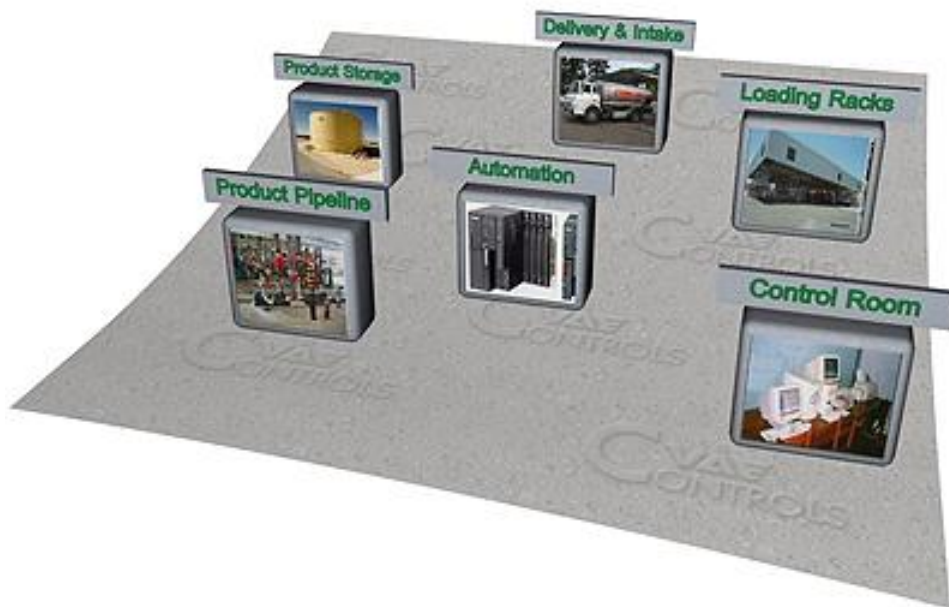


TAMAS

(TERMINAL AUTOMATION AND MANAGEMENT SYSTEM)

DESCRIPTION OF THE SYSTEM FOR MANAGEMENT OF FUEL STORES



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TAMAS

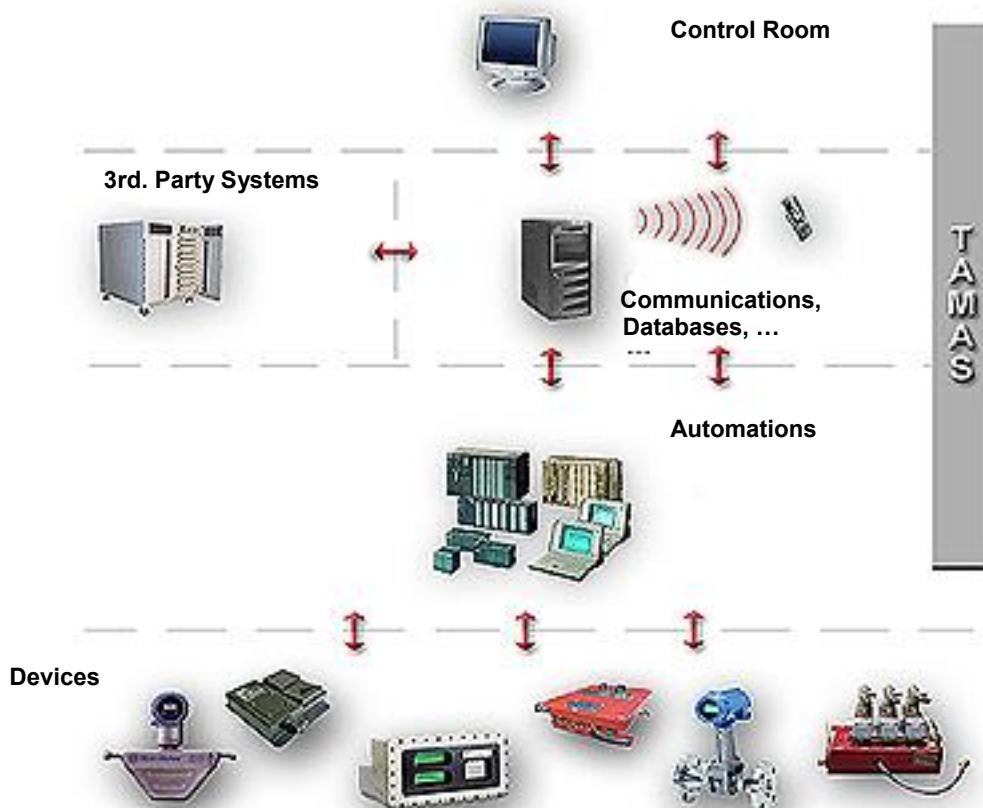
(TERMINAL AUTOMATION AND MANAGEMENT SYSTEM)

TAMAS is a computer system for control of terminals and fuel stores. Main functions of the system are: automation of the technological process, solutions for extraordinary situations (ESD - Electronic Shutdown System), visualisation, and dispatcher's technology control, printouts of filling notes, protocols, registrations of customers and their orders, registration of drivers, vehicles, transactions, etc., communications with other information systems e.g. economic, management, and similar systems, plus archiving of all events.

The basic feature of the TAMAS System is its modularity that provides a solution tailored to measure for each customer. TAMAS can also provide selected functions only, as needed - e.g. registration of delivered fuel - or on the contrary - it can provide automatic control of the whole store.

1. Concept of the Control System

Fuel stores are technological units that - from the point of view of their purpose - make high demands on reliability and safety of control systems, and on fast access to technological data. Handling highly combustible and dangerous substances ranks these systems among so called Mission Critical Systems that have to provide reliable functioning even in case of extraordinary situations e.g. power supply fall-out losses, or failures of some system components.



Continual changes of prices on petroleum markets and changes in tax tariffs make high demands on immediate access to data on movements of goods, and on integration with the Enterprise Information System, or with 3rd party systems.

1.1 Reliability of the TAMAS System

Reliability of the TAMAS System is provided thanks a three-stage architecture that provides a safe emergency operations of lower stages in case of a failure of the higher stage.

The lowest stage represents all technological equipment of the store that shall be included in the system. It provides emergency manual handling with individual components of the technological unit by means of operating panels.

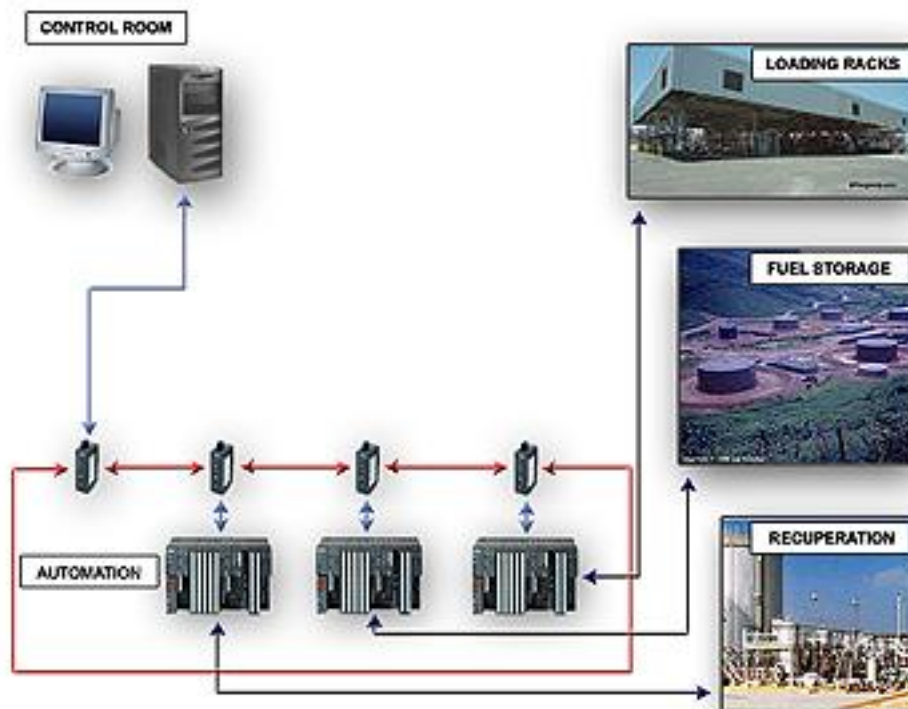
The next stage is represented by programmable automata (PLCs) to which all inputs, outputs, and communication lines coming from the technological equipment are connected. The automata contain algorithms both for manual, and automatic control of the technological equipment; further there are implemented such system safety elements as locking conditions, or the Identification System. Algorithmization at this level enables - in case of emergency - an alternative store operation (receipts & deliveries).

The highest stage consists of a Working Station equipped with the operating system Windows NT/2000/XP, and Client/Server architecture that provides a comfortable user interface for technology control & monitoring, and for goods transactions. The TAMAS System is open, and can be connected with the Enterprise Information System, or with 3rd party systems.

2. Low-level Automation

This term means a system consisting of one, or more programmable automata - PLCs in which control algorithms of the automatics, locking conditions for the run and safety of individual technological units are implemented. All input and output signals from the technological process are led to these PLCs that are included in the system, plus all communications. The PLCs are designed in such manner from the point of view of both software, and hardware, that they are able to provide an emergency operation in case of a failure of the dispatcher's workplace PC.

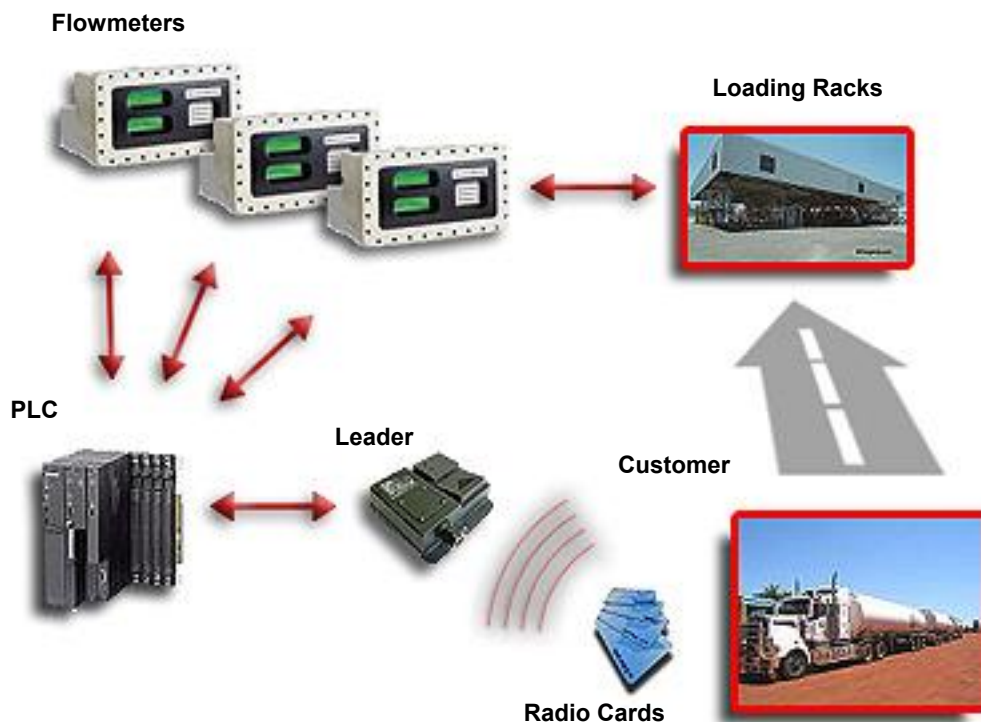
In order to reach system robustness, easy expandability and maintenance each unit is controlled by a separate PLC. These automata can mutually communicate through a ring-type bus (Industrial Ethernet, Profibus, MPI) which ensures fully viable operation in case when the line is broken in one point. Reliability can be even improved when redundant automata are used instead of standard automata. This solution prevents shutdowns in case of failures of their processor card, or their communication card.



2.1 Product Delivery

Product deliveries from delivery benches are solved using Accuload III flow meters in standard cases; the flow meters are controlled using Siemens PLCs series S-7 400 connected in the MPI / PROFIBUS DP ring-type network. This system provides both a comfortable user environment for operating personnel during delivery control and evaluation of information, and (in case of a failure of the dispatcher's workplace) also a possibility of emergency delivery without any loss of important information.

The sophisticated Identification System based on radio cards provides reliable assignments of delivery permissions for all customers, and enables a self-service filling system. The principle consists in assignment of identification cards to all customers, and in creating links between transactions and these identification numbers. On a wish, it is possible to create a special group of cards designed for deliveries without the necessity for the dispatcher to enter permissions. These cards are very suitable for emergency cases.



The solution for product deliveries is very comprehensive, and includes additive dosing into the product and blending. This all is closely bound with Customer's needs and requirements.

2.2 Product Storage & Transfers

The product storage technology includes - beside the tanks themselves - also means for collection and evaluation of information on the stored product, plus information on its transfer, i.e. receipt and delivery. Tank level and volume measurements, product density measurements, and product temperature measurements belong to the system optional components.

Automatic setting of product routes for deliveries and receipts from benches and railway stations, and for product re-pumping in case of enterprise internal transactions can be included in the system based on Customer's wishes.

A separate chapter is the automated system for pipeline control and recuperation.

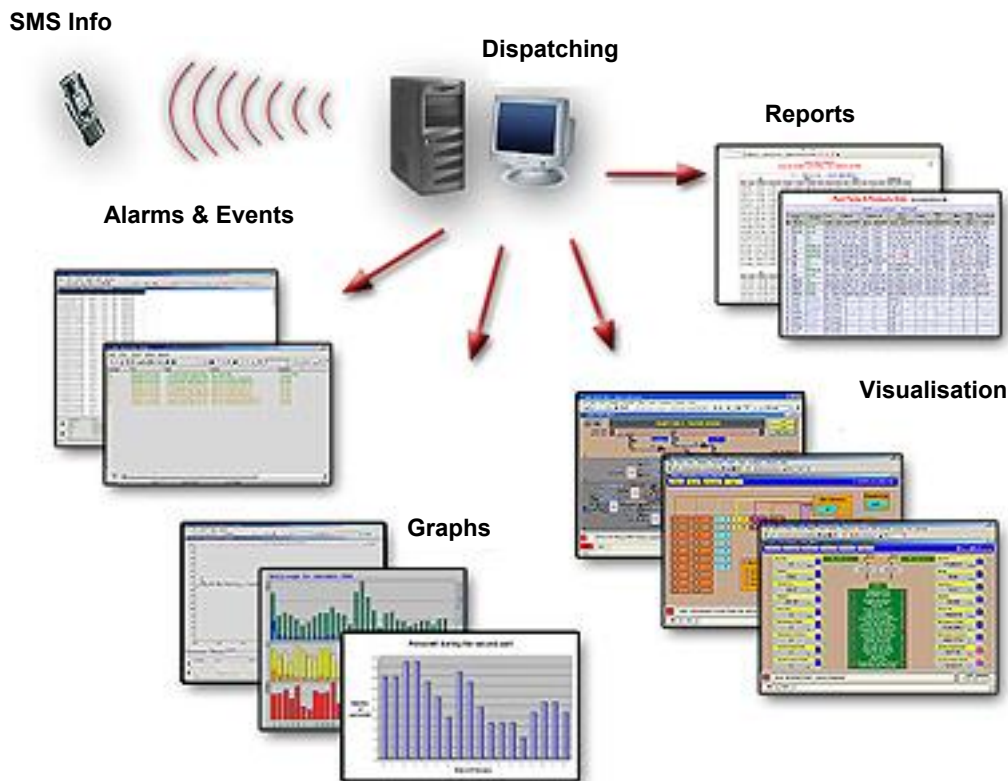
This list of algorithmizations being performed is indicative only, and can be adapted to the Customer's needs thanks high modularity of the TAMAS System.

2.3 Further Examples of Tasks Solved at PLC Level

- Level measurements, volume measurements, temperature measurements, and measurements of the other variables in tanks,
- Identification System for fuel delivery,
- Communications with flow-computers and additive dosing units during fuel delivery,
- Recuperation control,
- Fuel pipeline receipt & delivery control,
- Fuel delivery automatics,
- Evaluation of alarms and conditions necessary for safe & smooth fuel deliveries,
- Communications between PLCs, and mutual checks of states and information (delivery - store - recuperation),
- Pipeline automatic control system and regulation.

3. SCADA Server

A SCADA system (Supervisory Control And Data Acquisition) is used for visualization and technology control at the dispatcher's workplace. This system includes a possibility of visualization, control, overviews and evaluations of variables and values important for activities associated with product delivery and receipt.



3.1 System Architecture

The system architecture is based on the Client/Server principle while Server can be installed in two stations and run in the stand-by mode that can ensure smooth run even in case of a failure, or disconnection of one of the stations. Both Server, and Client can run in PCs with Windows NT/2000/XP operating system.

The basic functions of the SCADA System are to provide to the user means for the control of the technological equipment by means of a comfortable user interface, and technological data collection; the data are saved into the historical database. Both rich Clients that offer extensive possibilities for control, information display, and system management, and thin Clients that have limited functions on the contrary but they can be run anywhere in the environment of the Enterprise Network, or on Internet.

Operating is here very intuitive, and the Customer is able - after short-time training - to perform his own modifications (new screens, mimic diagrams, reports, or alarms) without any necessity of an intervention by our technician; this considerably improves flexibility of the system, and spares service costs.

3.2 System General Features

Features of the SCADA System supplied together with the TAMAS System:

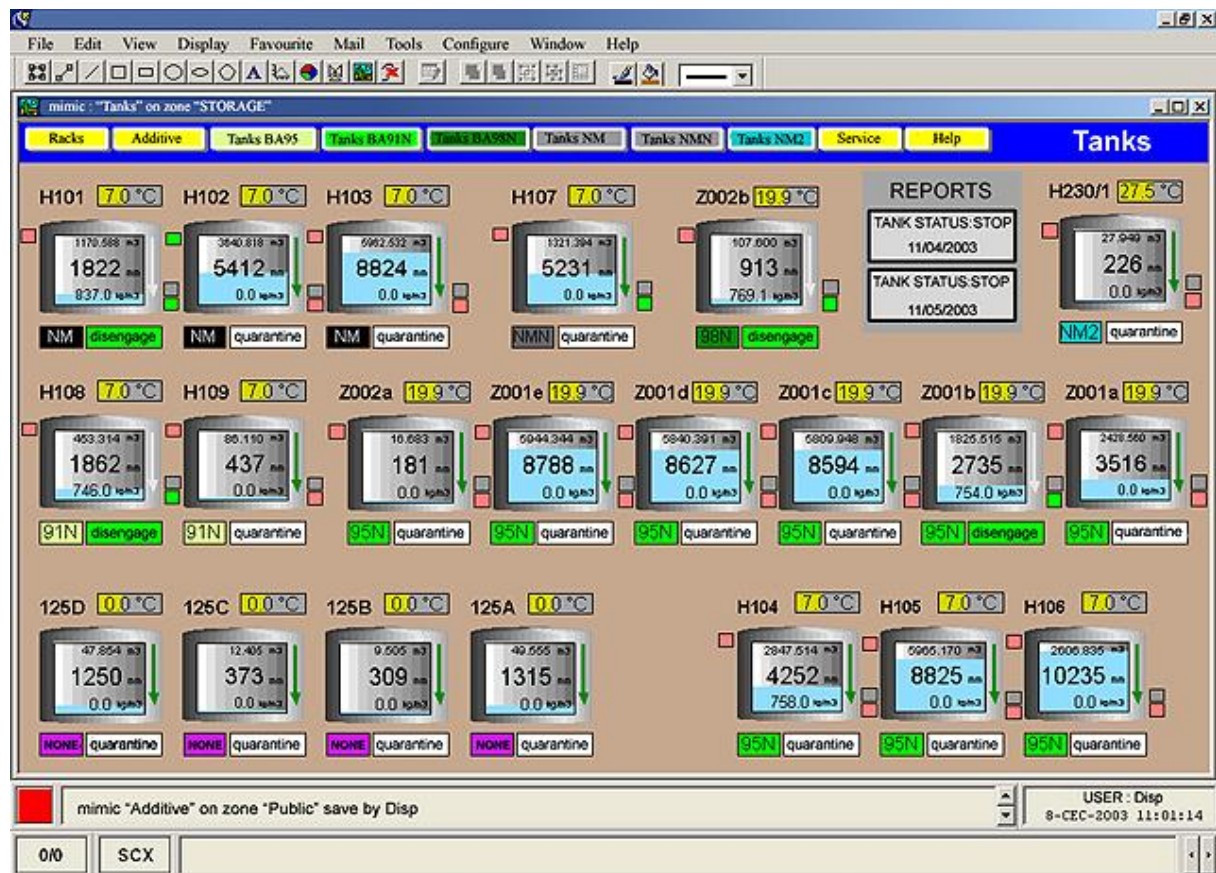
- Client/Server architecture is based on the well-tried SCX System,
- Windows NT/2000/XP,
- The option of Server stand-by,
- Multilingual support,
- Safeguarded access to data and services, various stages of user privileges within the range from data displaying, through control of technological units, to overall system management and development,
- Comfortable technology control, recording of control events,
- Checks of events and alarms,
- Data export into the Enterprise Information system (SQL Server, ORACLE, ODBC),
- Displaying Historical Value Graphs,
- Printouts of reports (texts, HTML)
- Data displaying through Internet
- A possibility of the SCADA System modifications and extensions by the Customer is included in each licence of the TAMAS System.

3.3 Examples of Technological Diagrams

The following figures show examples of technological diagrams taken from existing installations:

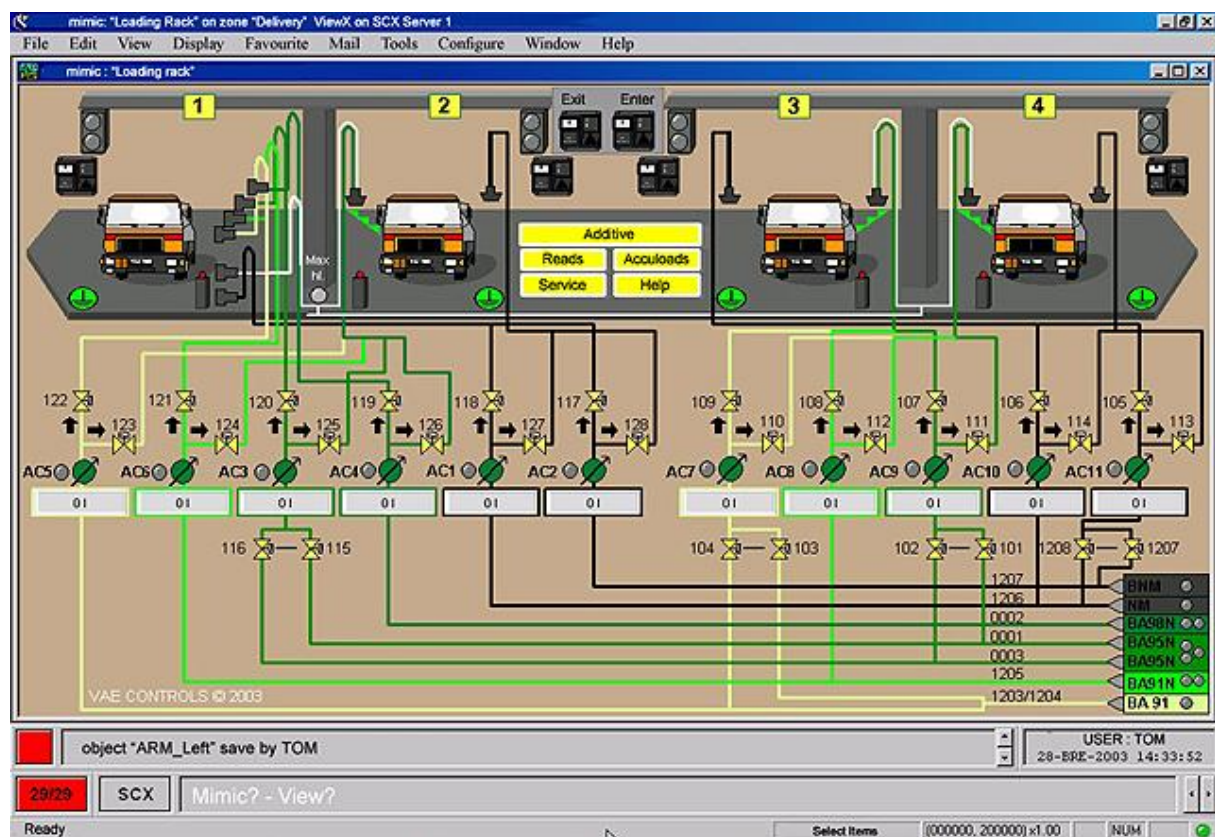
3.3.1 Displaying Data and Control Elements for a Fuel Store:

Mimic diagrams show basic information on product states in tanks of the fuel store. The shown data include level heights, re-calculations to product volumes according to calibration tables, temperatures in tanks, product types, delivery permissions for individual tanks, route settings for individual product types, and product qualities according to certificates. The information is transmitted from segment thermometers, level measurement radars, and are entered from an external system of a 3rd customer party (certificates). Minimum and maximum emergency levels are monitored in tanks, and pump locks are monitored in case of a danger that air can be sucked in.



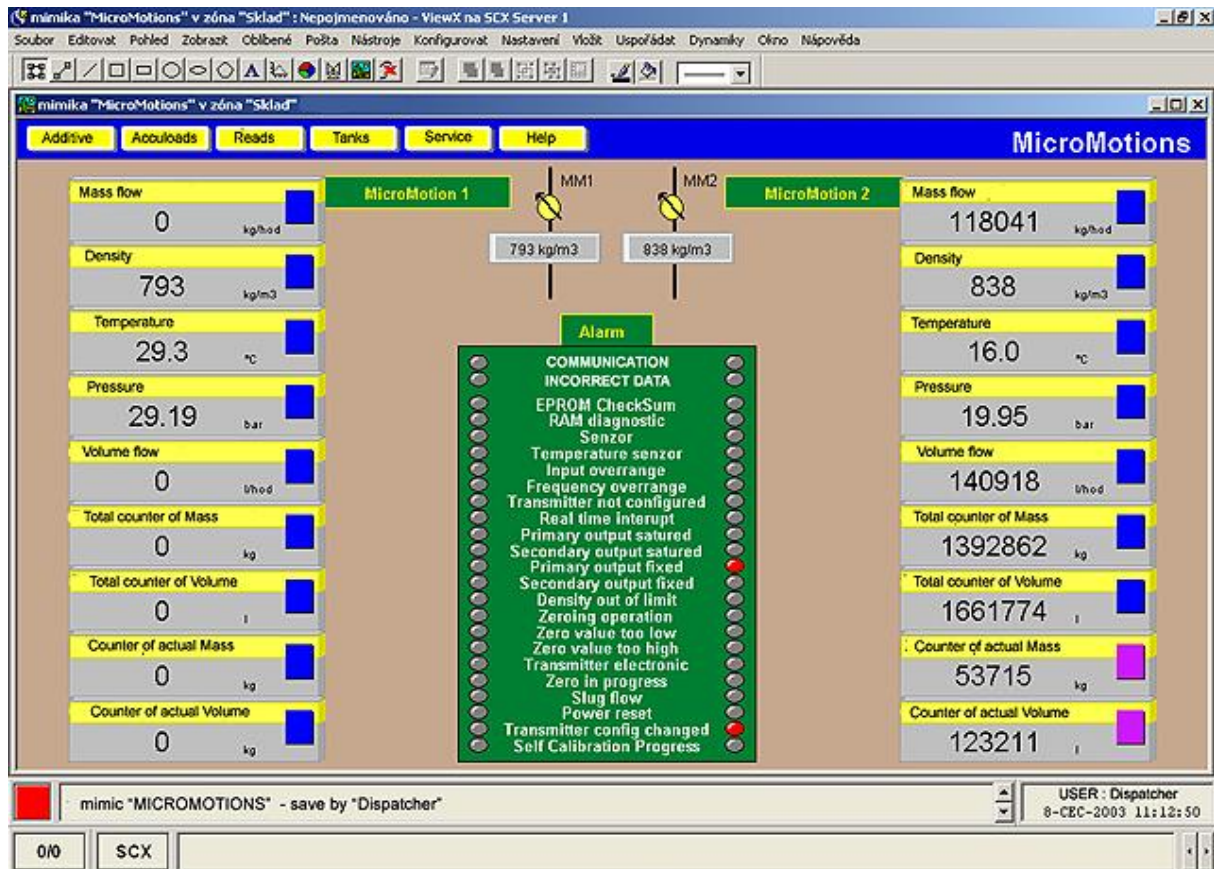
3.3.2 Displaying Fuel Delivery Benches:

Mimic diagrams show an overview of delivery benches incl. up-to-date information on delivery progress, states of delivery routes, states of flow meters, and identification cards used during the delivery. Important conditions and alarms for tank filling or emptying and Acculoads III are watched here. The whole delivery system is automated however it is possible to toggle to the manual mode any time. Mimic diagrams enable easy access to service information of the flow meter, dosing of additives, and the identification device. A clear screen incl. a Help is available, too.



3.3.3 Displaying Up-to-date Values and Alarms for MicroMotion Mass-type Flow Meters:

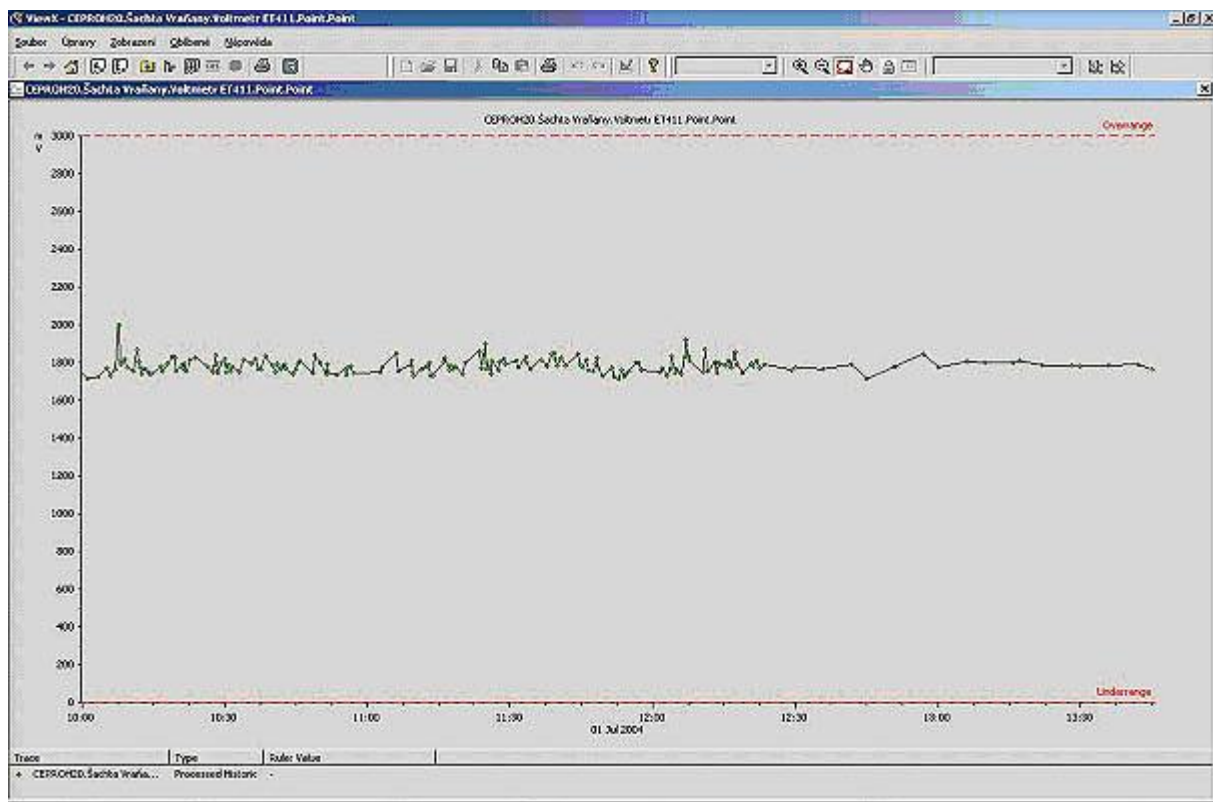
Mimic diagrams for Micromotion mass flow meters show up-to-date analogue and binary variables associated with the product and the equipment itself (events, alarms,...). Values such as temperature, density, pressure, flow rate, etc. are saved into the database, and can be further processed as balances and reports for certain time periods. Binary values indicate the flow meter state. These variables can be also saved into the historical list. Based on Customer's wishes, issues of direct commands and service mimic diagrams can be included into the system.



3.3.4 Example of a Graph:

An example of a graph created from saved analogue values of the controlled variable based on pressure, with one loose coupling. In particular, flow rate is regulated here using a control ball valve. In this case it is a pulse dynamic regulation.

Both the variable saving period, and saving frequency can be selected. The Customer is able - after short-time training - to modify these and other settings without any necessity for our service technician to be present.



3.3.5 Example of a Report on Tank & Product State:

Balances and reports covering certain time periods (24 hours, weekly, or similar) can be created from the variables saved into the database. These documents serve then for overviews, reports, or archiving.

The following examples show balances of product tanks of a few fuel stores for a defined time period, and product states in individual tanks. Receipt and delivery data of individual tanks are sorted based on time, and complemented with reference data (density, volume), pressure, and temperature. The residue balances in the tanks are calculated from the values, and the residue balances are compared with actual states.

Fuel Tanks Report
from 22.10.2004 14:00 PM to: 24.10.2004 01:00 PM

1. Tank n. 3. 1A / 22-OCT-2004 14:59:26 /																	
Tank			Litvinov							Báře				Blended tanks			
Time	Level	Volume	Volume 15°C	Volume	Mass	Density	Temp.	Pressure	Volume	Mass	Density	Temp.	Pressure	H4701	Volume	H4161	Volume
14:00	0.0	14.975	15.010	0.000	0.000	831.557	13.8	6.157	0.000	0.000	831.023	15.9	0.000	111.0	35.338	61.0	16.328
14:30	18.4	14.975	15.010	0.000	0.000	830.571	15.0	8.635	0.000	0.000	830.421	16.6	0.000	110.0	34.899	61.0	16.328
14:59	21.7	19.358	19.404	0.000	0.000	827.747	16.3	-0.291	0.000	0.000	829.053	17.9	0.000	111.0	35.338	62.0	16.703
15:00	21.8	19.358	19.404	0.148	0.122	827.139	16.3	18.424	0.000	0.000	829.024	18.0	0.000	111.0	35.338	62.0	16.703
15:30	95.5	137.031	0.000	122.228	101.316	831.057	12.2	12.241	0.000	0.000	828.834	18.5	-1.480	111.0	35.338	62.0	16.703
16:00	172.3	260.149	0.000	245.260	203.526	830.309	13.2	12.364	0.000	0.000	828.396	19.0	-1.479	111.0	35.338	62.0	16.703
16:30	248.5	382.394	0.000	368.398	305.770	830.208	13.2	12.368	0.000	0.000	828.334	18.9	-1.479	111.0	35.338	62.0	16.703
17:00	325.2	505.480	0.000	491.487	407.971	830.655	12.9	12.524	0.000	0.000	828.172	18.9	-1.479	111.0	34.899	62.0	16.703
17:30	402.3	628.222	0.000	615.004	510.632	831.514	12.1	12.574	0.000	0.000	829.113	17.7	-1.473	111.0	35.338	62.0	16.703
18:00	480.3	754.391	0.000	738.403	613.258	831.764	11.8	12.341	0.000	0.000	830.453	16.0	-1.472	105.0	32.722	62.0	16.703
18:30	557.3	877.099	0.000	861.850	715.952	831.932	11.6	12.396	0.000	0.000	831.698	14.3	-1.460	105.0	32.722	62.0	16.703
19:00	635.6	1003.350	0.000	985.471	818.805	832.004	11.6	12.323	0.000	0.000	832.780	12.8	-1.466	99.0	29.717	61.0	16.703
19:30	712.9	1127.220	0.000	1109.342	921.868	832.093	11.5	12.495	0.000	0.000	833.483	11.8	-1.466	99.0	30.144	62.0	16.328
20:00	791.9	1253.820	0.000	1234.038	1025.623	832.073	11.5	12.416	0.000	0.000	834.255	10.8	-1.466	93.0	27.607	61.0	16.328
20:30	861.4	1365.214	0.000	1345.529	1118.398	832.224	11.3	11.686	0.000	0.000	834.827	10.0	-1.465	93.0	27.607	62.0	16.703
21:00	927.4	1471.060	0.000	1449.382	1204.828	832.278	11.3	12.809	0.000	0.000	835.366	9.3	-1.459	86.0	24.708	61.0	16.328
21:07	945.7	1500.417	0.000	1479.006	1229.482	832.246	11.3	12.785	0.000	0.000	835.518	9.1	-1.460	86.0	24.708	61.0	16.328
21:30	945.7	1500.417	0.000	1573.718	1308.303	832.210	11.3	12.738	0.000	0.000	835.807	8.6	-1.460	86.0	24.708	61.0	16.328

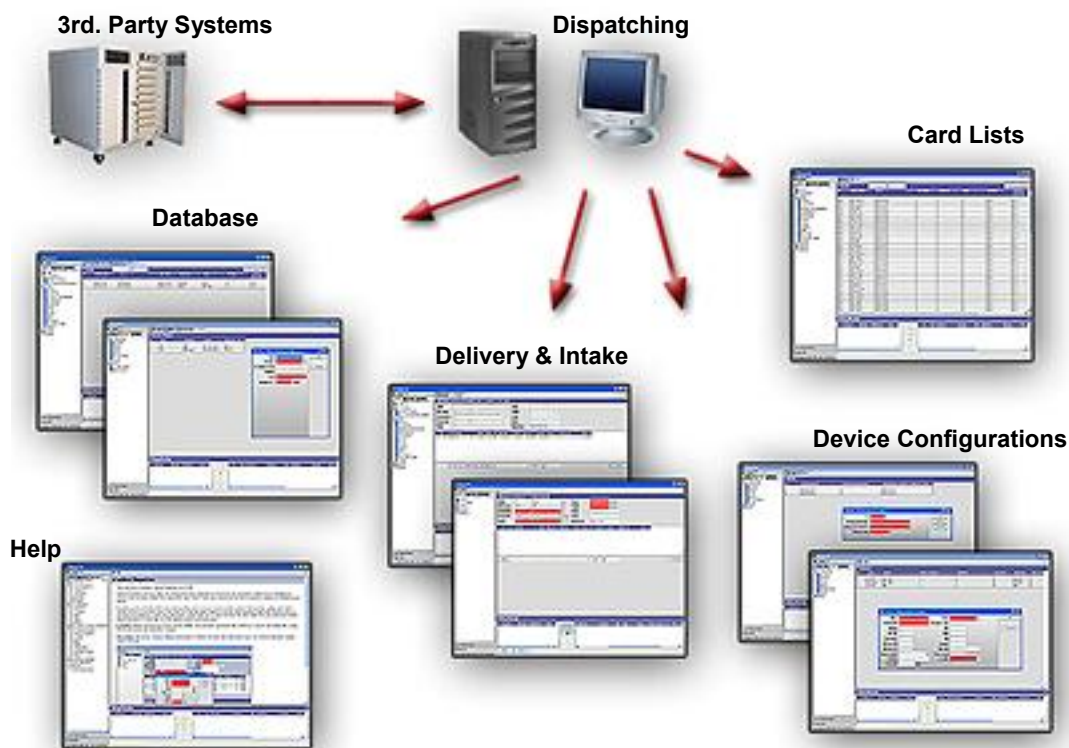
Fuel Tanks & Products State 25.10.2004 06:00 AM.

CEPRO, a.s. Třemešná Fuel Tanks															
Tank	Product	Lvl.	Volume		Volume ref.		Free volume		Temp.	Mass ref.		Mass	Free mass	For delivery	
ID	Name	[cm]	[m³]	[m³] 15°C	[m³]	[m³] 15°C	[m³]	[m³] 15°C	[°C]	[kg/l]	[kg/l] 15°C	[tun]	[tun]	[m³]	
1	H211A	BA95N	500.6	1400.462	1413.826	0.000	0.000	1735.019	1751.259	7.10	752.68	745.70	1054.100	1305.914	1340.462
2	H211B	BA91N	324.9	910.474	919.962	0.000	0.000	2235.705	2258.561	6.40	751.61	744.00	684.318	1680.369	850.474
3	1A	NM	450.9	707.192	709.208	0.000	0.000	792.100	794.299	11.70	830.90	828.60	587.606	668.166	687.192
4	1B	NM	24.0	20.966	21.026	0.000	0.000	1476.432	1480.523	11.70	831.60	829.30	17.435	1227.796	0.966
5	1C	BA91N/230	386.0	1422.280	1428.033	0.000	0.000	73.799	74.091	11.70	742.43	739.50	1055.951	54.791	1397.280
6	1D	BA95N/230	944.2	1493.150	1499.181	0.000	0.000	-1.922	-1.930	11.70	742.33	739.40	1108.410	-1.427	1473.150
7	1E	BA95N/230	940.0	1492.930	1498.939	0.000	0.000	1.603	1.609	11.70	744.05	741.10	1110.780	1.193	1472.930
8	2A	NM	890.4	5924.316	5941.175	1132.080	1128.933	-2.741	-2.748	11.70	831.70	829.40	4927.236	-2.279	4762.256
9	2B	NM	377.3	2416.532	2423.409	0.000	0.000	5219.089	5233.543	11.70	831.70	829.40	2009.822	4340.701	2386.532
10	2C	BA95N/230	0.0	0.000	0.000	0.000	0.000	7532.585	0.000	0.00	0.00	747.00	0.000	0.000	0.000
11	2D	BA95N	330.9	2073.347	2081.581	2007.792	2000.000	5461.756	5483.035	11.70	750.61	747.70	1556.281	4099.665	35.555
12	H401A	NM	389.3	2766.214	2783.918	2716.815	2700.000	6754.940	6797.008	7.50	836.78	831.60	2314.710	5652.392	-150.601
13	H401B	BA95N	646.9	4630.891	4667.416	1589.982	1577.775	4909.858	4947.845	8.50	749.45	743.70	3470.640	3679.713	2840.909
14	H401C	BA95N	671.6	4076.600	4115.871	4037.794	4000.000	5457.528	5509.094	7.00	754.26	747.20	3074.816	4116.395	-161.194
15	H401D	BA95N	677.7	4854.030	4883.026	0.000	0.000	4826.816	4855.105	10.10	746.05	741.70	3621.334	3601.032	4854.030
16	H4701	NM-Blend	46.0	9.938				100.062							
17	H4161	BA-Blend	16.0	2.583				107.417							
18	H4301	Slop-NM-BA	25.0	1.549				13.451							
19	H430A	Slop-NM	37.0	1.776				8.224							
20	H430B	Slop-BA	70.0	4.324				5.676							
21	H101A	Slop-NM	71.0	4.245				5.755							
22	H101B	Slop-BA	32.0	1.238				8.762							
23	1m3	Slop-BA	35.0	0.360				0.650							

4. Application Server

The Application Server provides a platform for function extension of the TAMAS System. Such tasks associated with product delivery, receipt and transfer administration to 3rd parties are solved here that are not suitable or able to be solved with SCADA System means. This application is based on the HTTP protocol and Internet technologies, and its Clients can be launched in the Internet Explorer 5.5 browser, or higher. The application modularity is kept also in this case; the modularity provides high ability of adaptation to Customer's needs.

Next possibility of the Application Server is connection of a communication to another device indirectly associated with fuel transfers (for example: data collection from a manual device, communication to a device of another manufacturer that is connected to PC, etc...). These connections are solved by external communication components.



4.1 SQL Server Database

The SQL Server Database is supplied together with the TAMAS System as a standard with which the Application Server closely co-operates. Variables concerning those applications that are created during goods movements inside the store (e.g. deliveries into road tank cars, receipts from rail tankers, or similar...) are saved into the database using the application logic. These transactions can be further processed or exported into another information system of 3rd parties. Further such tasks run there that monitor movements of drivers in the store based on information transmitted from the Identification System.

Another component is the database of drivers, transporters, owners, destinations and vehicles associated with fuel transfers, delivery and receipt routes, and certificates. These and other data can be easily completed and modified by the Customer.

4.2 Dispatcher Application

The Dispatcher Application offer tools for monitoring product deliveries and receipts into road tank cars and rail tankers with the possibility to print out delivery and receipt notes, and a connection to the Identification System. It enables concurrent processing of any number of transactions in various progress stages, and their easy and intuitive control. Forms for transactions contain basic checks for the delivery and receipt rules.

Dispatcher can be configured for a co-operation with the Enterprise Information System.

The application is of the Client/Server type, and multiple users having different access rights can work with the application.

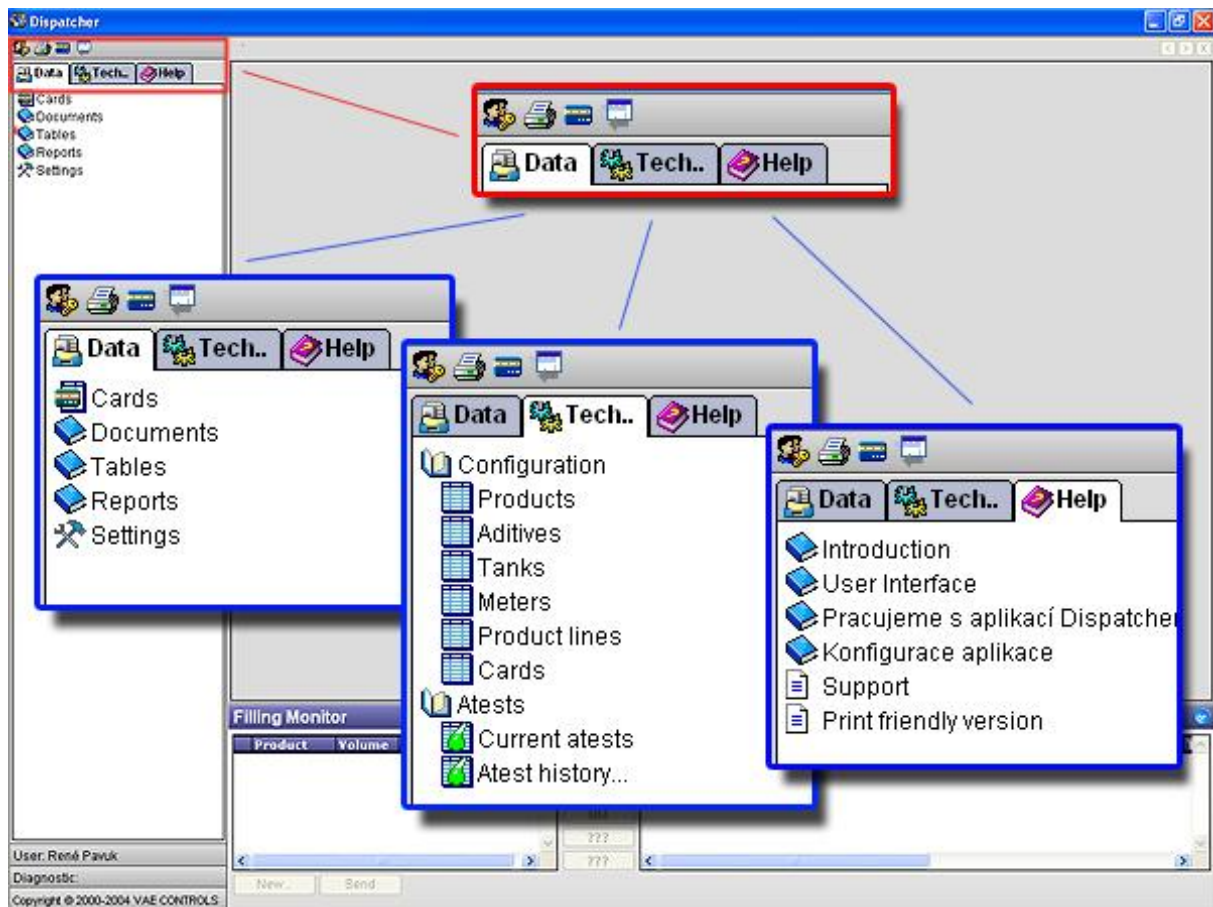
Basic Functions of the Dispatcher Application:

- Identification of drivers using identification cards, or an other type of identification facility,
- Entries of permissions for fuel deliveries, or receipts,
- Registration of drivers, semi-trailers, towing vehicles, destinations, transporters, etc.
- Entries of certificates,
- Configuration of products and additives,
- Automatic import of contracts and limits for fuel deliveries,
- Automatic export of data on performed transactions,
- Printouts of delivery notes, balances of delivered quantities for any time period.

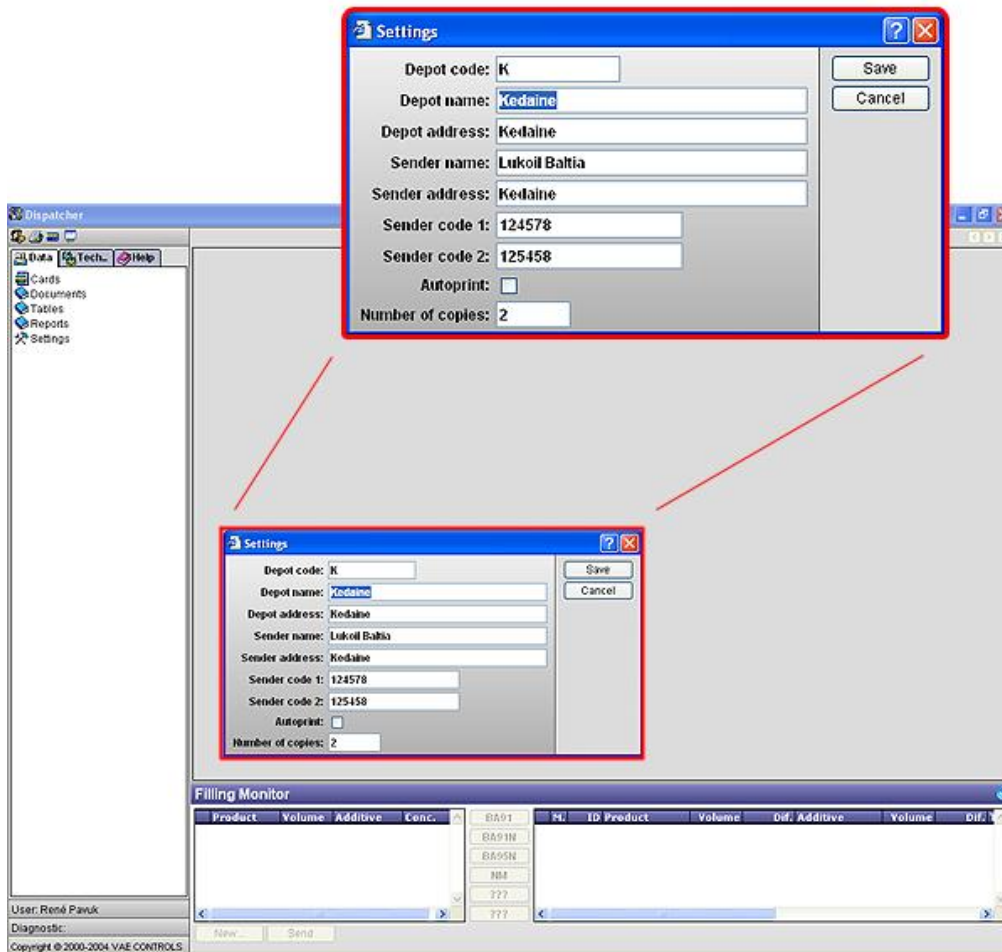
4.3 Description of Screens in the TAMAS Dispatcher Application

4.3.1 Introduction Screen:

The introduction screen offers in the left menu - after user login - a possibility to display transactions and saved values, technology configuration and Identification System, and an extensive clear Help. It is possible to open a few windows concurrently, and to switch over among them. A diagnostics of the system state is also included plus a database and communication to the Application Server and internal logic.

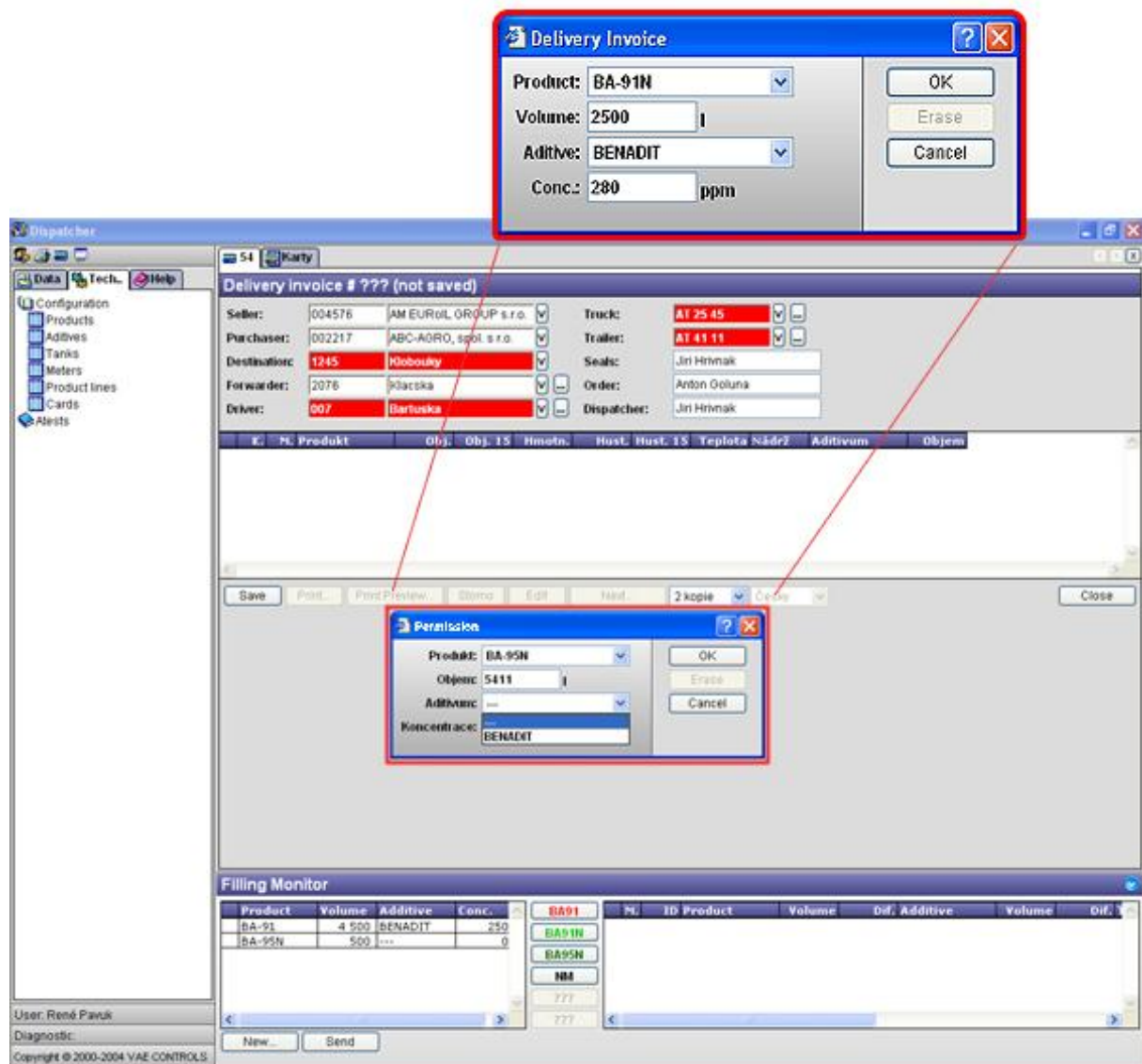


It is recommended in the basic setting to fill the items about the owner that are further shown in document printouts and delivery note printouts, and improve comfort for operators when handling transactions.



4.3.2 Screen for Product Delivery Entry:

When a radio card has passed through the identification device the Dispatcher Application opens automatically a window containing options for the transaction entry. After the data necessary the delivery note are entered - the data can be selected in a list - the operator enters quantities and type of products intended for the delivery, and the requirement is sent off by him with a single click to the filling algorithm in the automaton. The driver on benches sets and fills then the relevant quantity based on instructions shown on the flow meter display.



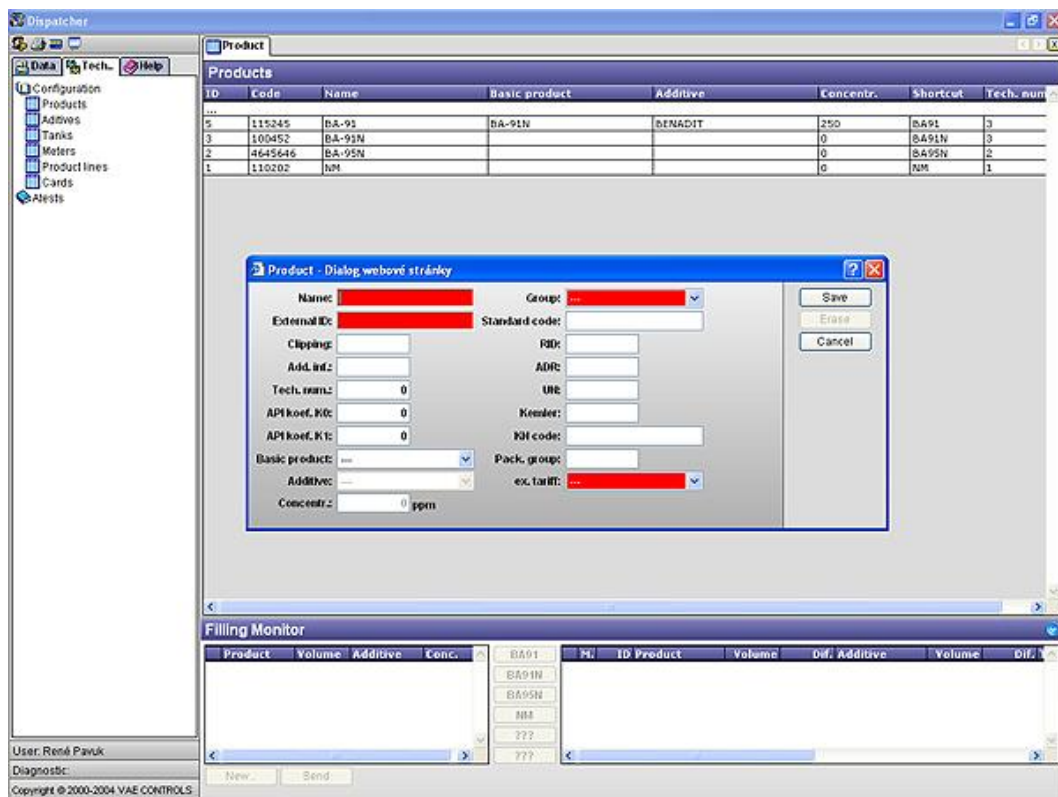
Identification numbers (cards) can be linked to a particular customer, and thus can make the information saved in the database clearer. It is easy then to find transactions for the customer in association with these links.

4.3.3 Entries and Overview of Variables for Product Delivery and Receipt:

The Dispatcher Application enables the Customer to create his own database of data that both are necessary for product transfers, and improve work productivity and comfort.

4.3.3.1 Variables Necessary for Product Delivery and Receipt:

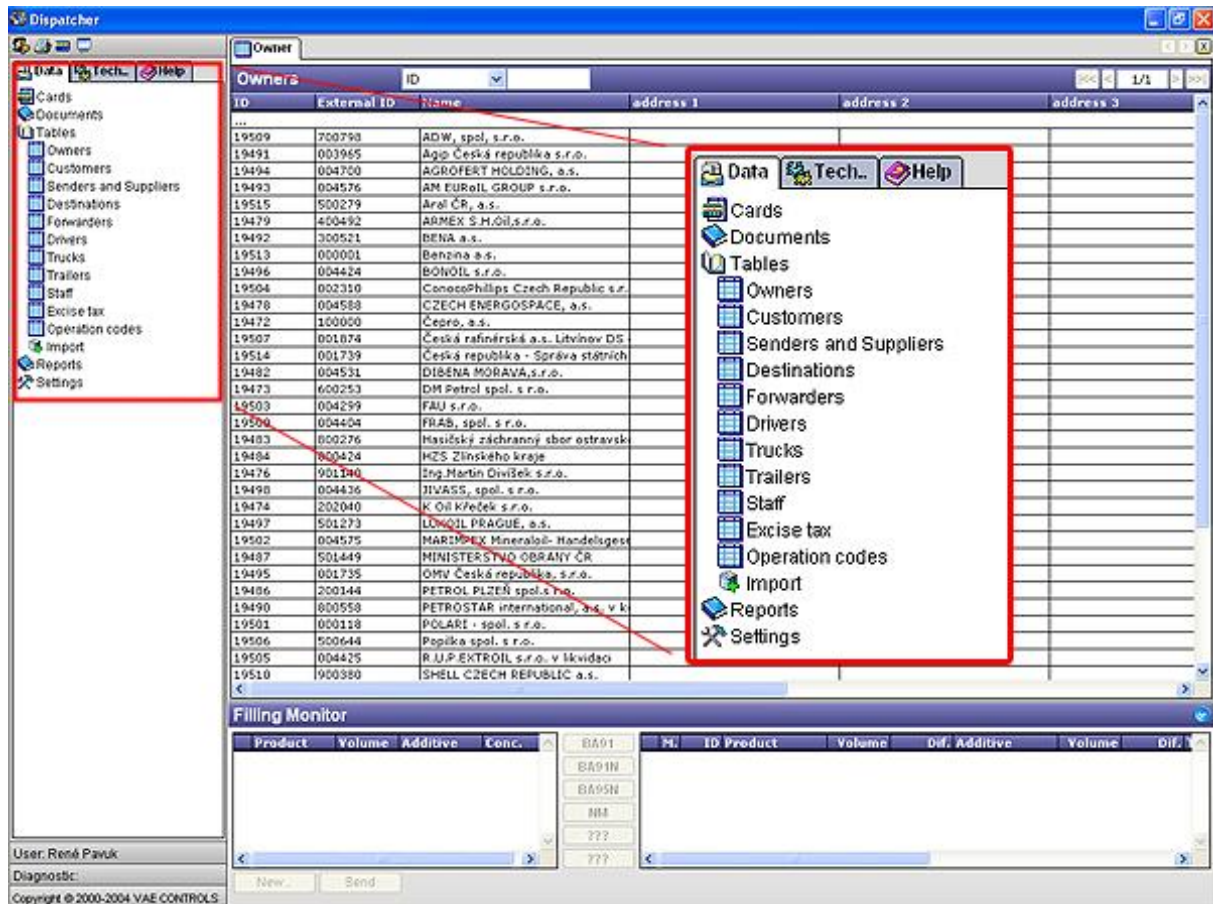
Variables necessary for product delivery and receipt are those that create direct links for information necessary for transactions. These include e.g. entering and configuring products, additives, entries of delivery and receipt routes and certificates, or similar. Absence of these variables is visually alarmed in delivery notes during transactions, and after transaction completion. An example of configuration and product entries is shown in the Figure.



4.3.3.2 Variables Selectable for Product Delivery and Receipt:

Selectable variables serve for work comfort improvement, and make transaction records more clear. The Customer has the possibility to create his own database of owners, customers, drivers, tow vehicles, and semi-trailers, destinations, employees having different access rights, etc., and thus he can reduce links for filtrations of transaction or other records. However their absence is no hindrance for product receipt and delivery.

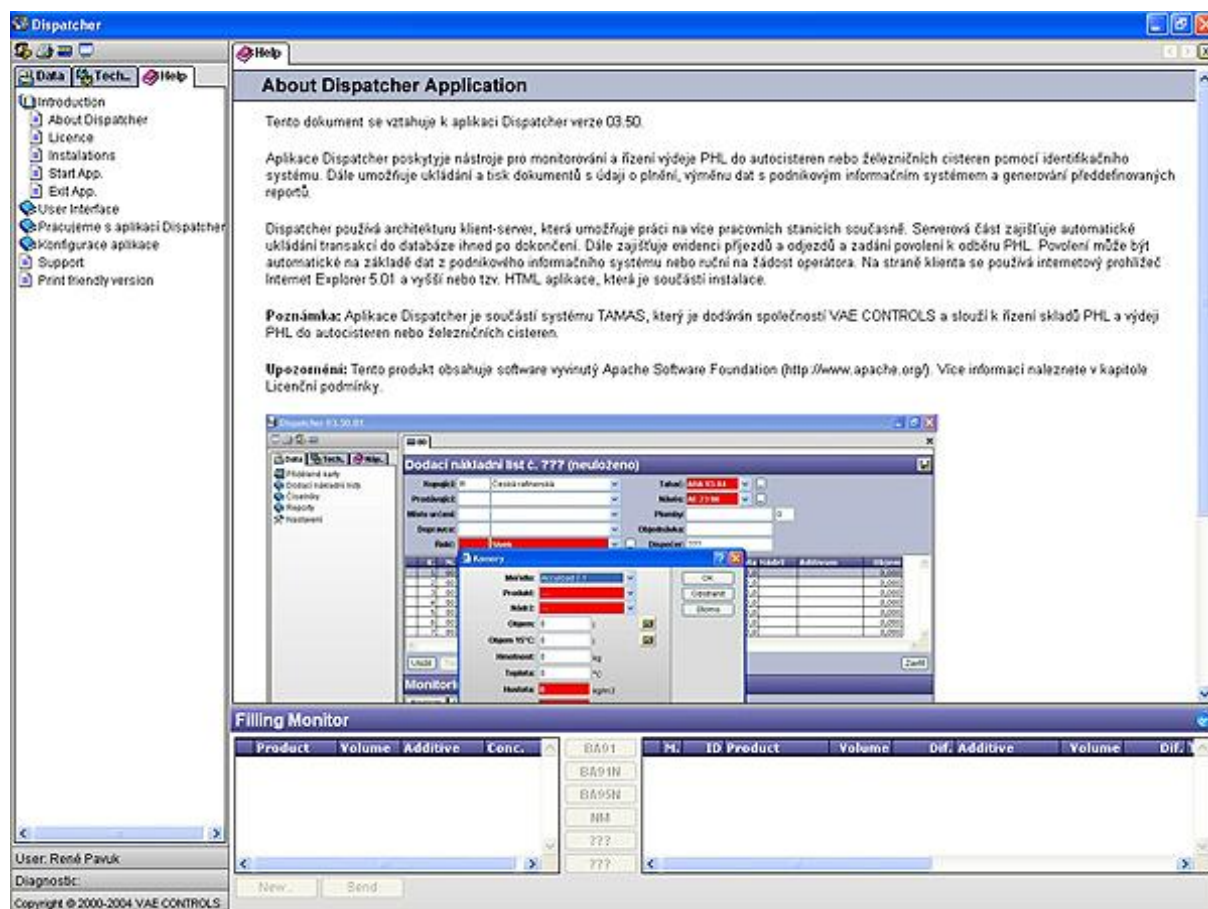
Information can also be imported into the database from suitable electronic patterns.



The existing database can be extended based on Customer's requirements by further areas (employees, transport zones, etc.).

4.3.4. Help for User and Online Support:

Clearness and intuitive operating of the TAMAS Dispatcher Application are completed with a voluminous Help that acquaints users with program possibilities, and provides help if needed. Contacts are also included for the case of a necessity to consult in a verbal, or written form.



Another help possibility is to enable at the Customer side a connection through WWW to the workplace, and a direct intervention by a service person.

5. Connection to the Enterprise Information System

Both the SCADA System, and the Application Server provide tools for data exchange between the TAMAS System and the Enterprise Information System, or a 3rd party system.

5.1 Supported Technologies

Supported technologies for data exchange:

- Configuration of automatic tasks for data transmission from, or to an other database, (There is a condition that such database has implemented the ODBC driver.)
- Data transmission by means of the HTTP protocol (XML, web services),
- Communication by means of the DCOM technology,
- Communication by means of the OPC technology.

5.2 Reports

The TAMAS System also offers reports to be included directly into the Enterprise Information System. Daily or monthly tank balances, or monthly volumes of delivered quantities of individual products can serve as examples.

5.3 Up-to-date Information on the Workplace and During Transactions

Up-to-date information and the state on the delivery workplace can be monitored from the Enterprise Network by 3rd parties using the Clients of the SCADA a TAMAS Dispatcher System during a transaction without any interventions into the transaction or technology control are allowed. This enables instantaneous checks of the workplace state from a remote place.

6. Extended Possibilities of the TAMAS System Modifications

Nowadays the latest version of the TAMAS System is used not only in Petrochemistry but also in Water Supply and Distribution and in Energy Industry. High adaptability and modularity enable to meet specific Customer's requirements not only during the system implementation but also during the guarantee period, and in the subsequent time period. In many cases, the Customer may specify himself the whole product delivery & receipt process, and in general, the whole link of the technology to the information collection and processing.

If you decide to use our system for your needs we believe you join our satisfied customers.