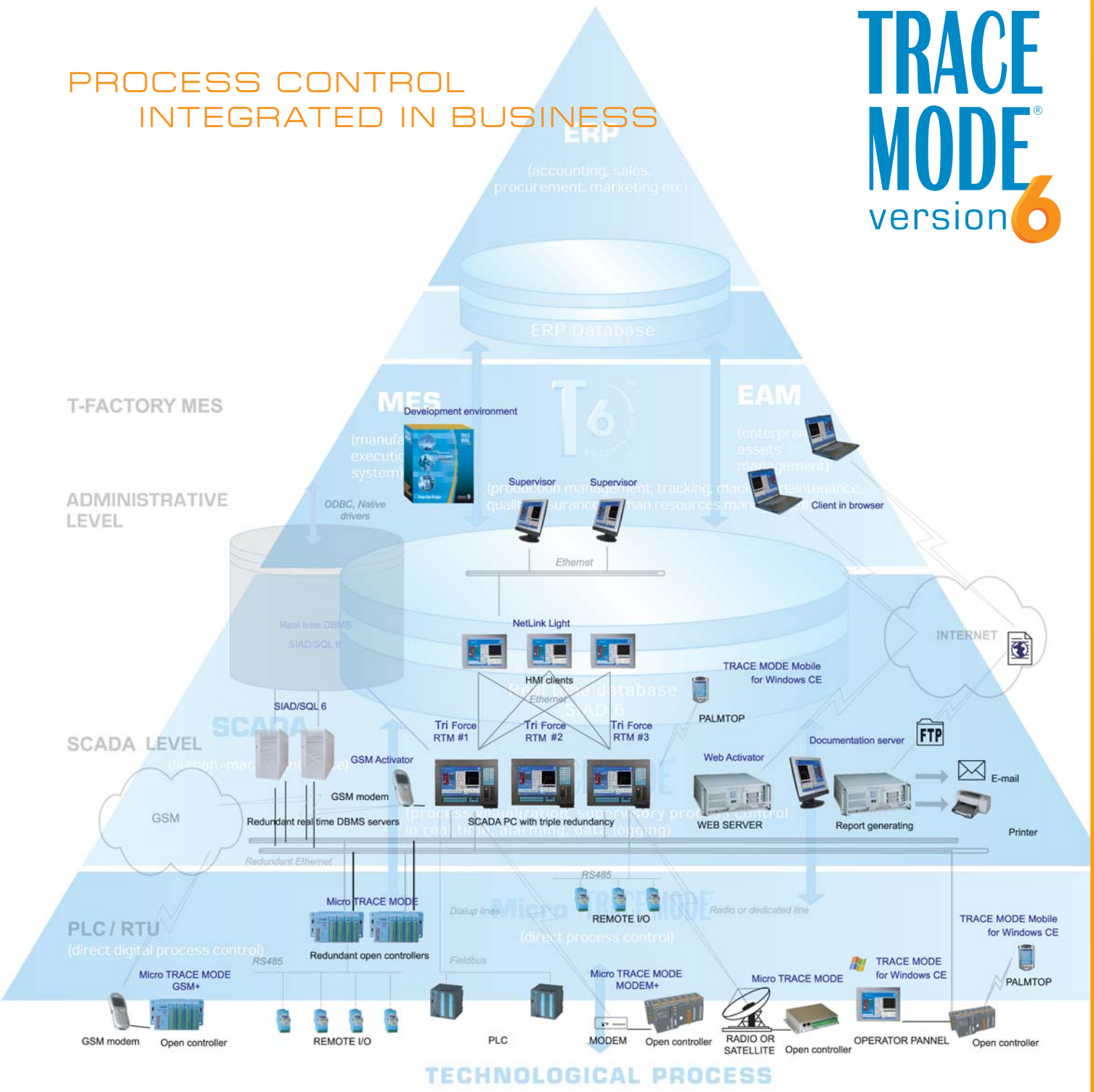
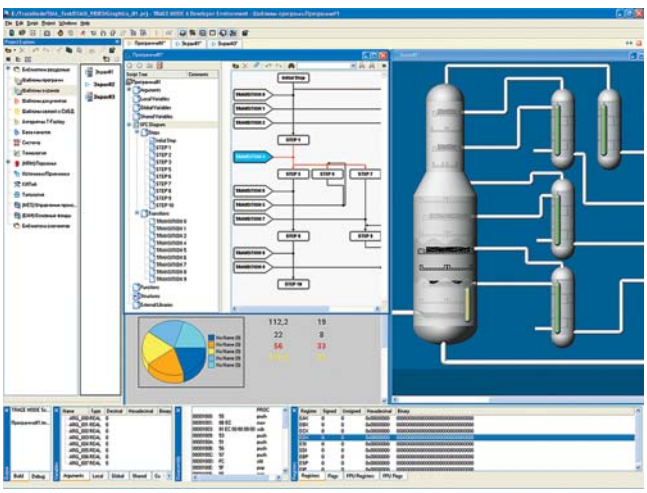
PROCESS CONTROL INTEGRATED IN BUSINESS

TRACE MODE® version 6





TRACE MODE® 6 — is the first integrated information system for manufacturing and process control, merging the **SCADA/HMI-SOFTLOGIC-MES-EAM-HRM** class software products into one comprehensive industrial platform.

T-FACTORY.exe® is a set of economical modules, used in manufacturing management automation systems fully integrated with process control.

The software products for **process control** and for **business management** are so closely integrated on the one platform for the very first time.

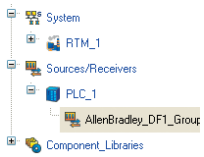
DEVELOPMENT SYSTEM

COMFORT FOR DEVELOPER

The new **TRACE MODE®** version integrates the **AdAstrA Research Group, Ltd 10-year** experience in process control development tools building.

Hundreds of company's engineers, programmers and testers worked hard to make the control engineer's work **easy and pleasant**.

The TRACE MODE® 6 **flexibly adjusts** to the developer's **experience** and **professional skills**. Whether you are creating the first control system in your life, or developing the most sophisticated corporate project for hundreds of thousands of variables, — working in the TRACE MODE 6 would be equally **easy and efficient**.



At startup, the system suggests you to select one of three methods of development: **Easy — Standard — Advanced.** The TRACE MODE 6 ensures **flexible**, **perfectly scalable object structure** of the project, in which any component e.g. *variable, technological object, screen, algorithm, driver, document and even SQL-query* is many times **reusable** at any project node. The project components linking is done with drag-and-drop.

INTEGRATED DEVELOPMENT ENVIRONMENT AND UNIFIED PROJECT DATABASE

More than **ten** TRACE MODE® 6 **editors** are built-in into the integrated development environment, which open automatically upon call of the project component. In the TRACE MODE® 6 project, all variables, no matter where they are used — *in PLCs, in OPC-servers, in operator HMI workstations, in asset, personnel or MES database are stored in the* **unified project database**. Such approach **eliminates the unnecessary duplication, support and integration of databases** for controllers and PCs. In some control system projects such technology **rises productivity** 10–20 fold!

The logical structure of the control system project in TRACE MODE® is fully separated from the hardware. Due to the **unified database of distributed variables** and 100% object approach, the variables available at the various project nodes can be used by developer as easy as those related to the local node. Any changes made with one object, are automatically applied everywhere it the project.

PROJECT AUTOBUILDING AUTOMATES ENGINEERING WORK

Autobuilding® is a set of automatic procedures automatically generating different components of the control system project. Autobuilding **relieves** the developer from the most tedious operations, substantially reduces the project **time** and eliminates **errors** of manual operations.

Autobuilding® in a moment **generates tag database** for PCs, PLCs and OPC-servers, sets up the **network links**, creates **HMI screens** and **documents**.

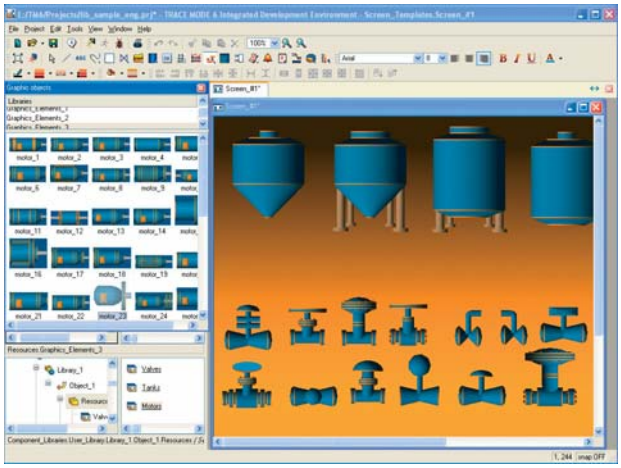
GROUP PROJECT EDITING MULTIPLIES FORCES

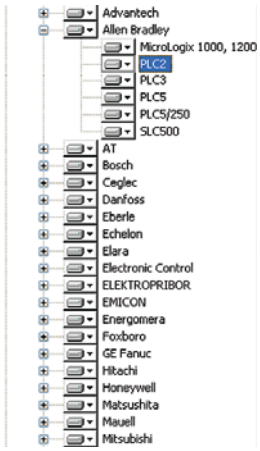
The deadline is coming, but you cannot add more developers to the project? Now it is in the past!

The group editing enables engineers from different company departments and shops to develop jointly the corporate factory information system.

RICH LIBRARIES OF DRIVERS, ALGORITHMS AND GRAPHICAL HMI OBJECTS

TRACE MODE 6 includes *record number* of resource libraries (professional version only), ready to be used in application projects.



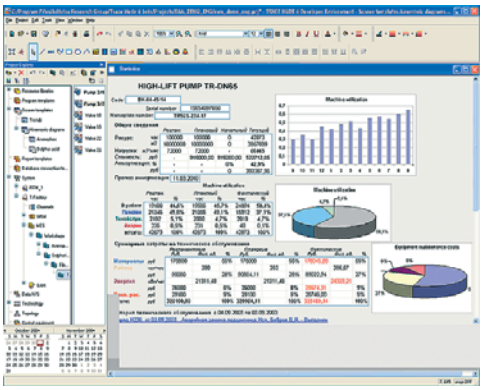


Among them, free-of-charge drivers for **2087** controllers and input/output cards, **1116** graphical HMI images for technology facilities and processes, **600** animation objects for HMI, more than **150** algorithms of data processing and control, complex technological objects.

Take the object «*pump*» from the TRACE MODE 6 library, drag-and-drop it onto the HMI screen — and that is all you need to do! The TRACE MODE 6 would create an HMI screen and record control algorithms. Now, drag-and-drop the icon of controller, onto the icon of HMI PC, and the required driver would be automatically connected to the project.

EASY INTEGRATION WITH BUSINESS APPLICATIONS

TRACE MODE and T-Factory projects are deeply integrated. Practically, developing a process control system, a user develops also manufacturing management automation systems. Both systems have the common tag database and interact with relational DMBSs through standard interfaces — **DDE, OPC, SQL/ODBC** etc..



For more comfort, the system contains the SQL-queries builder (wizard).

T6™ Factory.exe

SOFTLOGIC
— CONTROLLER PROGRAMMING TOOLS

Micro TRACE MODE 6 is powerful multiplatform runtime designed for use in open PLC for process control. The controller programming as well as HMI-designing is performed in TRACE MODE 6 integrated development environment.
Micro TRACE MODE 6 is supplied both independently, and as OEM-versions enclosed to controllers manufactured by the AdAstra Research, Group, Ltd OEM-partners.

HARD REAL TIME

TRACE MODE 6 ensures controller operation in hard real time mode. Micro real time monitors (MicroRTM) run under multitasking and multithreading operating system, they are deterministic and priority driven. Minimum system cycle is equal to **2 ms**.

CERTIFIED RELIABILITY

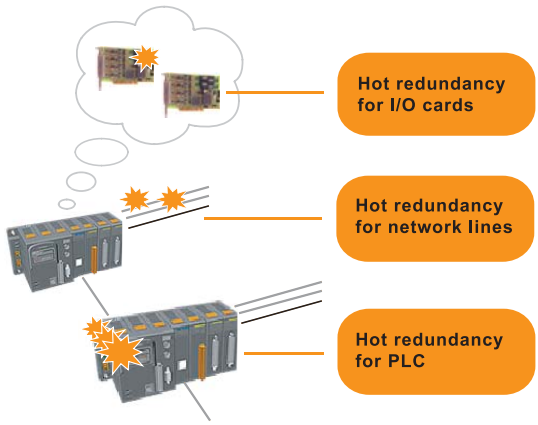
ISO 9001 TÜV CERT DIN EN ISO 9001:2000

TRACE MODE 6 is being developed in the framework of quality management system ISO 9001:2000 certified by TUV Turingen (Germany). The total testing time exceeds 50 man-years.

FAULT TOLERANCE

TRACE MODE ensures high reliability of the real time operation due to the advanced fault tolerance features. The software supports watch dog timer and provides smooth controller restart. The Micro TRACE MODE hot redundancy feature is fully automatic. The built-in **hot redundancy** system controls the controller operation and automatically switches to the stand by nodes in case of failure. The automatic history log synchronization feature is also available.
By default, the following hot redundancy technologies are implemented in TRACE MODE:

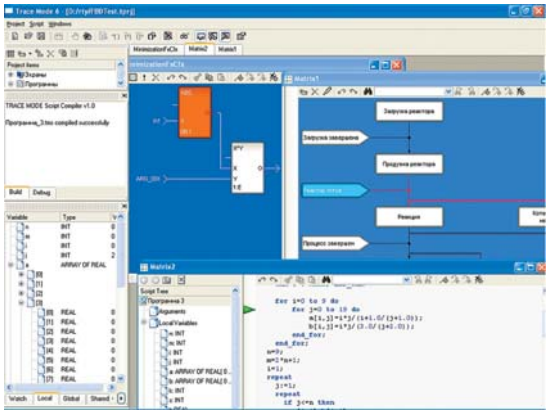
- channels database autobuilding for standby SOFTLOGIC controller;



- controller redundancy: switching-over of data flows to standby SOFTLOGIC controller in real time, in case of failure of the master;
- synchronization of real time data between the main and standby SOFTLOGIC controller.

IEC 6-1131/3 STANDARD PROGRAMMING LANGUAGES

The TRACE MODE® 6 IEC 6-1131/3 programming languages include **3 visual** languages, (FBD, SFC, LD), aimed to **engineers and business-analysts** and **2 procedural** (ST, IL), programmers-oriented languages. TRACE MODE logics can also be written in C language. Using the TRACE MODE® 6 IEC 6-1131/3 languages, one can program controllers, HMI algorithms, EAM and MES logics with equal convenience.
The TRACE MODE editors provide powerful debugging facilities and **online project editing**. The project can be **downloaded** into a controller **remotely**, and can be **remotely run** there.
TRACE MODE 6 includes a library with more than 150 ready-to-use algorithms, e.g. such control algorithms as filtration, PID, PDD, modal, fuzzy and position control, WIM, as well as integrated device control algorithms such as valve, drive, pump, motor, group of motors etc.



TRACE MODE 6 compiles all 5 IEC 6-1131/3 languages programs in machine-codes! This ensures the maximum **speed of program execution** in real-time.

ADAPTIVE CONTROL LOOP SELF-TUNING

TRACE MODE 6 contents libraries of adaptive PID loop self tuning algorithms, which ensures automatic calculation of the optimal control parameters (gain/proportional band, integral/reset, derivative/rate) for the desired control response. The control loop tuning in TRACE MODE does not affect the process and may be done without interrupting the real time control.

UNIFORM NETWORK TIME

TRACE MODE 6 automatically synchronizes time in controllers and in PCs. It is possible to link the time to the time standard.

REMOTE CONTROL/TELEMETRY

TRACE MODE 6 may be used in remote control applications. The Micro TRACE MODE provides process control on RTU and communicates to the operator PC via several physical interfaces, e.g. dedicated and dial up lines, radio, GSM. The Micro TRACE MODE saves local log in RTU, periodically uploads it to the operator PC, keeping the time of the real events. The noise immune M-LINK CRC protocol ensures reliable data exchange.

I/O SUPPORT AND COMMUNICATIONS

The Micro TRACE MODE 6 has free drivers for the most widely used I/O cards and protocols. The program may communicate to the PC through RS-port, modem (both dedicated and dial up), radio, GSM/GPRS and TCP/IP net.

MULTIPLATFORM

The Micro TRACE MODE 6 versions for different operating systems are available.

T6™ SCADA/HMI — OPERATOR INTERFACE

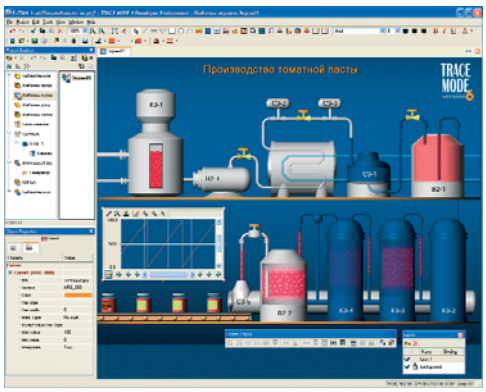
FREE I/O DRIVERS

All TRACE MODE I/O drivers are provided **free-of-charge**. TRACE MODE 6 driver libraries allow to connect to more than 2000 well-known I/O cards and controllers.

OPC SUPPORT

TRACE MODE® 6 supports the **OPC** (OLE for Process Control) standard. TRACE MODE 6 servers include OPC-client, which allows to acquire the data from any OPC-servers.
The OPC-server for TRACE MODE® 6 **M-LINK and I-NET** protocols are available also. The TRACE MODE OPC-servers may be used to connect to all TRACE MODE real time monitors, and to the Micro TRACE MODE programmed controllers.

PHOTOREALISTIC SCREEN GRAPHICS



The **TRACE MODE graphics** provides fast and quality 3D graphics. For 3D elements, it is possible to specify opacity, position of the light source, shape and color, transparency etc. Animation and raster drawings can be subjected to arbitrary transformation (turn, extension), and moreover, not only in the editor, but also dynamically. The transparency of background is also supported. The original technology of **3D Fast+** provides fast display of HMI screens in real time.

OPENNESS

TRACE MODE 6 and T-FACTORY.exe 6 interact with other applications through world standard interfaces, which ensures their easy integration into corporate informational systems. The **DDE, OPC, SQL/ODBC, TCP/IP, DLL, ActiveX** etc. are supported. User can write a proprietary system component and embed it in TRACE MODE 6 as a **PLUG-IN**.
The program has an **open** communication interface — **T-COM**, allowing writing **I/O drivers** for controllers, using 'C' language. The **M-LINK 6** communication protocol is **open**.

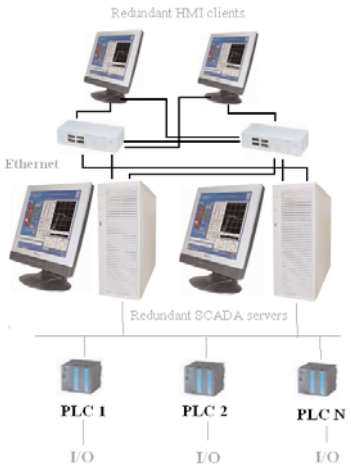
SCALABILITY

The object structure and the distributed database of the TRACE MODE project ensure **easy scalability** of the TRACE MODE 6 based control systems. The maximum number of variables in the project may attain

1.000.000.000. This enables using TRACE MODE 6 in the corporate scale informational systems.
TRACE MODE 6 may be used for both **client-server** and **DCS-like** control systems development.

RELIABILITY AND REDUNDANCY

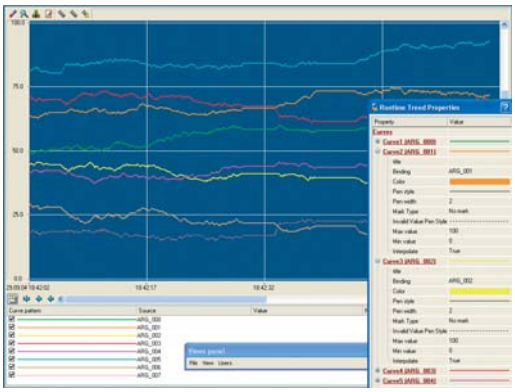
Reliability is one of the most important requirements towards a control system. TRACE MODE has the intrinsic redundancy concept aimed to provide **maximum control system reliability**. It has a fail-proof project design system and it has **built-in redundancy** for all control system levels — from a single sensor, to the enterprise scale servers. Redundancy features for the most components of the control system are provided **automatically** and no **additional programming** is required.



In the TRACE MODE 6 the redundant PC or PLC nodes may be created **utterly easy** — at one click of the mouse. Moreover, for the first time ever the control systems with **dual and triple redundancy** may be designed **with the same ease**.

INDUSTRIAL REAL-TIME DBMS

TRACE MODE includes original **high-speed industrial real time DBMS SIAD/SQL 6**.

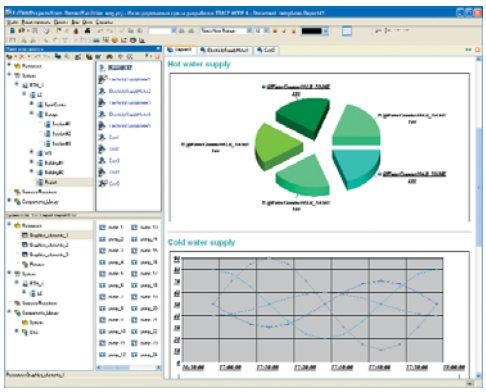


The SIAD/SQL 6 real time DBMS is **optimized** for **fast saving and reading** of intensive data flows in **24x7** mode. It can save over **one billion parameters** with time labels accuracy of **up to 1 ms**. It is **10–100 times faster** than most competing products. In order to provide **reliability** of data storage the SIAD/SQL 6 real time DBMS, provides **hot redundancy** (dual or triple) for servers, and the automatic **data recovery** system for corrupted archives. The SIAD/SQL 6 employs powerful **security system** providing **maximum protection** for from the unauthorized access.

ALARMING

TRACE MODE has a powerful **alarming system**, provided by alarm servers. The alarm servers are built in the most TRACE MODE and T-Factory server products such as Real time monitors, Loggers etc. The HMI alarms server saves text information about events occurred in the monitored process.
Alarming covers events of any kind, including those calculated and generated on the basis of statistical data processing of real time values, or of the data stored in the SIAD/SQL 6 real time DBMS. Each message can be **acknowledged** by the operator with registering of acknowledgement time and operator's name.
The alarming system may display messages on the HMI screen, print them out, save them in a file. Moreover the TRACE MODE HMI alarming system ensures alarm message sending from HMI PC (or from PLC) in form of SMS to the operator **mobile phone**.

DOCUMENTATION SERVER



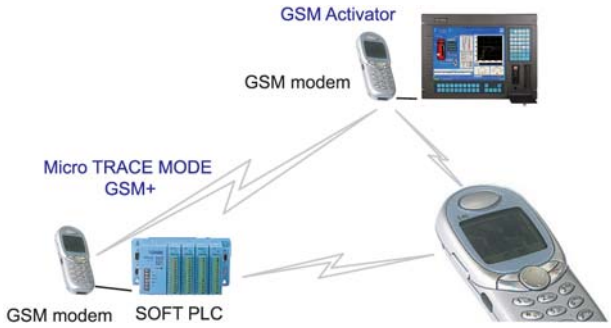
TRACE MODE 6 Documentation server allows to generate user defined reports, orders, lists etc and save them on disk in HTML format for further printing. As the data sources documentation server uses the data from RTM, DMBS, OPC-servers and other applications. It allows to generate reports, for the **unlimited** number of document templates and scripts, made in the TRACE MODE Integrated development system.
The Document generator editor provides *text formatting, lists and tables processing, inserting bitmaps, trends, bar and pie charts*. The Document generator templates editor ensures **flexible** setup of the trends and bars settings, e.g. it helps to preset *curves style, background color, grid lines scales for X and Y axes, page headers and legend*.

EASY DBMS CONNECTIVITY

In the real time mode, the TRACE MODE® 6 and T-FACTORY 6 servers can interact not only with the proprietary SIAD/SQL 6 real time DBMS, but also with other common DBMSs, for example, with *MS SQL Server®, Oracle®, Sybase®* etc. That ensures **easy integration** of TRACE MODE® 6 based applications into enterprise scale corporate informational systems. For easy connectivity to the

common relational DBMS and other third party applications an **SQL-queries editor** is included into the TRACE MODE® 6 development system. The editor helps preparing **SQL-query templates** and check their operability in both the emulation mode and with real transactions.

GSM-BASED REMOTE CONTROL



Some of TRACE MODE RTMs are GSM enabled. They may send/receive alarm messages, data queries and commands to mobile phones and to other TRACE MODE RTM PCs and to controllers run under Micro TRACE MODE GSM+.

MOBILE HMI

The TRACE MODE Mobile 6 is installed onto PocketPC and smartphones and provides remote connectivity to controllers, SIAD/SQL database servers and TRACE MODE Real time monitors (servers). The mobile personnel may monitor and control the process remotely viewing it on graphical HMI screens with trends. The Bluetooth, GSM and Wi-Fi interfaces are supported.

TRACE MODE version 6

SCADA/HMI System Requirements

Minimal:

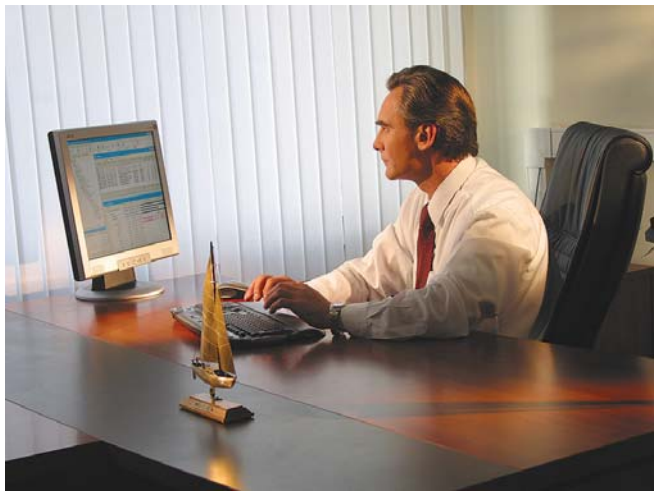
- Windows 2000 and higher;
- RAM 256 M;
- SVGA 800x600x16 bit;
- Intel Pentium II - 233 MHz;
- 300 M HDD space;
- CD-ROM drive;
- Mouse;
- LPT or USB ports;

Recommended:

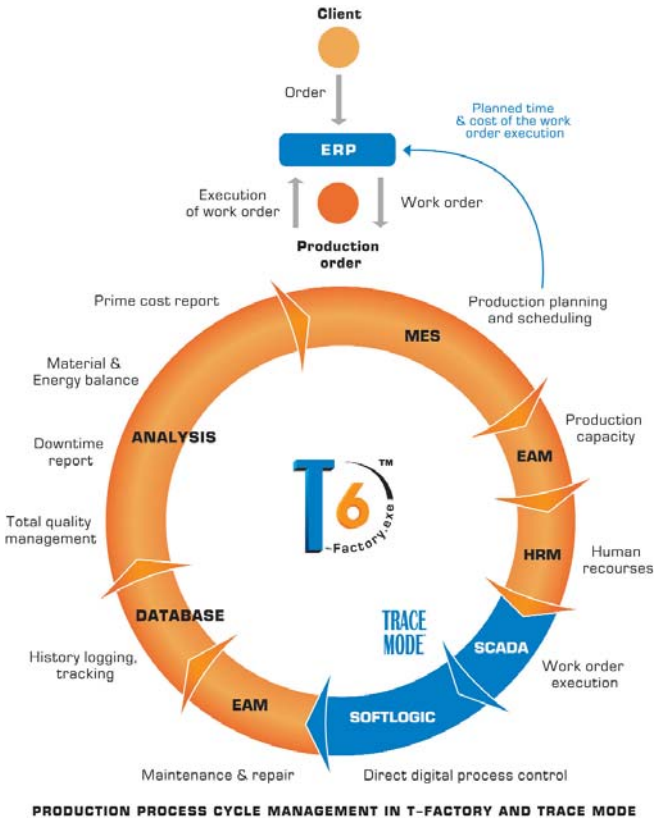
- MS Windows® XP and higher;
- RAM 512 M;
- SVGA 1280x1024xTrue color;
- Intel Pentium IV - 1.4 GHz;
- 1000 M HDD space;
- CD-ROM drive;
- Mouse;
- LPT or USB ports;

T-FACTORY MES

— REAL TIME PLANT MANAGEMENT



MANAGEMENT OF PRODUCTION CYCLE

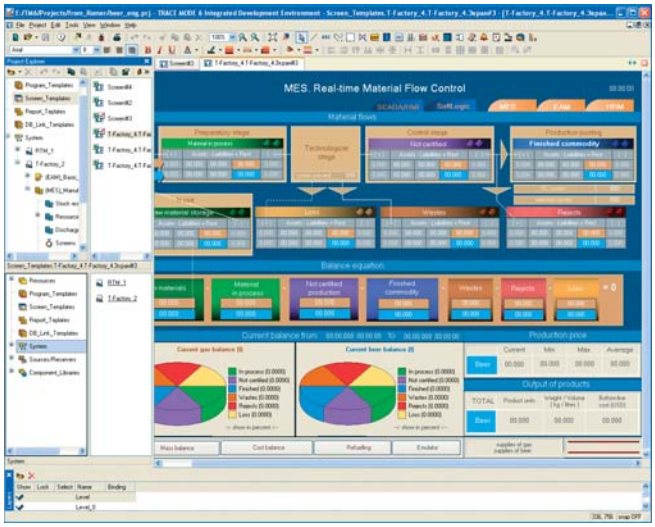


PRODUCTION PROCESS CYCLE MANAGEMENT IN T-FACTORY AND TRACE MODE

The manufacturing execution system T-FACTORY 6 offers control over the whole production cycle, covering such issues as *planning and control for production orders, prime cost calculation, material and energy balances accounting, monitoring of order execution*, etc.

A T-FACTORY manufacturing execution system project is developed in the TRACE MODE Integrated development environment in combination with control system (industrial controllers and HMI), and shares a unified informational base with the same. This allows avoiding unnecessary duplication of databases of the manufacturing automation and control system, and implementing business-control of manufacture on the basis of objective physical measurements received in real time mode.

PRIME COST CONTROL



The T-FACTORY manufacturing execution system represents the production process as a totality of interconnected **energy and material flows**. The T-FACTORY 6 MES provides real time monitoring of material flows in manufacturing. The product primary cost may be calculated and monitored in real time. The system supports decision-making targeted at reduction of product prime cost.

MATERIAL BALANCES

The T-FACTORY 6 MES makes it possible to calculate, in real time, the **material balances** between any components of the technological chain. At that it is possible to allocate unlimited number of categories of the balance, and calculate the cost of each category. It is possible to establish tolerance limits in the system, for each category, and perform automatic alarming in case of excess of the allowable quantity of waste, defects or losses.

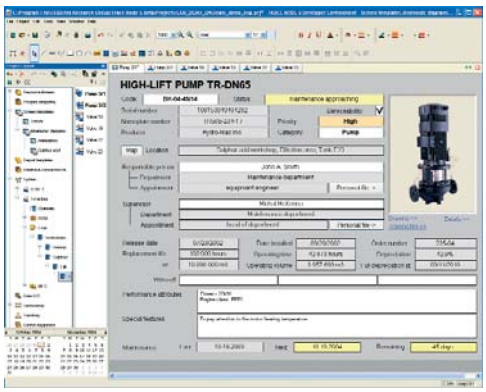
QUALITY MANAGEMENT

The process oriented approach implemented in T-FACTORY 6 MES makes it possible to manage the product quality in compliance with ISO 9000:2000 standard.

INTEGRATION WITH ERP

All T-Factory modules interact with ERP at the DBMS level.

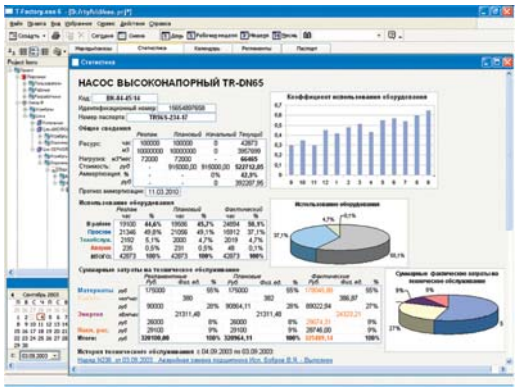
EAM – ENTERPRISE ASSET MANAGEMENT



MAINTENANCE SUPPORT

The T-FACTORY.exe™ 6 EAM (Enterprise Asset Management) is a **real time EAM system, fully integrated with enterprise process control** systems. The T-FACTORY EAM offers :

- automation of the enterprise asset **accounting** for entire life cycle;
- implementation of up-to-date methods of **preventive and predictive maintenance**;
- reduce equipment **downtime**;
- enhance **production efficiency** of equipment;
- extend life cycle;
- reduce **operating costs**;



For this purpose, the T-FACTORY EAM contains powerful tools, that offer:

- filling in the asset **record database**;
- elaborating the EAM **services** for **preventive and predictive maintenance**;
- assigning maintenance **priorities**;
- linking the maintenance services with real time data from TRACE MODE HMI and SOFTLOGIC;
- automatically generate EAM orders for materials and works;
- setting up the EAM **document flow circulation** rules with approval of stages by the personnel in charge;
- performing **network planning** for maintenance works, for an unlimited period;
- **controlling** the execution of works;
- logging the **EAM-statistics** of operation, downtime, failures and maintenance of equipment;
- accounting of the maintenance **cost**;
- generating reports automatically, and calculate the indices, required for decision making.

ASSET HIERARCHY

The T-FACTORY 6 EAM allows to represent all enterprise assets (equipment) as an hierarchy of **EAM-objects**. For each EAM-object the EAM server automatically calculates maintenance statistics, cost, events, generates services. According to activated EAM services, the system generates **work orders and material orders**. The orders are transferred to T-FACTORY 6 EAM planning subsystem.

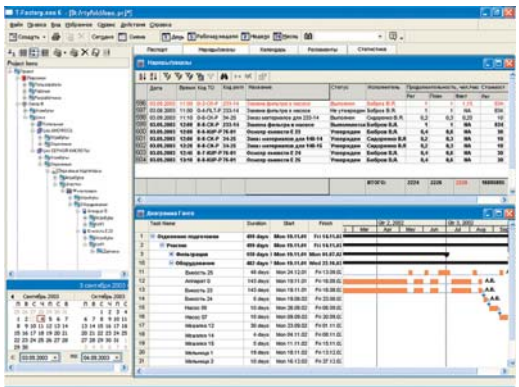
PREDICTIVE MAINTENANCE

The T-Factory EAM integration with control systems allows implementation of the modern technology of **predicting maintenance**, where possible malfunctions in operation of the equipment are eliminated **prior to their occurrence**.

PRIORITY DRIVEN PLANNING

T-Factory EAM offers **priority driven planning**. Each work order passes through the system of **document circulation**, during the course of which, authorized officers of the enterprise:

- correct the time for execution of works;
- assign or replace executors;
- cancel or approve the works.



CUTTING DOWNTIMES

The enterprise using the T-FACTORY EAM, could **extend the equipment operation life, cut the downtime** caused by equipment failures, control the maintenance **costs** and **enhance** the overall equipment productivity.

T-FACTORY MES SYSTEM Requirements

Minimal:

- Windows 2000 and higher;
- RAM 256 M;
- SVGA 800x600x16 bit;
- Intel Pentium II - 233 МГц;
- 300 M HDD space;
- CD-ROM drive;
- Mouse;
- LPT or USB ports;

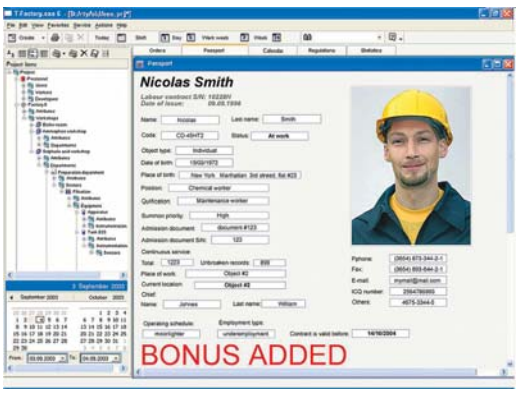
Recommended:

- MS Windows® XP and higher;
- RAM 512 M;
- SVGA 1280x1024xTrue color;
- Intel Pentium IV - 1.4 GHz;
- 1000 M HDD space;
- CD-ROM drive;
- Mouse;
- LPT or USB ports;

HRM – WORK MANAGEMENT

T-FACTORY.exe™ 6 HRM is a **real time work management** system integrated with control, MES and EAM-systems of an industrial enterprise.

The T-FACTORY HRM provides a manager with real time information about availability and accessibility of manpower of the enterprise required for accomplishment of works, and performs accounting of their time, quality and cost. This allows easy work management e.g. to plan the works flexibly, "to see" current load of the personnel, redistribute the manpower among production sites, reduce downtime, increase motivation and productivity of the factory staff.



TRACE MODE 6 – Integrated Platform for Manufacturing And Process Control