SJCE

SCIENTIFIC JOURNAL OF CIVIL ENGINEERING

SS CYRIL AND METHODIUS UNIVERSITY
FACULTY OF CIVIL ENGINEERING

Volume 9
Issue 2
December 2020

ISSN - 1857 - 839X

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EDITORIAL - Preface to Volume 9 Issue 2 of the Scientific Journal of Civil Engineering (SJCE)

Marijana Lazarevska EDITOR - IN - CHIEF

Dear Readers,

Scientific **J**ournal of **C**ivil **E**ngineering (SJCE) is an international, peer-reviewed journal published bi-annually since December 2012. It is an open access Journal available at the web site of the Faculty of Civil Engineering in Skopje (www.gf.ukim.edu.mk).

This Journal is committed to publish and disseminate high quality and novel scientific research work in the broad field of engineering sciences. SJCE is designed to advance technical knowledge and to foster innovative engineering solutions in the field of civil engineering, geotechnics, survey and geo-spatial engineering, environmental protection, construction management etc.

As an editor-in-chief of the Scientific Journal of Civil Engineering, it is my great pleasure to present the Second Issue of Volume 9, an issue that is mainly devoted to **MARE**, the **M**acedonian **A**ssociation for **R**oads **E**ngineers.

MASE has been present in the engineering world for 50 years. Celebrating its 50th anniversary they organized the First Macedonian Road Congress in Skopje, in November 2019.

This congress gathered more than 300 participants from 16 different countries. Invited lecturers from Netherlands, Serbia, Croatia, Slovenia, Austria and North Macedonia had a unique opportunity to share their rich and valuable professional experience, contributing significantly for the great success of the Congress.

This general idea behind this Issue of SJCE is to acknowledge the importance of MARE for the professional growth of many road engineers and to support their enthusiasm for staring a new chapter in their scientific research and expert development. That is the reason why the editorial board invited the guest speakers of the First Macedonian Road Congress to participate in this Journal by publishing their recent scientific-research work.

This Issue of the Journal contains the most current research findings in the field of planning, design and construction of roads, risk management of major road projects and road safety. It includes the introduction part that gives a short overview of the First Macedonian Road Congress, followed by eleven papers written by the invited and selected speakers of the Congress and one paper in the field of geodesy.

I thank all the authors for contributing to this Issue and all the reviewers for providing detailed and timely evaluations of the submitted manuscripts.

It is a great challenge for the editor members to bring a new journal issue into the world, especially when the journal aims to publish high quality manuscripts. I would like to express my sincere gratitude to all of them for their excellent work, remarkable contribution, enthusiasm and support, especially during these tough times of COVID-19 pandemic.

Sincerely Yours,

Assoc. Prof. Dr. Marijana Lazarevska

December, 2020

SJCE
SCIENTIFIC JOURNAL OF CIVIL ENGINEERING

Impressum

FOUNDER AND PUBLISHER

Faculty of Civil Engineering
Partizanski odredi 24, 1000
Skopje, N. Macedonia

PRINT

This Journal is printed in Printing House "Kosta Abras", Ohrid

EDITORIAL OFFICE

Faculty of Civil Engineering
Partizanski odredi 24, 1000
Skopje, N. Macedonia
tel. +389 2 3116 066
fax. +389 2 3118 834
prodekan.nauka@gf.ukim.edu.mk

ISSN: 1857-839X

ORDERING INFO

SJCE is published bi-annually.
All articles published in the journal have been reviewed.
Edition: 100 copies

SUBSCRIPTIONS

Price of a single copy:
for Macedonia (500 den);
for abroad (10 EUR + shipping cost).

BANKING DETAILS (NORTH MACEDONIA)

Narodna banka na RNM
Account number:
160010421978815
Prihodno konto 723219,
Programa 41

BANKING DETAILS (INTERNATIONAL)

Correspond bank details:
Deutsche Bundesbank Zentrale
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National Bank of the RNM
Address: Kompleks banki bb 1000 Skopje North Macedonia
SWIFT BIC:NBRM MK 2X
IBAN: MK 07 1007 0100 0036 254
Name: Gradezen fakultet Skopje

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RELIABILITY PROBLEM AND FAILURES OF TECHNOLOGY OR SYSTEM USED IN RAILWAY TRAFFIC FOR TRAFFIC REGULATION AND MANAGEMENT

Many travelers avoid rail out of frustration with unreliable train services. Trains are often late or canceled. From 10% to 25% of European passenger rail trains suffer delays, depending on the operator. About a third of those delays are caused by poorly maintained trains.

Lately new technologies have been developed. Driverless trains and maglev trains are the most important technologies developed in the railway industry. Maglev trains are faster, more efficient, and more environmentally friendly than modern wheeled trains. Driverless is the future technology, and there are many benefits and advantages of the system over conventional technologies.

Keywords: railways, transportation system, reliability problem, maglev trains, driverless trains, accidents

1. INTRODUCTION

Railway transport is energy efficient, comfortable, fast, provides a larger carrying capacity, is safe and reliable, and emits a low percentage of CO2 (less than 2%), making the railway industry one of the most efficient and environmentally friendly transportation systems globally [1].

Railways had reached their peak in the nineteenth century when they became essential in the transport of passengers and goods [2].

Railways are massive infrastructures and are the prime mode of transportation in numerous countries. Given that it is associated with cargo and passenger transportation, transport contains a high risk of asset costs and human lives. Even though better safety standards and new technologies continuously introduce, accidents still occur. Derailment and collision risks will always be present. However, the elimination of fundamental causes can reduce them.

2. RELIABILITY PROBLEMS IN RAILWAY TRAFFIC FOR TRAFFIC REGULATION AND MANAGEMENT

Reliability in transport relates to the absence of incidents, which relates to the risk factor. The latter is caused by technical failures and the physical environment, in which the human element is decisive [4]. Technical problems can occur in the track, rolling stock, or safety installations. Issues with the trail can be due to excessive speed or the failure of one or more of its components; those with rolling stock are caused by deterioration, with missing wheel flanges and suspension failure being the most frequent derailment causes.

Other incidents can relate to engines, which can cause the train to stop, or faults with couplings, whose failure can cause it to break apart. As for safety installations, their absence or defective operation can cause accidents.

The physical environment can affect trains in various ways, such as the slippage of a cutting or embankment, torrential rain, or earthquakes, and authorities can do little about them. Only railway construction on land where such events cannot occur can prevent such accidents or lessen their impact on train services.

Lastly, problems with the environment can include the human factor. Many incidents are caused by railway staff through incorrect action or failure to take the necessary action [5].

When railway accidents happen, regardless of the causes or the safety measures in place, we can't help but wonder about train travel safety. When a vehicle as huge and heavy as train crashes, the resulting injuries and life loss can be tragic and extensive.

3. TRAINS DRIVEN BY COMPUTER SYSTEM – DRIVERLESS TRAINS

Train reliability is an infamous sore point for commuters who have been caught in the middle of a system failure. With an automated system, this issue can be reduced significantly.

Driverless is the future technology, and there are many benefits and advantages of the system over conventional technologies.

First of all, it is a fully grade-separated driverless automated system. The Operation Control Centre automatically controls trains, and adjustments can be made quickly to meet demand changes. Before the regular operation starts in the morning, trains are automatically positioned for service. All is done automatically with little to human intervention [6].

In 2018, the International Association of Public Transport found 42 cities worldwide run 64 fully automated lines, with over 50 % of them in Asia.

In China alone, 32 fully automated metro lines will be entering service across 16 cities by 2022 [7].

4. MAGLEV TRAINS

In the 21st century, a few countries use powerful electromagnets to develop high-speed trains, called maglev trains. These trains float over guideways using magnets basic principles to substitute the old steel wheel and track trains. There is no rail resistance to speak of, meaning these trains can reach speeds of hundreds of km per hour [8].

Yet high speed is just one significant benefit of maglev trains. Because the trains rarely touch the track, there is significantly less vibration and noise than the conventional trains, resulting in considerably less mechanical breakdowns and weather-related delays.

The distinction between a conventional train and a maglev train is the lack of a traditional engine in the maglev trains. The engine that maglev trains use is rather inconspicuous. Rather than using fossil fuels, they create a magnetic field generated by the electrified coils in the guideway walls, which combine with the track to drive the train [9].

Maglev trains are eliminating friction as they hover on a cushion of air, which, combined with the trains aerodynamic design, enables them to reach unprecedented ground transportation speeds of more than 500 km/h, or twice as fast as Amtrak's fastest commuter train [10]. Developers say that maglev trains will ultimately connect cities that are up to 1,609 kilometers apart. You could travel from Paris to Rome at a speed of 550 km/h in just over two hours [11].

Some maglev trains can achieve even higher speeds. In October 2016, a Japan Railway bullet train blazed to 601 km/h during a short spell. Those kinds of speeds give engineers hope that technology will prove useful for routes that are hundreds of miles long [12].

5. TRAIN ACCIDENTS STATISTICS

Train accidents are not as frequent as other transportation accidents, so they are not viewed as a significant threat. Although railroads are not used as frequently as they were in centuries past, they remain considerably active. Regrettably, when train accidents occur, they usually result in severe injuries and fatalities.

In the EU-27, 1 666 significant railway accidents were reported in 2018. In these accidents, 853 persons were killed, and another 748 persons were severely injured. At the EU level, the number of fatalities in railway accidents decreased gradually from 1 245 in 2010 to 853 in 2018. Suicides occurring on railways were reported separately. With 2 379 reported incidents in 2018, suicides outnumber the victims of railway accidents [13].

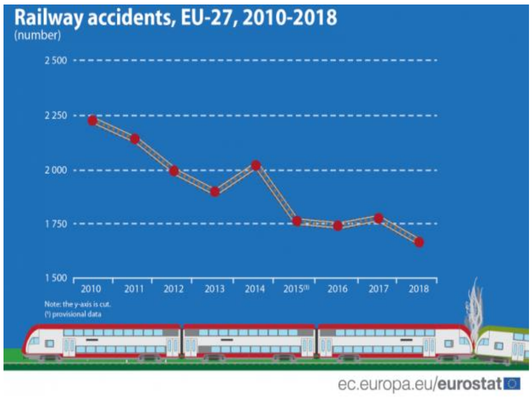

Figure 1. Railway accidents, EU – 27, 2010 – 2018, Source: Eurostat (trans_sf_railac)

Most fatalities from railway accidents happen at level crossings or involve unauthorized persons on the tracks [14].

On August 11, 2006, a maglev train chamber caught fire on the Transrapid Shanghai airport line. There were no injured passengers, and investigators believed that the fire was caused by an electrical problem [15].

On September 22, 2006, in Emsland, Germany, a Transrapid test train crashed into a repair car unintentionally left on the track during a test run. The train was going at least 193 km/h at the time. There were twenty-three casualties and eleven injured. A tribunal ruled that the incident was caused by human error, which could have been avoided if employees had followed established regulations and procedures.

Since 2006, no further maglev accidents have been reported [15]. Despite this, the test trains in Germany were eventually suspended while the Shanghai maglev train still operates.

Persons killed in railway accidents by type of accident, 2018
(number)

	TOTAL	Collisions	Derailments	Level crossing accidents (incl. pedestrians)	Accidents to persons by rolling stock in motion (excl. suicides)	Fires in rolling stock	Other accidents
EU-27	853	11	3	254	584	0	1
Belgium	13	0	0	9	4	0	0
Bulgaria	18	0	0	4	14	0	0
Czechia	28	0	0	21	7	0	0
Denmark	6	3	0	3	0	0	0
Germany	128	2	0	35	91	0	0
Estonia	5	0	0	2	3	0	0
Ireland	0	0	0	0	0	0	0
Greece	17	1	0	4	12	0	0
Spain	16	1	0	7	8	0	0
France	58	3	0	16	39	0	0
Croatia	18	0	0	8	10	0	0
Italy	73	0	3	4	66	0	0
Latvia	12	0	0	5	7	0	0
Lithuania	12	0	0	3	9	0	0
Luxembourg	2	0	0	2	0	0	0
Hungary	93	0	0	20	72	0	1
Netherlands	16	0	0	13	3	0	0
Austria	16	1	0	6	9	0	0
Poland	195	0	0	49	146	0	0
Portugal	18	0	0	4	14	0	0
Romania	60	0	0	17	43	0	0
Slovenia	5	0	0	1	4	0	0
Slovakia	30	0	0	15	15	0	0
Finland	5	0	0	4	1	0	0
Sweden	9	0	0	2	7	0	0
United Kingdom	30	0	0	4	26	0	0
Channel Tunnel	2	0	0	0	0	0	2
Norway	5	0	0	1	4	0	0
Switzerland	11	0	0	1	10	0	0
Montenegro	:	:	:	:	:	:	:
North Macedonia	6	0	0	3	3	0	0
Turkey	76	9	25	15	25	0	2

(:) Not available
Source: Eurostat (online data code: tran_sf_railvi)

eurostat

Figure 2. Persons killed in railway accidents, by type of accident, 2018, Source: Eurostat (trans_sf_railac)

6. CONCLUSION

We must be aware of the reciprocity between human interactions and technology and how each will proceed to underlie many causes and contributing factors of future incidents.

As a civil engineer who researches transportation infrastructure, dangerous goods, and risk, I see several changes to the policy that can help reduce future accidents.

Companies must perform everything they can to achieve safety for railroads and railways to ensure the passengers, operators, pedestrians, and society.

When a train crash occurs, the black box should be recovered as it will provide essential details of what has caused the accident, such as the train's speed and direction. The black box is crucial in determining if there was any oversight on the part of the railway.

Fortuitously, the safety of everyone involved in railway transport is more important than ever for the railway industry. Operators go through rigorous training, and solely the ones who meet strict requirements are accepted. State inspectors also work with the Macedonian Railways - Transport to ensure all railroad tracks and buildings across the country are safe, secure, and updated according to safety regulations.

From the above, I can conclude that maglev trains exceed other rapid transit rail systems in the areas of travel comfort and safety. The design of the guideway ensures that the trains are safe from the derailment. Today, maglev trains are considered to be among the safest and most comfortable rapid transit systems globally. Even concerning earthquakes, maglev trains are considered to be very secure fast transit systems, which will make them the rail transportation of the future.

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