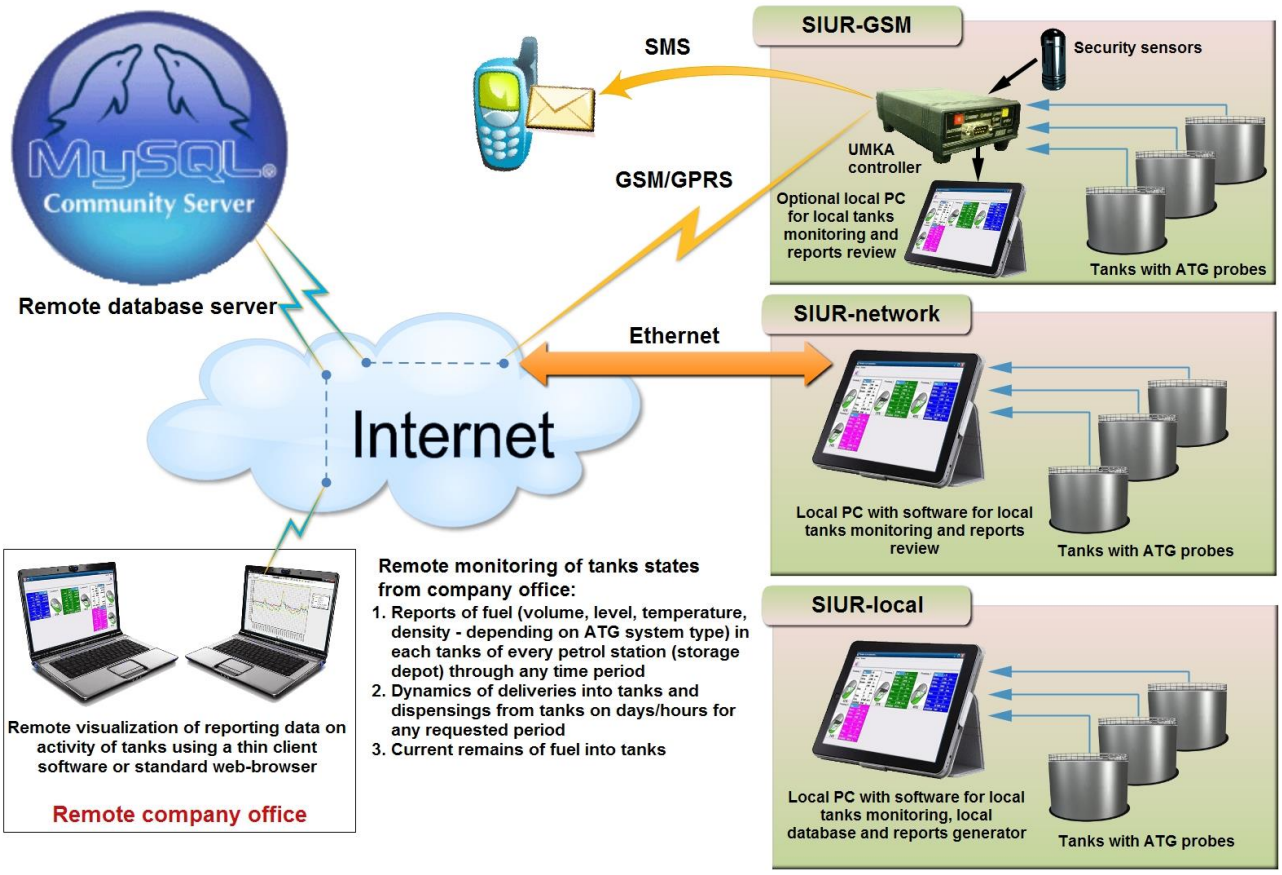
Tank monitoring system
TMS SIUR



Operating Manual

Firmware version 1.1.1.1

Review date: 11 May 2013

TECHNOTRADE LTD

CONTENT

REVISION HISTORY

REV.	DATE	BY	SECTION	DESCRIPTION
R01	11.05.2013	SA	All	First release of documentation

PURPOSE OF DOCUMENT

This Operating Manual is intended for studying of tank monitoring system TMS SIUR operation.

Given Operation Manual describes functional possibilities of tank monitoring system TMS SIUR with firmware version 1.1.1.1.

Due to a reason that functional possibilities of the tank monitoring system are constantly being extended and updated, changes are possible in final version of the utility, which are not described in given Operation Manual. Latest version of this Operation Manual can be downloaded from the tank monitoring system TMS SIUR web-page: http://www.technotrade.ua/tank-monitoring-system.html.

In case if you find any mistakes, omissions in this document or have any suggestions on improvements to this document, please feel free to e-mail them to our support mailbox: support_1a@technotrade.ua. We will be grateful to you for this valuable information.

All technical questions regarding the tank monitoring system TMS-SIUR are welcome to be asked on support mailbox: support_1a@technotrade.ua. Our support team will be glad to help you.

Also you can call to us or visit us on:

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APPOINTMENT

Tank monitoring system TMS SIUR is intended for control over the level of different liquids in technological processes at production facilities on industrial enterprises, petrol stations, tank farms, prevention of leakage, overflow, and also for registration of liquids at accounting operations.

In any branch of industry for precise execution of all conditions of technological process, it's necessary to provide control over levels of liquid in tanks. The use of tank monitoring system SIUR allows to control not only the level but also the parameters of the measured liquid (temperature, density, pressure). Timely control over given parameters helps to on time detect and eliminate leakage or overflow, due to which product may damage environment. The use of automatic level measurement systems – would be the best solution for improvement of production efficiency.

Reliability and accuracy of measurements are important components to ensure the quality of the liquid, taking into account that in most cases we are talking about measurable parameters of expensive and hazardous environments. Construction of systems on the highly intellectual equipment allows achieving accurate measurements even in complicated technological environments.

SYSTEM FUNCTIONS

Functions of tank monitoring system include:

1. Continuous/discrete measuring of liquid levels
2. Control of upper limit (overfill protection)
3. Control of lower limit (to prevent damage of the pump unit at dry running)
4. Execution of accounting operations while measuring quantity of liquid (calculation of density, weight, temperature, pressure and volume of products in open and closed containers)
5. Unification (gathering) and visualization of information
6. Processing, archiving and storage of information in MySQL database
7. Generation of report documentation

SYSTEM STRUCTURE

TMS SIUR is a single hardware and software complex that provides a multi-level model of system building:

Low (field) level

Intended for determination of parameters of controlled environment: division of environment, ultimate level, temperature, pressure, characteristics of measured product, etc.

Middle (controller) level

Intended for gathering data from the field-level devices, and transfer of information to upper level.

Upper (system) level

Intended for visual presentation of received information, execution of payment transactions, data archives, reporting.

Low (field) level

On this level, measurement of various parameters of the controlled environment is made: level, temperature, pressure, density, etc. For the measurement of these parameters special equipment is used – level gauge. At many sites, such as gas stations, oil depots, etc. level gauges contact with aggressive and explosive atmospheres. That's why its necessary to use level gauges with special certificates of authorization for use in hazardous areas and resistance to aggressive liquids.

Sensors for measuring the parameters listed above are located in the probe of level gauge. The probe is placed in the tank, converts the received from the sensors meanings of measured parameters into digital form and then via protocol of this level gauge these digitized data are transferred to the middle (controller) level.

In this system, the lower (field) level allows the use of a wide range of level gauges from different manufacturers: "Struna", "Start-Italiana", "Veeder-Root", "Petro Vend", "Hectronic" etc.

Middle (controller) level

On this level data collection is made from devices of lower (field) level, processing of the data and the transmission collected and processed information to the upper (system) level.

This system provides realization of functions of this level in two variants: hardware and software.

Variant of software version of controller level

Management of controller level operation is made by software SiurProbeServer, installed on PC. This software allows receiving data from level gauges, connected to the serial port of the PC. In settings of exchange of level gauges SiurProbeServer indicates: to which port of PC connected level gauge, communication protocol with level gauge, frequency of level gauges interview, serial port settings, and database settings for saving of received from level gauges measurements, etc. Quantity of connected level gauges is limited only by the number of serial ports of PC on which you installed the software SiurProbeServer.

Hardware variant of controller level

Management of operation of controller level is made by hardware device UMKA controller. This devise allows receiving data from level gauges that connected to serial port of UMKA controller. In settings of UMKA controller specified: to which port of UMKA controller is level gauge connected, communication protocol with level gauge, frequency of level gauge interview, serial port settings, database parameters for saving received from level gauges measurements, etc. UMKA controller has 3 serial ports and accordingly allows connecting to UMKA controller up to 3 different level gauges at the same time. The advantage of hardware variant execution of controller level is that UMKA controller has GSM modem and allows to make periodical messaging (SMS and MMS) with information about the status of connected to UMKA controller level gauges.

Upper (system) level

On this level takes place data collection from middle (controller) level, processing and storage of this information in MySQL database. This level includes the following modules

- module of data storing and execution of accounting operations («MySQL» module);
- module of system configuration («Config» module);
- module of visual presentation of current information about level gauges («GUI» module);
- report generation module («eReport» module);

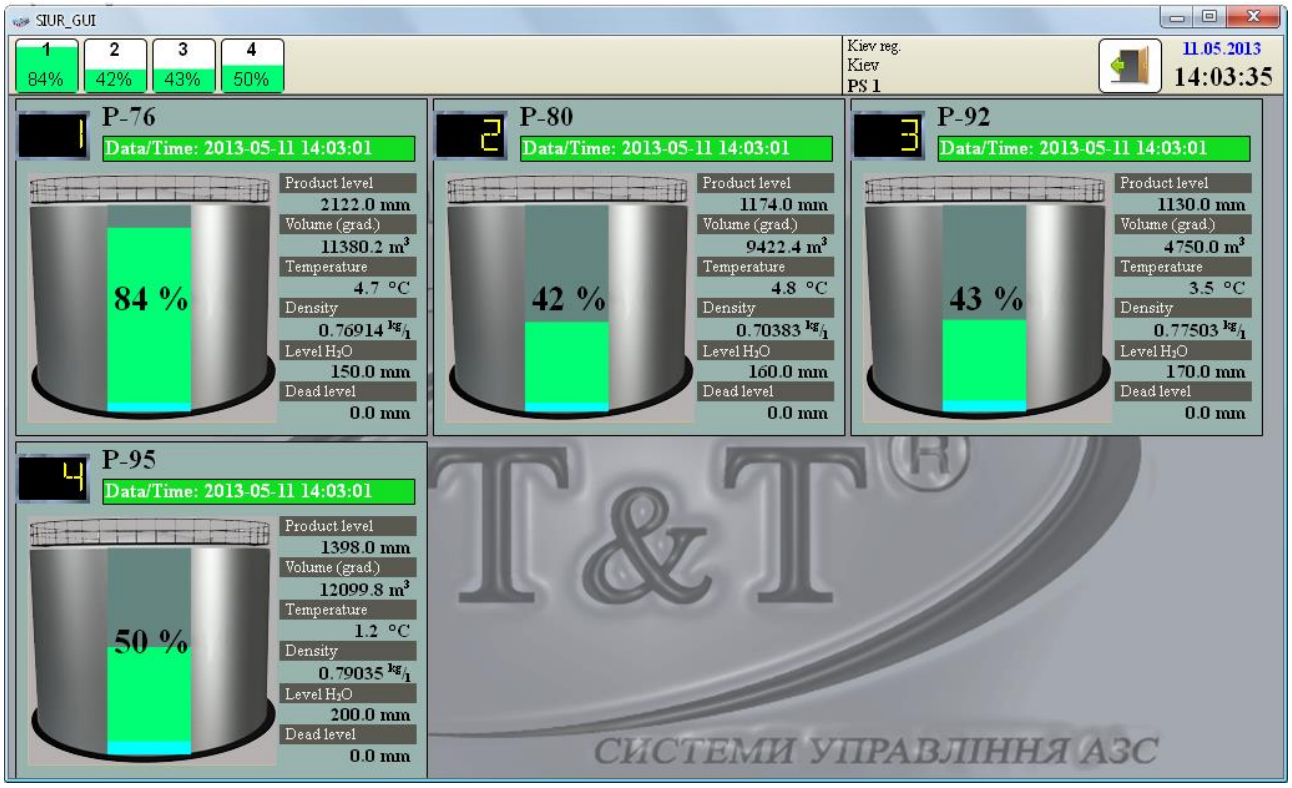
All modules of this level may be installed on one or on different computers.

«MySQL» module is a main module, without which operation of other modules is impossible. This module may be installed by customer on any computer, that satisfies requirements described in p.5.2.2. The installation of the module and its further administration can be carried out by the customer himself or the customer can rent dedicated "remote server on a hosting" with integrated «MySQL» and do further administration of remote server himself or order the service of server administration from the developer.

WARNING! After installation and running of a module «MySQL» is recommended to do monthly «MySQL» database backup for to be able to restore information in case of hardware failures and conflict resolution.

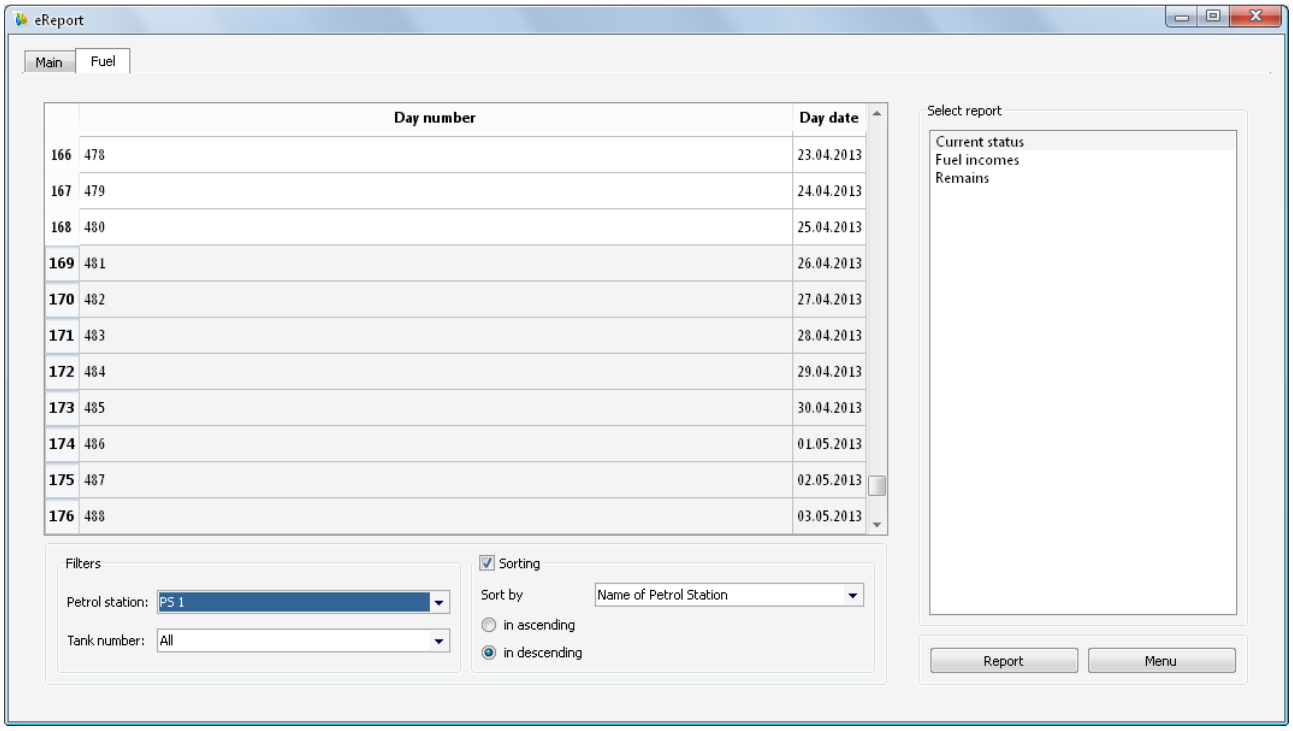
Modules «Config», «GUI», «eReport» are supplied to a customer as applications with licenses for a certain number of workplaces. These modules may be run on different computers that have access to a server that is running the module «MySQL».

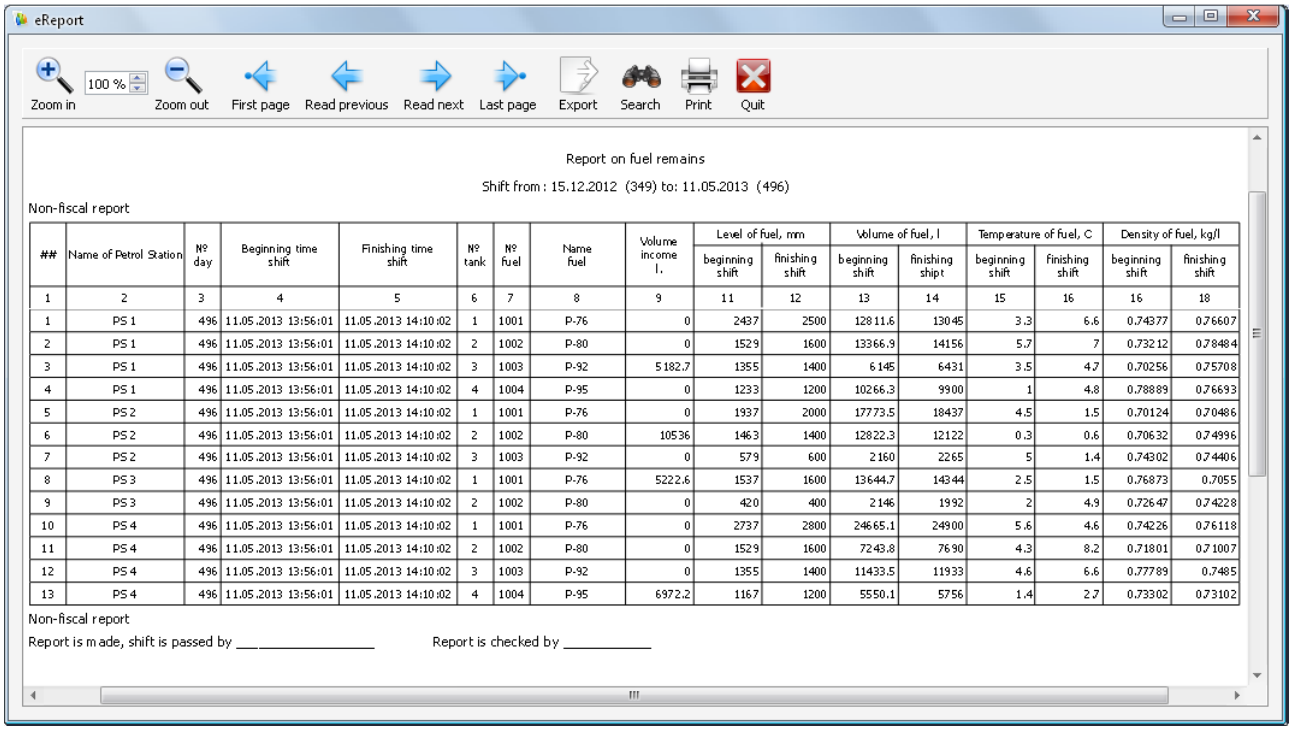
Module of visual presentation of current information about level gauges («GUI» module) provides a user an interface for graphical presentation of information about current meanings of measured product (level, temperature, density, pressure etc.). In case of excess of the measured meanings of the allowable range for these meanings - these meanings are highlighted in red.



Module for reports generation («eReport» module) provides a user with graphical interface for reports generation about meanings of measured product (level, temperature, density, pressure, etc.) for indicated period. Module «eReport» allows:

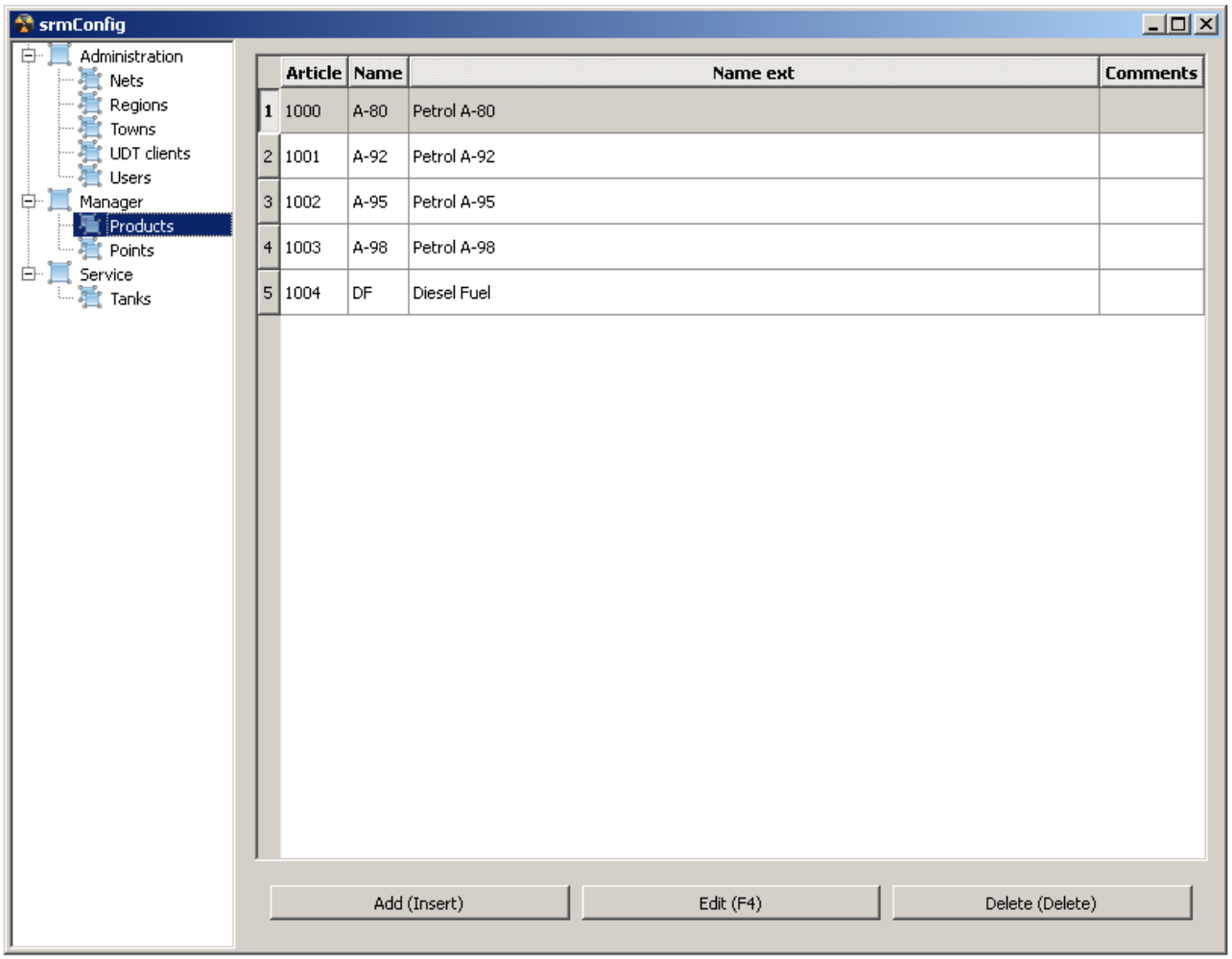
- reports generation by incomes;
- reports generation by current state of tanks
- reports generation by refuelings
- save generated reports in PDF form





##	Name of Petrol Station	№ day	Beginning time shift	Finishing time shift	№ tank	№ fuel	Name fuel	Volume income l.	Level of fuel, mm		Volume of fuel, l		Temperature of fuel, C		Density of fuel, kg/l	
									beginning shift	finishing shift	beginning shift	finishing shipt	beginning shift	finishing shift	beginning shift	finishing shift
1	2	3	4	5	6	7	8	9	11	12	13	14	15	16	16	18
1	PS 1	496	11.05.2013 13:56:01	11.05.2013 14:10:02	1	1001	P-76	0	2437	2500	12811.6	13045	3.3	6.6	0.74377	0.76607
2	PS 1	496	11.05.2013 13:56:01	11.05.2013 14:10:02	2	1002	P-80	0	1529	1600	13366.9	14156	5.7	7	0.73212	0.78484
3	PS 1	496	11.05.2013 13:56:01	11.05.2013 14:10:02	3	1003	P-92	5182.7	1355	1400	6145	6431	3.5	4.7	0.70256	0.75708
4	PS 1	496	11.05.2013 13:56:01	11.05.2013 14:10:02	4	1004	P-95	0	1233	1200	10266.3	9900	1	4.8	0.78889	0.76693
5	PS 2	496	11.05.2013 13:56:01	11.05.2013 14:10:02	1	1001	P-76	0	1937	2000	17773.5	18437	4.5	1.5	0.70124	0.70486
6	PS 2	496	11.05.2013 13:56:01	11.05.2013 14:10:02	2	1002	P-80	10536	1463	1400	12822.3	12122	0.3	0.6	0.70632	0.74996
7	PS 2	496	11.05.2013 13:56:01	11.05.2013 14:10:02	3	1003	P-92	0	579	600	2160	2265	5	1.4	0.74302	0.74406
8	PS 3	496	11.05.2013 13:56:01	11.05.2013 14:10:02	1	1001	P-76	5222.6	1537	1600	13644.7	14344	2.5	1.5	0.76873	0.7055
9	PS 3	496	11.05.2013 13:56:01	11.05.2013 14:10:02	2	1002	P-80	0	420	400	2146	1992	2	4.9	0.72647	0.74228
10	PS 4	496	11.05.2013 13:56:01	11.05.2013 14:10:02	1	1001	P-76	0	2737	2800	24665.1	24900	5.6	4.6	0.74226	0.76118
11	PS 4	496	11.05.2013 13:56:01	11.05.2013 14:10:02	2	1002	P-80	0	1529	1600	7243.8	7690	4.3	8.2	0.71801	0.71007
12	PS 4	496	11.05.2013 13:56:01	11.05.2013 14:10:02	3	1003	P-92	0	1355	1400	11433.5	11933	4.6	6.6	0.77789	0.7485
13	PS 4	496	11.05.2013 13:56:01	11.05.2013 14:10:02	4	1004	P-95	6972.2	1167	1200	5550.1	5756	1.4	2.7	0.73302	0.73102

Module «Config» provides user with graphical interface for configuration of «MySQL» module, «ProbeServer» module, and also provides interface for management over calibration tables.



COMPOSITION AND OPERATION

Software

Management over operation of middle (controller) level is performed by module «ProbeServer». Module «ProbeServer» is functioning under control over operation systems Windows or Linux. Module «ProbeServer» is a service, which is launched on a computer, to which hardware of lower (field) level. Module «ProbeServer» with period set in configuration requests hardware of lower 9field) level, sends received data to top (system) level. Configuration of module «ProbeServer» is performed using a module «Config».

Top (system) level includes a module of storing data and performance of accounting operations (module «MySQL»), module of system configuration («Config» module), module of visual representation of information on level measurement systems (module «GUI»), module of reports generation (module «eReport»). These modules function under control over operation systems Windows or Linux.

Hardware included into structure of tank monitoring system

As a devise for registration of parameters of measured product (level, temperature, density, pressure, etc.) level gauge is used. In this system low (field) level allows usage of wide range of level gauges from different manufacturers: “Struna”, “Start-Italiana”, “Veeder-Root”, “Petro Vend”, “Hectronic” and others. Detailed information about level gauge operation may be received from “User manual” for each of the level gauges.

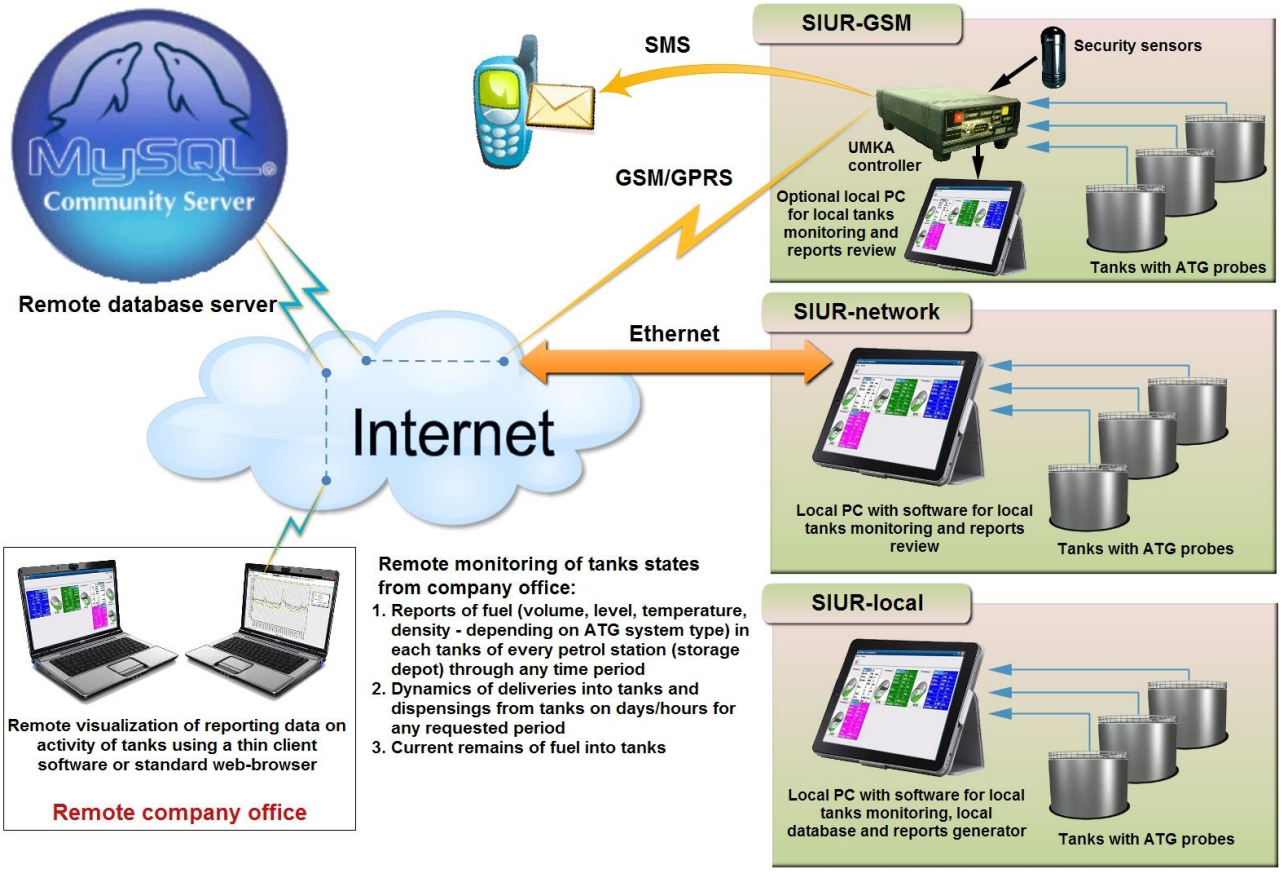
Connection of level gauges with RS-485 interface to PC is made through the conversion module of interface RS-232/485.

In case of using a hardware implementation option of controller level - as a device that receives data from the low (field) level - controller UMKA is used. Detailed information about operation of UMKA controller may be received from “Instruction manual of UMKA controller”.

VARIANTS OF APPLICATION

Tank monitoring system TMS SIUR is available in three configurations:

- SIUR-GSM
- SIUR-network
- SIUR-local



SIUR-local

Given variant of a tank monitoring system is intended for the case, when there is no necessity to collect data from level measuring gauges from several geographically dispersed petrol stations.

A personal computer is set at petrol station, which has in its structure serial communication ports RS-232. Connection of ATG level measuring gauges or consoles with interface RS-485 to personal computer is made through an interface converter RS-232/RS-485 (purchased separately). On this computer all five modules of tank monitoring system TMS SIUR are installed. Data from ATG systems is stored in a database of the computer, graphical user interface of tanks states and formation of reporting are available on this computer.

At necessity it is possible to connect this computer to Internet and thus receive a possibility to watch current state of tanks and possibility to generate reports and configure TMS SIUR remotely.

SIUR-network

This variant of a tank monitoring system is intended for the case, when is required to collect data of level gauges from several geographically dispersed tank farms and save these data in one database on specially

arranged for this purpose computer (hereinafter – «server»). Data from level gauges through communication channel “Internet” goes to “server” and save in “server” database. Now any user, who knows access point to “server”, login and password, may through “Internet” connect to “server” and receive graphical reports about current readings of level gauges, and also form reports for any period of time on indicated tank farm, according to their access rights.

Server software – is «MySQL» module. This module may be installed by a customer on any computer, that satisfy the requirements described in p.5.2.2. Installation of this module and its further administration may be held or by customer himself, or customer may rent dedicated «remote server on a hosting» with installed «MySQL» module and do further administration of remote server himself or order a service of server administration by developer.

WARNING! After installation and running of a module «MySQL» is recommended to do monthly «MySQL» database backup for to be able to restore information in case of hardware failures and conflict resolution.

SIUR-GSM

This variant of a tank monitoring system is intended for the case, when is required to collect data of level gauges from several geographically dispersed tank farms and save these data in one database on specially arranged for this purpose computer (hereinafter – «server»). But at sites, where located tank farms, there are no wired communication channel «Ethernet» with global network “Internet”. Wireless GPRS-channel is offered as an alternative to wired communication channel. For this purpose on site should be installed hardware devise – UMKA controller, that has GSM-modem. Data of level gauges by GPRS connection channel and through “Internet” get to “server” and save in database of the “server”. Now any user, that knows access point to “server”, login and password, may through “Internet” connect to “server”, login and password may through “Internet” connect to “server” and receive graphical reports of current readings of level gauges, and also form reports for any period of time on indicated tank farm according to their access rights.

Also this variant may be used without connection to “server”. In such case SIUR-UMKA may be used as system of tank monitoring, which you can configure for SMS notification on certain mobile numbers. These SMS may contain current information of tank gauges or information about events on site (fuel income, power failure on site, activation of alarm sensors, for example, opening / closing of any manhole cover, on which placed sensor with “dry-contact”, which connected to UMKA controller). SMS may be send due to event (for example, activation of security sensor) or in specified time will be sent SMS with current readings of level gauges.

For more information about UMKA controller read “Operating Instruction UMKA”.

Operating limits

Operating conditions of level gauges, UMKA controller, conversion modules of RS-232 and RS-485 interfaces, and power supplies are specified in the operation manuals of the devices.

Preparation for system application

Safety precautions in preparation to use a system

At the assembly, installation, maintenance and operation of the level gauges must be followed "Rules of operation of electrical installations." and "Cross-industry regulations on labor protection (safety) for the operation of electrical installations".

Requirements for computer IBM PC AT

- Processor is not below than Intel Celeron - 433 MHz
- RAM minimum of 512 Mb
- Display not worse than 1024x800
- OS - Windows 98, Windows 2000 or Linux
- Drive Free Space of at least 1 Gb
- Manipulator “mouse”

SIUR software installation

During installation check beforehand correspondence of space dimensions allotted to SIUR system. Install computer IBM AT on provided place.

Ground the computer (socket must be grounded).

Software installation

Software installation is made automatically by installation wizard. Initialization by installation wizard is done by running the executable file setup.exe. After installation in the directory ‘Program Files’ creates folder Siur (if during installation was not specified another folder), in which the necessary system files copy.

Installation and connection of controller

UMKA controller is installed on a flat surface, together with good signal of mobile operator. Conversion modules of interface RS-232/485, power supplies are installed on DIN - rail.

Hardware installation on technological tank capacity

To install the equipment on the technological capacity, refer to the manual of level gauges.

Installation of cables

Routing of communication lines should be chose in such a way to exclude the possibility induced noise from other lines (especially power). Length of cable is defined by project and routing on site. Requirements for the cable used to connect the level gauges are in the operation manuals of the devices. Connection of controllers through RS-485 interface on distance at least 5 m is possible with a help of any cable or wire with a cross section 0.35-1.5 mm2. For connection of controller via RS-485 at a distance of 5 m should be

used cable with a twisted pair in a general screen. If the distance between the controllers more than 100 meters it is important to take additional arrangements:
Topology of connection of controllers to cable - linear with installed the ends of the cable coordinated resistors of 120 Ohm. Outlets from the cable length of not more than 10 meters are allowed. Screen connection should be done from two cable sides. If between grounding points observed potential difference, across the screen grounded at both ends, can proceed unacceptably large compensation current. In this case, under no circumstances shouldn`t be disconnect the cable shield. Instead, you need to lay an additional equipotential bonding conductor parallel to the cable, which would take over the current screen.

Connection of converter modules of RS-232/485 interface to the UMKA controller or computer IBM PC AT should be lay wire cross section 0.35-1.5 mm2, no longer than 2 meters.

Using a system

General information

The procedure of service personnel while task execution application of the level measurement system, on particular site is defined by method developed by the user for solving their own tasks.

Tank monitoring system SIUR is supplied together with default configuration for equipment that goes with this shipment set. To change the configuration of the system caused by adding, replacing or moving the equipment necessary to edit configuration files (see Annex).

When installed correctly, all controllers in the program SIUR will be found automatically (if not previously have been added manually), it is enough to connect them as described above, and then add to them sensors. For controllers and sensors of level and temperature operation, should be correctly entered their serial numbers.

If some controllers weren`t found, then fault finding should be carried out starting from the top to down (power, communication with the system controller, power, communication with the controller located below, etc. to the lowest in the hierarchy of the controller or sensor) see Annex A. Possible faults and troubleshooting.

After all devices will be connected, you can start to work with the system.

Work with a system

Work order with programs siurTankGUI, eReport, siurAdmin is described in user manuals for these software.

List of possible faults and ways of their solving are described in Annex E

Safety precautions

During exploitation of the tank monitoring system, its necessary to follow “Rules of exploitation of electrical equipment” and “Cross-industry regulations on labor protection (safety) during the exploitation of electrical equipment”.

Computer IBM AT and UMCA controller should be installed in heated room. Cable leading from level gauges to the controllers should be routed in such a way to exclude any possibility to get to it extraneous currents and voltages.

TECHNICAL SERVICE

General information

Technical service of the tank monitoring system is carried out in accordance with present manual. For tank monitoring system exploitation allowed personnel that were acquainted with exploitation manual.

For tank monitoring system exploitation, in parameters configuration part, when tank monitoring system in operation (or reconfiguration during exploitation), allowed specialists in that subject area, in which tank monitoring system is used.

To carry out repair and reconstruction works of failed equipment allowed qualified staff with experience in devices based on modern microcontrollers and acquainted with documentation of tank monitoring system.

Safety precautions during maintenance

During maintenance of level sensor its necessary to follow Rules of exploitation of electrical equipment" and "Cross-industry regulations on labor protection (safety) during the exploitation of electrical equipment".

WARNING!
IT IS PROHIBITED TO CONNECT AND DISCONNECT LEVEL GAUGE WITHOUT TURNING OFF THE POWER!

Failure to observe this rule may lead to malfunction of tank gauge or controller that connects to it.

TRANSPORTATION AND STORAGE

Storage conditions of tank monitoring system

Group 7 according to National State Standard 15150 (in closed areas with natural ventilation without artificially controlled climate, where fluctuations in temperature and humidity are much smaller than in the open air: stone, concrete and metal with insulation and other storages).

Transportation of tank monitoring system

Transportation of tank monitoring system may be done by any kind of transport means (air, rail, road or sea) in protection package from the direct effects of precipitation and strong impacts.

ANNEX A

Description of file siur_config.xml

Tag name	Tag meaning	Tag description
dataBaseName	siur_db	database name
host	127.0.0.1	IP-address of database
userName	root	user name of database
password	root	user password of database

ANNEX B

Description of file siur_gui_config.xml

Tag name	Tag meaning	Tag description
dataBaseName	siur_db	database name
host	127.0.0.1	IP-address of database
port	3306	port number of database
userName	root	user name of database
password	root	user password of database
period	50000	data update rate (milliseconds)

ANNEX C

Description of file reportconf.xml

Tag name	Tag meaning	Tag description
name	siur_db	database name
host	127.0.0.1	IP-address of database
user	root	user name of database
password	root	user password of database

ANNEX D

Description of file reportpos.xml

Tag name	Tag meaning	Tag description

ANNEX E

Possible faults and troubleshooting

Name of fault	Possible reason	Elimination method
Message in software siurTankGUI: «No connection with system controller»	No supply voltage of conversion module of RS-232/485 interface or level gauge.	Connect power.
	Communication cable from convertion module of RS-232/485 interface doesn't connect to chosen Com – port of a computer.	Check and connect cable, check number of Com – port in file siur_config.xml.
	Defective a convertion module of RS-232/485 interface	Replace convertion module of RS-232/485 interface