

MIGROS



Pilot Summary

Test Phase: *Euroscan Recorders*



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Project Euroscan

Genossenschaft Migros Neuchâtel/Fribourg (GM NE/FR)

1. Initial Position

The employees of GM NE/FR did not utilize a Temperature Monitoring and Truck and Trailer tracking system and as a result did not have the specific experience for the interpretation, application and implementation of a quality assurance systems based on GPRS and GPS in real-time. Therefore, the Euroscan system had to be implemented with great care and an appropriate support agreement with Euroscan was achieved.



The test phase, the support and the system adjustments are complementary of Euroscan and are not binding.

The herewith presented Test Report, Data and Analysis reflect the desires, needs and experiences of GM NE/FR. It however does not encompass the entire range of functionalities and capabilities innate to Euroscan recorders.

2. Catalog of Specifications to Euroscan

- Graphical interpretation of recorded temperature data
- Alarm functions in real-time based on individual settings for upper and lower temperature thresholds.
- Real-time position of individual vehicles
- Driven Route & Geo-Fencing of individual vehicles

3. Test-Configuration

- Euroscan Temperature recorder, equipped with GPS- and GPRS/GSM-Modem incl. data transfer card (SIM Card)
- Service and data transfer provided by Orange Communications
- Machine-to-Machine Server application by Euroscan (Euroweb)
- Data transfer-Rate: every 10 Minutes (GPS- and Temperature Data)
- Integrated Alarm functions (server based), which allow for adjustability of individual Parameters

- Not installed: EuroLOG - a Software package which allows for the complete analysis and reviewing of individual temperature readings as well as the automation of certain analysis.

4. Functionalities of Euroscan

4.1 Temperature Measurement

The temperatures are measured every second and saved in the recorder. The average is calculated every 10 minutes (based on the data transfer setting) and made available for the data transfer.

4.2 Position Data

The GPS Antenna constantly acquires geographical position changes, which are saved in the central recorder's hard drive and made available for data transfer.

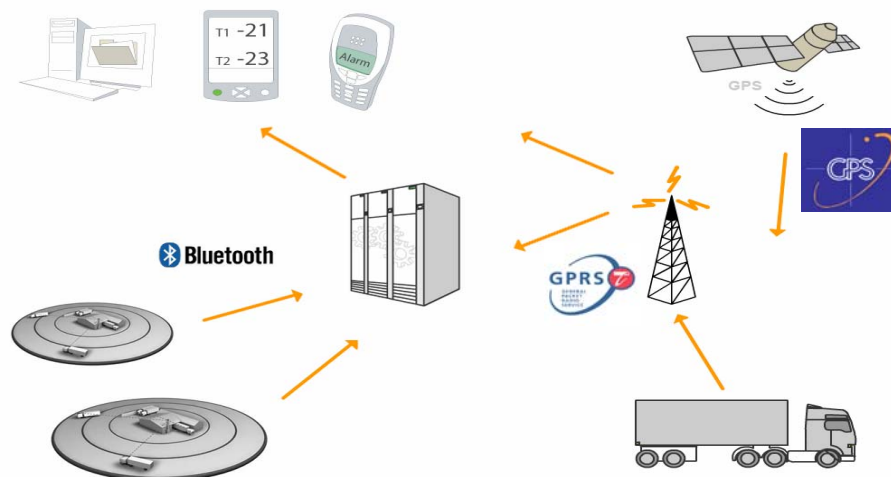
4.3 Data Transfer

The collected temperature and position data are transmitted to the central server every ten minutes (based on the adjustable presetting), which then in turn prepares the collected data for analysis.

4.4 Data Display

Via a username and password secured internet site access to live-data can be granted and parameter settings changed. Real-time location and temperature readings are available.

Chart 1: Functionality of Euroscan (Real-Time Data, Alarms & Quality Analysis)



5. Test-vehicles

5.1 „Camion“

Mercedes-Box truck with Frigoblock-Reefer FK 13 L, Euroscan Model RX2, 3 Temperature sensors (T1, T2 and T3) Total installation and startup time: ca. 6 hours Cabin-mounted Euroscan Unit (in the driver's line of sight)



5.2 „Semir.“

Trailer Frech-Hoch with Frigoblock-Reefer HK 13, Euroscan Model TX2, 3 Temperature sensors (T1, T2 and T3) Total installation and startup time: ca. 2.5 hours Trailer-mounted Euroscan Unit (directly below the reefer, not in driver's line of sight)



6. Persons Involved

Mr. Kader Hamrani (GM NE/FR)
Mr. Edgar Leibzig (GM NE/FR)
Mr. Toni Famos (Zanotti, Switzerland)

7. Project Developments, Experiences & System-Adjustments

April 2005

Initial contact by Toni Famos with Mr. Edgar Leibzig and Kader Hamrani

May 2005

Collective visit to the Transport Logistic Exhibition in Munich, Germany

June 2005

Installation of Euroscan Test Units on two vehicles

7.1 Problem 1:

The temperature recorder RX2 „Camion“ transmitted data that did not reflect actual events.

Solution:

The metal antenna cable extensions were not sealed. This caused contact to the steel parts of the body after the installation. Proper isolation solved the issue immediately. All further installations were equipped with the necessary insulation.

June 2005

After the successful installation and implementation visual data analysis was available immediately. Temperature and vehicle positions are very transparent through the Web-Solution.

June-August 2005

Transmission of the transportation data to the Euroscan-Demo server. Shortcoming of this particular server: the possibility for GM NE/FR to set, change or delete Alarms was not yet available. (Alarms in Real-Time, either via email or SMS).

As of July 2005

Alarm functionality after activation was established, applied settings through Euroscan Bonn.

7.2 Problem 2:

Alarm functionalities were not satisfactory, had to be activated through Euroscan Bonn, according to GM NE/FR specifications.

Solution:

Euroscan installed a new server, which allowed these individual functionalities.

August 15th 2005

Switch to the new Euroweb-Server, which allows individualized access and parameter settings for GM NE/FR (and all subsequent clients).

7.3 Problem 3:

The Euroscan TX2 „Semir.“ on the trailer is directly connected to the Reefer Unit, but Frigoblock’s Reefers do not have independent battery power. This created the situation that the Euroscan unit only had sufficient power supply to transmit data when the Frigoblock Reefer is turned on or powered by an external power supply or generator and created “holes” in the graphical charts. Saved data was not lost since Euroscan Units are equipped with an internal battery specifically designed to save data when external power is not available.



Solution:

The trailer was equipped with a battery and charger that charged the battery as soon as a power supply is available. (Battery CHF 70.-, approx. \$53. Charger CHF 35.-, approx. \$26.)

Note:

At this point in time all Euroscan works as Mr. Hamrani expected. The exception is the Alarm functionality. The Alarm Server provides invaluable Information about: a) the temperature in Cold-storage areas, b) the desired temperature of the transport vehicles, c) loading habits, d) the sensibility of products, e) as well as knowledge about the actual functionality of the reefer unit and how it reacts to certain parameter changes. The Alarm Server Settings are a customer specific „learning experience.“ Mr. Hamrani has the capability to effortlessly distribute and share this information with the necessary employees at GM NE/FR.

8. Solving the custom Alarm Server Settings in Real-Time

September 2005

Problem:

Following the battery installation on the trailer, and the software upgrade on the Euroweb-Server, approximately 40 alarm messages were being generated on a daily basis. The reason was simple: Migros trucks were operating on an irregular schedule, thus not allowing specific time-blocks (i.e. late at night or early in the morning) to be programmed into the Euroscan units (who work on a 24 hour schedule) which would result in eliminating alarm message generated when the trucks were not in use. This resulted in a flood of Alarm messages which were generated during times when Migros trucks were not in operation.

Solution:

In order to combat this tricky problem an additional digital sensor (Euroscan Units are capable of holding equal amounts of input and digital sensors) was installed. The Digital Sensor was installed to measure if an electric current (voltage) is existent; and is connected to the part of the Frigoblock unit which generates an electric current only when the refers are in use or being charged by an external power supply. This set-up allows the Euroscan unit to know when the Frigoblock Refer, and by extension the trailer itself is in use. The Alarm server sequence is therefore being started only if the Digital Sensor ‘allows’ it, meaning only when the Frigoblock unit is in actual use. The final result is an alarm server that generates alarms only in the desired circumstance, only when the trailer is holding temperature sensitive goods under or above the set thresholds, for a period of time that lies outside the determined acceptable time frame.



Alarm Server Parameters

The Following parameters for the Alarm Server where determined during the Testing Phase:

Desired Transport Temperature: +4° C
Upper Temperature Threshold: +6° C
Lower Temperature Threshold: +1° C
Alarm Message after 10 min.

8.1 Interpretation:

An Alarm Message is generated if the temperature lies outside the specified upper or lower temperature threshold for more then 10 min. The Alarm messages come in form of either Email or SMS and can be send to the any desired recipient(s).

8.2 Conclusion:

The above mentioned temperature and alarm server settings are ideal for summer-time operations, during which the Reefer unit is in its Cooling mode. However, during winter time when the heating sequence is generally being used, the set-up is not effective. This is due to the fact that the time allotment given for the pre-heating of the compartment is not sufficient to generate isothermal conditions. The appropriate winter-settings for the Alarm-Server have been determined to be as follows:

Desired Transport Temperature: +4° C
Upper Temperature Threshold: +6° C
Lower Temperature Threshold: +1° C
Alarm Message after 45 min.

Note:

It is important to note that a significant amount of time and effort was spent in order to determine the exact upper and lower temperature thresholds. Temperature data was analyzed minute by minute by Zanotti and Euroscan and the combined time invested in the Alarm Server Project for GM NE/FR was approximately four weeks in total. Additionally, it is worth mentioning that Mr. Hamrani had consulting advice on a technical and operational level at all times from both Zanotti and Euroscan, a great portion of it on-site. For Euroscan Bonn, the GM NE/FR project represented a completely new challenge even in light of the fact that the company enjoys 80% market share in the EU region for its temperature monitoring recorders. To assure that, even during the test phase, the operation was never compromised a new Euroscan Server had to be installed and tested in addition to the necessary data transfer. The success was realized in August 2005 when the new Server was fully installed and became operational. No Data was lost and the new system has been running stable and without error from its inception.

Chart 2: Example of an Alarm Message via E-mail

-----Message d'origine-----
 De : alert@euroscanweb.com [<mailto:alert@euroscanweb.com>] Envoyé : mardi, 11 janvier 2006 05:32 À : GMNEFR Logistique Transport Objet : migros

Vehicle: Semir.
 S/N: 11300112
 Date/Time: 11/01/2006 05:32

Message: Temperature of input T2 has reached -0.9°C and has been lower than 0.0°C for 10 minutes.

Chart 3: Alarm Protocol (Function „Event“)

Vehicle : Semir. Recorder : 11300112

Number of Events : 11

Date	Time	Type	Sensor / Input
11.01.2006	08:03:00	Temperature alarms switched off	1,2
11.01.2006	06:42:00	Temperature alarms set 1,0 < T1 T2 < 6,0 delay 45	1,2
11.01.2006	06:28:00	Temperature alarms switched off	1,2
11.01.2006	05:42:00	Temperature alarm confirmed	Entree Air
11.01.2006	05:41:00	Temperature alarms set 1,0 < T1 T2 < 6,0 delay 45	1,2
11.01.2006	05:39:00	Alarm Temp Off	Entree Air
11.01.2006	05:39:00	Temperature alarms switched off	1,2
11.01.2006	05:32:00	Alarm Temp On	Entree Air
11.01.2006	04:47:00	Temperature alarms set 1,0 < T1 T2 < 6,0 delay 45	1,2
11.01.2006	04:37:00	Temperature alarms switched off	1,2
11.01.2006	04:37:00	Temperature alarms set 1,0 < T1 T2 < 6,0 delay 45	1,2

9. Benefits for GM NE/FR (during Test Phase)

9.2 Benefit 1

Effective quality control is only possible with a minimum of two temperature sensors, located in different location of the shipping space (i.e. Reefer discharge and Reefer). Due to this knowledge and the analysis of graphical temperature data and curves it was possible to determine that the Reefer units of the Box truck was working on an improper cooling cycle. This problem was due to a phase-reversal caused by the power sockets in the Body Shop of GM NE/FR, resulting in an improper rotational direction. The Carburetor turned into a Condenser and actually heated up the load. With only one Temperature sensor in the cargo space of the truck, this serious problem would not have been detected.



9.2 Benefit 2

Alarm notification, via Email and in Real-Time to the allocated Quality Control Manager, as soon as a load is running outside its previously specified temperature range. A looming quality problem and/or possible load loss can be pro-actively addressed and prevented.

9.3 Benefit 3:

A fully automated system is in place that a) measures temperature and controls temperature settings b) allows the operator to generate new and old temperature readings in a fully automated way, thus not tying valuable manpower to tedious and mundane tasks and c) eliminates the element of human error (such as Data loss, trailer mix-up, erroneous measurements etc.) while generating the required data and temperature records.

9.4 Benefit 4:

It has become evident from the obtained temperature measurements during the test phase that, after the correction of the improper cooling cycle, the reefer units in the trucks operate properly. The excellent performance of the reefer units can be credited to the GM NE/FR body shop. Furthermore, if the unit performance will deteriorate in the future, Euroscan devices will detect and report it.

10. Conclusions of the Test Phase

With the exception of the initial problem relating to the wiring of the temperature sensors, the Euroscan recorders functioned properly and as expected once they were installed. Rare occasions do exist during which, due to minor technical problems (i.e. Software updates for the Server), live-data cannot be viewed, but this does not affect the customer version.

Problems 2 and 3 were related to the Alarm Server and its Alarm Settings whose set-up was unique to Migros. Euroscan was capable to quickly and accurately address

the problems that arose and was able to provide satisfying solutions. The initial difficulties lay in the interpretation of the Temperature Curves, and later with the correct settings for the Upper and Lower Temperature Limits in connection with the time-delayed alarm messages. The alarm settings had to be adjusted in order for the Alarm server to



distinguish between temporary and normal spikes and drops of the Reefer unit versus actual temperature related problems in the load and with the trailer.

The now implemented and mature system is fully functional and runs stable. Furthermore, the incoming Alarm Messages are correct and represent actual temperature problems that are occurring within the fleet.

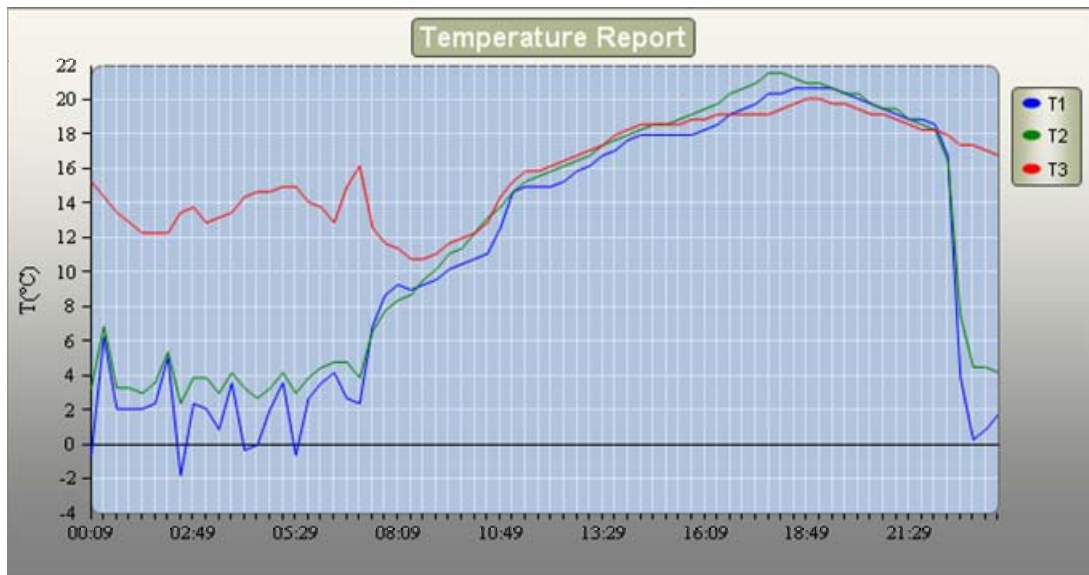
The learning curves of both End-user and system supplier have been great and the temperature recorders have become a valuable and vital tool.

The Euroscan recorders meet all Swiss and European standards, regulations and quality requirements. Open data interfaces (SQL- Database) allow for easy integration and compatibility of the units and the data generated into other open-source IT systems. The Euroscan recorders also allow for various combinations in terms of Data transfer (i.e. Bluetooth and GPRS) which can be of interest in the future for clients such as Migros.

Many Swiss, as well as most European Trucks are already equipped with Euroscan recorders. This allows Migros the possibility to receive as well as transfer data from Suppliers and to centrally store the data along with other relevant product information.

11. Appendix

Chart 4: Example of Graphical Representation of Temperature Curves



Legend: T1 = discharge air from the Reefer unit
 T2 = Return air for the Reefer (warmed through the product)
 T3 = unconditioned area behind partition wall (dry goods)

Effective quality control is only possible with a minimum of two Temperature sensors, located in different parts of the trailer. This enables one to accurately

determine if the loaded goods have been stored and cooled properly. With the two temperature sensors we can eliminate quality problems related to goods being stacked to high or Reefer units that do not work effectively, since T2 (green curve) would otherwise show a colder temperature than T1 (blue curve).

Chart 5: Example of GPS position of a Vehicle in Real-Time

