

CHAPTER XXII

OPERATING STATISTICS

22001. Definition.- Statistics are numerical facts arranged and classified so as to provide ready comparison between the results of two or more operations. Their principal function is to show where efforts can be most advantageously applied for future improvement in order to eliminate waste and enhance efficiency and increase gross earnings.

22002. Railway Statistics.- (a) The railway statistics are based on factors of quantity, distance, duration and service. The primary factors denoting these units are expressed as follows :-

- (i) Quantity - expressed in number of tonnes and passengers transported and in earnings derived;
- (ii) Distance - expressed in kilometres;
- (iii) Duration - hours and days; and
- (iv) Service performed - in trains, vehicles, wagons and engines.

(b) These primary units are linked together to denote joint conceptions and are expressed in composite terms called "Fundamental Units", viz. tonnes kilometres, representing the product of the quantity and distance travelled. Passenger kilometres, train kilometres, wagon kilometres, engine kilometres, engine hours, wagon days, etc. are obtained in a similar manner.

(c) Finally, the eventual conceptions on which statistics are based, i.e. the relationship that exists between two sets of primary or fundamental units and the results thus arrived at are termed "Derivative Units". The process by which this relationship is ascertained is as illustrated in the following examples :-

- (i) $\text{Passenger Earnings (Primary)} \div \text{Passenger Carried (Primary)} = \text{Earnings per Passenger.}$
- (ii) $\text{Passenger Earnings (Primary)} \div \text{Passenger kilometres (Fundamentals)} = \text{Earnings per Passenger per kilometre.}$
- (iii) $\text{Passenger kilometres (Fundamental)} \div \text{Number of Passenger (Primary)} = \text{Average Distance travelled per Passenger.}$
- (iv) $\text{Wagon Kilometre (Fundamental)} \div \text{Goods Train Kilometres (Fundamental)} = \text{Average Load in Wagons per train.}$
- (d) These "Derivative Units" serve to bring out the character of particular aspects of transportation and railway working.

22003. Classification of Railway Statistics.- The principal heads under which Railway Statistics are generally grouped are indicated below :-

- (a) **Economic and Financial Statistics.-** Under this head are to be included the detailed statistics relating to the advance quarterly approximate figures of earnings, traffic handled in the shape of passengers booked and tonnage lifted and wagons loaded for current information, and the statistics of revenue and expenditure as booked in monthly and yearly accounts.
- (b) **Operating Statistics.-** Here are the statistics of both the total transport output (i.e. work done) as well as efficiency of operation. Examples of former are : the number of trains run, train kilometres, shunting kilometres, wagon or vehicle kilometres, engine kilometres, total coal and oil consumed, tonne kilometres transported etc. Examples of the latter relating to different aspect of railway operation are (i) punctuality and speed of passenger trains; (ii) speed and loads of goods trains; (iii) wagon usage as indicated by wagon kilometres per wagon day, net tonne kilometres per day, average starting wagon load and average load during the run; (iv) engine user, namely engine kilometres per day per engine in use and on line on different services, net tonne kilometres per engine day and per engine hour; (v) auxiliary i.e. unproductive services such as shunting kilometres per 100 train kilometers, percentage of train hours to total engine hours, etc. (vi) marshalling yard terminal goods stations and break-of-gauge points detention statistics and (vii) coal consumed per engine kilometres and per 100 gross tonne kilometres, etc.
- (c) **Commercial Statistics.-** Under this head are included the statistics relating to number of passengers/tonnes carried, passenger kilometres, tonne kilometres, average rate per passenger or tonne kilometres average load of traffic etc. Statistics regarding freight traffic and earnings by commodities, claims for compensation of goods or parcels lost or damaged are also included in this category.
- (d) **Rolling-stock and Workshop repair Statistics.-** Under this head are grouped statistics dealing with the repair and maintenance of rolling-stock, cost of repairs, hot boxes etc., as well as out-turn and other information relating to workshop activity.
- (e) **Other Miscellaneous Statistics.-** Such as statistics relating to staff matters, their number and cost by categories, and classes of staff etc. number of stations, by classes and by standards of interlocking, medical and engineering statistics, etc.

22004. Compilation of Railway Statistics.- (a) Compilation of Statistics of Indian Railways falls broadly under two categories, namely (i) the statistics required to be compiled by the railways for submission to the Railway Board in order to keep the Board generally informed about the different activities of the Indian Railways and (ii) further detailed Railway Statistics which individual railway may undertake for their own respective domestic requirements;

- (b) The statistical compilation work on the North Eastern Railway is in the charge of a Statistical Officer assisted by Assistant Statistical Officer.
- (c) The format and the methods of compilation of the monthly Statistical statements and the Annual Statistics required to be submitted to the Board are detailed in the Manual of Statistical Instructions, Volumes I and II respectively.

22005. Operating Statistics.- (a) Operating Statistics for the various Indian Railways are issued in the form of various pamphlets published periodically by the Railway Board. Detailed statistics

relating to each division and gauge of the North Eastern Railway are contained in various parts of the North Eastern Railways "Domestic" pamphlets issued quarterly (Part I, II A and II B and C).

(b) Only the more important statistics will be dealt with in this chapter.

A - Passenger Train Performance.

22006. Punctuality.- As punctuality is the main criterion of judging passenger train performance, some of the statistics compiled separately for "Mail and Express trains", "other passenger" trains, and 'Mixed' trains are :-

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| (a) | Percentage of trains not losing time; | } to total number
of trains run |
| (b) | Percentage of trains arriving right time; | |

22007. Vehicle Kilometres per vehicles day.- (a) this figure indicates the extent to which coaching vehicles are kept 'on the move'. The main factors affecting its value are :-

- (i) the average speed of trains;
- (ii) the average length of train runs (average load);
- (iii) the idle periods provided for in rake links.

(b) Since the lengths of train runs are not susceptible of much change, only by increasing the speeds of trains and tightening up rake links an improved performance can be achieved.

(c) This result is calculated by dividing the coaching vehicle kilometres by the vehicle days which is the product of average number of coaching vehicles on line and the number of days in the period under reference.

22008. Average Booked Speeds.- This figure represents the average time-tabled speed of passenger trains. The higher this figure, the better the service to the passenger and the more intensives the utilization of coaching stock.

22009. Shunting kilometres per 100 Train Kilometres (Passenger including proportion of mixed).- (a) This figure indicates the amount of unproductive service that has to be performed per 100 train kilometres (Passenger including proportion of mixed). Since the amount of shunting to be done on a passenger train depends upon various local factors, the figure will vary from division to division and from railway to railway,

(b) The figure is arrived at by multiplying by 100 the quotient of shunting kilometres divided by train kilometres (Passenger including proportion of mixed).

B - Wagon Usage.

22010. Average Starting Wagon load.- This figure is compiled separately for coal and coke, heavy merchandise and light merchandise, thus affording an indication of the extent to which wagon space is utilised by stations from which traffic originates. It is extremely important that wagons be given as full a load as possible because this means economy in wagon usage and hence engine

power and less strain on line and yard capacity. Even a slight improvement in the starting wagon load can mean a tremendous saving to the Railway.

- (b) The result is calculated by dividing the number of tonnes loaded by the number of wagons loaded (in terms of four wheelers), but CR and TR vans and wagons used for live stock and departmental purposes, however, are excluded.

22011. Wagon kilometres per Wagon Day.- This figure is a measure of wagon mobility and indicates the average number of kilometres moved by wagon, on the average, per day, both loaded and empty journeys being included. Delays in marshalling yards, delays at stations when loading or unloading, delays in clearance from roadside stations, decrease in average speed of goods trains, increase in the number of wagons under or awaiting repairs, and shorter leads of trains are some of the factors normally responsible for poor mobility.

- (b) This result is obtained by dividing wagon kilometres by wagon days which is the product of daily average number of wagons on line and number of days in period.

22012. Net Tonne Kilometres per wagon day.- (a) This unit is a measure of the revenue earning work done by the wagons and reflects both mobility and loading. A decrease in this figure may be inter alia due to any of the causes which affect the figure of wagon kilometres per wagon day. The proportion of loaded to total wagon kilometrage, the average loaded wagon and the relative amount of heavy and light merchandise carried are some of the other factors which may affect this figure.

- (b) The numerator in this case is the net tonne kilometres (excluding departmental) and the denominator wagon days.

22013. Wagon Turn Round.- (a) This figure expresses the ratio between the total number of serviceable wagons on a railway and the number of wagons required daily for effective use on the railway for its outward, inward and transshipment traffic. Stated in a different way, wagon turn round represents the average period of time in which a particular wagon completes its average loaded trip and after which it again becomes available for loading.

- (b) (i) The wagon turn round figure as between different railways can only be of general interest. No useful purpose is served in comparing the turn round between different railways as a number of factors influence the figure and these factors differ on different railways. The factors governing wagon turn round are :-

Average load; traffic density; ruling grades; line facilities - such as double or single line, and main and branch lines; gauge; strength of track and bridges; types of locomotives in use; normal loads of trains; Standards of signalling provided; facilities at terminal yards; and communications available:

- (ii) As between different periods on the same railway or division/district of a railway, however, the figure is a useful indication of efficiency as it also varies with such factors as speeds of goods trains, detentions in yards, stabled loads, condition of locomotives, engine failures and accidents.

- (c) Wagon Turn Round is calculated by means of the following formula :-

Effective average daily wagon holding*

Wagon Turn Round =	Average No. of wagons loaded daily including loading at transshipment + points;	Average No. of inward loaded wagon received daily from adjoining railways/divisions).
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*Departmental wagons and wagons loaded for departmental use, stock used for coaching traffic, wagons under or awaiting repairs daily in Mechanical Workshops and wagons out of commission in sick lines, are to be excluded for the wagon holding.

22014. Average Wagon load during the run.- (a) This unit is a good index of wagon utilization as it refers to the average load of all loaded wagons carried. It suffers from the drawback that it does not directly reflect the performance of the division, gauge or railway to which it applies, as only a proportion of the loaded wagons carried is loaded locally and the balance consists of both received traffic and cross traffic.

(b) For obtaining this figure net tonne kilometres are divided by loaded wagon kilometres, (the figure relating to departmental trains are excluded).

C - Goods Trains Performance

22015. Average speed of goods trains.- (a) This result is calculated separately for "through goods trains" and "all goods trains" and is arrived at by dividing the total train kilometres by total train engine hours of the concerned services. Detentions to goods trains at roadside stations enter into these calculations and have, therefore, the effect of bringing down average speeds.

(b) Some of the factors on which the average speed of goods trains depends are :-

- (i) The proportion of the density of trains to the sectional capacity. The nearer a section is worked to its sectional capacity, the poorer the speeds obtained;
- (ii) Hauling power of the engines used, standard of maintenance of locomotives and time taken by drivers for loco requirements.
- (iii) Loads of trains.
- (iv) Condition of rolling stock, particularly the brake power available.
- (v) Standards and maintenance of signalling and interlocking.
- (vi) Facilities at roadside stations to complete shunting in the minimum time and shorter block sections which will increase the sectional capacity.
- (vii) Engineering restrictions - permanent and temporary, gradients and curves.

22016. Average Net Train Loads (in tonnes).- This figure refers to the average freight load carried in tonnes, i.e. to that portion of load which earns revenue for the railway.

22017. Average Gross Train Loads (in tonnes).- This figure represents the average overall load of goods trains i.e the freight load plus the weight of the rolling stock. The principal factors affecting this figure are :-

- (i) the tractive capacities of locomotives employed, on goods train services;
- (ii) the gradients on various sections of the line;
- (iii) the nature of goods carried.

22018. Shunting Engine Kilometres per 100 Train Kilometres.- (a) This figure indicates the amount of non-revenue earning work done per 100 train kilometres (Goods and proportion of mixed). Its value is affected mainly by the load of goods trains, their loads and the amount of terminal work involved.

- (b) However, for the same division or railway, the pattern of traffic remaining the same, a rise in this figure is indicative of wasteful shunting.

22019. Net Tonne kilometres per Engine Hour.- The figure of net tonne kilometres per engine hour is a very useful index of the efficiency of freight working on a division. Net tonne kilometres indicate the amount of revenue earning work done while engine hours measure the cost of doing it. A decrease in net tonne kilometres per engine hour may be due to factors such as :-

- (a) Shunting engine hours not being cut down in proportion to the decrease in traffic offering;
- (b) increase in departmental, assisting required, assisting not required and light engine running;
- (c) decrease in the average train load and/or the average speed of goods train;
- (d) decrease in the average starting wagon load or in the wagon loads of wagons received from other divisions;
- (e) increase in the proportion of unbalanced traffic;
- (f) the type of traffic carried-heavy or light

D - Marshalling Yard Statistics

22020. Average detention per wagon - (a) All wagons (b) Through loaded wagons.- Detention suffered by stock in a yard depends, inter alia, on the layout of the yard and on the number of trains per day that can be despatched in various directions. Target figures have been laid down for each yard for detentions to all wagons and through loaded wagons. Such targets take into consideration the condition of work and facilities available in the yard concerned. Detentions in excess of this figure indicate inefficient yard work. Lesser detentions mean lesser cost of handling wagons in yards.

22021. Number of wagons dealt with per Shunting Engine Hour.- The number of wagons that a given yard can deal with per shunting hour depends, inter alia, on its layout. Accordingly a target figure has been prescribed for each yard to enable the efficiency of yard work to be gauged. As shunting involves cost, the higher this result, greater the efficiency of the yard.

E - Locomotive Performance.

22022. Engine Kilometres per day per Engine in use.- This figure is compiled separately for passenger, mixed and goods train services as well as for all services and refers to 'engines in use'. This is affected by such factors as :-

- (i) the average run of trains;
- (ii) the average speed of trains;
- (iii) the engine links;
- (iv) the location of diesel sheds with respect to the stations which they serve.

22023. Engine kilometres per day per engine on line.- This figures is also compiled by services and for all services put together. The proportion that this figure bears to the corresponding figure of "engine Kilometres per engine day per engine in use" indicates the proportion of available engines "on line" that were put to effective use during the period in question.

22024. Kilograms of fuel consumed per engine kilometre by service.- This figure indicates the coal consumption in relation to engine kilometrage. Since, however, it does not take into consideration the loads hauled, its utility is limited.

22025. Kilograms of fuel consumed per 1000 gross tonne Kilometres by services.- This figure indicates the fuel consumption in relation to the work done and is, therefore, a better index of fuel consumption than the "kilolitres of fuel consumed per engine kilometre" figure. The main factor that influences this result is the gross load of the train.

22026. Cubic decimetres of Lubrication oil per 100 engine kilometres by services.- This figures refers to the consumption of lubricating oil used on locomotives.

22027. Cubic decimetres of lubrication oil per 1000 vehicle kilometres.- This figure refers to the consumption of lubricating oil used on vehicles.
