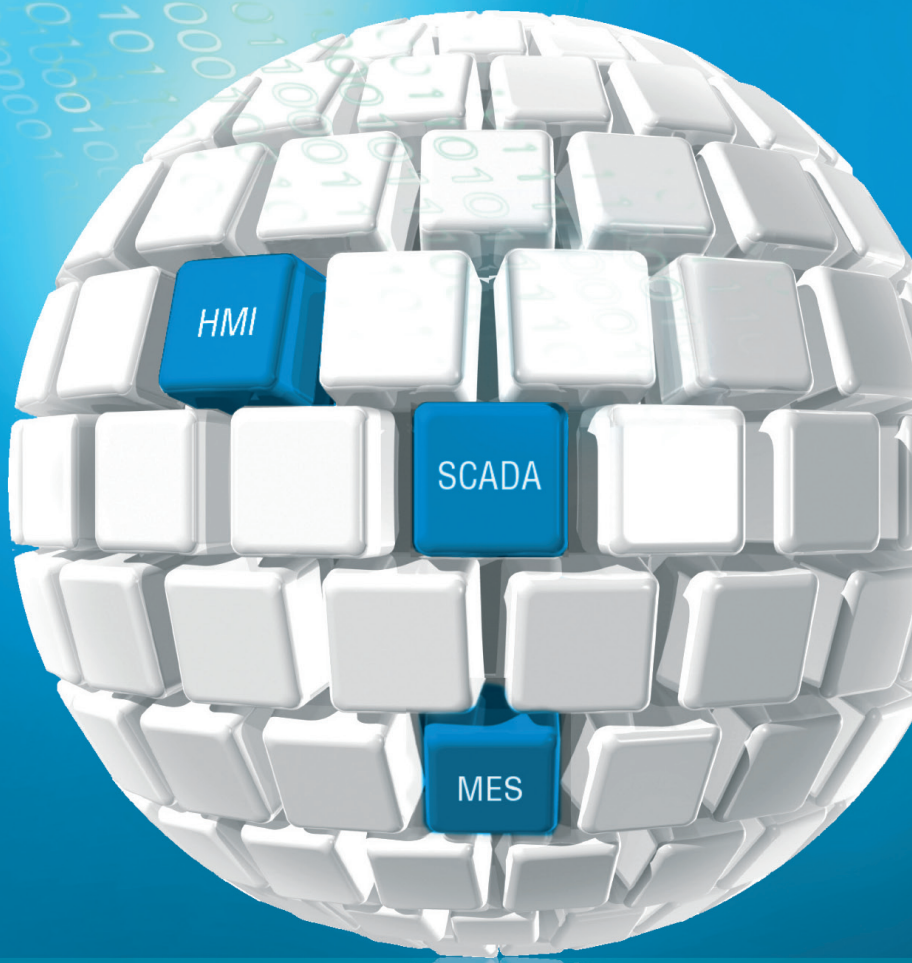
asix 6

see and get more...

SCADA SYSTEM



ASKOM

RELIABLE SOLUTIONS

Contents:

asix visualization system

asix is software package for design and implementation of industrial IT systems intended for plants, processes, production lines, machines and devices offering rich functionality expected of HMI / SCADA / MES systems. In addition to standard visualization and control, it allows effective data logging, reporting and generating graphical trends, alarms management, creating recipes, visualization on the Internet, multilanguage support, production monitoring and tracking. All this is available through scalable licensing programme to match the size of the project.

HMI + SCADA + MES

are the three attributes of asix allowing the user to "know and see more..."

More than 4000 user licenses are an impressive achievement, which confirms the many strengths of asix when successfully applied in various demanding fields, such as:

- power generation and heating,
- food industry (dairy, meat and sugar industry),
- chemical and mechanical industry,
- coking plants,
- public utilities,
- smart buildings,
- telemetry systems,
- automotive industry,
- steel industry.

asix
– a tempting proposition!

We can safely assume that each good food lover most likely tried some Chinese cuisine at one time or another. Although he did not know much about it, he was tempted by the commonplace opinion and the delight of friends. Anyone craving the satisfaction of a new experience must have positively answered the question: why not give it a try? We hope that this description, a bit like a restaurant menu, will make it easier for you to try the **asix** system. We are confident that just like Chinese cuisine, **asix** will not disappoint anyone, a designer or a specific application user, who decides to order and implement the system.

Price
Admittedly, the price should not be the main choice criteria for a product such as SCADA system, but one cannot deny that it is an important factor in each investment decision. Competitive pricing of the **asix** package is no marketing trick. This is a natural consequence of the product's Polish origin, which results in a more attractive price on the domestic market and is unmatched by any other product developed abroad.

Scalability
The package can be tailored to specific needs with regards to application size and functionality (from local operator stations for a dozen measurement and monitoring points up to very complex multiple-workstation systems with thousands of variables having the capacity to handle an entire production plant in a single integrated environment and allowing access to data through the Internet). Available are packages for 32, 64, 128, 256, 512, 1024 and 4096 variables or practically without any limits (a limit of 232 variables). What's more, future expansion to a larger number of variables or extension of the functionality is not associated with any hidden costs as this is just the difference in the license price appropriate for the existing and the new range of functionality!

Wide range of functionality comes as a standard
There are some car manufacturers who sell their vehicles for relatively small amount of money. But it only seems that way. If you want to buy a specific vehicle, it turns out that you will have to pay extra for everything except the engine and the brakes! **asix** package is different - included in the price you will get more than from any other package, for example: recipes, event logging in a database, which is the key to production tracking, automatic restoration of missing events or alarm data due to computer or communication system failure (provided the source of backup data is available), design environment, report generator, sophisticated tools for creating trends, OPC/OLE/.NET servers making the data available to other Windows environment applications.
Each license also includes a built-in tool for application design! What's more, without interrupting data acquisition from the drivers, data logging and alarm recognition, it is possible to change application mode to design, introduce the necessary changes to the project and then switch back to the application run mode. There are few additional modules and their prices are also moderate.

High quality and suitability to one's needs
ASKOM's highly qualified software developers working in close cooperation with the engineers designing the applications for production control systems guarantee the high quality of the software presented here. Thanks to the continuous feedback from **asix** users, the quality is subject to continuous improvement. Close collaboration with application developers allows the programmers to implement the ideas of the actual users and their clients rather than dream up their own Imaginative concepts regarding the industrial sites.

Help and technical support - we will give you peace of mind
Naturally, some programming errors are inevitable. However, knowing that ASKOM's specialists can deal with the problem without delay and provide free software updates and patches offers any software designer and the user peace of mind.
If this still isn't enough to make you feel completely relaxed, perhaps information about the best technical support on the market (that's our goal) will convince you! Technical support by e-mail and phone is quick and competent. You should not hesitate when you find yourself in a tight spot in the middle of the night. Technical support by mobile phone will be provided even at night time!
Such technical support and complete documentation allow even the less experienced designers successfully build their own application. An example included in the package called The Factory can be used by copying ready solutions and pasting in your project. Even if the designer does not feel confident enough to use more advanced functions of **asix** package, ASKOM will provide training to introduce the user to the world of SCADA.

Ease of use
Beside the design process, a separate aspect of the application is its use. A wide range of objects, a possibility to obtain the same results in many ways makes the creation of an economic, user-friendly and easy to use application not overly difficult. Even those application components whose modification and adaptation to own needs are put in the hands of the operator are designed in such a way to make them easy to learn by any user.

Profit
Summarising the above arguments, you can be ensure that **asix** is your best choice - an excellent product which will give you a peace of mind without any extra cost.

asix – multifaceted visualization system

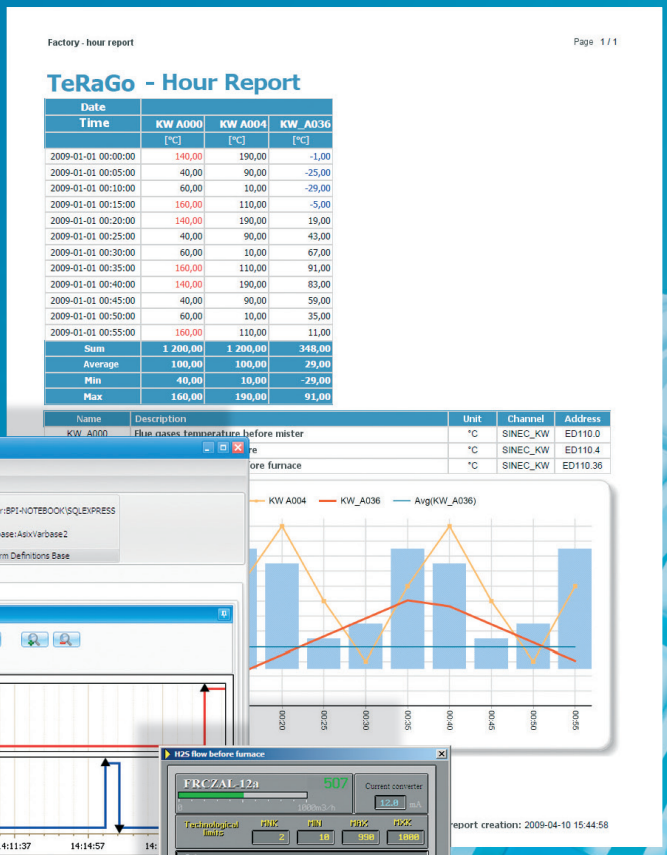
asix SCADA system has been offered on the market for many years. It is still being developed, expanded and enhanced by new functions and new application options. It is a sophisticated supervision and control software, which can be applied in systems of different complexity and size. This continuous development process has given rise to many faces of the **asix** package, depending on where it is applied within the multilayered structure of the production supervision systems.

It can be stated that **asix** point of view is related to the user's location. The system allows building applications for:

- direct control of the production process (Operator module features), including all necessary tools and functions,
- process supervision (Supervisor module features), in addition to everything at the disposal of the operator makes available data analysis tools, printing hard copies of transient values, alarm analysis, reporting and statistics,
- production management (Manager module features), synthetically collecting information from many technological nodes to provide reporting of the aggregate and statistical data and processing of data for production management systems,

The fourth "face" (Designer module features) is not associated with any specific type of user, but rather relates to what **asix** offers to a designer and application maintenance engineer. This aspect of the application also evolves and changes to make project implementation easier and faster.

All application levels communicate in harmony, exchanging source data collected during the production process and logged by the system. Operation within a uniform **asix** application environment ensures easy access to data relevant to each production management level: from the operator to the manager.



Factory - hour report

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TeRaGo - Hour Report

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2009-01-01 00:25:00	40,00	90,00	43,00
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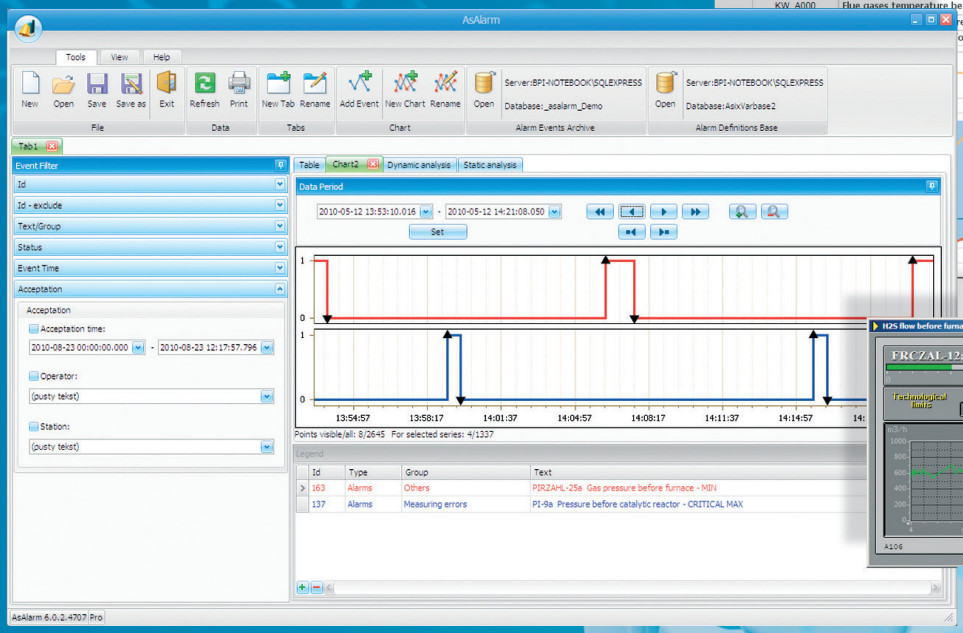
	ore furnace	°C	SINEC_KW	ED110.36

KW A004 KW_A036 Avg(KW_A036)

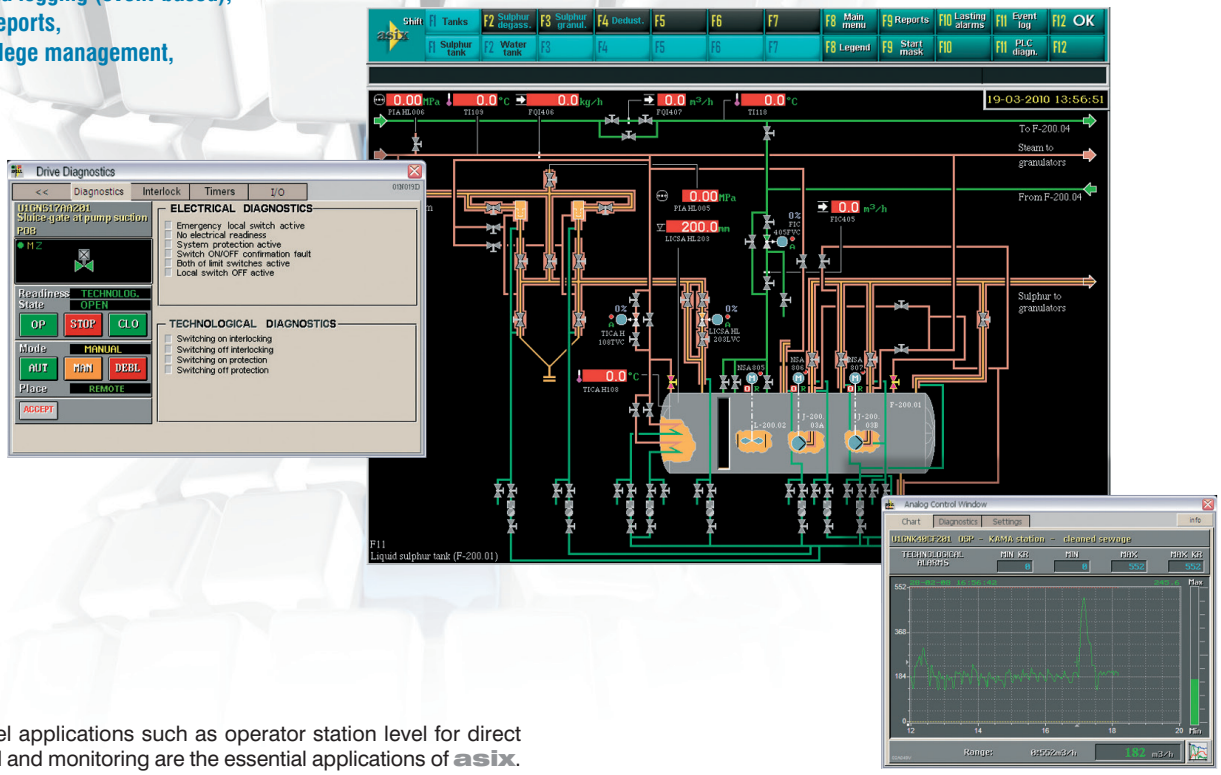
report creation: 2009-04-10 15:44:58



asix in operator stations – OPERATOR face

This level has the following features:

- visualization of process information,
- efficient data logging,
- operator alarming in situations requiring intervention,
- recipes,
- selective data logging (event-based),
- production reports,
- precise privilege management,
- application validation,
- multilingual applications,
- data acquisition channel redundancy,
- multiple display workstations.



The lowest level applications such as operator station level for direct process control and monitoring are the essential applications of **asix**. The expression "essential" is used because it is precisely this place where measurement data is acquired from programmable controllers, counters and other process data sources. It is from here that drive activation and deactivation commands are sent to the controllers, **binary and analogue signal change logs** are saved and the **alarm log** is registered. In other words the operator's application is the soil from which the production monitoring system draws its nutrients, which is the data.

The nature of the Operator module is characterised by the variety of process parameter presentation methods using visualization objects showing current measured analogue and binary signals. The production process status information is displayed in various windows, synoptic diagrams, measurement stations and drive stations, active alarms windows and report windows.

Analogue measurements and binary signals

Current measurements of analogue signals can be presented as numbers or bars. A suitable visualization object is also available for those who are used to analogue meters. In all cases, alarm indication (exceeding of technological limits) is only a matter of simple parameterisation; all objects are well prepared for this. A common solution in applications is the use of measurement stations or small windows presenting synthetic information regarding current measurement, technological limit values (with an option to modify them) or a graph of historical changes; consequently the measurements can be presented in various forms in different parts of the application.

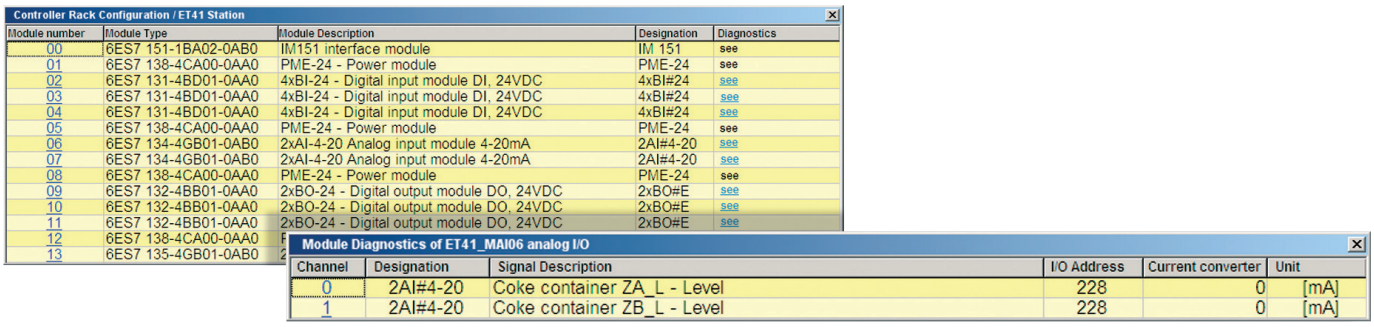
The application not only supports analogue measurements but also binary signals which reflect the status of devices and control them.

These signals can be logged and then viewed and analysed by the operator. Examples of binary signals will include drive information such as circuit closed, open or ready status. Efficient transmission of 16 or 32 bit word binary data, visualization of device status through various discrete objects using bitmap elements and single bit control all make up the image of what **asix** is capable of doing with binary signals, most often compiled into logical packets in the form of so-called drive stations. Operator action involving value entry in the station's control field or selecting a given field (button) sends the value (command) directly to the controller or after a prior confirmation.

A wide range of visualization objects available in the **asix** system allows the design of a clear and functional application featuring ergonomic data presentation.

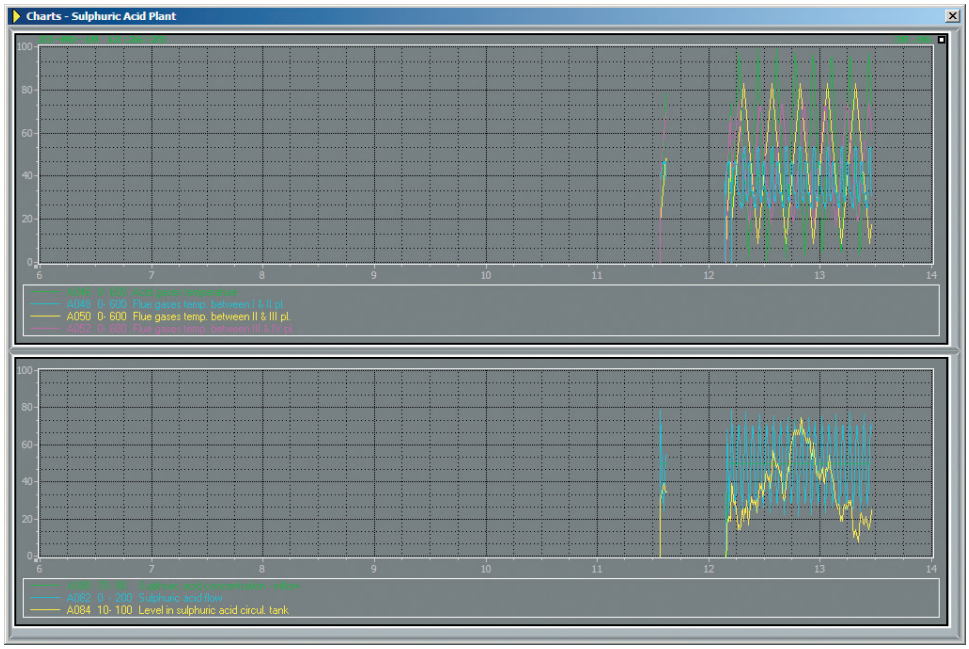
Freely definable interactive measurement TABLE

A user-friendly visualization system should allow the operator to easily adapt the process information presentation method to individual needs and the requirements of current process conditions. The TABLE object takes special place among other visualization objects. It is used for viewing in a tabular form of current process variables, which are freely selected online by the Operator or grouped into sets pre-defined by the application designer A predefined TABLE object can be used to display any set of variables, including: all variable attributes (ID name, description, unit or other attributes arbitrarily defined by the application designer) and current values, while dynamically matching the number of displayed rows to the number of variables in the set being displayed. Drive status variables can be shown in the table as text reflecting the status of individual drives rather than numbers, for example On, Off, Auto. Obviously this improves clarity of information and reduces the risk of making a mistake.



Graphs - archive data curve charts

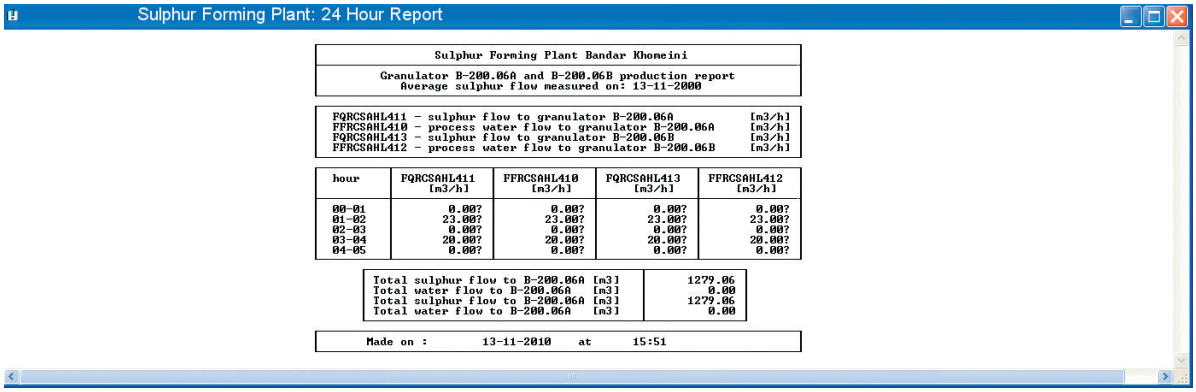
The logging module (Aspad) is an especially important tool of **asix** application which allows efficient collection of binary and analogue data. The size of available online archive on the process operator's or dispatcher's workstation is only limited by hard drive capacity. Data stored by Aspad module is used for presentation of measurement graphs directly on P&I Diagrams. The operator can adapt the graphs to his own needs by changing the viewed time range, going backwards and forwards in the historical data, by zooming in or reading a specific value of a past measurement. It is also possible to overlay any **pattern curve** onto current curve and set the application to read successive settings from this curve and send them to the controller in order to accurately implement a sequence of changes in the variable being controlled.



Production reports

Reporting the production and process status is a requirement for any computerised supervision system. Usually the available range of production reports is limited to averages, actual values or selected aggregate values presented in a tabular form. The built-in reporting application offers a range of predefined report templates that are not associated with a specific moment in time. Using a special window containing a list of report templates identified by a clear description one may select a specific report and the calculation starting point. The report is generated immediately and presented in a layout which is ready for printing or viewing on the screen. Reports can be generated automatically without any action required on the part of the operator, according to a schedule or in response to a controller signal or when an alarm occurs (post-mortem).

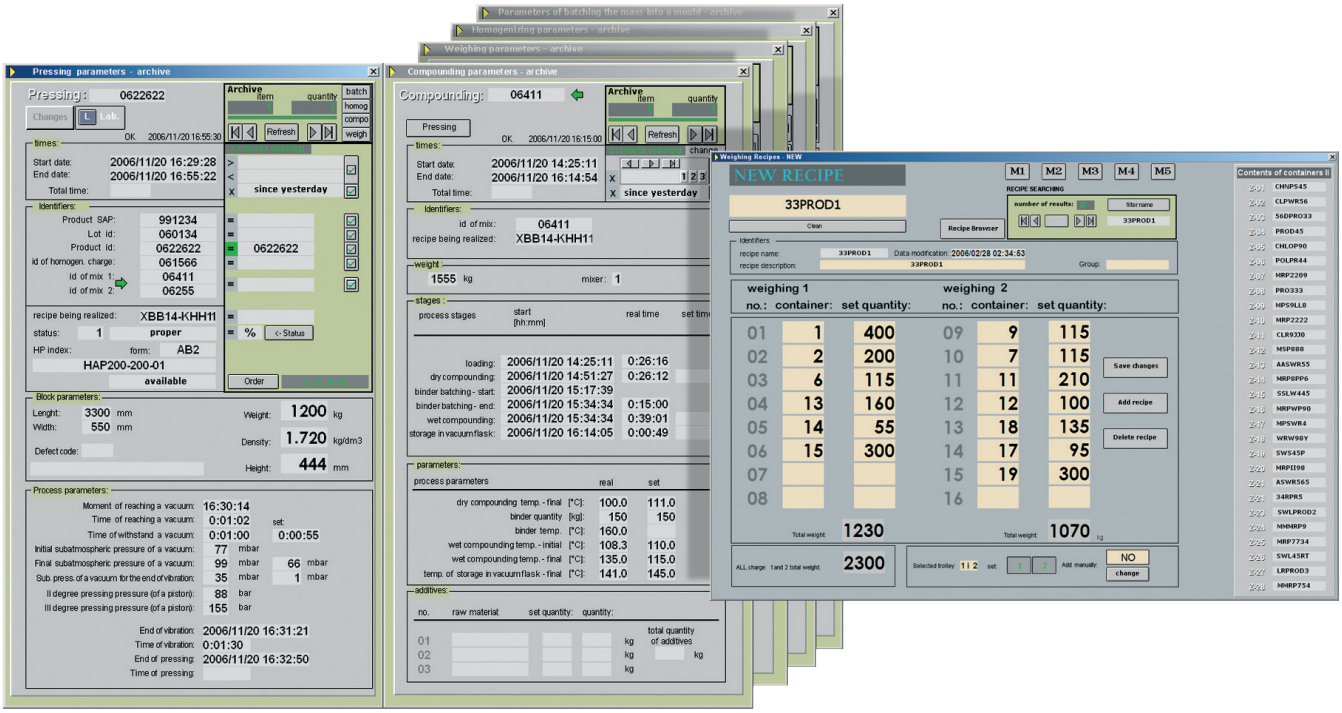
In special cases the generated report can be an object located in the process status visualization window, which illustrates the process, for example process quality indicators, current batch size, drive characteristics, current power and material consumption, post-mortem reports.
Taking advantage of the **asix** system open architecture it is also possible to generate reports using external tools such as Microsoft Excel spreadsheets.



Recipes and selective data logging (event-based)

Standard **asix** package is supplied with MS SQL Server 2008 Express and a specialised database management tool AsBase, which allows easy application of recipes both manually and in an automated mode. Recipes are supported by the application using standard visualization objects, which means that the operator does not have to learn new control methods or the complex database utilities interface. From the user's point of view everything including recipe creation and modification (if the designer made this possible) is as simple as normal drive control.

In addition to recipe support, AsBase offers manual or automatic registration of predefined data records which contain selected technological process parameters associated with a specific product or batch through a unique identifier. This allows production flow tracking and generating production documentation for a single product or product batch. Such product history is often required for formal reasons in order to make the product identifiable and ensure its quality and is often the basis of production management analysis.

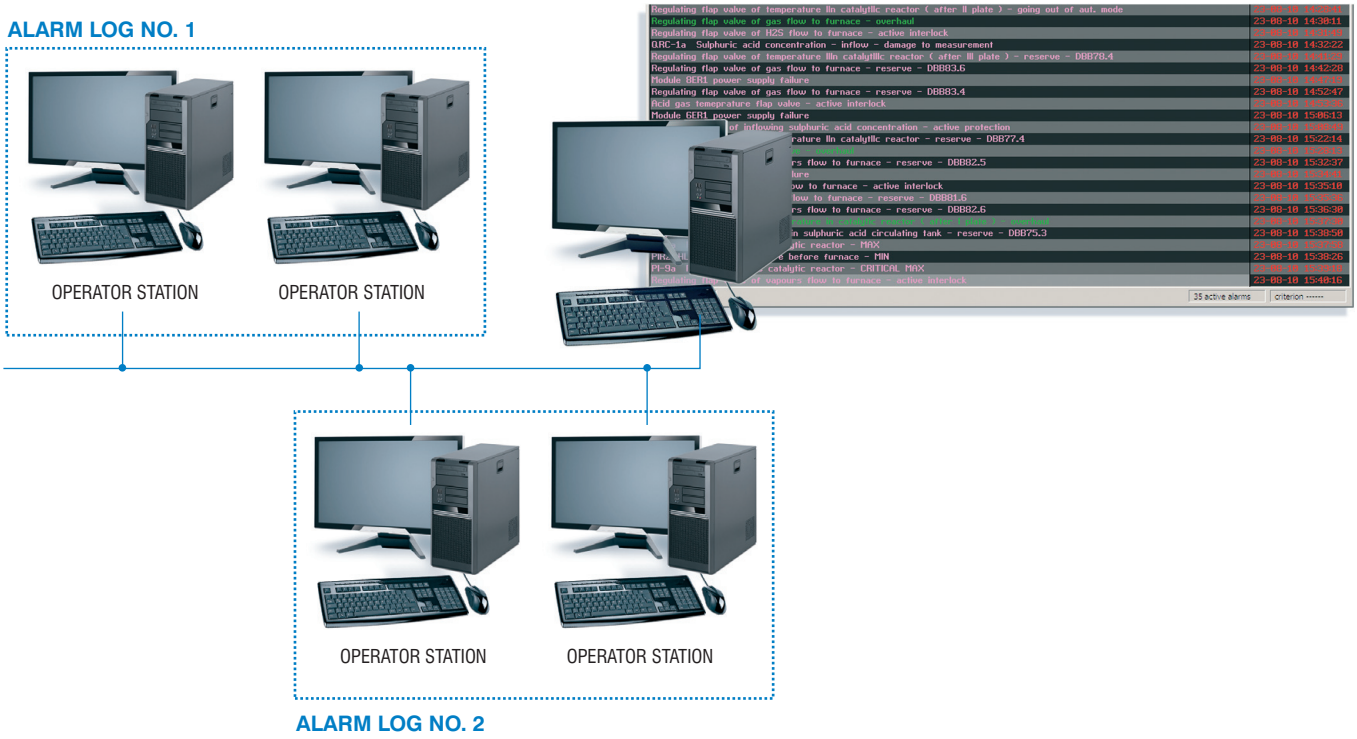


Alarm system

The alarm system is an indispensable element of any SCADA application and **asix** also has one. In order to ensure alerting the operator promptly to faults and emergencies **asix** supports alarm recognition in a number of ways called strategies. Application of a strategy suitable for a given application guarantees reliability of alarm and event related information. History of alarms is only limited by the hard drive's capacity. Alarm logs are stored in the daily archive file structure. Using this data, the application allows displaying an alarm list in specialised current and historical (past) alarm windows. At the operator's disposal is a number of tools allowing fast searching through the list using various search parameters such as time, text, status, type, number. Printing of the alarms filtered out using the search criteria it is also possible, which allows quick analysis of abnormal situations.
When operating over the network with many operator stations, the alarm system is additionally characterised by the following:

- synchronised alarm support in interconnected operator stations;
- automatic restoration of archived alarm data during workstation restart;
- optional viewing of alarms from many systems/servers in so-called checking mode;
- optional viewing of alarms from many external applications using dynamic switching between them.

Historical alarm data acquired from operator stations can be also made available to higher level applications (Supervisor and Manager modules).



Application validation, control registration and privilege allocation

In special cases, when required by the customer or the law, **asix** can be expanded by **AsAudit** module which is an advanced tool adapting the system to the requirements imposed by the system validation procedures applied in pharmacy, food industry, automotive industry according to FDA 21 CFR Part 11 standard. The operator is given specific privileges to perform specific actions which are also logged. However the operator does not need to be concerned about the application adequacy since validation guarantees its quality.

Multiple language support

In the event that the application is implemented outside Poland it is often necessary to provide the application with a multilingual interface. **asix** system layer (system windows) supports one of the two languages (Polish or English), but the application can support up to five languages which can be switched on line (during operation), depending on the language selected by the operator. Any strings defined by the designer and translated during the design process are switched to the required language. This means that any description and text displayed on the screen including alarms are changed to the correct language at the operator's request.

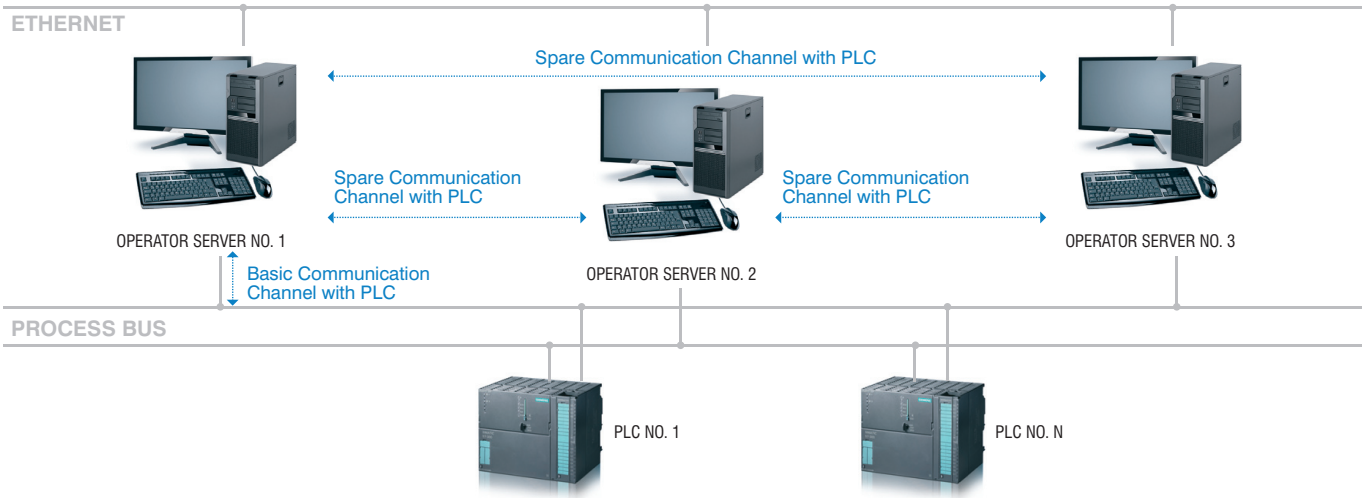
Multiple workstation applications – redundancy

asix has been designed specifically for control systems. This is why a great emphasis has been put on system stability, internal control of correct operation of individual modules and ensuring redundancy to help minimise the effects of hardware failure. In particular, the **asix** system is prepared for creating a redundant structure called "hot reserve", when two or more supervision workstations are connected to the site through separate communication channels conducting independent acquisition and logging of process variables and have their own copy of event and alarms log which is updated in real-time.

Such a system of redundant **asix** workstations when connected through Ethernet becomes resistant to failures including:

- Physical damage to the communication link to the site - workstation affected by this type of failure automatically switches to data acquisition from a redundant station via Ethernet and all supervision workstations continue to operate.
- Supervision workstation failure; until the failure is repaired, the process is supervised by other workstations and once the damaged workstation has been restored, its archive data as well as events and alarm logs are automatically synchronised.

High reliability operation mode is supplied by standard with every **asix** network server license. It should be emphasised that prior configuration of redundant computer pairs is not necessary. When there is a need to switch to a redundant channel, the operator station will automatically find a computer in its proximity to acquire data from over the network. The user can be alerted to the switchover to a redundant channel or switching back to the primary channel once it is back online.



Multiple display workstations

Systems with a large number of variables require additional screens to present process status information. **asix** package has been enhanced with solutions using standard Windows system mechanisms allowing multiple display operation. The user can intuitively control the whole technological process presented on multiple displays connected to a single computer workstation using a keyboard and a mouse. Multiple display solutions reduce the overall cost through the reduction of the number of computers, the number of software licenses and communication processors.

asix for supervision personnel
SUPERVISOR face

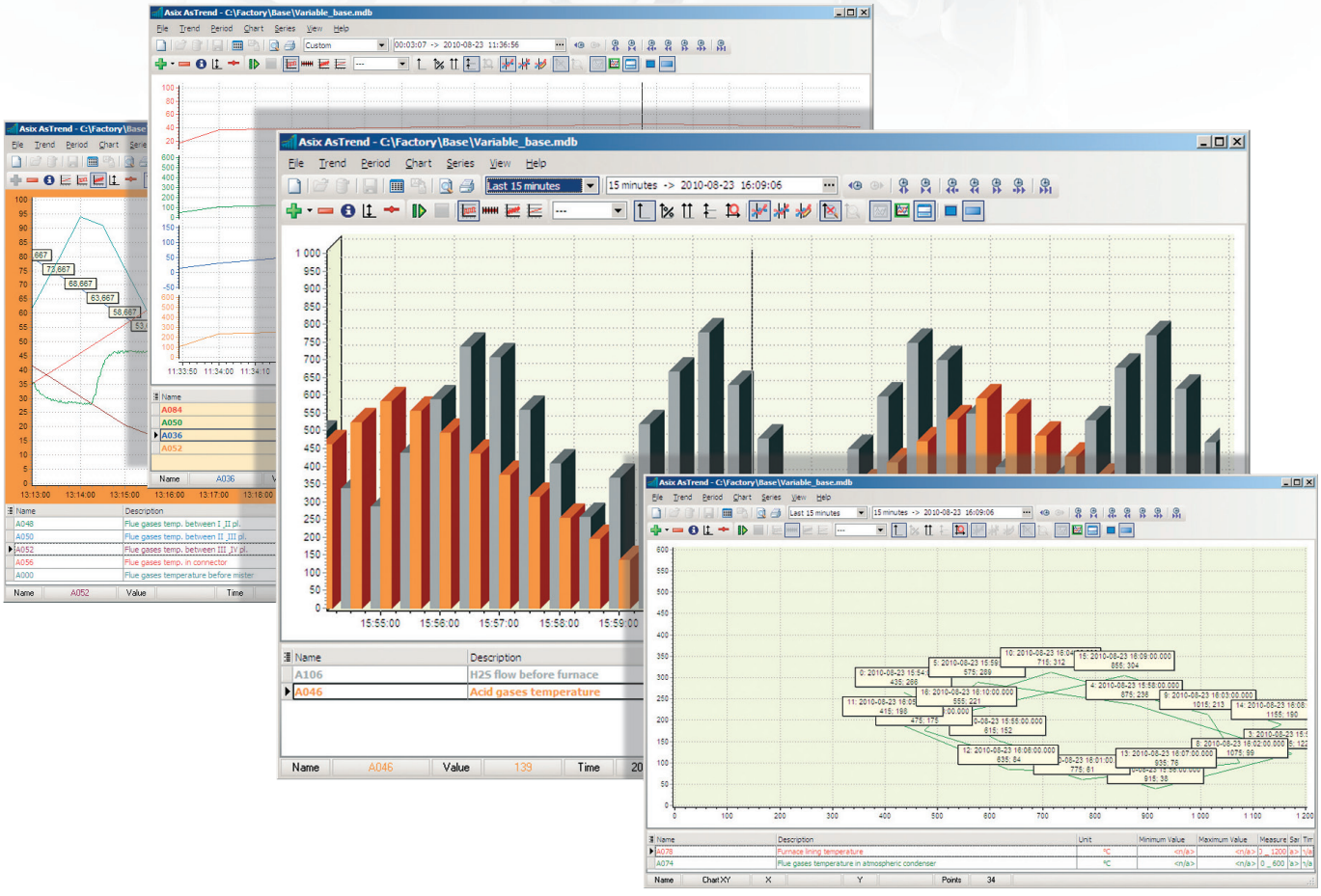
This level has the following features:

- AsTrend to analyse historical data and to generate a graphical charts and reports,
- multiple X-Y charts,
- advanced reporting by AsRaport,
- AsAlarm for advanced alarm analysis,
- recipe system management,
- AsAudit records analysis,
- AsAlert remote messaging.

Because of the greatest number of offered features including data access and analysis tools, the OPERATOR “face” description is the most extensive. Naturally, all these tools and features are accessible from the higher level - the SUPERVISOR. However, new requirements arise and the need to introduce new functionality. This is because the users of the supervision level have different expectations. For them a SCADA application is the tool needed to analyse a process behaviour rather than to directly control it.

Analogue and binary measurements historical charts and hard copy curve graphs

In today's systems it is difficult to come across hard copy recording devices as in most cases they have been replaced by digital data logging. In **asix** this function is performed by the Aspad module whose archived data is the basis for displaying graphs and charts on the operator's application screen. For supervisory personnel it is often an analysis tool which is not powerful enough - they normally require presentation of freely composed variable groups in relation to a history of binary signals and/or alarms. **AsTrend** module is an in-depth archived data analysis tool. It allows displaying, **browsing and printing** of time based graphs of selected set of variables and is also used for generating site operation graphical reports and diagrams. **AsTrend** can be operated as an integrated part of the visualization system or as a standalone application with access to data archive on the local machine or with a remote network access.



Innovative graph viewing method

The **AsTrend** module allows quick identification of graph fragments of interest to the user thanks to the smart viewing method which arranges the graphs based on aggregated values calculated and archived by a special Aggregator module. Application of Aggregator module allows optimising the display of extensive time-range graphs. The graphs are drawn using aggregate values acquired from asix server archive, which significantly improves the speed and flexibility of presentation. **AsTrend** automatically matches the aggregate period to time range of the presented graph. As a result of plotting a curve with a time range of 12 months for an analogue value registered in the archive takes 2 or 3 seconds using typical hardware and the information showing the variability of the graph is not lost.

Wide range of presented data types

Various data types which can be presented on time based graphs offer many possibilities for process information analysis. In addition to analogue measurement values, graphs can also show:

- constants;
- drive and device status acquired from archived status variables;
- **evaluated variables** based on the value of up to 9 other variables;
- information on the timing of alarm status changes;
- data retrieved from external sources (*.csv, and *.xls files, MS SQL and Access database files)

Moving across timelines is facilitated by the wide range of predefined data time ranges, such as: "last/next day", "last/next shift", " last/next hour", etc.; an option to describe the Y axis with the text labels representing status (for example sterilisation, pasteurising, product ejection, emergency ejection, washing) are especially useful for a clear process sequence presentation.

Two-dimensional X-Y graphs

AsTrend also offers a possibility of presenting and analysing the relationship between variables using two-dimensional X-Y graphs, which are essentially graphs of **many** asix variables as a function of a single independent variable. Furthermore, by adding a minimum and maximum, the range of allowable variable changes can be declared (also as a function of independent variable!), which allows placing the graph and analysis within the correct operating range of the controlled system. The option of plotting graphs for many dependent variables in X-Y arrangement is a **unique feature** of the asix package, which is unavailable in all other SCADA packages! This allows to easily create documentation for system analysis as a function of a single set-point signal.

Arbitrary arrangement of graphs from different periods

The possibilities offered by the graphical representation of data should also include a comparison of the same or different variables in different time periods. **AsTrend** makes this possible by the use of an additional time axis added for one of the variables whose time curve needs to be compared with that of another variable (it is also possible to compare time based curve of the same variable in two different time periods).

Individual scaling of graphs

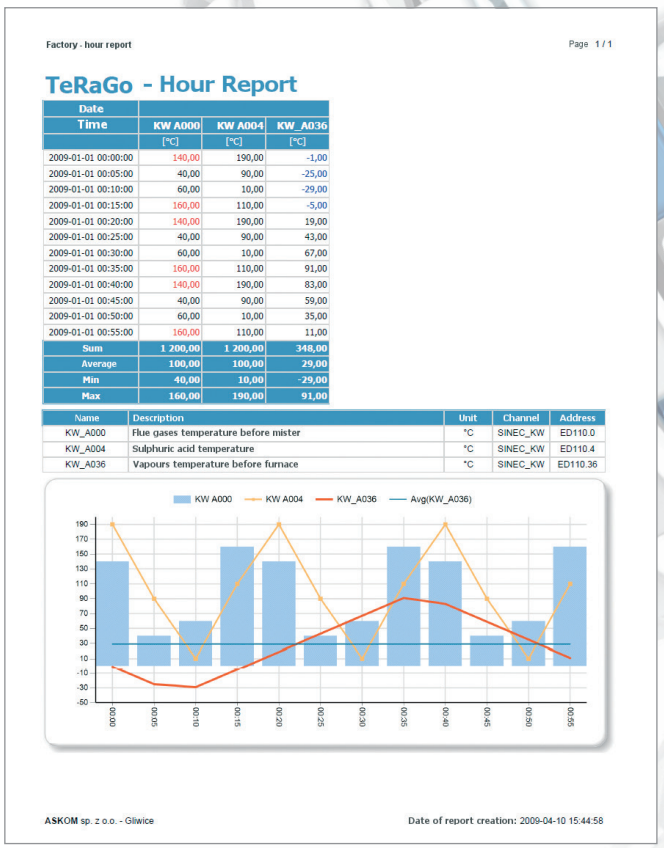
The multiple OY axis mode makes it easier to analyse and compare curves representing different parameters on the same chart. The curves can be scaled independently allowing them to be moved away from each other which facilitates assessment of their interdependence.

The above feature is complemented by the following functions: intuitive trend wizard; value grid; extensive legend providing description of all presented parameters; real-time zoom in/out function for a selected graph section; presentation of all data in a tabular form; **exporting** the data to*.PDF, *.BMP, *. TXT or a **Microsoft Excel spreadsheet**; importing data from external sources; displaying variable description as axis labels.

AsRaport – advanced reports

In addition to the standard, built-in tool for generating reports which serves as a basic production report generator, version 6 of asix offers a new feature – a reporting system integrated with Microsoft's Reporting Services. For the user this means an option of freely designing, modifying, browsing and generating reports in asix environment. At the supervisor level the user is not only seen as the **AsRaport** client (offering predefined reports), but also as a creator of new reports, which meet his specific needs. Since **AsRaport** is based on Microsoft® SQL Server™ 2008 Reporting Services, it offers a possibility of creating reports providing in-depth site data analysis to optimise process parameters, plan maintenance, etc.

The reports can be generated according to schedule or on demand. The user can define the preferred publication format (PDF, DOC, XLS, HTML, etc). If such a need arises, the report can be authorised by the SUPERVISOR level user before official publication to a number of recipients. As far as information protection is concerned it is possible to manage user privileges restricting access to different types of reports.



Factory . hour report

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TeRaGo - Hour Report

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2009-01-01 00:55:00	160,00	110,00	11,00
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Max	160,00	190,00	91,00

Name	Description	Unit	Channel	Address
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KW_A004	Sulphuric acid temperature	°C	SINEC_KW	ED110.4
KW_A036	Vapours temperature before furnace	°C	SINEC_KW	ED110.36

ASKOM sp. z o.o. - Gliwice

Date of report creation: 2009-04-10 15:44:58

AsAlarm - in-depth alarm analysis

AsAlarm is a completely new application providing tools for detailed analysis of alarms generated by the monitored site and of other data relating to alarm system operation. The application meets the EEMUA (The Engineering Equipment and Materials Users Association) guidelines No 191. The module allows two-level alarm analysis:

- Static: assessment of the alarm system structure validity for a specific application;
  the application offers specific measures to the control and supervision system designer, by which it is possible to assess if the system has been designed according to the universal guidelines and takes into account the operator's perception capacity
- Dynamic: in-depth analysis of alarm events logged at the site;
  to this end **AsAlarm is an essential tool for maintenance and repair services**, both in the aspect of event timeline analysis and statistical analysis to determine trends in system behaviour. Available information:

  - Event occurrence distribution (number, percentage),
  - Event duration,
  - Average time to acknowledge,
  - Number of terminated alarms,
  - Number of acknowledged alarms,
  - Identification of most frequently occurring events,
  - Identification of the longest events.

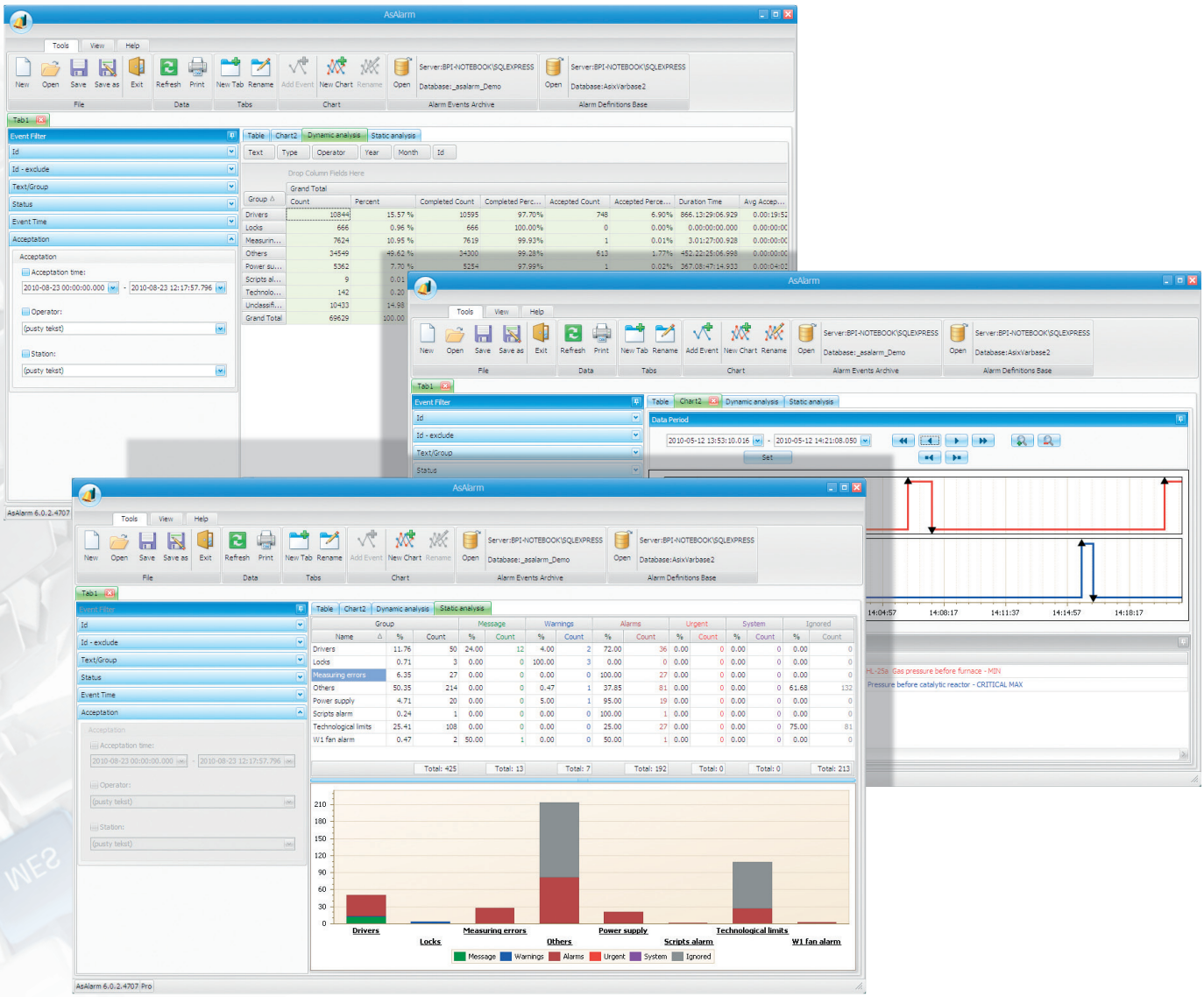
Alarm information management is implemented with the use of:

- historical event table,
- graphs of selected alarm events,
- analytical section for calculating various statistics.

The application uses an interface similar to the Multi Document Interface (MDI), which allows creating many tabs in the application's main window thereby making it easier to manage many experiments.

The application allows the user to create configuration files containing preferred settings. Within a single file, it is possible to create many tabs for the program window, where each contains its own set of filtering options. This mechanism allows including alarm analyses for different periods in a single project without the need to set filtering criteria again.

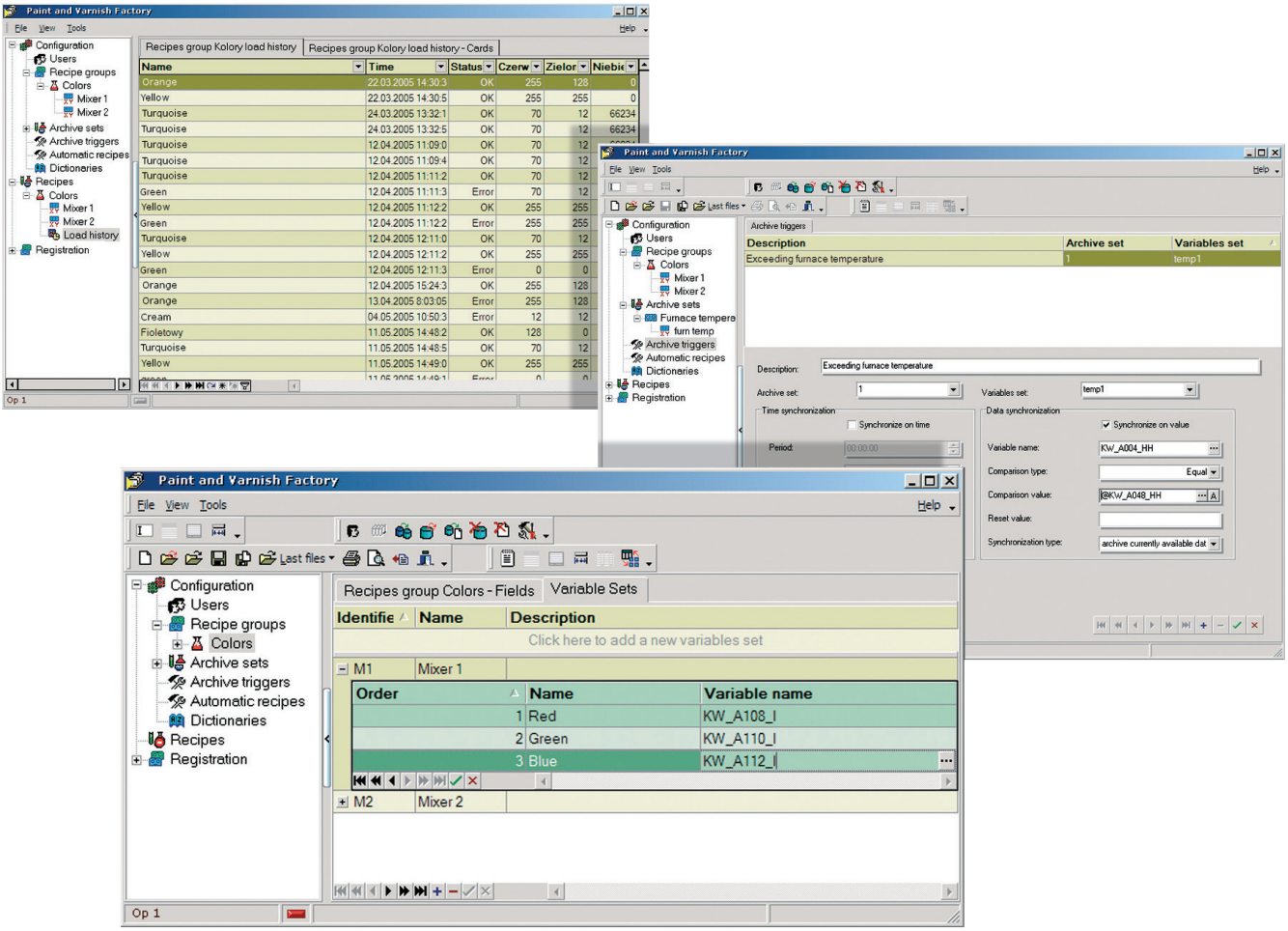
An additional feature of **AsAlarm** module is the ability to print out all presented data and the related analyses, such as alarm tables, alarm data statistical and dynamic analyses graphs.



Defining recipes and searching through event data log

If the application features the recipe and event data logging system, the user usually does not have privileges to modify recipes - these parameters are determined by the process engineer. When granted suitable privileges to access AsBase module resource maintenance functions, the supervision personnel and process engineers can manage recipes according to current needs. In **asix** application, this involves simple actions taken using standard visualization objects: entry of new numbers and text parameter values, defining new recipe records using buttons on application screens. **No specialised knowledge of database utilities is necessary.** Central recipe database or a database replicated on all computers can be easily and efficiently adapted to new products.

The mechanism for viewing event database in connection with suitably designed archive database search feature of **AsTrend** module allows prompt finding of the associated Aspad archive records and plotting the resultant curves on the screen. This constitutes a powerful tool for searching and analysis of archived data relating to identified products or production batches. Based on AsBase data, generating a hardcopy document showing how process parameters associated with a given product change is a matter of a few mouse clicks.



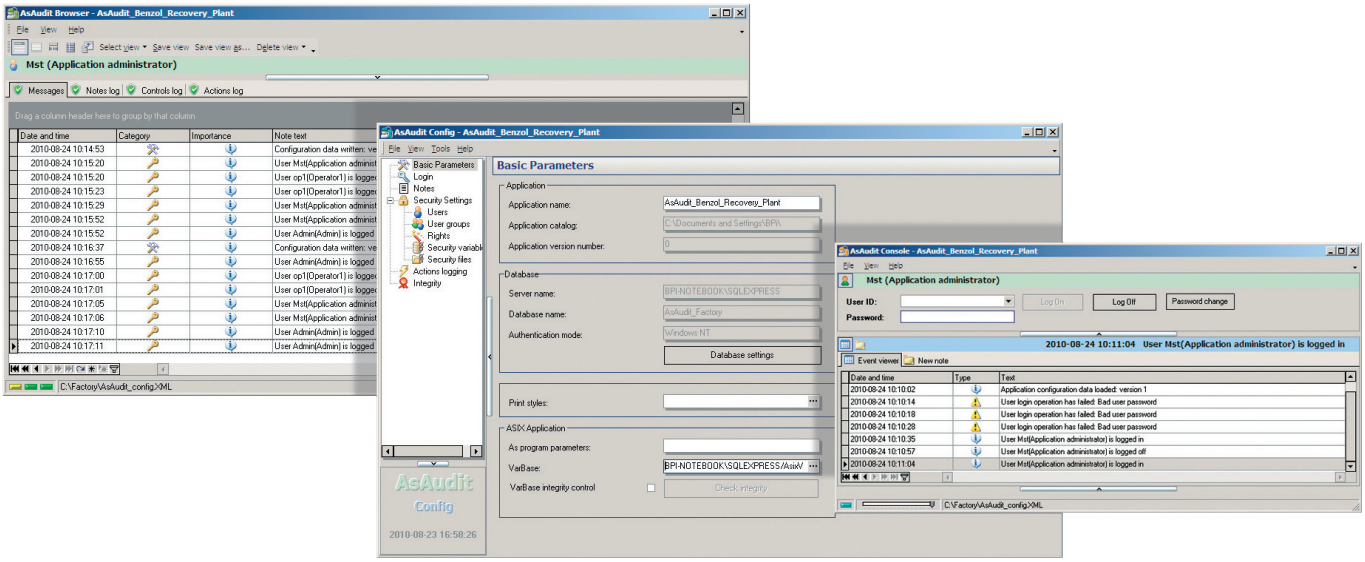
AsAudit log analysis

Operator supervision system would be useless if log analysis was not possible. It is the supervisory personnel who is given privileges to view and analyse the operator actions log. The supervisory personnel can also maintain the control system by changing user privileges as well as modifying the list of users. The initial designer settings must endure the changing conditions of system use.

The **AsAudit** module provides the following supervisory level features:

- **The central system for user login and privilege control.** The module ensures that the system is not accessed by unauthorised individuals. Logged in system users are authorised to use its features. When any command is issued, **AsAudit** verifies user privileges to carry out a given action. The action is executed provided the user's privileges are sufficient . Based on these mechanisms, certain actions can be restricted, for example exercising control, opening synoptic screen, visualization of restricted variables, access to reports, not to mention switching to application editing mode.
- **control action log** – the system automatically registers a non-editable log: the new control value, the previous value, the date and time of the control command, and the operator(s) identifier; if the privilege verification system requires an approval by another individual, the control command log can be reviewed by supervisory personnel.

- **operator action log** – each operator action is logged in the system, which allows step-by-step retracing of practically any system control action. Similarly as in the case of control action log, the supervisory personnel can analyse operator's actions in order to assess their validity,
- **operator notepad** – this module allows making notes by the operator and their subsequent viewing. Users with suitable privileges can make comments to notes or edit their original content.

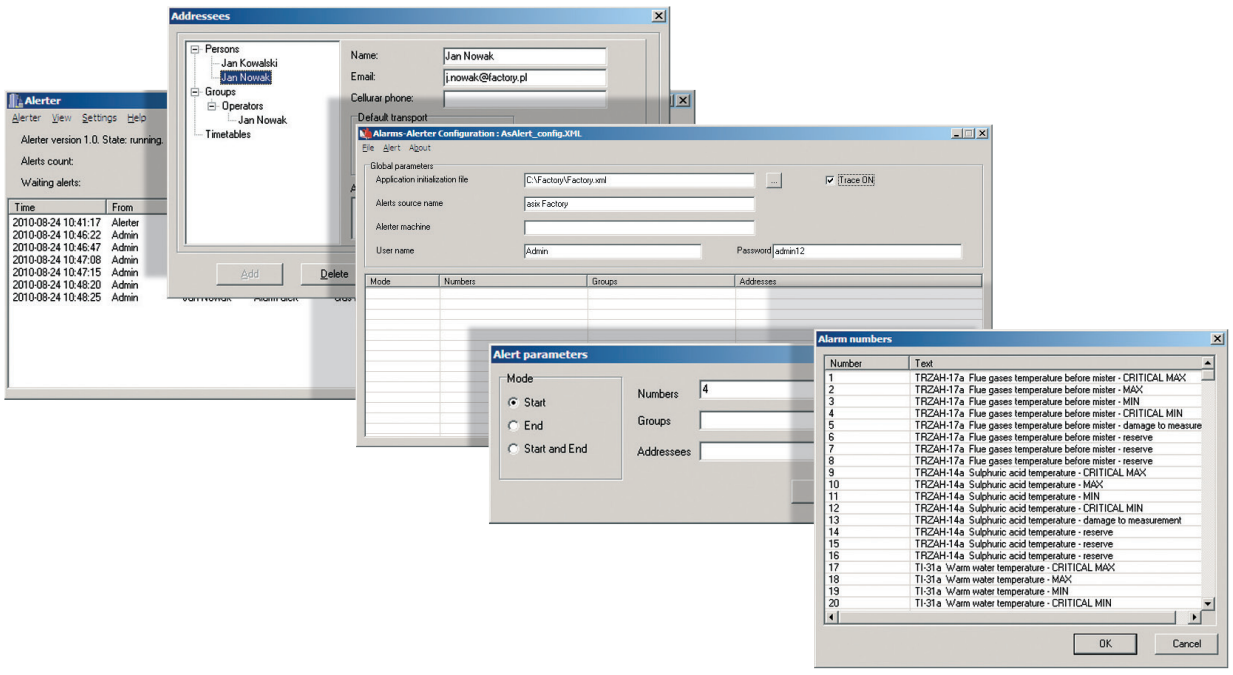


AsAlert – remote messaging

Supervisory personnel often work in a turn of duty system and they do not have to be present on site. However they need to be reliably and promptly notified of any extraordinary events or system abnormal operation or failure. **AsAlert** module offers this functionality in a smart way by supporting the list of recipients of alert messages and the messaging schedule, which ensures that relevant information reaches appropriate individuals on time.

Messages can reach recipients in a variety of ways:

- standard electronic mail over the Internet using SMTP protocol;
- electronic mail over GSM network using e-mail services provided by mobile operators;
- text messages over GSM network;
- text messages over the Internet;



asix for the management personnel – MANAGER face

This level has the following features:

- **synthetic data,**
- **statistical data analysis,**
- **access to the application from anywhere and at any time.**

Surely, the managers bearing overall responsibility for a company have different requirements than operators or supervisory personnel . This is where synthetic perspective on many aspects of production from the point of view of many company departments, in-depth statistical analysis of production data in order to plan and take strategic decisions are of real essence. Similarly as for supervision application, the overall management application also allow access to all options and features of the operating level, however this is not what the managerial level is all about.

Master applications

If a company operates asix applications, which directly monitor production process or acquire data only, then **the task of designing master applications is easier**. However the master application does not have to be based just on individual asix systems – there is nothing in the way to acquire data for master application from different sources. However a common data acquisition platform, a uniform environment of the "roots" of the master application result in a certain feature, which is difficult to achieve otherwise: modifications of source applications can be **automatically** transferred to the higher level. This slight detail ensures the quality and reliability of data on the decision-making level, which is absolutely priceless!

At this stage of the master application design process, a question may arise if only selected or all data streams should be acquired. asix software solutions and hardware capacity allow for seemingly extravagant processing of all available data. However, it is often found that what seems to be an extravagant gadget during the application design process, turns out be a necessity in time.

Statistical analyses

Overall management application perspective allows access to a wide spectrum of current and archive data unavailable for operator or supervision applications. **AsRaport** reporting tools accessible from the supervisory level, based on Reporting Services, gain in significance and obtain new possibilities. What allowed only partial analysis of a single production process or node at the supervision level, now becomes an efficient analytical tool supporting the strategic decision-making process for the whole company at the master application level. Calculating statistics, correlations between different sets of data from different sources is now not just within reach but only a mouse click away.

Unlimited availability

There could be a single or many such master applications tailored to meet the specific requirements. However, in each case it is possible to configure the system in such a way that the master application is available on each computer station operating on the company's network. Such mechanisms are available in **asix** package. But if this is not enough, the entire functionality of such a master application, including access to analytical tools (extensive **AsRaport** reporting, **AsAlarm** alarm analysis, **AsTrend** trend graphs) and ordinary graphical screens presenting P&I diagrams can be transferred to Internet browser environment. This means total freedom from restrictions of the company network and making the applications available over the Internet. If such a solution is used, application data is available worldwide, even on PDA devices! This feature of **asix**'s unlimited availability cannot be over estimated by top management. However, do exercise caution: overload of bad information can ruin a holiday even in the most beautiful spot!

Browser-based applications are of two types:

- graphical equivalent of an ordinary application with dialogue windows similar to those of the PC-based application,
- process information portal.

Web-based AsPortal **Process Information Portal** is a ready-to-use universal application allowing browsing over the Internet of the process data from any **asix** system application. The Portal allows browsing of the application's variable database including its attributes, reading current values of individual process variables, viewing the list of historical and active alarms, presentation of historical process variables as a table or in the form of graphs with an option of calculating the required formulas. Using the variable selection window, the user can configure its preferred sets and categories of presented data, having an option of saving these definitions in the form of projects for reuse at a later time. Retrieving such a project is as simple as opening a file in a text editor. It offers immediate access to the required range of data and offers prompt access to the results of the analyses. Information one click away!

asix from inside – DESIGNER face

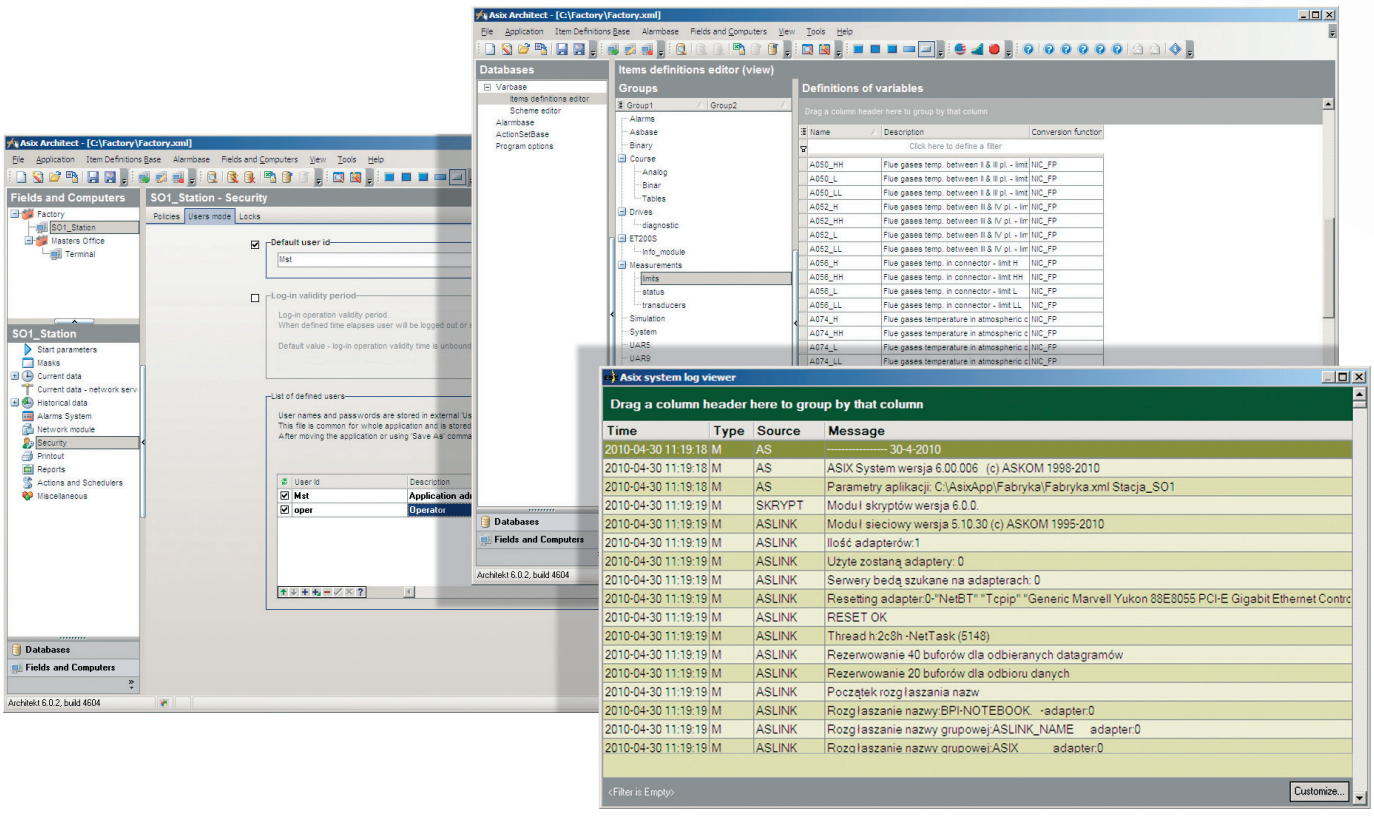
This level has the following features:

- Architect – the designer's desktop,
- process communication,
- Constructor – process mimic diagram editor,
- application component wizards,
- application updates,
- Aspad – an advanced logging module,
- chart configuration,
- event data logging and recipe definitions,
- scripts – user application programs,
- AsAudit – application security and user privileges,
- Web application Wizard,
- AsRaport – advanced report design,
- asixConnect – open system.

Someone must design applications with required features for the Operator, Supervisor and Manager level. Someone must make a lot of effort so that an operator has his process control tool, a supervisor has medium level analysis and control tool while the final decision maker is offered an overall view of the company. It is clear that still there is no system able to automatically create applications without participation of any designer -- perhaps this is our future. For now, someone still has to fire up his computer and launch the design tools to make operation tools for other people. For a designer, these tools are the **asix** package components. Again, referring to the initial kitchen analogy, it can be said that the design tools are bread and butter of designer's work just as a kitchen knife, an oven or a hob are basic essentials for a chef. Application component wizards can be compared to an experienced chef, who cooked many dishes (application) and mentors the junior cook (designer) giving instructions for preparing the best dish out of the current and archive process data.

Architect – the designer's interactive desktop

Beginning with **asix** version 5, our approach to application design has changed entirely. Introduction of the Architect module is a breakthrough in application design. Thanks to dialogue windows with tabs, which group all options pertaining to individual application functions in an orderly and easy to read way and guide the designer to complete all the required parameters, the module allows the design, configuration and editing of applications in a truly intuitive, graphical environment. The Architect module combined with VarDef variable definitions database module allows fully interactive and visual operation of the database containing configuration of all key modules responsible for **asix** application behaviour. Such a solution allows a significant reduction of the time required to design advanced applications and makes it easier to manage the whole system.



Support that a designer receives from the Architect module can be illustrated by a few examples.

- Architect features an editor for parameterisation of communication drivers. Using appropriate context, this tool provides all available options for a specific driver, provides information on the default values, verifies parameters entered by the designer and provides context help for individual driver parameters, which ultimately results in an efficient and faultless configuration of data acquisition channels.
- The Architect module features a mechanism allowing any user to define operator actions in a few simple steps, which are the essential means of controlling the application. A specially designed editor contains the description of all possible actions within the asix system with an indication of compulsory fields to be filled in by the designer in order for the application to operate correctly.
- The Architect module boosts efficiency of creating menu bars with pull down menus placed on visualization screens. Definitions created using the editor allow menu design including operator actions launched through individual menu items.
- Architect is the launch platform for the Constructor module which is the application graphical layer editor as well as allows to launch and terminate the final application.
- Architect has a built-in tool for editing Microsoft Excel spreadsheets, which allows application design and maintenance engineer to work on a computer where Microsoft Office package is not installed. This also allows quick and easy importing of an application designed in the previous versions of asix system.
- Interactive application parameterisation in the Architect module is supported by a number of wizards and help system, which eliminate the possibility of typing or semantic errors and does some of the work for the application creator.
- Architect generates a uniform parameterisation file, which is launched on all application computers.

VarDef – process variable definitions database

Data exchanged with the controller is the application's lifeblood, as without it any SCADA system is a useless collection of images. Provided as a part of Architect, the variable database editing and generating tool offers a wide range of possibilities for database editing or generating it from external sources. But this is not enough! The **unique concept of functionally related variables** allows for **automatic** parameterisation of the visualization layer. Retrieval of a single variable from the VarDef database during an object parameterisation results in reading the related variables and parameters required to complete the object parameterisation. For example reading of an analogue measurement variable involves the retrieval of associated limit definitions, formats and status variable. This boosts the designer's productivity, **minimises the probability of making a mistake and makes application maintenance much easier.**

VarDef variable definitions, in addition to obligatory elements (such as variable name, unit, variable controller address, value range, alerts and alarm thresholds), can contain any additional information configurable by the system's designer (for example: aliases, terminal number on the terminal strip, display format, quantity, etc.). This additional data shown to the operator supplements measurement information, makes it easier to maintain the system, reduces the time of accessing information previously available as hard copies.

- VarDef database is the only repository where application variable definitions are stored. If there is a need to change any variable attributes, it is enough to change its description in VarDef database.
- All asix application dynamic visualization objects are configured automatically based on variable attributes retrieved from the VarDef database.
- VarDef database can be modified online without interfering with the running application. The range of possible modifications includes adding/removal of variables in the database, appending or removing a variable from the logging process, changing variable attributes.
- The VarDef database is the basis for operation of the "variable selection window" object, which is the only and unified mechanism allowing the application user to view the variable definitions database entries. It also interactively defines the set of variables presented in a tabular or a graphic form both in classic asix environment or in an Internet browser.

Starting with version 5, VarDef can be defined as MS SQL or Jet (MS Access) format or stored in an ordinary Microsoft Excel spreadsheet. The use of MS SQL format allows creating of the central variable database accessed by all workstations from a single location guaranteeing full system process variable data integrity.

Process communication

asix supports a wide selection of communication drivers for a broad range of controllers and regulators. Communication can be implemented simultaneously through a number of different physical channels – Ethernet, field bus, serial ports, the Internet. Besides numerous protocols of globally renowned manufacturers such as **Siemens, GE , Beckhoff, LG, ABB, Schneider Electric, Omron, Festo, Saia, Mitsubishi, Advantech, Emerson, Wago and Phoenix,** support for standard protocols including **OPC DA 1.0 , 2.0A, Modbus RTU, Modbus TCP/IP and Profibus** has been implemented in asix system.

The list of communication drivers supplied with asix package is continuously updated.

An important aspect for the application is that the Architect module, using a built-in communication channel wizard, supports the designer in creating links to the controllers and guides him through a thicket of communication driver parameters prompting the optimal default settings.

Communication parameters:

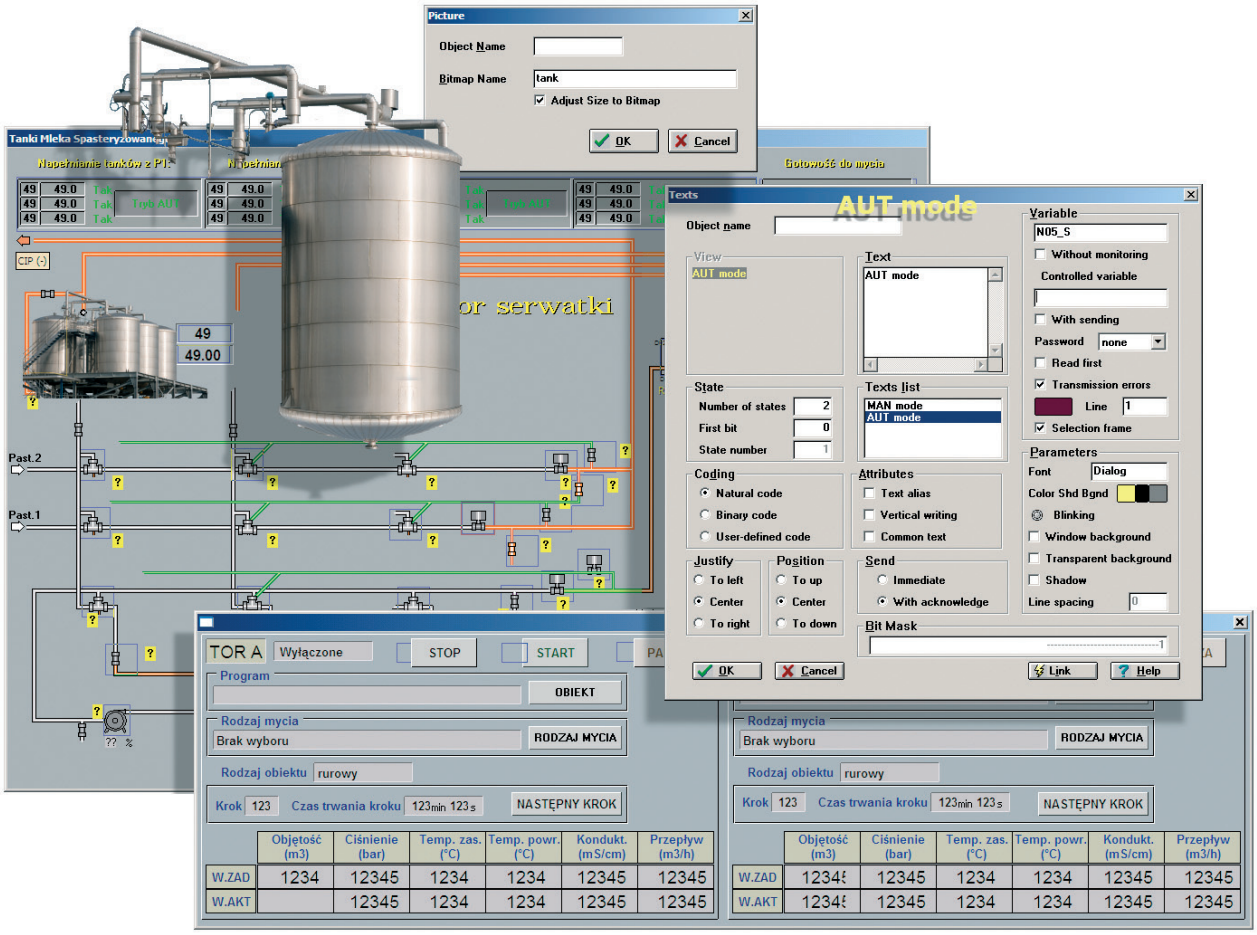
Number of variables	depending on license type: 32 to 2^{32};
Sampling period	multiples of 1 s; selected drivers have a sampling period of 1 ms;
data types	byte, single/double 16 bit word, 32 bit word, 64 bit word, floating-point, simple type table.

Constructor – process mimic diagram editor

The Constructor module comes as a standard with every license (even the cheapest one!) and is a tool for graphic editing of application components -- so-called masks: synoptic diagrams, measurement stations, drive stations, etc. Building the application involves providing an image of the process status in many windows of different size and positioning, which are composed into a coherent and meaningful whole with the use of actions controlling the way they are displayed. Creating a process diagram involves placement of the selected objects in a declared screen window and selecting the parameters, which dynamically control object appearance. A graphical symbol library provided with the package and the possibility of importing any external image files makes the designer's work easier and more efficient. Furthermore, Constructor's ability to define proprietary templates based on already parameterised objects or groups of objects allows creating a quickly growing palette of the designer's own tools. As the work progresses on the development of successive applications, it is much easier and more efficient not just due to experience acquired. The new **asix** package brings a new breeze to the Constructor module: improved graphics, easier access to editing functions and visualization objects, sequential macro launching. This makes the application more attractive and accurate, and also allows for provision of information depending on additional conditions (operator privileges, application level). Built-in process data simulation allows observing the dynamic functioning of the designed mimic diagrams without the need to connect the computer to data source.

The Constructor module and the entire application can be launched (and terminated) from Architect level, which makes it easy to introduce changes in application environment settings and to monitor efficiency of these changes, test the navigation mechanisms in application windows and control objects.

The Constructor module can be used directly at the operator station or at a dedicated engineering station, which remotely controls the applications executed on operator stations over the computer network also **during the normal system use.**



Application updates

Almost all **asix** application components are stored in separate files on the hard drive. This system feature allows for automatic or manual updating the application **without restarting** (certain limitations only apply). Once the files are copied into relevant application folders, new application components can be immediately accessed by the operator. Updates can be performed remotely, for example using VPN connections or over the local network.

Aspad – logging module

Archive resources used on the operator, supervisor and manager level must be declared before use. Depending on the needs and design assumptions, the designer has a considerable margin of freedom in this respect and is given an option to select logging in the Aspad's proprietary format guaranteeing real-time data compression and the removal of redundant data or in MS SQL database format.

Characteristics of logging in proprietary format files:

- Unlimited number of logged variables;
- Maximum sampling period of 1s;
- data compression – raw sample of 10 bytes is compressed to reduce its size; two compression methods are used:
  - in the first stage samples with a negligible change in value are omitted (dead zone);
  - in the second stage, the logged sample is compressed to reduce its size to typically 1 to 3 bytes;
- Archive data types: byte, single/double word, floating-point;
- Automatic archive library management,
- calculation and logging of a series of predefined aggregate values which significantly speeds up advanced data analysis; the increased processing speed is especially noticeable in network systems where many workstations simultaneously connect to resources stored on a single server
- automatic restoration of missing log data, once another computer containing the missing data is automatically identified. This mechanism allows configuration of systems where the central process database stored in the proprietary **asix** format is eventually automatically supplemented with previously missing data.

Data logging in SQL database format:

- Unlimited number of logged variables;
- Maximum sampling period of 1s;
- supplementing backward historical data required in:
  - dispatch systems with data collection over modem links in packages for a specific period of time;
  - Communication with the devices allowing to buffer measurement data after a period of no communication.
- Archive data types: byte, single/double word, floating-point;

It is also worth taking note of other logging features provided by the **asix** system. The list of variables subject to logging and the sampling period can be dynamically changed during system operation. **asix** does not impose any limit on the type and quantity of information stored on the hard drive. The data processing tools can calculate different characteristic values based on full sets of logged data - this can be much more than just typical average values. Version 6 of the **asix** system also offers an option of prior logging of the selected aggregate sets. This solution significantly improves the speed and flexibility of plotting charts with a broad time range. Effective logging in the **asix** system allows implementing visualization, process control and report generation on a single computer station even for a large number of variables.

Thanks to the above features, Aspad module made available in **asix** version 6 meets the functional criteria set for Historians when implementing MES (Manufacturing Execution Systems).

Analogue and binary measurements historical charts – designer's perspective

The designer has at his disposal the tools allowing configuration of charts pasted into mimic diagrams and stations as well as those launched from the **AsTrend** application. These graphs have greater limitations and are less flexible than those generated by **AsTrend**, but their purpose is different. They allow quick presentation of a maximum of 16 plots in a specific context of the production process or the station and they are accessible more quickly but allow fewer maintenance activities. They are also permanently parameterised in the design process. Pattern plot editor allows easy and interactive design of pattern curve shape for the measured value.

By contrast to the chart object, the **AsTrend** module allows:

- creating a dynamic list of displayed curves and storing them together with additional display parameters as ready to use templates; supervisor level users can create their own templates, however some are prepared by the designer during the application design process,
- calculating aggregates for selected plots - for instance integrals, distances between selected points, etc,
- generating reports in the form of accurate printouts with suitable descriptions and the calculated aggregate values,
- defining variables, which are calculated based on up to 9 process variables and displaying them as ordinary variables. The way these variables are calculated can be initially defined by the application designer or entered in the course of application use, provided the user has sufficient privileges (supervisory personnel).

Alarm system – multiple recognition possibilities

Alarm signals delivered to the operator must be recognised by some mechanism. **asix** offers several so-called alarm recognition strategies:

- **The bit strategy** involves association of alarms with individual bits in the controller's memory, which is periodically read by the computer running the supervisory application. The controller actively recognises failures and other events and identifies them by setting or clearing bit flags.
- **The limit strategy** is implemented directly by **asix** system application, which compares current measured values of process variables with defined limits and generates an appropriate alarm when these are exceeded.
- **The active strategy** is based on receiving from the controller an ordered sequence of alarm numbers identified by the controller, optionally with a timestamp. This strategy is dedicated to Siemens Simatic S5 controllers.
- **The buffering strategy** involves collecting alarm information in the controller's buffer from where it is acquired by an **asix** system application based on the value of synchronising variable set by the controller. This strategy is dedicated to Siemens Simatic S7 controllers.
- **The OPC alarm strategy** allows sending active alarm information from OPC alarm server to an **asix** application.

Identified alarms are displayed in dedicated windows, which also contain appropriate tools to handle them. It is the designer who decides which tools will be available to the user. It is up to the designer to allow the user to display alarms according to certain criteria (time, group, text, validity, acknowledged or active status) or filter, exclude, acknowledge or print alarms.

Up to 65535 alarm descriptions divided into any number of groups can be defined within the application. Alarm history storage time can be freely configured up to infinity (limited only by the hard drive capacity).

AsBase – recipes and event-based data logging

Not every SCADA application designer is a database expert. asix application may need an SQL database to handle recipes or store a specific data record at the request of the controller (event-based logging). In order to not to confuse but rather support such designers and facilitate the design of these functions, the AsBase module offers an interface to handle SQL database server functions, which is efficient and simple to operate. This interface offers the following:

- dialog-based application development system, including creation of database structure;
- user privileges management system integrated with the application;
- automatic logging of process variable sets according to a preset schedule or based on their values;
- manual supplementing or modification of archive log;
- recipe editing, selection, loading and registration of recipe loaded for execution;
- a system of views facilitating analysis and printing of the data associated with production tracking and a recipe implementation;
- exporting data to xls, xml and html text files;
- built-in database management system;
- handling of operator actions to create complex production tracking or recipe views on synoptic visualization screens.

Scripts – user application programmes

The scripting module is an extension of asix system allowing execution of Active X Scripting® scripts using VBScript or JScript. Scripting allows implementation of non-standard calculations, program special system responses to certain events, handle proprietary databases, generate reports and alarms.

The scripting module has the following features:

- automatic initiation by the asix system, in the event these functions are called from the application;
- Script running control ensuring protection against scripting errors and infinite loops (timeout exceeded);
- automatic detection of script source code modification, which causes the scripts to be automatically recompiled and restarted without the need to restart the system.

Scripts can be executed in three ways in the asix system:

- **scripts are** declared in the application file and **automatically initiated** at the start-up. The start-up code determines how the script is executed; the function to be executed after each process variable retrieval is declared, an interval or a specific time is specified.
- **scripts executed through operator actions** can be launched from visualization objects by key shortcuts and from the scheduler.
- **scripts launched from the Reporting** module allow execution of a report constructed using VBScript or JScript, which offers greater data processing and the possibilities for generating non-standard reports, which are not intrinsic to asix reporting language.

Independent of the entire range of services and information available in the operating system (access to database files, file management services), the scripting module makes available to scripts the services directly associated with asix system operation. The scripts offer enough functionality, so that the Designer creating an application is not limited in any way.

AsAudit – Designer related functions

The **AsAudit** module is used by the supervisory personnel to analyse operator action logs and control signals sent from the application to controllers. A designer has at his disposal some dedicated tools for which he is responsible. In addition to creating the whole application supervision system, managing privileges, operator action and control signal monitoring, what remains is the issue of monitoring application and variable database integrity. It is the application's designer who is responsible for the security of tools deployed to users: after each application modification in the scope protected and controlled by **AsAudit**, especially during modification of variable database, the designer must ensure that the application is revalidated. Validation process will ensure that the application is modified by the authorised personnel only and protect against launching the application with unauthorised changes.

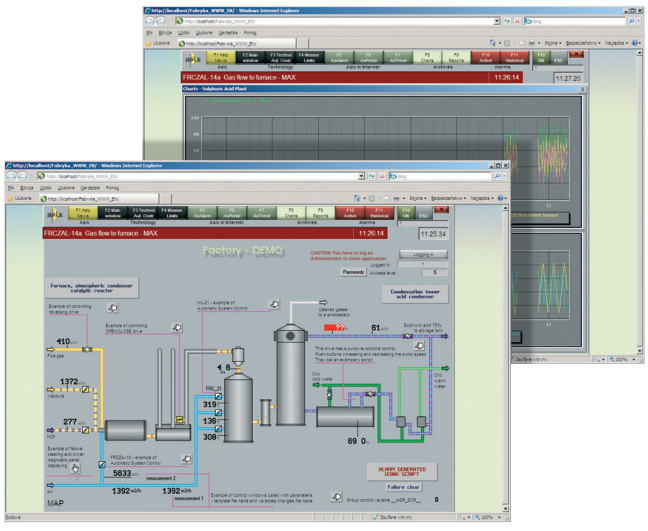
Web-based asix applications

Once the operator application is created, it is also possible to prepare web-based applications. Web-based applications can be made available in two ways:

- Process information portal
- Dynamic web-based application

Conversion of an ordinary Windows application to a web-based application is very easy and simple: The Architect module's built-in tool for application conversion is extremely simple and requires only a few mouse clicks to complete the conversion. However, one must remember to install a special asix package extension on the web server.

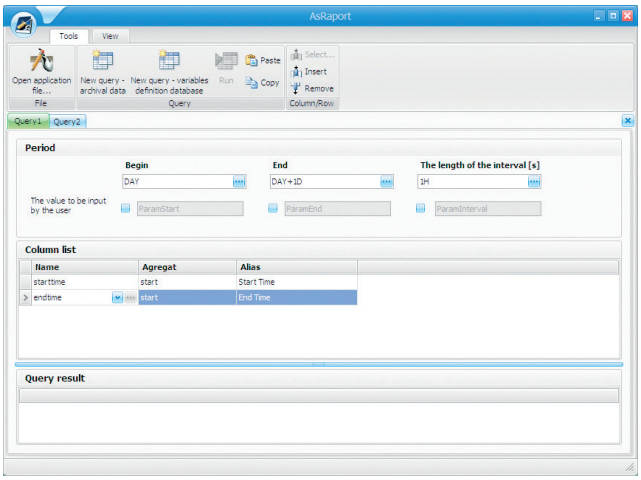
Once the web-based application is generated it can be immediately viewed within Internet Explorer. The most recent version of Internet Explorer (preferably version 7) is recommended. Measurements and other dynamic elements are periodically updated so current values can be observed. However, there is no option to send control signals from the web browser.



AsRaport

Microsoft® SQL Server™ 2008 Reporting Services provides a complete, server-based platform designed to support a wide variety of reporting needs enabling organizations to deliver relevant information where required across the entire enterprise. Reporting Services, which are a component of SQL Server 2008 database, enable reporting from different data sources (including ad hoc reporting based on user friendly semantic report model which allows creation of reports without the detailed technical knowledge of the data sources used), enable managing of reports environment consisting in report generation planning, report subscriptions managing and user access managing as well as delivering reports to users in the preferred format (automatic delivery based on e-mail subscription or embedding of reports in the business applications and portals).

As a part of **asix** integration with Reporting Services, the proprietary method for retrieving logged data from an ultra efficient **asix** archive through SQL queries is of key importance. A correct query to retrieve data from the proprietary **asix** archive is constructed with a user-friendly application supporting drag-and-drop functionality, which does not require the user to have any IT experience. Thanks to this, the user can take advantage of many Reporting Services based report building applications available on the market, for instance Microsoft Report Builder 2.0 or Microsoft Bussines Intelligence Development Studio with extended functionality.

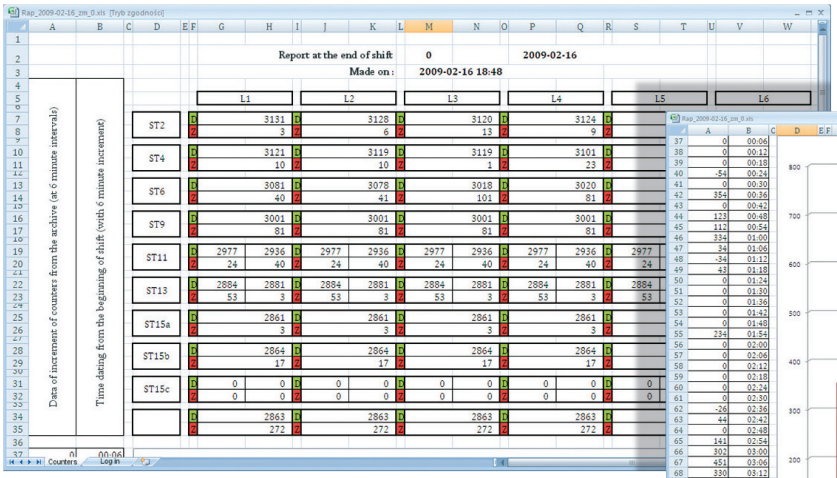


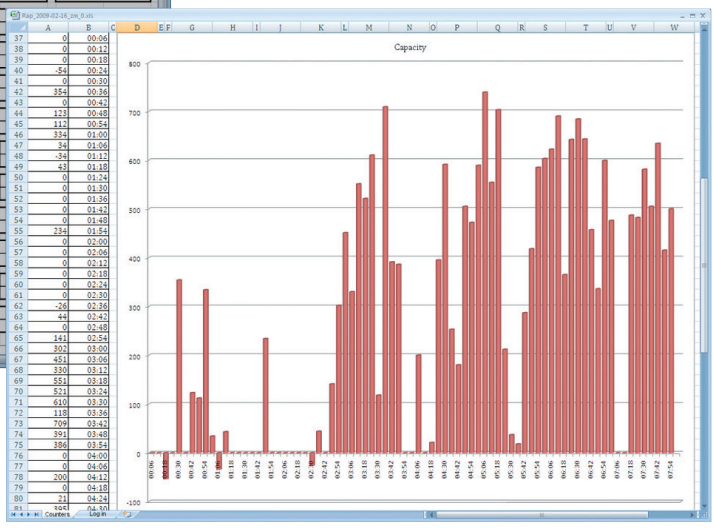
As a consequence of further integration with Reporting Services, version 6 of **asix** offers modules facilitating report viewing (AsRapView) and deployment on the Internet portal (AsRapDeploy). Thus an application designer has very efficient and convenient tools for report design and analysis for all supervisory and management application users.

Open system

asix is an open system understood as the possibility of direct two-way access to data from other applications supporting data exchange standards adopted for Windows environment. **asix**Connect serves as a middleman between Windows operating system applications and **asix**. The module enables access to all **asix** data including current and past data, alarms and variable definitions. Access to data in Windows environment is possible using DDE, OLE DB and OPC protocols, for Windows/Visual Basic environment Automation server is available, while .NET servers are available for Windows/Visual Studio. Web Services server ensures access to data over the Internet/Intranet.

Typical examples of applications, which have direct access to process data via the **asix**Connect module are Microsoft Office applications including Excel, Access, Word and Power Point. The range of applications is extended by the possibility of using macros available in each of these programmes, which can call **asix**Connect services. The user can develop his own applications retrieving data via **asix**Connect, creating them using programming environments such as Microsoft Visual Studio or Borland C++ Builder.





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