministry of Railways, May 2002.

Reference book:
The Bulletin on Energy Efficiency
June 2002, Vol. 2,
Issue 6