

RAILWAY MAINTENANCE METHODS IN GERMANY, ITALY AND INDIA

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Abstract -Railway maintenance is an important aspect which is not spoken much. This article speaks about the need of it, its importance and its prevalence in three major countries India, Italy and Germany. We start with the fleet size of each countries and methods deployed by each country, and finally concluding the situation in India and how it is being improved.

Key Words: Maintenance, Railways, India, Italy, Germany

1.INTRODUCTION

Railway management is an essential element which can be seen in the case of public transport systems across the globe. It is essential to infer that railway management systems are required in order to ensure a high rate of effectiveness and efficiency which can be undertaken in the delivery of services to the general population of all countries. In the context of this, technological advancements have saved a pathway for enhanced management and maintenance of railway systems. Maintenance is important to ensure that the infrastructural capacity is maintained and enhanced effectively. Furthermore, it can be analysed that there is a salient requirement of ensuring that the systems are effectively aligned to the prospects which are effectively required. This research will look into the aspect of developing an understanding regarding systems of maintenance in railway management in the countries of India Germany and Italy. The study initially seeks to enumerate the railway systems and further it looks into how technological advances have helped the field of railway maintenance. The study at the end will effectively conclude by identifying why Indian railways has not adopted technological advancements and digital maintenance systems in order to understand the current context of railway management in India,

1.1 German, Indian and Italian Railway system

The German railway system effectively and efficiently stretches over a distance of 41,315 kilometres and have an electrified track length of 19,857 kilometres as compared to 18,201 kilometres for double tracks (Web.archive.org, | Impact Factor value: 8.226 2015).They have a total of 3,188 long-distance vehicles and 17,174 short distance vehicles for passenger transport with an additional 3,134 trains for goods carriage (Web.archive.org, 2015).{22}

DB Netz is the largest operator of railways in the case of Germany and further the structure development is also upto them. It can be analysed that the operating income of this company is around 4.797 billion Euros and the net income is 716 million Euros (Cia.gov, 2020). A total revenue of 440.576 billion euros was noted for German railways effectively in the year of 2016 Thus, it can be understood that the German railway system is an extensive and large system which is present. (Cia.gov, 2020). {4}

The Italian railway system in comparison to the German railroad system stretches for a total of 24,227 kilometres and the active lines in these are worth 16,723 kilometres (Ec.europa.eu, 2019).A total ridership of 848,757,000 was noted in the year of 2017. It has a double rack length of 7,505 kilometres in total and further it has electrified tracks which function on 3 kV DC worth 11,921 kilometres and 25 kV AC worth 1,296 kilometres (Ec.europa.eu, 2019).{5}

In the case of the Italian railways it can be understood and ascertained that the overall number of trains are adjoined with the EU and hence proper figures are not decipherable. In contrast to this it can be viewed that the railroad system generates a total revenue of 5.4 billion Euros as discerned in 2018 (Statista.com, 2020).

Thus, it can be understood that the Italian Railway system is an effective and efficient system which is conjoined with that of the EU and hence it gains additional efficiency. The total number of employees in Trenitalia of Italy is 27,607. Thus, it can be ascertained that Trenitalia is much smaller in size than Germany, but it carries much more passengers.

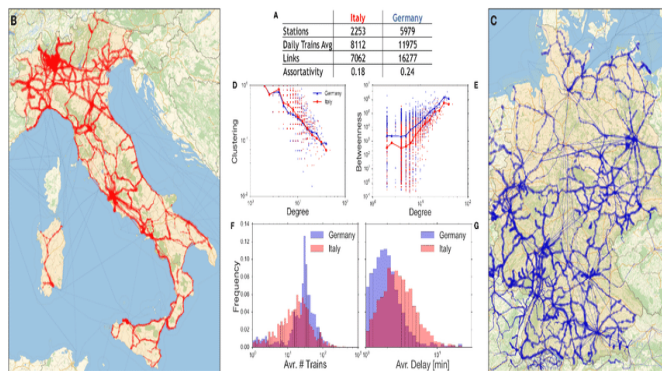
Elements	Germany	Italy	India
Manpower	295.653	27,607	1.23 million
Revenue	€40.576 billion	€5.4 billion	\$28 million
Number of Trains	24,496	N/A	2,89,185 freight wagons,74,003 passenger coaches, 12,147 locomotives.

Table 1: Railway Strength in Three Country

In the case of Indian Railways, it can be understood that the country has a total track length of 68,155 kilometres and is further expanding. Out of this, 40,576 kilometres worth track is a broad gauge track and these routes are electrified with a 25 kV 50 HZ AC electric traction (Indianrailways.gov.in, 2019).

The Indian railway system annually as of 2019 carried a total of “8.44 billion passengers” in addition to “1.23 billion tonnes of freight”. Indian Railways additionally runs a total of 13,523 passenger trains on a daily basis across a total of 7,321 stations in the subcontinent (Indianrailways.gov.in, 2019). Additionally, a total of 9,146 trains are run daily for freight carriage. In terms of the total manpower of the railway system it can be viewed that it employs 1.23 billion people and additionally it can be understood that the aggregate number of trains in the country is larger than what is run every day (Indianrailways.gov.in, 2019).{12}

As of 2019, “Indian Railways” had a “rolling stock of 2,89,185 freight wagons, 74,003 passenger coaches and 12,147 locomotives”. The net revenue of Indian Railways from 2018-2019 stood at US \$ 28 billion (Indianrailways.gov.in, 2020). {13}



Graph No-1= comparing the Italy and Germany networks

Differences in revenue and the quantity of passengers helps to denote the fact that the operational structure of Indian Railways is much more stable as compared to railway systems in either Italy or Germany. Through 2 Methods of railway maintenance implemented : It can be stated that there is an effective need for the maintenance of railway systems effectively and efficiently. Vansteenwegen et al. (2016),{19} indicates that this is indicative of the fact that maintenance is a salient recruitment in the case of railway systems. Maintenance aids in order to ensure a “high rate of efficiency” in the case of railway service delivery and quality control. Additionally, it can be ascertained that there is a definite level of efficacy which is produced through systems which are aimed at delivering proper value to customers.

Verbert et al. (2017),{20} indicate that service delivery is important and the requirement of infrastructure development and maintenance also plays a large role in this process. Effectively it can be understood that infrastructure development is essential to ensure that the systems which have been developed are not skewed at any given point of time. It can also be understood from the study of Catelani et al. (2020) ,{3} that the level of infrastructure development directly puts an impact on the prospect of products and services which are given to customers.

In case of railway systems of India, Italy and Germany, it can be ascertained that these three areas have different types of railway constant developments in increasing these aspects even further, Indian Railways can be stated to be the most railway system that is the most prone to achieving even greater efficiency in the future as well. It can thus be viewed that the size of Indian railways is much superior to that of Trenitalia or even the German railways.

It is additionally discerned that Indian railways employ a larger number of individuals and this is more than the combined employment which is created by Germany and Italy effectively. It can be ascertained from the above statistics that the large population of India puts a large emphasis on the maintenance and service delivery of the railways properly.

It also is indicative of the fact that the Indian Railways are required to ensure a high rate of efficiency in delivery of product quality as compared to that of Germany and Italy. Further, maintenance requirements are more requirements for Indian railways and it can be viewed that there is an effective need for ensuring new technological developments which can be applied in the context of this country.

Comparing the statistics however, it can be analysed that German railways have the highest revenue generation capacity. As compared to this, Indian Railways has a decent amount to buy Italian railways which do not generate as much. (Indianrailways.gov.in, 2020) {13}

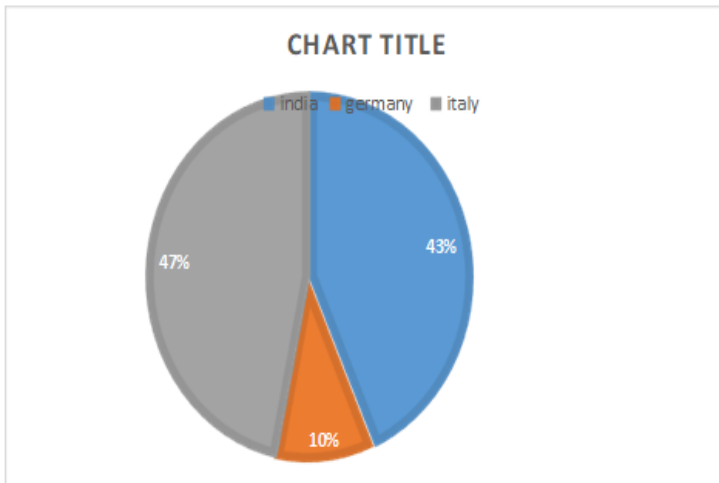


Chart-1: Comparison of maintenance amount between Italy, India and Germany

3. Case Study



We have visited to the Miraj junction for getting the information of the maintenance methods machinery's and other information for the future expansion and modification as per to the following two developed countries which we have selected they are Germany and Italy .

There we meet the respected Engg Dipak Kumar sir who have guided us very properly for which we have asked and they also provided the extra knowledge for us and they cleared all our doubts and gave us the right information

4. Objectives

1. To study maintenance techniques used in developed countries.
2. To study maintenance techniques used in India
3. collect information of maintenance carried out in that railway station

4. To compare maintenance techniques between developed countries and in India.
5. To suggest the best maintenance techniques with various parameters.
6. To conduct visit to the nearby railway station and

5. CONCLUSIONS

Summarizing the findings of this study it can be inferred that there is an effective rate of conclusively that can be drawn out in terms of the overall systems in the three railways. It can be analyzed that the Indian railway system is not below par and it is heavily suited to take the laid which has been described 239 However, it can also be inferred that the Indian railway system essentially is functioning at a breakeven and has not been able to achieve its full efficiency. This indicates as to why the level of effective quality is lower and the revenue generated is also lower.

It can be viewed that there is a need for implementing the Industry 4.0 system in addition to big data analytics procedures and predictive analysis systems. The existing predictive analysis system is a huge efficiency area for the Indian railways and it also provides a sound amount of effectiveness in terms of efficiency. Additionally, it can be analyzed that the systems of online monitoring of railway systems helps in order to effectively improve the safety quotient of Indian Railways. Additionally, it can also be inferred that a combination of these aspects makes it very advantageous and safe.

However, owing to the great population size the pressure on these systems is greater and thus, it can be inferred that Industry 4.0 will be advantageous for the Indian railway maintenance and service delivery prospects. This is because the process of industry 4.0 falls in line with TQM requirements and seeks to provide high quality delivery. This will allow for Indian Railways to generate an extended scope of their operations and also ensure that safety and security for passengers are maintained in the overall process. It will also add to the existing big data analytical and predictive risk measurement systems and provide greater efficiency to the overall system of OMRS as well. Thus, it can be understood that a higher level of effectiveness can be instilled into the Indian railway management and maintenance systems and this would also allow in reduction of risks. It conversely would allow the generation of economies of scale for larger scales of revenue generation even after cost cutting. This provides a double benefit for the passengers and the railways.

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