OPTIMIZATION OF THE COMMUNICATION NAVIGATION SYSTEM OF TRUCKS

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ABSTRACT

The communication navigation system of trucks is one of the tools used for good management of bigger groups of vehicles. The concept itself was introduced in 2005. The theoretical basis was put into practice towards the end of 2008 with the new generation of systems for tracking, navigation and communication CVS/Via-Vek, the IT solution to manage transport operations TMS Click Trans and to organise the process of managing transport operations system in VIATOR&VEKTOR group. The existing system is presented and the savings based on it. Suggestions for an upgrade of the existing system are given and the expected positive changes.

1 INTRODUCTION

The communication navigation system of trucks in use is the tool for a more rational use of transportation. Educating most of its users is needed for its use. With the education of drivers in the area of safe and economical driving in the cooperation with MAN Gospodarska vozila Slovenija d.o.o., we reached substantial savings on fuel, reduced damage and wear and tear of vehicles. In the area of administrative preparations for the transportations and the analysis of transportations made, the savings show on a faster response of dispatchers, easier and better communication and reduction of Admin work. Because the system is open to new applications and updates we are monitoring the work and analyzing the results. On the basis of results and experience we suggest some updates and changes.

2 A DESCRIPTION OF THE EXSISTING SYSTEM

The system enables a constant written communication between the drivers and the control centre, a simple navigation in the vehicle (turn by turn) with voice guiding in different languages and increasing the drivers’ security. It enables the dispatcher to manage the fleet online, plan the transportations, plan the route, show every vehicle’s current location, show current positioning of every vehicle, show the route travelled for every vehicle, generate work orders, enter points of interest, status confirmation, a constant written communication with the driver, monitoring of all telemetry data from the CAN-BUS lead and the additional sensors (speed, fuel, temperature ...), monitor and respond to alarms from the vehicle. The purchaser is able to monitor their cargo’s transport online, ETA (estimated time of arrival), while the owners are able to constantly monitor expenses, plan and manage the maintenance of the fleet, see on-line reports by different parameters (by vehicle, driver, customer, country ...), to analyze by various parameters (by vehicle, driver, customer, country...), and to link and integrate with ERP solutions.
2.1 Tracking

Tracking is the basic service that gives the dispatcher a simple way to manage and control the fleet. A GSM-GPS module is built in every vehicle, taking in the information about a vehicle’s position and telemetry, and sending it to the central server in the control centre via GSM-GPRS network.

2.2 Navigation

An intelligent touch-screen terminal CVS-VIAVEK NAV is built in to every driver’s post. The navigation interface is based on the installed navigation interface, which enables voice command, entering points of interest, displaying the route travelled and sending and receiving various messages from the traffic office.

2.3 Communication and data transfer

The system enables a two-way connection between the vehicle and the control centre. The transfer is based on the GPRS communication via mobile network. Thus the data acquired through the FMS signal from the vehicle and the sensors connected to it are transferred. The picture below shows the data transfer.

![Picture 1: A schematic diagram of the system; Source: http://www.cvs.si/index.php?id=4](Picture 1: A schematic diagram of the system; Source: http://www.cvs.si/index.php?id=4)

The upper diagram (Picture 1) shows how information travel in the whole system of operations performed to make the system function correctly. The system is based on a central server, all units communicate with it, depending who needs what information. After recording the current state, the test application was configured on the computers of dispatchers in the department of schedules and department of internal control.

3 SYSTEM DATA

To start using CVS-VIAVEK Mobile Map you first need to enter a username and password (Picture 2), given by the supplier. A username and password are pre-registered and activated in the system, otherwise the login isn't possible.
The main window of the program (Picture 3) allows quick and easy to use features. The software application shows and enables the next:

- **TO DRIVERS:**
  - a constant written communication between drivers and the control centre (Picture 8),
  - easy navigation (turn by turn) with voice guidance,
  - increased security;

- **TO DISPATCHERS:**
  - managing the fleet online (Picture 8),
  - planning the services (Picture 8),
  - planning the route (Picture 8),
  - displaying the vehicle’s current location (Picture 3),
  - displaying all vehicles’ current position (Picture 3),
  - displaying the route travelled for every vehicle (Picture 4),
  - the transmission of loading orders from the transport module to the navigation unit in the vehicle (Picture 5),
  - entering points of interest,
  - a constant written communication with the drivers (Picture 5),
  - the monitoring of all telemetry data from the CAN-BUS lead and the additional sensors (speed, fuel, motor temperature, load…) (Picture 9);
TO CLIENTS:
- monitoring their cargo online (Picture 3),
- ETA (estimated time of arrival) (Picture 3);

TO MANAGEMENT:
- Regular monitoring of costs,
- Planning and managing the maintenance of the fleet,
- Online reports (Picture 8),
- Analysis by various parameters (Picture 9),
- Connecting and integration with ERP solutions (Picture 9),

Picture 4: Display of driving history; Source: CVS software application, mobile ver1.6.108

Picture 5: Data about border crossing and status; Source: CVS software application, mobile ver. 1.6.108
Considering the above stated data and regarding the fact they are taken from a vehicle’s tachograph, which is legally binding, we can also use this data for salary calculation. This makes a part of the copying of the travel order into the accounting module automatic.
By applying the daily, monthly and weekly fuel consumption (Picture 9), dispatchers can efficiently oversee fuel consumption on individual routes, by different vehicles and drivers. By comparing it, we can eliminate deviations from normal distributions.

4 INSTALLING THE SYSTEM

For the data to transfer between the vehicle and the telemetry system we first need to make some modifications to the vehicle itself. We need to install an interface (Picture 10) and activate the FMS signal. With this upgrade we achieve the flow of information from the vehicle on the navigation communication interface and on through the control centre to the end user.

4.1 Installing the FMS Getaway unit interface

By installing the FMS interface (Picture 10) in the vehicle we achieve a signal conversion from CAN protocol or J1708 (coming from the vehicle) into FMS CAN or RS232 protocol (input signal for the appropriate modem). With the input we can transmit information about the vehicle's telemetry, which the vehicle is reporting to the system on the GPS unit via the appropriate modem.
4.2 Release of broadcast signal via the vehicle’s service application

Via the modem unit (Picture 12) the vehicle's signal is linked to the communication navigation system.

The system sends the information to the communication navigation system via the program interface in the vehicle, and that sends them on to the control centre. The program interface is intended for sending and processing data for the program solutions of the CVS Mobile company. The data is sent to the system of management, navigation and communication via the modem, between the transmitter and the receiver.

5 SYSTEM ACQUISITIONS

The changes and acquisitions of the described system were checked with two groups of vehicles (Chart 1,2), five vehicles each. The data was acquired from the tacographic units in the vehicles and linked via a modem unit in the vehicle to the base, where they were processed. The time period was from 1.7. to 31.8.2010. The first group had a tracking system with no communication navigation interface, that only enabled a correct measurement. The second group of vehicles was equipped with a full system of navigation, tracking and communication.
The savings and advantages in using the system for tracking, navigation and communication CVS/Via-Vek gained on the basis of comparing both test groups of vehicles:

- 63% decrease in communication expenses (mobile phone)
- 50% less working hours of the dispatcher
- 8% more kilometers – greater productivity
- Less Admin work (processing the travel order and belonging documents, calculation of fuel consumption)
- A more precise control of fuel consumption
- Warning about an excessive deviation of the fuel consumption
- Records of fuel consumption with the possibility of checking after the journey
- Reducing the likelihood of errors (resting, working hours of the driver)

### 6 SUGGESTIONS FOR UPDATING THE SYSTEM

We offer some suggestions for the existing communication navigation system, which will be used and tested on the company’s fleet by the end of 2011.

#### 6.1 Semi-truck tracking and automatic merge with the driving unit

Reasons, advantages:
- A record of the semi-truck and driving unit combination
- The ability to monitor the temperature regime in the semi-truck (isothermal upgrade)

#### 6.2 Monitoring the temperature regime in the semi-truck (isothermal upgrade)

Reasons, advantages:
- The control over the temperature in the semi-truck in real time
- A warning about an unwanted change
- A record of the temperature regime
- The customer can monitor the temperature regime in real time

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**Chart 1: Test group of vehicles 1**

<table>
<thead>
<tr>
<th>VEHICLE MAKE</th>
<th>VEHICLE MODEL</th>
<th>INTERNAL NO.</th>
<th>REG. NO.</th>
<th>DRIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. MAN</td>
<td>TG - A</td>
<td>177</td>
<td>LJ U2-67T</td>
<td>VUČKO MARKO</td>
</tr>
<tr>
<td>2. MAN</td>
<td>TG - A</td>
<td>817</td>
<td>KR V4-181</td>
<td>ŠTIRN ROBERT</td>
</tr>
<tr>
<td>3. IVECO</td>
<td>STRALIS</td>
<td>5024</td>
<td>KR 59-17L</td>
<td>DOLENEC BOJAN</td>
</tr>
<tr>
<td>4. IVECO</td>
<td>STRALIS</td>
<td>9976</td>
<td>LJ 57-6DS</td>
<td>JELOVČAN BORIS</td>
</tr>
<tr>
<td>5. RENAULT</td>
<td>PREMIUM</td>
<td>9967</td>
<td>LJ 46-7UR</td>
<td>RAMIĆ SENAD</td>
</tr>
</tbody>
</table>

Source: Dispatch centre VIATOR&VEKTOR

**Chart 2: Test group of vehicles 2**

<table>
<thead>
<tr>
<th>VEHICLE MAKE</th>
<th>VEHICLE MODEL</th>
<th>INTERNAL NO.</th>
<th>REG. NO.</th>
<th>DRIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. IVECO</td>
<td>STRALIS</td>
<td>5023</td>
<td>KR 59-16L</td>
<td>GORNIK DUŠAN</td>
</tr>
<tr>
<td>2. IVECO</td>
<td>STRALIS</td>
<td>5030</td>
<td>KR NS-404</td>
<td>KONDIČ DOBRIVOJ</td>
</tr>
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<td>3. IVECO</td>
<td>STRALIS</td>
<td>601</td>
<td>LJ 50-1DS</td>
<td>LAMOVŠEK CIRIL</td>
</tr>
<tr>
<td>4. IVECO</td>
<td>STRALIS</td>
<td>608</td>
<td>LJ 50-8DS</td>
<td>GORIŠEK DANILO</td>
</tr>
<tr>
<td>5. IVECO</td>
<td>STRALIS</td>
<td>614</td>
<td>LJ 51-4DS</td>
<td>SIMAKOVIČ BOŠKO</td>
</tr>
</tbody>
</table>

Source: Dispatch centre VIATOR&VEKTOR
6.3 **Driver's check in/out when entering/leaving the vehicle (driver's card)**

Reasons, advantages:
- A record and identification of the driver of the vehicle
- Acquiring data for an automated calculation of return travel costs for driver's salaries

6.4 **Automated calculation of return travel costs for driver's salaries**

Reasons, advantages:
- Less Admin work with calculation of return travel costs for driver's salaries
- Greater accuracy and less errors with calculation of return travel costs for driver's salaries
- A record of data acquired.

7 **CONCLUSION**

On the basis of the propositions for modernizing the existing system we can expect a decrease of time for dispatcher's operational work, bigger customer satisfaction and a better client control over handling their goods. Less admin work in accounting and transport analysis, with a more accurate work records and driver's efficiency, and a more appropriate policy to awarding and punishing the drivers, to achieve a bigger speed of taking action on technical errors and consequently less damage cases and complaints. Consequently we can expect cost reduce per one transported cargo unit and achieve an increased competitiveness and reliability from the rest of providers on the transport services market. The system introduced has this advantage, that with simple amendments and new program settings we can achieve an improvement. The new adjustments do not burden the transport service with extra expenses, except the initial investment.

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