RAILWAY SAFETY MANAGEMENT SYSTEM

Pavel Popov[1]

The article is devoted to the analysis of railway safety management system. It is clear that advanced railway safety management system is of great importance for a country. The fact is understandable as well as for the global community due to rail transport is a part of the logistics chain, which facilitates international trade and economic growth. In the article the author also examines the key components of safety management system and the requirements to it.

Safety is regarded by the author of the article as a prime consideration in the successful performance of duties of railway managers. Management is specifically responsible for the development and implementation of safe practices and procedures.

It is pointed out that the objectives of the safety management system regulations are to ensure that safety is given management time and corporate resources and that it is subject to performance measurement and monitoring on par with corporate financial and production goals.

The author of the article stresses that it is important to railway safety management system that company policy should sustain continuing programs designed to promote the health and safety of all employees and to co-operate with organizations and associations devoted to safety research and education.

Russia has 85,000km of railways, making it the second largest network in the world after the US. Rail dominates the freight transport network accounting for 42.7% of total turnover, according to the Federal State Statistics Service, and around 85% of total turnover, if pipeline traffic is not included. Rail has a competitive advantage due to the large distances between different production centers in Russia. The road network is currently insufficient in terms of coverage and quality of the roads, while the waterways freeze during Russia's long winter. The major cargo types carried by rail are coal (23% of the total) followed by oil products, (18%) and construction materials, (15%). That's way railway safety management system is very important to RZD as to a railway company of any other country.

Key words: railway safety, railway transportation

1 Safety on railway

The problem of safety in railway transportation becomes especially important on account of ever-increasing speeds. Safety on railways depends on many factors [1]. One of them is signaling. Two trains cannot be running on the same section at the same time and then they cannot collide. This factor forms the basis of most signaling system. The method of controlling train movements is known as CTC or Central Traffic Control. The next important thing for safety on railway is automatic train protection system which

[1]Student Pavel Popov, Moscow State University of Railway Engineering, Institute of Transport Engineering and Operation Management, 127994, Moscow, ul. Obratsova, dom 9- 9, Moscow, Russia, tel.: + 9067060201, E-mail: pavel.ch.9@seznam.cz

is a technical installation on railway lines and trains to ensure safe operation in presence of human failures.

2 Challenges to standard train control

Some decisive action needs to be taken soon in order to ensure the evolution of a truly standardized European Train Control System. The first interoperable lines have been put into operation, and traffic is starting to grow. This should have the way for interoperability to move from pragmatic to full implementation. But whilst the end vision is clear, it seems that not enough attention has been paid to common international migration strategies, and the interoperability issues that arise when railways have reached different stages of implementation.

Looking at operations, it is possible to say that current practice is that bilateral agreements which negotiated between infrastructure managers and railway undertakings as well as between infrastructure managers in neighboring countries. But these agreements are not standardized.

Infrastructure managers acting only within their own country prefer to install balises which command and accept only those systems that apply in that country.

Right across Europe, politicians and railway operators are putting their faith in ERTMS (ERTMS = European Rail Traffic Management System) as the panacea for many of the rail industry's problems. More capacity, greater reliability, cross-border interoperability, ERTMS will solve them all. But time after time, the road to Utopia has been paved with problems - and not just technical teething troubles.

In many cases, there seems to be a basic lack of comprehension about what ERTMS is, and what it does. Or speaking in other way, about the technical elements of the signaling and train control aspects forming the European Train Control System. The omission of operating standards from the TSIs was intended to give railway operators and infrastructure managers the flexibility to apply ETCS to their networks in the most appropriate way.

Each country claims its choice based on sound arguments, but it would be hard to explain to a driver why such important changes occur when his train crosses a border. In most cases these differences will only become apparent to the driver under specific failure conditions, which makes the issue potentially quite serious. Most railway accidents do not happen in normal operating conditions, but only after one or more ‘abnormal’ events.

The detailed operating requirements are influenced by the following three factors: 1) mandatory rules; 2) infrastructure and equipment; 3) operating practices.

While speaking about mandatory rules it is important to point out that they are the essential requirements for safe operation, such as those laid down in Germany's EBO (Railway Building & Operation Regulations). Not all railways have everything in their written rule book, but the key rules differ between railways more by their comprehensiveness than their content.

It has become clear that there is still no common agreement on how railways should operate using ETCS (ETCS = European Train Control System). The emergence of international standards for the application and operation of ETCS will depend on the convergence of infrastructure and equipment standards.

Another key issue is the question of braking parameters. This involves the ETCS equipment manufacturer, the rolling stock supplier and the infrastructure manager, whose choice of trackside equipment is influenced by the characteristics of the rolling stock using the routes being fitted.

3 Ongoing reform of RZD

Proposals for the reform of Russian Railways long-distance passenger business and the creation of a new operating company have been agreed in principle by the RZD management team. Restructuring of the long-distance passenger business is seen as one of the most important issues in the ongoing reform of RZD. In its proposals for the evolution of the new company, RZD has drawn up two development scenarios, with the investment programs to handle the projected traffic volumes.

Speaking at a special railway congress on November 24, 2009 Russian President Vladimir Putin emphasized the importance of renovating the national rail network, and providing for a fundamental technical modernization of rail transport throughout Russia. The congress formally adopted RZD's 'Strategy for Railway Development up to 2030', which had been endorsed by the government on September, 2009.

New lines are needed to open up mineral reserves, especially in the eastern and northern regions. At present seven of Russia's administrative regions have no railways at all, but Vladimir Yakunin said that four of them - the Altay Republic, plus the Tyva, Magadan and Nenetsky autonomous districts - will get their first lines by 2030. In total, the strategy envisages the construction of 20 000 km of new lines by 2030.

RZD says the development strategy will be delivered in two stages. The first covers 2008-15, during which time 'current operations will be fundamentally modernized and capacity shortages addressed. Obsolete motive power and rolling stock will be replaced, reducing average fleet age by about 15%.

Adoption of asynchronous drives is expected to reduce energy use.

3.1 Three-stage program to update RZD's fleet

The Strategy for Railway Development in the Russian Federation to 2030 sets out the details of a policy to modernize the 86 660 km national network and renew the aging motive power fleet.

Stage 1 of the program is designed to raise the performance and productivity of locomotives now in service and to develop and test prototypes designed during the transition period. Stage 2 envisages expansion of motive power manufacturing capacity, with extensive modernization of production facilities. Stage 2 is also connected with the start of series production of locomotive designs developed during the transition period, while prototypes for the future generation of motive power with asynchronous motors will be built and tested, paving the way for series production in the final stage.

RZD has already updated its purchasing strategy to reflect practice elsewhere. In the past RZD bought locomotives on the basis of capital cost, but future purchases will take life-cycle costs into account. This should also reflect quality and reliability, with components standardized where possible and specialist equipment provided for specific duties. In association of 72 railway equipment manufacturers had been set up to tackle the issues facing Russia's locomotive supply industry. The association would help draw up a production program for building the next generation of locomotives.

3.2 Fleet renewal

At the moment RZD has 13 800 diesel and electric locomotives, of which 11 100 are designed to haul freight; it also has 16 000 EMU cars. The Strategy for Railway Development says that RZD will need 23 400 locomotives and 24 000 powered EMU cars built to international standards by 2030 [2].

While spiking about a vision of the intelligent railway, it is important to us to emphasize that communications-based train control is putting more intelligence on board trains, along with high capacity data links that can be harnessed to carry other systems. The biggest challenge is that communications-based train control means putting infrastructure onto the trains. We need to understand the balance of costs and benefits between infrastructure manager and train operator. Communications-based train control is to optimize asset management, control and monitoring using the same closed communications loop without compromising the safety integrity.

We need time to allow that to become established, for customers to become confident, and for suppliers to deliver against that standard.

3.3 Growing market share

Invensys is growing fastest, with an average of 10% per year. We recognize the lumpy nature of order intake. The strategy is clear: no doubt it is important to focus on single-platform technologies. When choosing new markets it is necessary to look for a clear commitment to invest in rail. Although that is a very simple filter it is good enough to give us the confidence to commit resources into the country. It is all about sustainability and the visibility of the order pipeline.

Another area of growth is maintenance and support services.

While speaking about manufacturing capacity expands it is important to point out that RZD uses two main motive power suppliers: Transmash Holding, which is the main builder of diesel and electric locomotives, and Sinara Transport Machines Group. To meet demand from RZD, TMH is expanding its production capacity [5].

3.4 Intelligent automation

A lot of rail technology today was pioneered in industrial automation applications [3,4]. It is interesting to look at how technology can help the capacity and efficiency of railway operations. If we look at the industrial automation processes, we can see a similar progression there too. In the rail sector, it is possible to start with discrete elements prove a number of applications and integrate them later.

A broader intelligent infrastructure offers the next level of technology. There are systems for real-time monitoring of track circuits and point machines, for instance. In case we add in power supplies and energy usage, ventilation, security and passenger information systems this would all help to optimize system availability.

3.5 Railway of the future

Russia has 85,000km of railways, making it the second largest network in the world after the US. Rail dominates the freight transport network accounting for 42.7% of total turnover, according to the Federal State Statistics Service, and around 85% of total turnover, if pipeline traffic is not included. Rail has a competitive advantage due to the large distances between different production centers in Russia. The road network is currently insufficient in terms of coverage and quality of the roads, while the waterways freeze during Russia’s long winter. The major cargo types carried by rail are coal (23% of the total) followed by

oil products, (18%) and construction materials, (15%). That's way railway safety management system is very important to RZD as to a railway company of any other country [5].

There is a great hope in the nearest future we will see the evolution of an overarching intelligent infrastructure for the whole railway. The intelligent railway concept poses a challenge for operators as well as suppliers. This cuts right across organizational and technical boundaries. There will be an impact on the IT department, operations, maintenance, S&T, even the customer services department. They all need to discuss the concept, and work together, and everyone needs to get comfortable with the vision.

Thus we can make a conclusion: if the railway company works with one or two customers to define their requirements and produce a working model to demonstrate reliability and effectiveness then it will give a nice opportunity to refine the requirements, and the customer to develop a business case.

Reference literature

1. ИНСТРУКЦИЯ по движению поездов и маневровой работе на железных дорогах Российской Федерации. Москва: МПС, 2002. pp. 316.
2. КОЛУБЕНКО В.Г. – Безопасное управление поездом, Москва: Маршрут 2005. 307 p. ISBN 5-89035-169-9.
3. ПОПОВ, Павел. – Железнодорожная лексика как составная часть общетехнической терминологической системы // Профессионально-ориентированное обучение иностранному языку: Материалы международной конференции. Москва: Российский университет Дружбы народов, 2009 .pp. 264-269.
4. ПОПОВ, Павел. – Железнодорожная лексика как составная ПОПОВ, Павел.– Терминология в транспортной деятельности. // Третьи Всероссийские Державинские чтения: Сб. статей в 8 кн. –М.: РПА, 2008. pp. 160 -164.
5. ПРОКОФЬЕВ И.А. Коммерческая эксплуатация на транспорте. М. РАПС, 2008. – pp. 227.