ELEVATORS AND ESCALATORS IN INDIA

A. B. Lohit Centralized Controls Nagpur (India)

P. P. Holay Laxminarayan Institute of Technology
Nagpur University Nagpur (India)

ABSTRACT

The potential for application of elevators and escalators in India is increasing tremendously. The state of art, however, is not satisfactory. There are several reasons, important ones are mismatch between lift selections and traffic conditions and inadequacy of existing Indian Technology to increase the reliability and reduce maintenance overheads.

This paper describes relevant facts by concrete examples and stress the need of reorganising specifications for carrying capacity, speed and riding comforts suitable for Indian environment. Further authors feel that the consulting activity in this area has to be developed in India.

INTRODUCTION

History of elevators and escalators in India dates back to the period of British rule. In those days, there were few elevators in major cities like Bombay, Calcutta etc. But now nearly 40,000 elevators are reported. These elevators are categorised as 56% low speed types ie .6 to .7 m/s, 40% medium speed, (1 to 1.5 m/s) and only 4% are of high speed (1.5 to 2.5 m/s). Out of them 65% are residential, 30% commercial and 5% are others. In India, growth of dwellings is more horizontal than vertical. There are a few high rise buildings requiring group of high speed elevators and there are large number of low rise buildings requiring single low speed elevators which are sufficient up to 10 floors. The aspects such as safety, reliability and traffic conditions are required to be reviewed. There are no complaints about riding comforts.

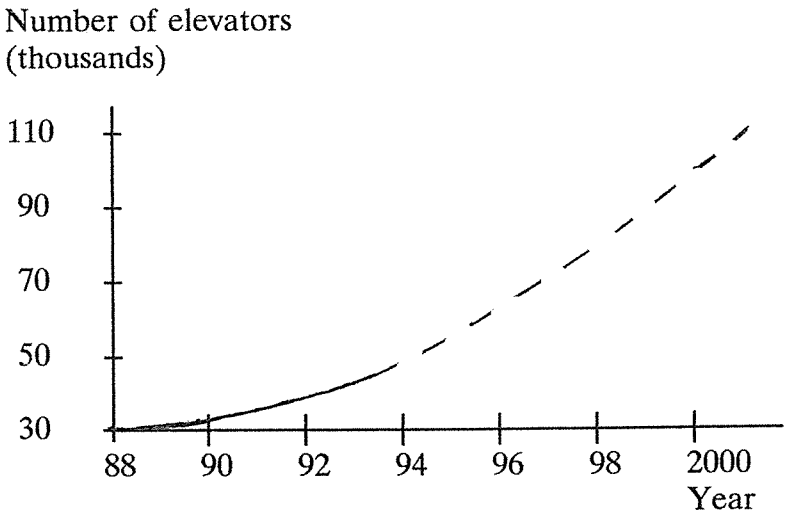
Escalators are less than 100, they are installed in most of the international airports and are slowly coming up in business centers. Main parts of all of them are imported from U.S.A. and Japan. Escalators are yet to come under the focus of research and developement.

In the year 2001,there shall be around 1 10,000 elevators, all over India. This forecast is made by extrapolation of a data collected in a survey, from 1988 to 1992. Consequence of this forecast is very clear,and is the fulcrum of this article. The demand of elevators is going to be 10,000/yr and according to authors, if resources are not generated with planning then situation will be aggrevated.

In this paper, the forcast of energy, technology, material, manpower, business is presented. Also laws-regulations and Government's present liberalized financial policies are discussed on the basis of the survey of 50 elevators and authors'20 years experience of erection and mantainence.

SURVEY REPORT

In India,number of elevators installed from 1988 to 1992 is plotted and extrapolation for the year 2001 is done, as shown in the graph.



Graph of extrapolated number of elevators in India by 2001

ENERGY

Energy auditing for elevators is not a practice as it is not yet alarming problem.

Dr. Schroeder's formula (ref 1) relates energy consumption with rating of motor R, typical trip factor TP and number of starts per day ST. The energy estimates calculated from this do not tally with observations because of two reasons One TP and ST are random variables, and can not be estimated easily and secondly the efficiency of the drive in most of the cases is around 90 %, so one has to resort to factual data.

It is observed that 6-passenger low speed lifts installed for 7 to 10 storied buildings at Nagpur consume on an average 5 Kwh /day. With this consumption expected energy requirement in 2001 is likely to be approx 660 MWhours / day and connected load 550 MW which for the nation like India is an appreciable quantity.

Energy can be saved by using electronic circuits, 30% with VVVF controls in gearless drive and regenerative braking, 15 % in DC variable speed Thyristor drive & 10% in Ward Leonard method. The use of these hightech methods for energy saving however increase the technological overheads of maintenance apart from their high capital costs. These points are dealt seperately elsewhere in this paper.

TECHNOLOGY

As adequacy of technology is finally reflected in performance and relaiblity, to evaluate this, failure analysis of 50 elevators was done. Conclusion is in confirmation with ref(2). MTBF of important parts in one elevator are observed as follows.

SN	PART	MTBF in Months	Spares needed in Inventory	Remarks * Site repairable
1	Door locks	1	15%	*
2	Brakes	2	6%	*
3	Selectors & other switches	4	5%	*
4	Safety devices	6	10%	*
5	PCBs	6	25%	

Low MTBF can be attributed to the quality of the material and non availability of specific quality control. In addition to this there is scarecity of mechanical spares and is overcome by repairing parts at site. Here after instead of repairs, parts will have to be replaced. Inventory management with off site repair shop will be a practice but it will increase technological overheads.

In case of electronic spares, ICs required for controller are all imported. Many a times, because of high ambient in India, they exibit low MTBF and require replacement. Fault diagnosis and repairs of PCBs at site is next to impossible. Hence replacement of PCBs is preferred for maintenance. If this extra demand of spare PCBs is considered along with that required for erection, then 12,500 PCBs will be needed per year.

Many functions of motor current and frequency command can be assigned to on card microcessors in an invertor drive and along with this task it can handle floor programming. It will be more advantageous from all the angles. For single medium speed elevators, Microprocessor controllors, for drive and floor programming is at R&D level. It's commercial aspects are to be tested. Softwares for traffic analysis, designs & erection programming with CAD /CAM is also on the way.

MATERIAL

From the low MTBFs indicated, it can be said that the quality of the material and ruggedness of the designs have to be improved. Also to simplify and concise erection procedure in order to save time and money, R & D activity is necessary.

When 1 10,000 elevators shall be working, for maintenance,2000 gatelocks,700 switches and 700 sets of safety devices will be required per month in addition to that of erection. This will mandate changes in entire infrastructure.

Indian standards for elevators provide broad guidelines for the quality and functions of major parts. Most of the parts selected for elevators are not tailor made, they are selected from general purpose lot. Only some of the parts like Directional switches, Gate locks, R -cam, S -cam, Rope pulleys, Gear boxes and Safety devices are especially manufactured for elevators. There are such 4 to 5 companies who manufacture these. With future need, some new companies can come up. It is also possible that companies may form a group to manufacture compatible parts for elevators. There can be some consultants offering package deals of entire elevator projects.

MANPOWER

For the erection of one elevator, 900 skilled, 100 unskilled and 90 supervisory man hours are required & with this manpower, 10 elevators can be erected in an year by one team. Every elevator requires one hour maintenance visit including diagnostics and repairs other than two Hrs preventive mantainance visit by technicians in a month. Here after 1000 teams of three skilled persons will be required for erection and 600 persons for maintenance by the year 2001. Now there are no enough skilled people in this activity, so efforts are necessary to produce the technicians.

COST & ECONOMICS

To day the cost of low speed elevator in India is Rs 2 00,000, medium speed Rs. 3 50,000 and that of high speed is Rs. 7 00,000 inclusive of supply, installation and taxes. Cost of machine, cage, controllor are major. In ref (1)the cost of running the elevator is calculated only by considering cost of energy but it will be proper to include cost of maintenance and interest on the capital cost. One typical calculation for low speed 8 passenger elevator is as follows. Cost of energy per month Rs 500, maintenance Rs 500 and the interest on capital cost is 18% i.e Rs 3000, per month. which gives Rs 9 per Km. which is double the cost of horiontal conveyance. With this outcome and considering cost of hightech electronic controllors, which is double the total cost of other major parts and running cost increases three fold. Hence it is necessary to investigate how to reduce the cost of hightech controller.

BUSINESS

There are few companies having licence for manufacturing and erection and some companies have licence for only maintenance. Decisions regarding selection of the elevators are taken by architects of the buildings and there is a direct contract between user and manufacturer. As there

is no consultant, no arbitrator and no insurance agency involved in the business, an inadequacy is left in the specifications of elevators and contracts.

In yr 1992, revenue from sale was Rs 120 crores*, from maintenance Rs 30 crores ie Rs 150 crores total. By 2001 anticipated revenue from sale will be Rs 260 crores, from maintenance Rs 70 crores ie Rs 330 crores total. There will be more business potential for manufacturing, maintenance, arbitration, insurance and consultation.

GOVERNMENT'S FISCAL POLICIES

Flameproof and gearless elevators are specialized fields. Its technology is not available in India. Government has marked this area as hightech and liberalized financial policies to promote international trade by way of import/export, collaborations and know how. For collaboration the Government is providing all infrastructural facilities, finances, licences. etc, for setting up a project in India. For trade,the condition imposed is value of export must be minimum 20 % above import. Consultancy for technology transfer is now freely allowed. Elimination of all duties, taxes etc. are also announced.

LAWS & REGULATIONS

In India,State Lift Inspection Department works under Electrical division of public works department. It is headed by a lift inspector of the rank of Executive engineer. They observe following regulations.

1) Bombay Lift act 1939 & 1977. 2) Bombay Lift rules 1958. 3) Indian Bureau of standards 4666 of 1980, 1860 of 1980, 3534 of 1976

Lift inspection department issues licences,Inspect the installations and biannually check the performance and safety devices of elevators. They are empowered to discontinue the licence of user or manufacturer in case of default. By the Year 2001, for the Distribution of powers, flexibilities in inspection procedures, the laws will have to be modified.

CONCLUSIONS

To generate the resources for 2001 , all round, systematic and planned efforts are needed. Also it is necessary to review the scenerio in minute details every year so that the predictions can be corrected and evaluation of the efforts made in this direction can be rationally judged. Energy auditing practice for elevators must be introduced. Techno economic quality control for elevator industry will have to be developed.

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* one crore is approximately £200 000

REFEENCES

1) Book, Elevator Technology (1986), Edited by Dr. G.C. Barney

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BIOGRAPHICAL NOTES

A.B. Lohit, B.E.Electrical,M.Tech(Integrated Power Systems) Proprietor of "Centralized Controls" Nagpur (India)

Manufacturer of Elevators & Rope ways Practicing consultant, member of I.A.E.E. and Manufacturing Engineers in India.

P.P. Holay, B.E.Electrical,M.Tech(Integrated Power Systems) Lecturer,General engineering Department of Laxminarayan Institute of Technology. Nagpur University,Nagpur(India)

Member of Institution of Engineers India, Published paper in National level conference proceedings on the topics of, Power system controls, Simulation Techniques and Energy saving.