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ALTERNATIVE USE OF PARAMETERS COLLISION AND THREATS DETECTION MODULE TO ADVANCED REPORT OPTIMIZE FUEL CONSUMPTION AND ENERGY

Abstract

Introducing integrated system ZSIKRP have important implications for increased passenger comfort and improve the technical level and reduce the maintenance costs of rail vehicles. Currently the majority of manufacturers of rolling stock is focused on meeting the TSI requirements in the context of the interoperability of rolling stock within the ERTMS/ETCS and in these works there is no place for activities aimed at introducing systems supporting the work of the driver and increase the safety of passengers. The adopted within the framework of ERTMS/ETCS work focused on ensuring the safety of structural (as defined in the standard EN 50129), while the project ZSIKRP focused on the safety of travellers and safety resulting from the technical conditions in rail transport as well as in the context of protection against attacks of aggression. A special module was devoted to the role of optimizing the fuel consumption of the vehicle SA 132-006 (type SZT) and energy in EN 57-1756 (type EZT).

INTRODUCTION

Fuel consumption monitoring module enables effective management of rolling stock. The flexibility of the module makes it possible to adapt it to various types of locomotives with diesel engine and different types and amounts of fuel tanks [11,12]. Probes fuel used to measure the hydrostatic pressure generated by the fuel stored in the tank. The tank SA 132-006 (SZT) placed one probe fuel. The probes are made in microprocessor technology and the data from the sensors are transmitted to CPU units via RS485.

Fuel consumption module in ZSIKRP (Fig. 1) system [1-5] allows the generation of an extensive multi-dimensional report, taking into account: the data driver RPM, vehicle speed, fuel consumption, the slope of the land and obtained the acceleration of the vehicle. On vehicle fuel economy have important impact of the above parameters. The following is a comprehensive report (Figs. 2,3) that allows multidimensional analysis for a selected period of time.

1. THE MAIN ELEMENTS FUEL CONSUMPTION MONITORING AND PREDICTIONS MODULES

In ZSIKRP system the very useful data collected to the report from collision and threats detection module the acceleration values and the angle of inclination of the rail vehicle were obtaining.

Because the fuel consumption of a railway vehicle is affected by environmental conditions, sub-module is designed tab METEO, taking into account the possibility of obtaining information regarding, eg. Temperature, wind speed and direction, etc. All the above. parameters allow the analysis of the level of fuel consumption by the driver depending on many environmental parameters including the parameters of climate, weather.

Tab METEO module to optimize fuel consumption information examples of websites giving information on the current meteorological situation, eg. www.imgw.pl.

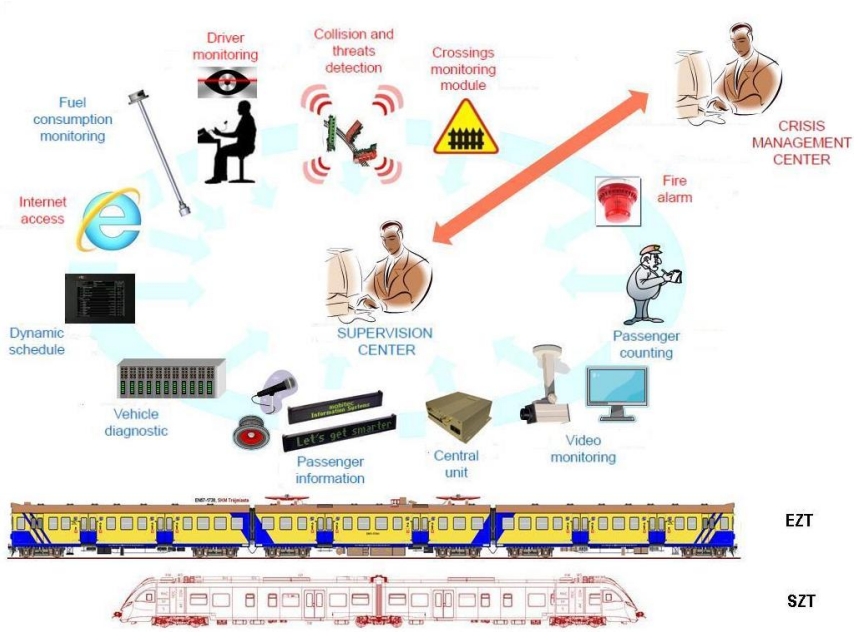

Fig.1. *Concept of integrated system supporting information management of railway passenger traffic*

It is possible to observe from the level of application Supervis-Center module picture trail in front of a rail vehicle - option is useful in order to determine whether on the track or in their vicinity are: leafs (the cause of wheel slip when starting a rail vehicle, affecting on consumption fuel), snow, the information from the video-monitoring module used for visual analysis environment of the vehicle and rails purity (Figs. 4,5).

Fig.4. *Video on-line from video-monitoring module – monitoring rails purity in Surveillance Centre module - SA 132-006 (type SZT), winter*

Fig.5. *Video on-line from video-monitoring module – monitoring rails purity in Surveillance Centre module - EN 57-1756 (type EZT), autumn*

The module allows monitoring of tilt and acceleration (Fig.6) of the vehicle and send the information to the Supervision Center Module.

In the train two collision and threats detection modules are installed. Communication with the modules is done via Ethernet. Resulting parameters from the Central Unit Module via GSM module [6-8] sends to the Supervision Center Module.

From the collision and threats detection module are sent to the current values of acceleration and tilt angles.

Information obtained about transient acceleration values are important in finding whether the driver was in a hurry trying to implement the planned timetable (SKRJ). It is logical to conclude that delayed vehicle will consume more fuel trying to make up for the delay. This will have an impact on the values obtained acceleration and inclination of the vehicle with the collision detection module and threats (Fig. 7).

Below are the characteristics of combustion engines and their characteristics, which efficiency depends on the way driving (frequent acceleration, delay, variable speed). In addition, power consumption globally influences the emissions of nitrogen oxides, hydrocarbons, affecting significantly the environmental aspect – emissions: NOx, CnHm [9] (Figs. 8-10).

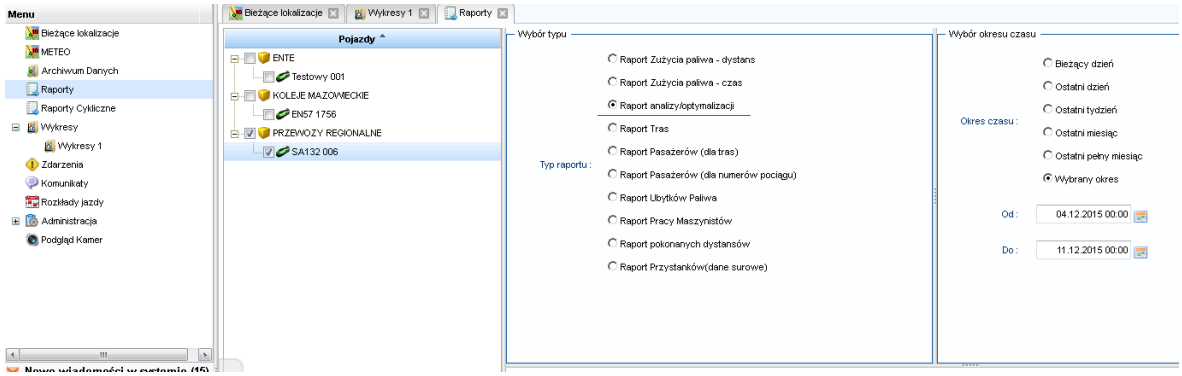

Fig.2. *Selection of parameters expanded report analysis/optimization of fuel consumption*

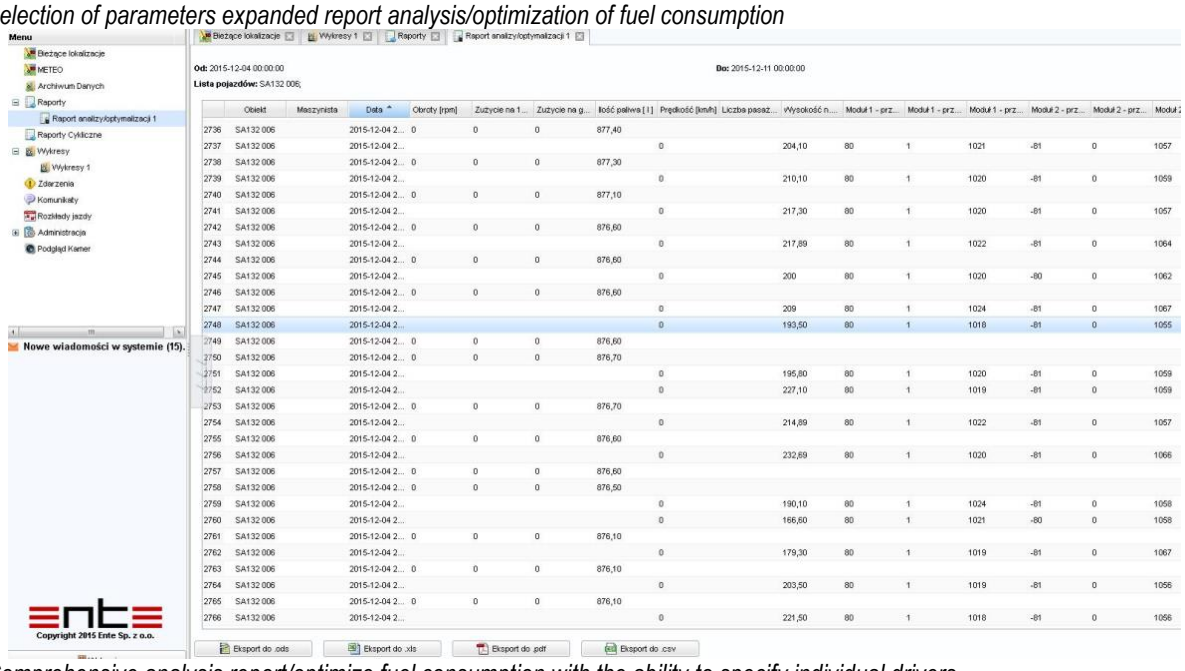

Fig.3. *Comprehensive analysis report/optimize fuel consumption with the ability to specify individual drivers*

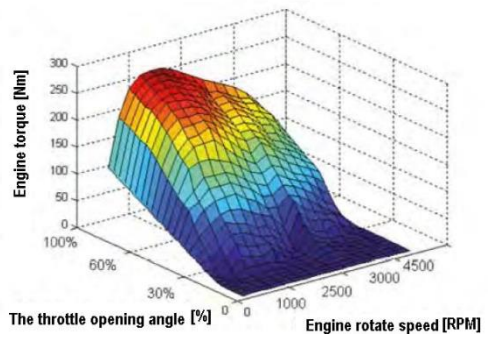

Fig. 8. *Characteristics of engine torque - very high fuel consumption at 60-100% throttle opening [10]*

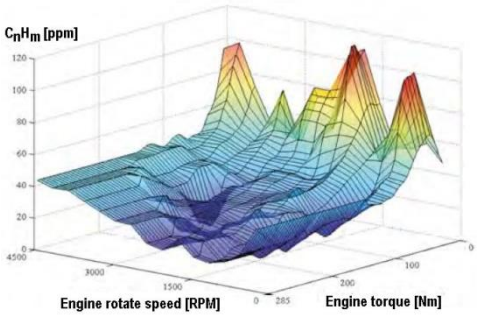

Fig. 10. *Emissions of hydrocarbons CnHm - control determines the emissivity of CnHm [10]*

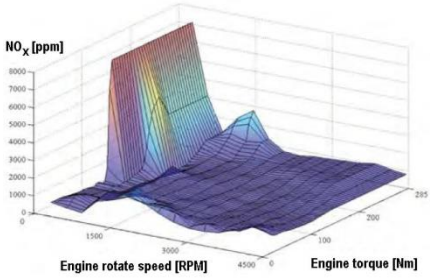

Fig. 9. *NOx emissions - control determines the emissivity of NOx [10]*

CONCLUSIONS

Additional information on fuel economy basis on of information from the collision detection and threats module are achieved, exactly: accelerations and speed from central unit module. The module optimize fuel consumption is realized as a programming module. it enables the processing of data from the sensors and measuring systems, such as: fuel probe, the speed, the engine parameters. additionally parameters from the collision and threats detection module provide additional information about economy of driving (prediction function module for a vehicle type SA 132-006). Similar rules can be applied to electric trains, assume electricity consump-

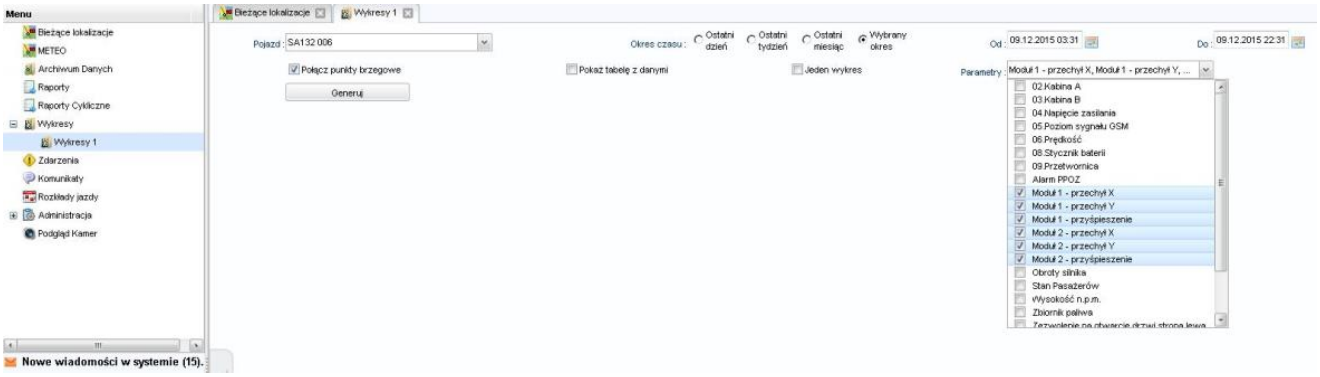

Fig. 6. *Generate a report from collision and threats detection module - initial conditions and the choice of values*

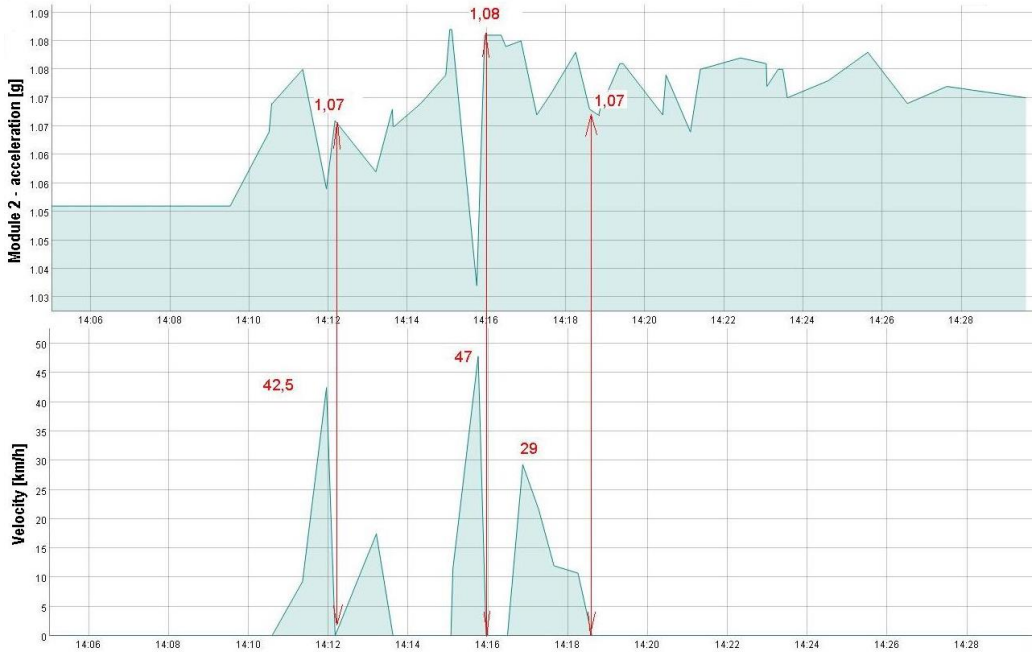

Fig. 7. *The correlation between the values of speed (braking moment) and obtained maximum values of acceleration (delay) of the vehicle SA 132-006*

tion [MWh] as the amount of energy consumed by the electric vehicle. the diagnostic module is ready to process the data coming from the vehicle type EN-57- 1756, such as information about: raised pantographs, energy consumed, the voltage on the inverter, voltage traction, etc. Collision and threats detection module can function as a predictive module to optimize fuel consumption for vehicle SA132-006.

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The Polish Patent Office received a patent describing collision and threats detection device, dated 20.11.2014, the number of the P. 410110, "Collision and threats detection device especially to rail vehicles".

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ALTERNATYWNE ZASTOSOWANIE PARAMETRÓW MODUŁU WYKRYWANIA ZAGROŻEŃ I ZDERZEŃ DO ZAAWANSOWANYCH RAPORTÓW OPTYMALIZACJI ZUŻYCIA ENERGI I PALIWA

Streszczenie

Wprowadzenie zintegrowanego systemu ZSIKRP ma istotne znaczenie dla zwiększenia komfortu pasażerów i zmniejszenia kosztów eksploatacji i utrzymania pojazdów szynowych. Obecnie większość producentów taboru koncentruje się na spełnienie wymagań TSI w kontekście interoperacyjność taboru w ramach ERTMS / ETCS. W tych obszarach nie ma celowości dla działań mających na celu wprowadzenie systemów wspomagających pracę maszynistów i poprawiających bezpieczeństwo pasażerów. Przyjęta w ramach ERTMS /ECTS prace skoncentrowane są na zapewnieniu bezpieczeństwa elementów struktury systemu (jak zdefiniowano w normie EN 50129), natomiast projekt ZSIKRP zorientowany jest na bezpieczeństwo podróżnych i bezpieczeństwo wynikających z warunków technicznych w transporcie kolejowym, a także w kontekście ochrony przed zagrożeniami. Dodatkowo opracowano specjalny moduł dedykowany do optymalizacji zużycia paliwa przez pojazd SA 132-006 (typ SZT) i energii w EN 57-1756 (typu EZT).

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