	I3E ***South East Europe TCP***

Best Practice Report

Rehabilitation of a Network of Water Wells for Capturing Raw Water – Automation System for Monitoring and Command

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Everybody please state revision index and short description of what has been done + partners involved and date.

Final approval	Name	Partner
Reviewer		

1. Best Practice Title

Rehabilitation of a network of water wells for capturing raw water – Automation system for monitoring and command

2. Location of Best Practice

Country, region, town

Romania, North-West, Satu Mare

3. Best Practice Executive Summary

Describe briefly (max 10 lines) the BP context (partnership, funding, objectives, approach followed, results)

This best practice describes a successful implementation of a project resulted from the collaboration between local authorities and governmental authorities, the funding of the project being supported by EU grants and co-financed by the local authorities from Satu Mare.

The objective was to extend the infrastructure regarding the drinking water, due to the population growth that was not anticipated when the existing infrastructure was first developed. The approach was to rehabilitate the water wells network for water collecting and to create a system for the monitoring and control of the whole process, with the purpose of increasing the capacity of delivering the raw water to the Station for the Treatment of Drinking Water, which delivers drinking water to the city and to the surrounding smaller towns.

The results of the successful implementation of the project were the assurance of a minimum flow of 1200 m^3/h and a substantial improvement of water quality delivered to the Treatment Station, by reducing the suspensions in the water.

4. Best Practice Classification

Best Practice Theme

x Research Transformed to Innovative Product
x Research Transformed to Innovative Service
□ *Research Transformed to Innovative Methodology*
□ *Research Transformed to Innovative Production Process*
□ *Financial Mechanism for Transformation of Research to Innovation*
□ *Support Mechanism for Transformation of Research to Innovation*
□ *Other (describe)*

Best Practice Research / Application Areas

□ *Industrial / Manufacturing Systems*
- *x Industrial Informatics and Communications*
- □ *Intelligent Devices*
- *x Distributed Control Systems*
- □ *Flexible Manufacturing Systems*

□ *Embedded Systems*
- *x Industrial Embedded Systems*
- □ *Nomadic Environments*
- □ *Private Spaces*
- *x Public Infrastructures*

5. Description of Best Practice

5.1 Best Practice Context

Overall background of the Best Practice. Location, socio-economic, technical & policy background of the BP (max 10 lines)

The city of Satu Mare was confronted for some time with a population growth that had not been anticipated when the water reserve for the needs of the population had originally been evaluated and used. Therefore, the Local Council of Satu Mare, through SC Apaserv SA Satu Mare, has started a program for developing the infrastructure regarding the drinking water and the used water in the city, in partnership with the County Council of Satu Mare and MLPAT (Ministry of Public Works and Territory Administration).

The project *funding* was supported by EU grants through the ISPA financing program and co-financed by the Local Council and the County Council of Satu Mare.

The design and implementation of the project was done by S.C. Technosam S.R.L. Satu Mare, Romania, in partnership with two companies from Hungary: Keviep and Vikuv.

5.1.1 Policy Elements

What are the policy initiatives that have influenced the contextual environment of BP: innovation promotion policies, research funding policies, certification etc as well as relevant tools (max 10 lines)

The National Plan for Research and Innovation for the period 2007-2013 involves the private sector, the economic sector being consulted in order to determine the development requirements. The public investment in RDI has to stimulate the interest of the economic sector concerning the RDI activity, its participation to partnerships with public entities, having consequences on the increase of private investments in RDI. The development of technology transfer infrastructure and services were also proposed in view of a better capitalization of RDI results in the economic environment.

The Programme of the National Plan II is the largest programme in the plan. It focuses on creating conditions for a better collaboration between the different RDI entities, companies and/ or public administration units, in order to offer solutions for issues within research areas.

The necessity to extend the infrastructure regarding the drinking water was recognized for some time, but the available funding from the local budget was not sufficient for starting such a program. This program could be started due to the possibility of co-financing through EU grants.

Other elements that had to be taken into account and that were important motivational factors for launching this program:

- The necessity for modernizing and developing of the water supply infrastructure in conformity with the European standards;
- The Strategy for County Development, which states that all the inhabitants of the county are to benefit equally from water provisioning, sewerage system and water purification.

5.1.2 Socio-economic & Other factors

Other contextual factors such as customer / target market addressed, international validity, customer density, economic conditions, customer values, research area addressed (max 10 lines)

The motivation and the necessity of the project are given by many important factors. The advantages of the city of Satu Mare, namely a very good geographical position (8 km from the Hungary border and 30 km from that of Ukraine) and a quite developed infrastructure (industrial park, airport, national and European roads, railway) attract the interest of investors in various economical branches (automotive, food, wood, textile, processing, consumer goods, etc.) The activity of these investors, as well as the life of the approx. 115,000 city inhabitants and the functioning of all the socio-economical and cultural objectives (schools, universities, hospitals, theatre, philharmonic), depend on the existence of drinking water, quantitatively as well as qualitatively appropriate. Furthermore, some neighbour small towns are connected to this same network of water supply.

The project was initiated due to the necessity of developing the infrastructure regarding the drinking water and the used water of the Satu Mare city and its neighborhood. This, in turn, was needed because of the population growth, and also because of the economical development of the region. The local authorities have observed that the existing infrastructure was no longer able to sustain the number of private and public consumers, and they have decided to initiate a program for developing

this infrastructure.

The implication of Technosam Company in this project was determined by many important reasons. The concordance between the known, high potential of the company to execute corresponding qualitative projects for infrastructure and the acute need to extend and modernize the water supply network of the city in order to bring it at the European standards played a decisive role. Moreover, the necessity to modernize the water distribution network is not limited to Satu Mare, being an actual problem for many towns and cities of Romania, including the North-West region of Transylvania, where Technosam extends its area of activity. On the other side, many foreign companies are interested to cooperate with Romanian firms in the infrastructure field. The existing older partnerships of Technosam with many multinational companies, and the availability of Technosam to cooperate with foreign partners, the specialization and existing experience of the employees in the field, as well as the goal to accumulate new knowledge and practical experience in this type of projects, were other key elements which determined the worth final results.

5.2 Objectives

Aim of the project, specific objectives & strategies to achieve these objectives (max 10 lines)

The aim of the project was to extend the existing city infrastructure for drinking water supply. The specific objective was the development and modernization of the existing water supply infrastructure in conformity with the European standards, which would contribute to the durable development of the city and its neighbourhood. The main strategies for achieving this objective were:

- The cooperation with local authorities and governmental authorities, in order to obtain the necessary funds, the project being supported by EU grants and co-financed by the local authorities;
- The cooperation with multinational companies from Romania and abroad in order to design and implement the telemonitoring, control and supervisory structure;
- The integration of many team innovation concepts and research experience of Technosam in order to develop and adapt the general solutions to the local characteristics and particularities;
- Rehabilitating the existing water wells that were in an advanced state of decay, therefore affecting the delivered water quality;
- Expanding the water-catching front (through driving new water wells) in order to increase the water flow delivered to the Station for the Treatment of Drinking Water;
- Reducing the suspensions in the delivered water;
- Creating an automated system for monitoring and control of the wells and of the process of collecting the raw water.

6. Process

Describe the project including key concepts and the overall approach followed. Indicate project end users, target market, main project phases, problems encountered and solutions, problem resolution (max 10 lines)

The project has proposed itself to modernize the actual system for capturing raw water. The main purpose of the project was to obtain a minimum flow of approx. 1200 m^3/h to cover the water requirements for the Station for treatment of raw water.

The approach was to modernize the water capturing network, such that it would have 46 wells, of which 15 new and 31 rehabilitated existing wells. Each of the wells has a minimum flow between 60 and 80 m^3/h. Also it was decided to implement a radio communication system between the wells and the dispatcher, and an automated drive system for driving the wells depending on the pressure, flow and level of the water, such that the whole system can be remotely monitored and controlled. The central system for monitoring and command is a SCADA system.

The project duration has been of 18 months.

The experience of Technosam gained with this project and the applied solutions can be largely used in the process of rehabilitation of water supply network not only in local applications but also in future similar projects all over the country.

6.1 Project Design

Project design based on targeted market complete understanding, project structure, policies and procedures, management and implementation actions (max 10 lines)

The infrastructure modernization process in Romania represents an actual opportunity for the specialized national and foreign companies, the corresponding market being in development, in a process of stabilization and maturation.

In the design phase and the following phases a team from Technosam worked to ensure the specification of the project, the management for implementing the project and for monitoring and evaluating the project. The team included a project manager, an assistant project manager, a jurist, and a technical specialist.

The work plan contained the following actions:

1. Old wells rehabilitation and drilling new wells for capturing raw water;
2. Carrying out the water adduction network, water adduction tanks, sinker tanks with valves, the electrical power installation;
3. Design and implementation of the automation system;
4. Design and implementation of SCADA system for remote monitoring, supervision, command and control;

After the end of implementation, service and maintenance activities were considered as market niches.

6.2 Project Management

Activities relevant to project coordination and management, project documentation and reporting, quality control, validation and verification (max 10 lines)

The relevant activities for the management of the project included:

- Elaboration and approval of the working procedures for design, execution, assembly and deployment;
- Elaboration of the documentations for execution and technical advice;
- Approval materials and supplies needed for the project;
- Inspection of the made supplies and approval for assembling;
- Inspection and approval of the work done in situ;
- Carrying out the setting and verification of the functioning parameters;
- Carrying out the functioning proofing for the manual regime as well as for the revision;
- Carrying out and verification of the radio-communication system;
- Implementation and deployment of the SCADA system;
- Carrying out the functioning proofing for the automatic regime;
- Elaboration of the daily, weekly and monthly working reports;
- Elaboration of the project documentation, which included:
  - Written parts:
    - document presenting driving and automation system;
    - manuals for SCADA and radio-communication systems;
    - utilization and maintenance manuals.
  - Drawing parts:

- single line wiring circuit diagrams (expanded), specification of equipment, wiring journal;
- SCADA hardware configuration and radio communication system diagrams.

Quality control has been done in all phases of the project: design, procurement, execution, assembling, adjusting, deployment and commissioning. At each phase, the representatives appointed by the consultancy firm to supervise the work have been involved, as well as the final beneficiary of the work. The compliance of the proposed solutions with contract requirements, as well as the compliance and the origin of the materials used were examined (only products made in EU member states were accepted). All materials were approved based on the technical sheets and on the analysis of requested parameters for the project. After completion of assembling, functional tests were performed for both manual and automatic operating regimes.

The validation and verification of the work was carried out by practical functional tests performed at each of the 46 modernized water wells. The functioning was verified based on commands locally issued for the manual system and for the revision system, and remotely based on commands issued by the dispatcher at the water plant. The protections that protect the submersible pumps were tested, and also the systems that protect the well. The transducers for level, pressure and flow were tested. For the SCADA system it were tested the compatibility of the components with which the hardware was configured, the radio communication system, the volume of information that can be transferred, how the data was stored, how the reports are done, how the operating personnel is alarmed. The verification was done in accordance with ISO 9000-2008 quality standards and with the specific technical standards for electrical drive and automation installations.

6.3 Project Implementation

Main elements associated with the project implementation. Realization of new idea, or new technological realization or improvement / novelty to known technology and means to achieve this. Innovation associated with the project realization in terms of new products, services, methodologies. Marketing, advertising and customer service. (max 10 lines)

Many conceptual and implementation innovative elements were developed in this project, the most important being: the solutions adopted for actuating the wells for collecting the raw water, as well as for the automation of the pumping system, the communications between the various components and with the human operator, and for adapting the SCADA platform for controlling and monitoring the system.

Consequently, this platform offers the following functionalities:

- Displaying the functioning of the wells and of the measured parameters;
- Monitoring the conditions of the functioning of the wells;
- Drive, automation and remote control of the wells;
- Developing the analysis reports.

The system is organized in three functional levels:

1. Technological level (installation) – contains the installations to be monitored;
2. Local operation and installation control level – contains the PLCs and the operating panel;
3. Server and SCADA application level – contains the computer and the applications for displaying and remote control.

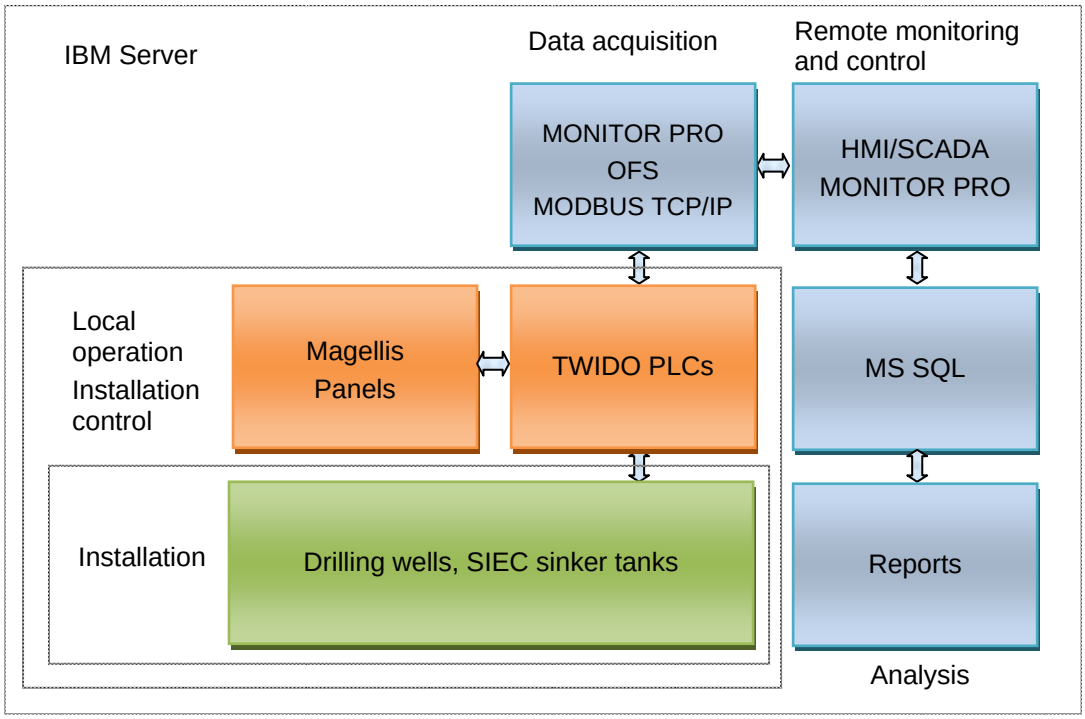
The communication channel is a protected radio channel, and uses the TCP/IP protocol.

The software system has four main modules:

- Data acquisition;
- Displaying;
- Archiving;

- Analysis and report.

The application allows the graphical display of the state of each well and of various measured data (flows, water level in tanks, etc.), the control of each well or groups of wells, the saving of the collected data in a database and the generation of various reports based on the obtained data in the



database.

The modules of the software system may be distributed on a number of computers, or may be run on a single computer.

The system ensures the full monitoring of the whole process and the access being restricted based on user access rights.

6.4 Project Evaluation

Project feedback mechanisms and evaluation mechanisms. (max 10 lines)

Project evaluation was done based on the obtained results, which confirmed that the proposed general and specific objectives have been achieved.

The impact of this project was evaluated to be also an increased concern of the investors for building production centers, therefore the need for local workforce would increase and, implicitly, the living level in the city would increase.

As a feedback following the finishing of the modernizing project for the raw water capturing can be mentioned:

- The possibility of starting a new project for rehabilitation of the system for treatment of the raw water;
- Other projects that can ensure the development of the city (rehabilitation of the drainage network, water purifying station).

The corresponding international results in the field were taken into account. The new, possible to integrate, technologies were also studied, and the performances were compared with the ones of the existing similar services.

7. Description of Research team/Institution

Short description of R&D team and institution (max. 10 lines)

The R&D team was a consortium of 3 partners (SME) from Romania and Hungary.

The Romanian partner was SC Technosam SRL, Satu Mare, which includes in its activity profile:

- design, software development, implementation, assembly, and deployment of industrial automation systems;
- design, implementation, and deployment of pneumatic and hydraulic systems, of electrical installations for automatic compensation of the reactive energy;
- measurements, adjustments and verifications for the protections of the electro-power installations of power consumers;
- complete solutions in the fields of automation systems for installations of drinking water supply, for sewerage systems and stations for used water purifications;
- energy audits for optimization of power consumption;
- monitoring of power consumption, etc.

The company has received all the necessary accreditations and certifications for these activities.
The company is also System Integrator, Representative or Official Distributor for renowned companies, such as: SIEMENS, SCHNEIDER ELECTRIC, MOELLER, OMRON, SCHRACK, RITTAL, ATLAS COPCO, VERDER, SMC, LENZE, FESTO, CAMOZZI, PARKER, JUCOMATIC.

8. Applied Financial Mechanism

Describe financial mechanisms applied in transformation of research into innovation within BP, as well as means of connecting scientific research team and financiers (max. 1000 char.)

The project was funded by the European Union (89%) through the ISPA financing program, and by the Local Council and the County Council of Satu Mare (11%). The total budget was not only for the work needed for the automation system, but also for preparation (for land acquiring and arrangement, for the basic investment) and other expenses (such as technical assistance).

Keviep company from Hungary was the general entrepreneur that obtained the financial resources for the whole project.

For the automation part, Technosam has received an advance payment. As the works advanced, it regularly received other payments. From the total value, 10% was withheld for 12 months for performance bond, which after passage of this period was unlocked in its favor.

9. Impact and benefits

Describe achieved benefits of R&D team and/or enterprise implemented innovation, as well as impacts on institutional and policy levels. (max. 1000 char.)

As a result of modernizing the system of capturing the raw water, the following benefits were achieved:

- the project for the rehabilitation of the system for capture of the raw water;
- experience for starting other projects that will ensure the development of the city (sewerage network, purification station);
- SCADA system for remote monitoring and control is a component of the project that can be easily adapted to other projects for efficient water capturing; it can be applied in any other town or city in the country.

The impact of this project will be a grown interest of investors for new production centres, therefore increasing the number of workplaces in the area and, consequently, raising the life level of the population.

10. Sustainability

Provide information on sustainability of innovation after financial aid within implemented financial mechanisms, and some multiplier effects as replication and extension of the action performed in BP. Expected use of Best Practice and lifecycle considerations. (max. 1000 char.)

After ending the funding of the project, the costs for functioning and maintenance of the waterfront collecting will be supported from the water delivery taxes collected from the population and from the economical agents.

The economical-financing analysis and the sensitivity analysis have revealed that the inhabitants of the city of Satu Mare and from its neighbourhood, as well as the economical agents and the public institutions, are able to sustain a maximum level for the price, but rising above this level will increase the number of bad payers.

Further on, the company SC Apaserv SA Satu Mare will take care of the water collecting system, because it holds the necessary means for its exploiting, monitoring and maintenance.

Based on the experience gained in this project, Technosam can count on winning other similar works, considering our country's policy regarding the infrastructure for drinking water and wastewater. There is a market that can provide similar projects for at least 10 years.

11. Repeatability and transferability

Lessons learned from the project implementation team. Repeatability and transferability of the project. (max. 1000 char.)

In the actual context in which the economical situation in the world as well as nationwide is unstable and insecure, the main concern of a company has to be to ensure its share of market through supplying quality products and services, through which to gain the confidence of the customers, but also taking account of the needs of the future generations. Therefore, any activity accomplished has to be part of a durable development. Conforming to this principle, S.C. Technosam S.R.L. has as a strategic objective the investment in environment-friendly technologies, based on industrial informatics and embedded systems. By successful ending this project, the specialists of the company acquired new competencies in engineering, especially in the design and development of software for PLCs and SCADA, by using the software E-plane 8.1 or Monitor PRO.

By adding on the list of references in the field of automation, of the applied informatics and embedded systems will increase the trust of our clients such that, through a pragmatic marketing, we count on expanding on the local, national and international market. The accumulated experience will contribute to building-up the human resources of the company through dedicated trainings and it will enhance its attractiveness for new employments. Through this project, S.C. Technosam will increase its economical competitiveness, will enhance its image on the market, and will obtain a greater number of orders. These are due to the increased technical capability of the company, as well as due to the alignment to the new trend in the field of engineering in which the applications based on the information technology and communication occupy a leading place.

The SCADA system for remote monitoring and control is a component of the project that can be easily adapted to other projects for efficient water capturing. It can be applied in any other town or city in the country. If the interface would be translated in other language, it could be applied in other countries as well.

There is a promotion policy for this system in other cities and in other countries. Namely, Technosam representatives participate in exhibitions specific to drinking water and wastewater infrastructure. They also made direct visits to the stakeholders and presented all the advantages of these systems. In the future Technosam together with the final beneficiary will organize a special conference dedicated to presenting the project results for both professionals and the public, in fact for the actual consumers of drinking water.

12. Evaluation

Describe reasons and evaluation criteria why the described example is a best practice. (max. 1000 char.)

The project involved the collaboration of partners from neighbour countries that had to solve a shared problem.

The solution is flexible and can be adapted to different cities.

This example was selected as a best practice because its results can easily be transposed in any of the cities and towns from Romania or other country, if they do not have yet a proper system for water capturing.

The company identified a promising field to invest, in accordance with European and international tendency and national necessities. It also found the most appropriate possibility to obtain the financial support.

Technosam used the experience and innovative ideas of its employees, integrating in the same time high quality equipments and expertise of older and new multinational and foreign partners.

13. Contact of research team/institution	14.Contact of financial mechanism facilitator
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