REPUBLIC OF MOLDOVA

APA CANAL CHISINAU

CHISINAU WATER SUPPLY & SEWAGE TREATMENT - FEASIBILITY STUDY



SUPERVISORY CONTROL AND DATA ACQUISITION

FINAL

August 2012

seureca A Subsidiary of VEOLIA ENVIRONNEMENT

In association with and Business Consulting Institute

European Bank for Reconstruction and Development and EU Neighbourhood Investment Facility

LIST OF ABBREVIATIONS AND ACRONYMS

ACC	Apa Canal Chisinau
PS	Pumping Station
SCADA	Supervisory Control and Data Acquisition
SQL	Structured Query Language
ToR	Terms of Reference
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

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1. FOREWORD

1.1. OVERALL OBJECTIVE

The potable water system of Chisinau is complex. The water is produced almost exclusively from a solely source (Nistru River) and then treated and distributed via a network that includes about twenty pumping stations, sixty tanks of which fifty are in operation and eighty boosters, supplying water within six pressure zones and thirty three hydraulic entities.

The wastewater collection systems in Chisinau are designed as “separate” systems. Although most of the network is of gravity pipes, some pressure pipes are located at the outlet of the 30 existing pumping stations.

SCADA System is in the range of tools that can help a water company to better operate and manage the water and wastewater systems.

SCADA System provides a live picture of the status of items in the water supply and wastewater collection schemes, which can be controlled remotely in order to cope with various situations. In water supply for instance, the primary purpose of SCADA is regulation of water transmission. Uses include:

- Regulation of pumping station operations, in order to meet water transfer requirements;
- Regulation of the distribution system reservoir volumes, in order to ensure full-time delivery of required flow to all consumers at required pressures;
- Surveillance of water quality in terms of residual chlorine.

A requirement of the ToR (Phase B6) is to provide a strategy to increase the use of telemetry and automation to improve system performance and monitoring.

1.2. OBJECTIVE OF THE REPORT

The present report presents:

- An assessment of the current situation regarding the use of telemetry within ACC;
- An analysis and inventory of possible solutions to be implemented by ACC to better operate the system and monitor its performance with SCADA.

2. ASSESSEMENT OF THE CURRENT SITUATION

2.1. POTABLE WATER

ACC does not start from null in terms of telemetry. Indeed within the existing system some of the pumping stations are already equipped with measurement devices or with telemetric system.

Today 26 water pumping stations are concerned. They are listed in the table below.

Table 1: Pumping Stations equipped with measurement systems

ACC installations		pressure and level sensors - flowmeters		pressure and level sensors – no flowmeter	without pressure or level sensors	stopped
		with telemetry for pressure and water level	without telemetry			
N°	NAME					
1	Aeroport			x		
2	Balsevsc		x			
3	Botanica	x				
4	Bucurta					x
5	**Buiucani**		x			
6	Cartusa			x		
7	Ciocana	x				
8	**Codru**		x			
9	Codru Reservoirs				x	
10	Colonita Reservoir			x		
11	**Ghidghici**		x			
12	Gribova			x		
13	Ialoveni		x			
14	Independenta		x			
15	Petricani					x
16	**Schinoasa**		x			
17	**Sîngera**		x			
18	**Stauceni**		x			
19	Telecentru	x				
20	Timis Reservoir					x
21	Tohatin		x			
22	Universita agrara	x				
23	Valea Dicescu	x				
24	WTP (Chisinau)		x			
25	WTP (Nistru) - Treapta II		x			
26	WTP (Nistru) - Treapta IIA		x			

A colour code is used to specify some characteristics:

- Green: information from the pumping stations (water level and pressure) is sent on a LOVATI system located in the dispatching room of ACC head office;
- Yellow: these pumping stations are to be connected soon to a LOVATI system
- Blue: The flow data with a 1-hour time step are collected during the 1st week of each month.

Transfer of data is performed manually via Switch Telephone Network or by direct file download.

A scheme presenting the structure of the existing SCADA system with the flow of information is presented in the figure below.

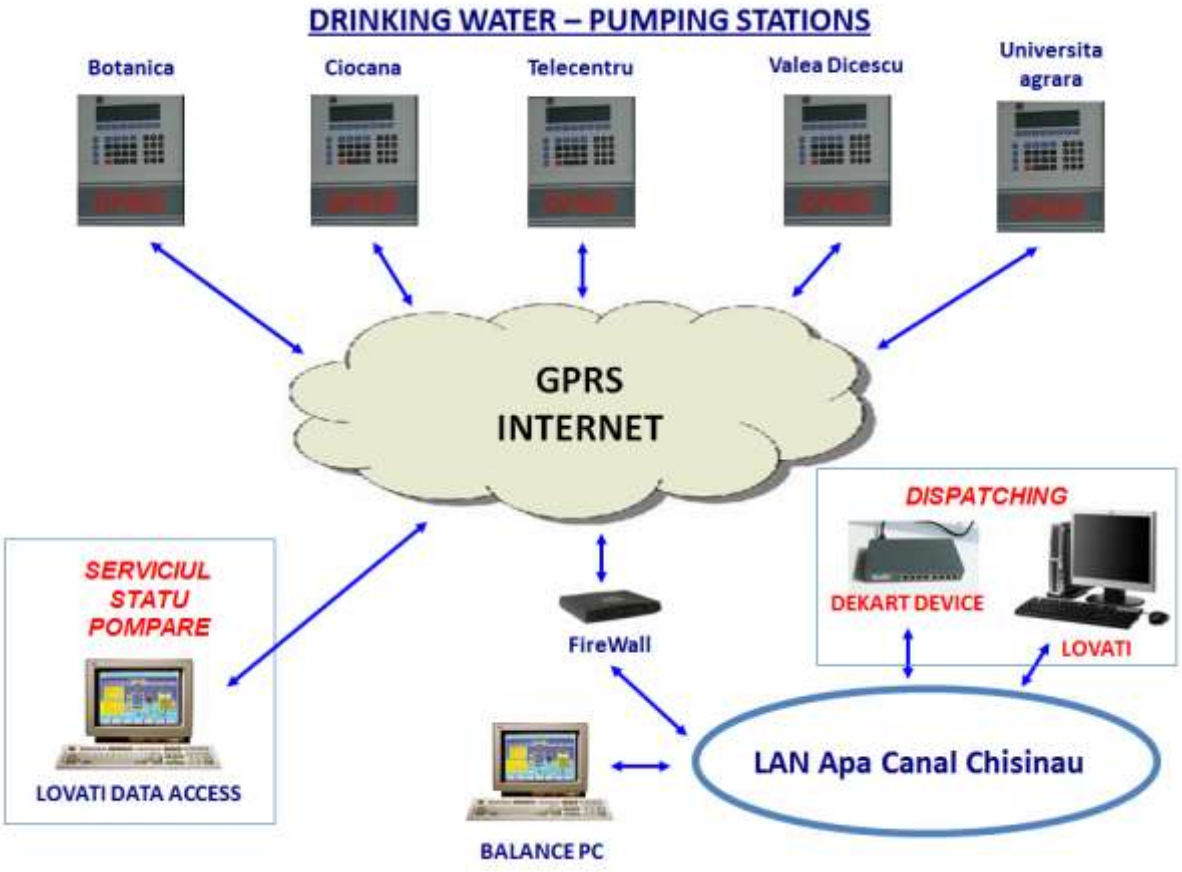

Figure 1: Existing Structure for the Water Pumping Stations

Data collected are then analysed by ACC operators (dispatching room): applications generate automatic balance for example.

It is worth noting that ACC is currently dealing with two companies:

- DEKART, which provides the software integrator,
- TECHNOTEST, which is in charge of the physical part (equipment).

2.2. WASTEWATER COLLECTION

Over the 30 existing wastewater pumping stations, 12 are automatic, i.e. equipped with remote supervision systems. These 12 pumping stations are indicated in green in the below table.

Table 2: Pumping Stations equipped with measurement systems

Municipality / Rayon	Sector	Name	ID	n° of pumps	Total flow (m3/year)	Energy cuns. (MWh/y.)
CHISINAU	Botanica	PS CODRU	18	3	475 133	151
		PS SÎNGERA	19	4	697 086	154
		PS SÎNGERA ŞCOALA	21	2	-	-
	Buiucani	**PS CHIMISTUL**	15	2	61 493	15
		PS DURLEŞTI-CARTUŞA	Ca	2	4 070	2
		PS GHIDIGHICI	14	2	52 782	7
		PS PRUNCUL	13	3	161 136	20
		PS SCULENI	7	3	359 841	47
		PS V. LUPU	4	3	737 498	87
		PS VATRA	12	3	592 892	108
	Centru	PS COSTIUJENI	8	4	343 668	169
		PS DOC-CPL	20	3	107 700	36
		PS HÎNCEŞTI	6	2	99 505	11
		PS LERMONTOV	3	1	13 582	3
		PS MOTEL	10	4	990 629	323
		PS TRIFAN BALTĂ	Tr	2	12 511	2
		PS VIERU	9	4	673 609	269
	Ciocana	PS TOHATIN	16	4	127 325	58
		PS TOHATIN-2	To 2	2	15 063	10
		PS VADUL LUI VODA PRINCIPALA	26	2	555 138	80
		PS VADUL LUI VODA RAIONALA	27	2	188 635	29
	Riscani	PS GRĂTIEŞTI	17	2	144 805	16
		PS PETRICANI	11	2	341 492	35
		PS PETRICANI-27	5	2	489 508	21
		PS STĂUCENI VALE	St 1	2	7 700	2
		PS ZAICHIN-30/1	Za	1	7 292	1
IALOVENI		PS IALOVENI 1	22	2	580 757	250
		PS IALOVENI 2	23	2	701 757	244
		PS IALOVENI 3	24	2	52 410	8
CHISINAU	Ciocana	Chisinau WWTP	1	6	55 662 288	5 314

The information from these 12 pumping stations is sent the Dispatching room.

Depending on the PS, the Russian server retrieves and stores the following data:

- Levels of the sump: level corresponding of the stop of the pumps, of the start of the first pump and of the second pump (this last level is named “avari level” because used during rainfalls);
- Operation of the pumps: stop-start, hours of operation, power, …;
- Electricity: which source is used;
- Other data: temperature, …
- Emergency signal: in case of electricity failure, fire, …

This SCADA has been installed 2 years ago and the scheme presenting the structure of the existing SCADA system with the flow of information is presented in the figure below.

We have been told by ACC that 4 new pumping stations (not referenced in the table) will be equipped soon. This operation is scheduled for early 2012.

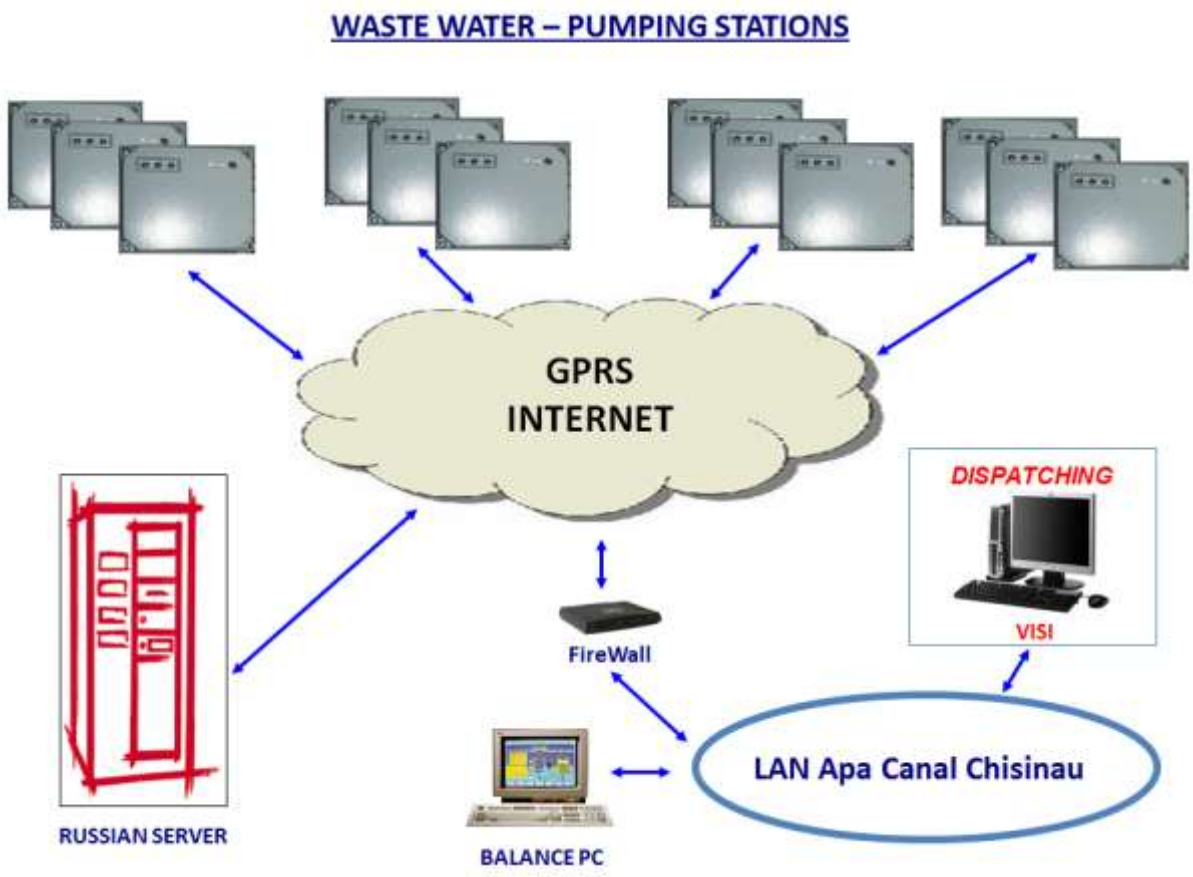

Figure 2: Existing Structure for the Wastewater Pumping Stations

SIVOL SERVICES Corporation is the hardware and software integrator company working with ACC.

3. DEVELOPMENT & EXTENSION OF SCADA

3.1. PROJECTS STUDIED AND IMPLEMENTED BY ACC

ACC is willing to increase the use of telemetry and automation to improve their water and wastewater collection systems performance and monitoring and to limit risks (cut of water, lack of treatment, …).

Some projects including a "telemetry" component have already been identified and they should be implemented by ACC very soon. They are recalled hereafter.

3.1.1. WATER DISINFECTION FACILITIES

As a result of non-compliance with safety regulation in the provision for chlorine gas disinfection of water at the Chisinau water treatment works, ACC decided in 2011 the replacement of the existing plant by new facilities. The option chosen to provide a long-term sustainable water disinfection solution consists in using bulk supply of sodium hypochlorite.

ACC required the implementation of an automatic functioning. This should be in operation in February 2012. This supervision will be made on the site of the plant. However the data will be also sent to ACC head office on a database of SQL type for some analysis and for storage.

The Company, which constructs the new facilities, selected SIEMENS equipment (hardware and software).

3.1.2. ACCESS TO INFORMATION FROM TERMOCOM

Termocom SA is a thermal power supplier. Termocom supplies heating to Chisinau and is responsible to heat the water before it arrives to the consumer.

Currently, 70 boosters operated by ACC are located next to stations of Termocom that are equipped with remote control systems.

Therefore, to access additional and valuable information with limited and reasonable investments, ACC asks Termocom to share its infrastructure. The 70 pumping stations will be equipped with measurement equipment and the information (pressure) will be saved and store by Termocom, then sent to ACC. The collaboration contract between S.A. "Apa-Canal Chişinău" and "Termocom" concerning the data transfer was coordinated and submitted for signature to the new administration of S.A. "Termocom".

As shown on the next figure, Radio (MOTOROLA hardware) is the medium of communication used.

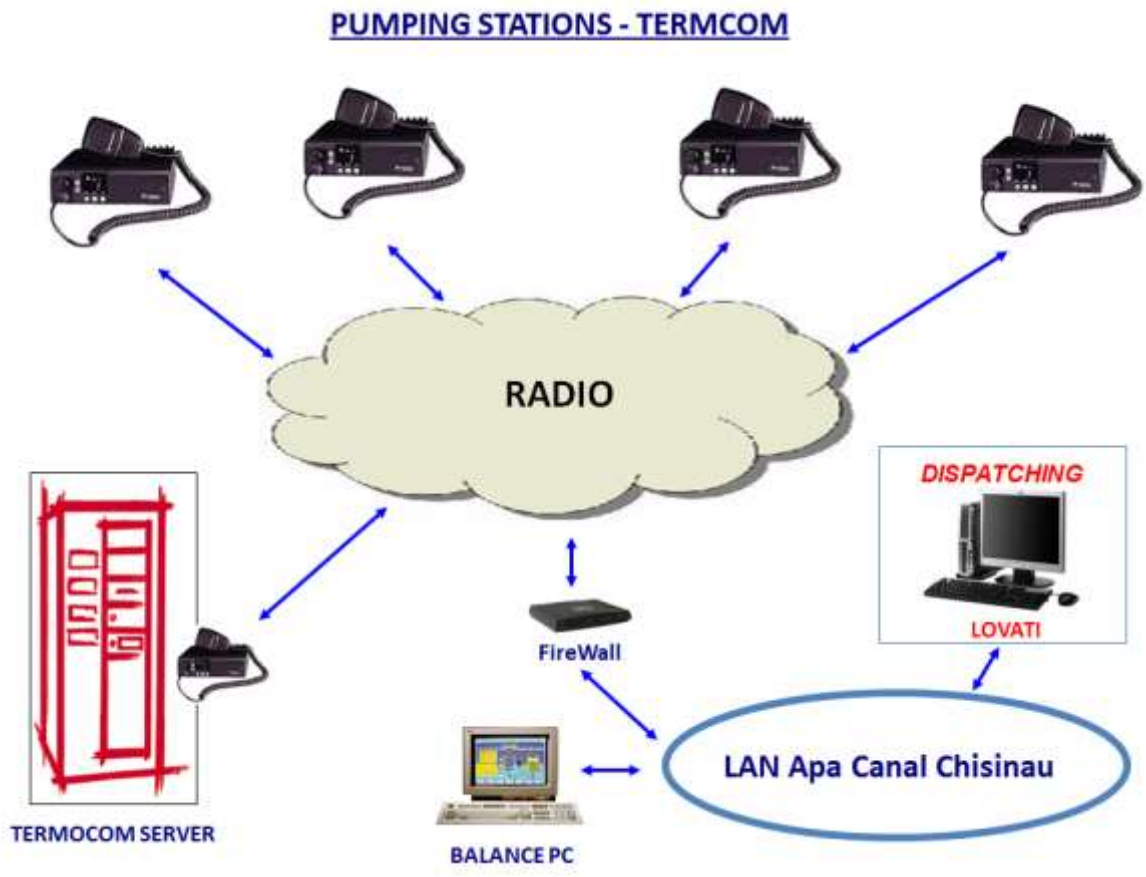

Figure 3: Share of information using Termocom structure

The scan cycle time is 10 minutes for the 70 stations. Attention, it seems that if 1 failure appears just after the station has been scrutinized, this information (failure) will go back on the system to the next cycle (after 10 minutes if the failure is still there).

3.2. OUR RECOMMENDATIONS

3.2.1. EXTENSION OF THE SYSTEM

The existing SCADA systems used by ACC are operational and work properly. We therefore recommend to keep the existing systems and to develop it, as already planned.

Indeed, ACC should pursue their investments for the equipment of remote transmission, such as for Stauceni water pumping station and the WTP pumping stations.

We strongly recommend ACC to limit the number of providers they are working with. This is necessary for maintenance, operation and financial proposes. A selection should be made based on financial and technical criteria. For example, VEOLIA has “qualified” three suppliers (SOFREL, PERAX & WITNET) for its telemetry equipment; and only 2 providers (SCHNEIDER & ROCKWELL) are in the VEOLIA catalogue for the automation parts.

It is worth pointing out that in case a problem happens with one of the selected supplier, it should be replaced by another more satisfactory. Recently, SIEMENS has been withdrawn of the Veolia catalogue and replaced by ROCKWELL.

3.2.2. ENHANCEMENT OF THE EXISTING SCADA

To significantly improve the current situation, we advise to implement the 2 following steps:

Step 1 – Data Storage

This is crucial that ACC fully appropriates all the data that are measured and sent to the Head Office. In this context the intention of ACC to install a computer room makes perfect sense. The data will be received and stored on reliable and dedicated servers.

Access to these data will enable and facilitate developments of specific analyses using common and easy computer languages (EXCEL, SQL…).

Step 2 – Choosing a unique tool for data processing

This step consists in equipping the Dispatching Room with a unique tool for data processing. The data sent from the pumping stations should be accessible and visible on a screen. For example, we could imagine that the items (pumping stations, WWTP, WTP, …) would be indicated on a map and that any operator could access the data by clicking on the item.

The software should be chosen to allow a future upgrading of the system; i.e. remote control and management of the system for example.

3.3. ROUGH COST ESTIMATES

The table below presents a preliminary and rough estimation of the cost for the recommendations proposed in the previous chapter.

Table 3: CAPEX for the extension and upgrading of SCADA

Item	Quantity	Unit Cost (EUR)	Total Cost (EUR)
Extension of the system			
Upgrading or renewal of the equipment for water PS	17	5,000	85,000
Upgrading or renewal of the equipment for wastewater PS	18	5,000	90,000
Step 1: Data Storage*			
Redirect data (potable water) arriving on the LOVATI server to a server computer service	10 days	700	7,000
Redirect data (wastewater) arriving on the Russian server to a server computer service	15 days	700	10,500

Item	Quantity	Unit Cost (EUR)	Total Cost (EUR)
Transfer selected data from the WTP to a server computer service	10 days	700	7,000
Redirect data arriving on the Termocom server to a server computer service	15 days	700	10,500
Step 2 – Implement a unique tool for data processing*			
Development of a specific tool or adaptation of an existing tool	100 days	700	70,000
Total investment			**280,000**

** This tasks required consultancy services only, based on a fee rate of 700€/day. Hardware (server, back-up systems, … are not included).*