



**MAXIMIZE YOUR PLANT.**

*Achieving peak performance from  
your process control system*

COMPANY TECHNOLOGIES AND CAPABILITIES OVERVIEW



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ProSys focuses  
on process control  
to help companies  
experience:

INCREASED PRODUCTION

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REDUCED RISK

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GREATER OPERATOR EASE-OF-USE

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INCREASED OPERATOR EFFICIENCY

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STABLE PLANT OPERATIONS

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REDUCED UNPLANNED EVENTS



## Company Overview

### ProSys is a leading global provider of process control engineering services and solutions.

ProSys, Inc. delivers high-quality, cost-effective, innovative process control systems consulting services and product solutions to the international refining and chemical industries. Our expertise and experience cover the full range of modern control system technology, including basic control, advanced control, dynamic configuration, alarm management, and the documentation and maintenance of the system configuration.

Our emphasis is on maximizing the customer's control system, which results in reduced energy consumption, improved product quality control, increased product recovery and significant additional benefits. Our specialized process control applications can help you achieve more profitable plant operation. And our alarm management solutions dynamically configure the control system to focus operator attention on the task at hand, reducing time spent in abnormal situations.




### Comprehensive, proven process control solutions

ProSys consulting services and product solutions are focused on helping you gain maximum benefit and optimal control from modern control system technology. Our alarm management, control, and interface philosophies have been implemented at client sites worldwide consistently and reliably achieving process operating objectives.

Our base-level approach to **control system design and strategy development** typically follows this progression:

- Study existing plant operation or new construction P&IDs;
- Perform detailed process operation analysis;
- Define basic operator interface, including graphic interface;
- Develop basic and advanced regulatory process control functions;
- Formulate supervisory (model-based/optimization) control functions;
- Check installed regulatory database and provide loop check assistance;
- Tune basic regulatory control functions;
- Implement advanced regulatory control functions;
- Perform process identification / develop parametric, step-response or equation-of-state models; and
- Develop and implement supervisory control functions.

ProSys product solutions are realized through our **Process Dynamics Suite**, which includes:

- 
**Alarm Dynamics** – applications that bring consistency and reliability to the system by keeping it optimally configured for the process state; including alarm system design, dynamic alarming, and alarm shelving
- 
**Control Dynamics** – basic control templates and advanced algorithms that more accurately and easily achieve your desired control objectives
- 
**Interface Dynamics** – end-user controls that give operators a clearer, more accurate and more reliable view of the control system

ProSys consulting services can be categorized into these four main areas:

- **Alarm Management** – providing a robust platform for managing abnormal and normal situations
- **Basic Controls** – providing the foundation for all of your control objectives
- **Advanced Controls** – optimizing plant operation according to goals that may include reducing variability, increasing throughput, increasing conversion, and reducing off-spec or by-products
- **Human-Machine Interface** – designing the operator environment and interface to relieve fatigue and increase the clarity of the process

### Fully committed to your success

ProSys' success can be attributed to our group of talented, experienced, highly motivated individuals who combine engineering and technical expertise with the ability to be dynamic, innovative team members and leaders. We are driven to provide quality, innovative and timely solutions to clients in a collaborative environment that values open communication, creativity, integrity, and diversity.

Our staff has both plant operating and computer systems experience, and bring knowledge and insight gained from many different operating environments when working with your project. We work exclusively on digital process control systems, which increase our team's productivity. We have developed additional procedures, methodologies, and technologies that minimize wasted time and effort. We have the expertise in process control technology, process operations, process engineering, process modeling, computer control applications, and advanced dynamic configuration to effectively integrate all elements of a process system — leading to maximum economic return for our clients.

## The ProSys difference

Three important attributes differentiate ProSys from our competitors — how we view process control, how we address challenges, and the cumulative knowledge and insight we bring to each new job:

**1. Philosophy:** Our philosophy is based on a **global view of process operations and control systems** — not as a disjointed system of pipes, valves, pumps and vessels. We know that it is a complex system of mechanical, chemical and human interactions, and that chemical reaction and separation processes require specific conditions of temperature, pressure and flow rate. These conditions are maintained by a control system, and plant operators are responsible for verifying that the control system is making the correct combination of valve adjustments to keep product streams on specification.

The ProSys philosophy is used to implement effective process control systems that **distribute the control functions in a hierarchical structure**. The basic regulatory controls serve as the foundation of the system and should not be dependent on the conditions of any advanced or higher-level controls. Additionally, the ProSys philosophy sets standards for the successful implementation of the higher-level supervisory control functions, such as model predictive or dynamic matrix controls, steady-state parametric or equation-of-state models, and optimization applications. We believe that a **successful process control system** is one where the higher-level control functions:

- Are robust and dependable;
- Achieve the objectives for which they were designed; and
- Are utilized by the operators because the controls can be understood without daily engineer-level support.

Our philosophy for alarm management solutions is radically different from the software and services other firms offer — we actually address the underlying problems that often degrade the effectiveness of the alarm interface, instead of masking the symptoms while the underlying problems become worse. Over the past decade, ProSys has earned a leadership role by pioneering practical solutions for the industry, and we continue R&D efforts in alarm management and operator interface technology to push the limits even further.

**2. Approach:** A successful process control system must be able to provide dependable responses to process changes. In order to achieve maximum performance from a process, **our approach establishes the operational needs of the user as the primary focus of the control system design**. These primary needs of the user are:

- Meaningful process measurements, presented in displays easily understood by operators;
- Logical process control displays;
- Basic process control functions, which can operate independently of any advanced control applications;
- Operator keystrokes for advanced control applications that are very similar if not identical to those required for use of the basic controls; and
- Operator access to all levels of control functions through a single operator station/console

No matter the client or project, we never veer from this focus on the user's unique needs.

**3. Experience:** In a complex, changing industry, there's no substitute for real-world experience. The resources available to your project through ProSys bring broad international experience gained by **hands-on work** in the refining and chemical industries, including:

- **Control Systems Consulting** – using a process systems approach to design and implement modern control systems and advanced controls that significantly improve plant operating efficiency
- **Dynamic Alarm Design and Alarm Management Implementation**— using knowledge gained since 1990 in providing dynamic Alarm Design services and implementing practical alarm management solutions
- **Advanced Control Technology Development** – using proven analytical techniques to develop new technology and methods for solving complex process control problems through automatic control functions
- **User Interface Design** – using innovative and tested user interface techniques to improve user understanding, response, and ease-of-use to design intuitive interfaces used by plant personnel.
- **Plant Operations** – using experience and knowledge to assist and direct operations personnel in dealing successfully with complex unit operating problems
- **Personnel Supervision** – using management training and experience to direct the activities of process control engineers, plant operations personnel, and refining and marketing analysts
- **Project Supervision** – using technical training, project management techniques, and experience to schedule, monitor, and coordinate activities on major projects
- **Process Engineering & Design** – using heat and material balances, distillation simulations, kinetic reaction process models and other tools to define, analyze, and solve plant operating problems and thereby improve unit performance; or to develop design parameters for process plant construction

## WHO WE'VE HELPED

Our expertise has taken ProSys staff around the globe. Our solutions have been implemented on more than 100 process units worldwide for clients including:



The process units on which our staff has successfully implemented include:

- **Alkylation** – including both HF and Sulfuric Acid
- **Aromatics Recovery** – including Sulfolane® extraction, extractive distillation, benzene/toluene recovery, orthoxylene recovery, paraxylene recovery via adsorption or crystallization, and xylene isomerization
- **Boilers** – including CO boiler
- **Catalytic Cracking** – including Exxon, UOP, and Amoco-Kellogg processes
- **Catalytic Reforming** – including semi-regen, cyclic, and continuous
- **Crude Fractionation** – consisting of atmospheric and/or vacuum tower
- **Delayed Coking** – including heater, coke drums, and fractionation tower
- **Hydrocracking** – including Unicracking® process
- **Hydrotreating/Desulfurization** – including naphtha, kerosene, and gasoil
- **Light Ends Recovery** – typically consisting of absorber, stripper, depropanizer, and debutanizer
- **Lube Oil Extraction** – including Furfural® and Duosol® processes
- **Lube Vacuum Fractionation** – including heater and vacuum tower
- **Olefins Production via Pyrolysis** – including cracking furnaces, quench tower, refrigeration compressors, and fractionation towers
- **Polyolefins** – including polypropylene and high density polyethylene
- **Propylene and Ethylene Oxide Derivatives**
- **Resid Solvent Extraction** – using Demex® and ROSE® processes
- **Sulfur Removal** – typically including amine treating, sour water stripping, and sulfur plant
- **Titanium Dioxide Production**
- **Waste Water Treatment Plant**
- **Water Treatment Plant** – demineralization and softening

The process units on which our staff has successfully implemented **Alarm Dynamics and Control Dynamics applications** are:

Alkylation, Boilers, Catalytic Cracking, Catalytic Reforming, Crude Fractionation, Delayed Coking, Hydrotreating/Desulfurization, Light Ends Recovery, Resid Solvent Extraction, Vacuum Fractionation, Polyolefins, Sulfur Removal, Paraxylene, Purified Terephthalic Acid, Purified Isophthalic Acid, Propylene and Ethylene Oxide Derivatives



PROSYS PRODUCTS





# PROSYS Process Dynamics™ SUITE



## ProSys Products

The ProSys team has spent nearly two decades in the global process control environment observing what works, what doesn't work and what is truly possible given our expertise and today's sophisticated control systems. We've taken this knowledge and developed a powerful group of software applications — the Process Dynamics Suite — that help plants maximize their operations, running more safely and efficiently.

The Process Dynamics Suite is composed of three modular applications — Alarm Dynamics, Control Dynamics, and Interface Dynamics — each built and tested to work alone within your existing control system, or fully integrated for maximum benefit. The following pages explore each application's unique capabilities and benefits.



**The Problem:** Most alarm system configurations are optimized for a single process state (run), leaving critical modes of operation (shutdown and startup) compromised. The fact, however, is that process state changes are the most critical areas of plant operation, and most process incidents occur on startup. As a result of current configurations, alarms are often presented to the operator outside the context of the current process operating state. Alarm floods are generated on a change of state, burying secondary events beneath a flood of alarms and monopolizing the operator's time during the most critical situations.

**The ProSys Solution:** Alarm Dynamics provides operators a consistent and reliable action event notification interface that supports their efforts to safely and efficiently operate the process. Alarm Dynamics reduces the risk of escalating events by focusing the operator's attention on the required areas, giving him the ability to quickly diagnose events and take corrective action, avoiding unnecessary shutdowns and incidents.

Two principles that are the driving force behind the development of this revolutionary software:

- Every alarm presented to an operator should be meaningful (clear) and relevant to the operator; and
- Every alarm should have a defined response.

An optimal configuration is one wherein the performance characteristics of the process controls, alarms, and messages meet the required process operation objectives. Such a configuration should:

- Aid the operator in meeting the objectives
- Not inhibit him from taking necessary actions
- Not hide necessary information or conditions
- Not show unnecessary information or conditions.

ProSys Alarm Dynamics software is a two-part solution to achieving optimal configuration through process control alarm management — Dynamic Alarm Management and Alarm Shelving.

### 1. Dynamic Alarm Management

The primary function of Dynamic Alarm Management is to manipulate alarms based on the current state of the process unit or system — thus, giving all relevant alarms to the operator but suppressing alarms that are unnecessary based on the current conditions. In short, Dynamic Alarm Management allows the alarm configuration to be context-sensitive through effective management of alarm parameters. (The product is also flexible enough for use in changing non-alarm related parameters based on the state of a unit.)

Dynamic Alarm Management was introduced in 1995 to bridge the gap between micro-programming, which can be exceptionally difficult to maintain, and macro applications, which often fall short of meeting your complete objectives. The software uses logic to determine that the system has changed from one process state to the next, then dynamically changes the alarm configuration of the points belonging to this system (a logical grouping of points that react to the same changes, usually around a piece of equipment such as a reactor or column, etc.) to match the desired process conditions for that state. This functionality allows for tighter alarms in process run states. During process upsets, shutdowns, or startups, broader alarm limits are used. This dynamic behavior gives the operator the best of both worlds. Tighter, faster, and more useful alarms improve operator response, process downtime, and product quality. At the same time, fewer useless or redundant alarms allow the operator to focus on the problem at hand during a process upset or emergency and



practically eliminate the chance of overlooking the one “gotcha” alarm that always seems to lurk underneath the alarm flood.

Components: Dynamic Alarm Management consists of five independent but fully compatible software modules:

- Selector Module (SEL) – Uses logic (set during configuration) to determine which state (also called case) the system is in. The selector module can also be placed in manual to allow the case to be set manually.
- Global Alarm Module (ALM) – Allows for alarms of a point to be completely disabled or enabled based on the case determined by the Selector Module.
- Analog Alarm Module (AAL) – Allows for trip points and alarm priorities of individual points to be modified based on the case determined by the Selector Module.
- Configuration Module (CNF) – Allows for any modifiable parameter to be modified based on the case determined by the Selector Module.
- Interface Module (ITF) – Interfaces with other applications and/or the operator. This allows other applications to be run, or messages be sent to the operator based on based on the case determined by the Selector Module.

#### Product Benefits:

- Dynamically change the alarm configuration based on the current state of a process system.
- Elimination of unnecessary or redundant alarms during a startup, shutdown, or upset, allowing the operator to more easily react to relevant alarms.
- Automatic reactivation of alarms during startup and/or normal run states, assuring that all needed alarms disabled during shutdown are active.
- The ability to tighten alarm limits during normal operations, since they can be relaxed or eliminated during other conditions in which they may be nuisance alarms — thus increasing product quality.
- The ability to add or modify alarms for additional process states such as catalyst regeneration, decoking, recirculation, etc.

- Change to another alarm configuration (set during configuration) when a product changes, feed changes, or product specifications change. (Depending on the system, this may require some manual intervention, such as the setting of a flag.)
- Improved operator response, decreased process downtime and better product quality.

#### Product Features:

- Three modes for selector blocks: Manual allows the case to be set manually. Automatic sets the case automatically using logic. Semi-Automatic requires the operator to confirm the case determined by the logic before the case is switched.
- Key-level protection can be set for each mode, and for each case while in manual mode.
- Multi-platform user interface for Honeywell’s Experion PKS, TPS, and TDC3000 control systems.
- Operator interface displays contain module details and execution status. Of particular interest are the mode of the selectors and the graphical representation of the case logic.
- Selector blocks contain logic blocks specifically designed to handle bad process value logic so that the case can change to a “safe” case (usually all alarms on) when the logic becomes indeterminate due to too many bad process values.
- Includes online help documentation so operators can take quick, decisive corrective action
- The Selector Block, Configuration Block, and Interface Block can be used for applications other than Alarm Management.
- A delay time can be set before a case is selected.
- After a new case has been selected, changes to the alarm configuration are not immediately set. Each individual setting can be delayed, or changed only after the alarm has cleared. Thus, there is no alarm flood upon change of state.
- Up to 20 cases per selector block
- Up to 40 inputs and up to 40 logical tests per selector block



- Logic is extensible into additional Selector block as necessary
- Up to 20 points per Global Alarm block
- Up to 20 parameters per Analog Alarm block
- Up to 20 parameters per Configuration block
- Up to 20 parameters per Interface block
- All blocks can be associated with up to 20 different cases
- All blocks types can activate other blocks (including a similar block type), thus allowing an almost limitless (other than memory) number of blocks and points that can be assigned to a case.

*Technical Specifications: Contact us for complete details.*

## 2. Alarm Shelving

First introduced in 1997, Alarm Shelving is an alarm management application used to eliminate nuisance, chattering, and status information from the alarm screen. This capability is highly beneficial to operators because:

- Chattering alarms can cause the operator to become desensitized to alarms and ignore important alarms;
- Status alarms, which typically give the status of a particular piece of equipment, may be useful when they first appear to indicate a change of state, but they often last for days or even months; and
- Instrument Maintenance issues often leave unnecessary alarms that clutter the alarm screen and do not require further operator attention.

In the old method of alarm shelving, there is no connection between the disabling and re-enabling of alarms. All actions are manual, and no reminding capabilities are available. Utilizing this unique ProSys software, however, provides more than just the ability for operators to disable alarms — it also allows for:

With Our Alarm Shelving Tool

- Disabled alarms to re-enable when the alarm clears (or to reactivate after a certain time);
- Alarms to be disabled after active and acknowledged for a certain period of time; and
- Configuring which alarms the operator can manage and how long the alarm can stay disabled.

#### Product Benefits:

- Eliminates nuisance alarms from the alarm summary, allowing the operator to concentrate on important alarms.
- Retire alarms that have become status information from the alarm summary.
- Engineers determine which alarms can be operator-managed, and how they can be managed.
- Automatically re-enable disabled alarms, thus ensuring that the operator does not forget to re-enable an alarm. This feature can also be used to remind the operator that an alarm is still active.

#### Product Features:

- Easily accessible to operators by the touch of a button.
- Automatic bookkeeping – Alarms that are no longer problems are re-enabled and removed from the list.
- Shelved alarms may be categorized (e.g., short-term nuisance, long-term maintenance, maintenance).
- Seamless integration with ProSys Interface Dynamics.
- Engineer has per-user or per-unit control over which alarms can be shelved and for how long.
- Operator interface displays provide details, execution status, and easy-to-use access to adding or deleting tags and setting timer limits.
- Multi-platform user interface for Honeywell’s Experion PKS, TPS, and TDC3000 control systems.

*Technical Specifications: Contact us for complete details.*



**The Problem:** Operator awareness of the process is critical to plant safety and performance. As such, the design of the operator's environment is critical — however, many process control systems continue to operate with interface (display and keyboard) attributes that are far less logical, intuitive, clear and easy to use than possible with today's technology.

**The ProSys Solution:** Interface Dynamics is a human-machine interface (HMI) library that supports process-operator interface goals for:

- Process displays
- Historical trends and data
- Operations Data
- Control System Data

Interface Dynamics was developed to provide operators with a clean, reliable interface to:

- Safely operate the plant – identify and resolve plant problems; and
- Efficiently operate the plant – identify areas of operation that are deviating from desired values and encourage operator response.

In building Interface Dynamics, ProSys considered all components of the process-operator interface:

- Event notification – alarms (process and control system integrity) and messages
- On-demand information – process displays; historical trends and data; operations data (procedures, operating limits, etc.); and control system data, such as configuration

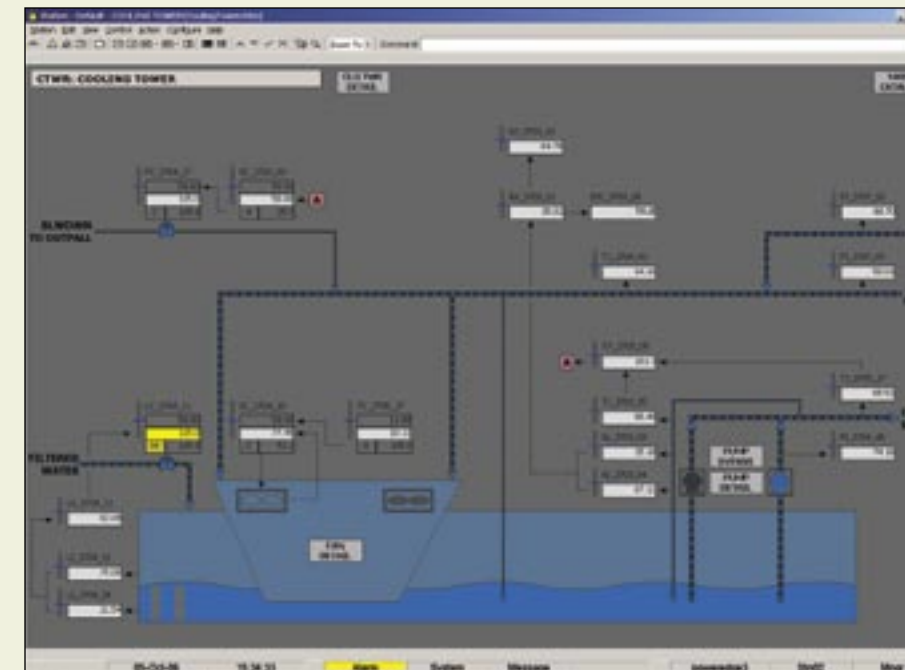
#### Product Benefits:

- Flexibility in use – Users can customize displays to view specific information, depending on their needs (e.g., show or hide instrument lines, display data tag name, display engineering unit descriptors, display deviation bars to perceive changes over time, etc.).

- Consistency – Objects used to represent data have a common look and feel, regardless of the system type.
- Ease of maintenance – ProSys provides template displays and documentation to facilitate maintenance of existing displays and creation of new ones.
- Trending capabilities – Display historical information for a single point (Quick Trend) or multiple points (Full Trends). Can also view hourly parameter averages for one or more points.
- Versatility – Interface can be set up for single, dual and quad consoles.
- Future-proofing – Interface Dynamics Library is continually improving with new features and enhancements
- Customization: ProSys offers custom support and development.

#### Product Features:

- Established display hierarchy categorizes process information by importance. For instance, information that provides an overall plant status is presented on top-level displays and supporting information on detail, shutdown, startup, and help displays.
- Process display database populated with operating ranges that scale, deviation bars, trends, and overviews. Eliminates re-entry or hardcoding operating ranges.
- Common interface attributes include:
  - **Color scheme** (designed to reduce eye strain and improve recognition of alarms and other abnormal items)
  - **Quick entry and interface** (for increased entry speed with fewer keystrokes, more intuitive usage, and quick display call-up).
  - **Consistent look and feel** (reduces operator training and increases operator recognition).
- Common interface shapes – ensure that processes are displayed in a consistent manner, without dominating the screen area or cluttering the screen with unnecessary detail. Also reduces the time required to generate displays.



Actual Screen from Interface Dynamics



- Common interface elements – allow for easier interpretation of the process and process readings (to recognize potential problems before they escalate); and feature a standard entry format (makes operation more intuitive, safer and more oriented toward operator response)
- Common elements include:
  - Values, indications, and control points – Values can be entered by a simple select element-type value-press enter method, or by "Select Point" or PMK keys.
  - Alarm indications – Use standardized, high-intensity colors that stand out from the rest of the display, as well as standardized symbols and blinking unacknowledged symbols.
  - Dynamic Shapes – Indicated with a bold outline. Open pumps and valves turn line color; closed pumps and valves turn reserved dark grey color
  - Context menu – Available on all points with a right-click. Provides standard functions for all points, and point-specific functions based on point type.
  - Menu bar – Provides easy, standardized access to all functions on all displays, and rolls away on mouse-hover, reducing required operator clicks or keystrokes.

- Tooltips – Provide additional information on mouse hover.
- Hyperlinks – Provide a standard interface for navigating process displays.
- Realistic plant visualization – process data and instrumentation are accurately displayed by corresponding pieces of equipment to help users to better understand the units they control.
- View different process display types – including Console Overview, Control, Detail, ESD/Permissive, Help, Plot Plans, Reports, and Catalogs
- Console Overview (unique to Interface Dynamics) – shows any deviation from a marked process or unit setting (PV/SP/OP) at a glance.
- Trending features (Quick Trend and Full Trend):
  - Quick Trend – single-click access from any "trendable" point; one-click access to PV, SP and OP traces
  - Full Trend - full screen; multiple trace trend; save, load, and delete trends
- Appropriate color selection – improves recognition of alarms and abnormal conditions in a timely and efficient manner.
- Reliability and high quality performance standards



**The Problem:** The basic configuration of a plant's control system provides the foundation for all of your process control objectives. Advanced control applications are also necessary to optimize plant performance. However, developing, modifying and maintaining the applications that drive both basic and advanced control strategies are often complex, time-consuming tasks that, in many cases, do not fully maximize performance.

**The ProSys Solution:** Control Dynamics is a complete software solution that includes Basic Control Templates and Advanced Process Control (APC) algorithms. Through these two powerful modules, operators and engineers can take advantage of a wide variety of pre-designed and tested solutions to maximize plant performance easier and more efficiently.

## 1. Basic Control Templates

Our Basic Control Templates library was built for systems that use function block diagramming for control configuration. The library consists of powerful, time-tested, control strategies that allow consistent functionality and maintenance for reliable process operations.

Our template library simplifies the task of building new points because every template has been built and tested. All the engineer must do is locate the template in the library, instantiate it, and assign a point name, after which the point can be customized by changing the preconfigured parameters and making any connections to other points. The point can then be further customized with additional functionality, if needed, by adding additional function blocks.

All related templates in our library are grouped together under a base (less complex) template. For example, you

will find the template designed as a secondary controller under the PID branch. Building in this hierarchical structure also provides additional functionality. Templates allow for all points built under that template to be modified in mass by simply changing the template. Thus, you can change a parameter on all points built under a template by just modifying the template, then reloading the points that were changed. (Note that most changes made to a template do not affect the points built under it unless you specify that you want the change to affect all points by defining it as a template-defining parameter.)

The template library helps standardize control modules since all points are consistently depicted in the same manner throughout the database. This is important because in new systems, the possible combinations of blocks are extensive, and ensuring a standard for commonly used point types forwards your objective of building consistency across control strategies. In the library you will find similar blocks in the same or similar location in all control modules. Blocks with similar function are also the same color, and control modules are built so that data flows primarily from left to right, and top to bottom. Finally, because the exposed Configuration and Monitoring parameters are consistent throughout the library, it is much easier to locate the desired block and parameter, which expedites building, editing and troubleshooting.

### Product Benefits:

- Time savings when building new points
- Pre-tested strategies save you time and guesswork
- Easy mass modification to all similar points
- Consistency between tags built from templates, which expedites editing and troubleshooting

### Product Features:

- Intelligent displayed parameter choices
- Templates built in the library in a logical hierarchical structure
- Color-coded blocks
- Consistent data flow (left to right and top to bottom)

*Technical Specifications: Contact us for complete details.*

## 2. Advanced Process Control (APC) Algorithms

ProSys has developed algorithms for a number of different common applications that drive advanced process control strategies. In our experience, we have found that standard algorithms can at times be too aggressive for certain applications; ProSys APC algorithms are designed to prevent system upsets while still achieving the desired control objective and bringing up the level of optimization across the plant.

### Algorithms include:

- Control based on a discontinuous input, with frozen input detection (e.g., gas chromatograph analyzers)
- Heater pass balancing
- Capacitance control
- Constraint selection
- Duty control algorithms for heat transfer processes
- Smart filtering
- Incremental constraint controller
- Dynamic model-based controller
- Dual ramp ratio
- Smart ramp
- Internal reflux

- Split range control
- Total flow control
- Watchdog commissioning and decommissioning logic

*Technical Specifications: Contact us for complete details.*

One example of the value of ProSys APC algorithms is the use of watermark technology in level control to flow cascades for a tank. With our algorithm, the level in a tank is allowed to deviate from the set-point (SP) for a “reasonable” amount (defined by the watermark tuning parameters) before a flow out the vessel is manipulated. A typical PID program, on the other hand, will constantly integrate and change the flow control SP out the vessel. Under the ProSys algorithm, fewer fluctuations in the flow out the vessel ensure fewer upsets to processes further downstream and allow surge vessels to be used more efficiently for surge protection and to maintain constant flow conditions to other processes. Slow moves are made close to the SP, but if the Process Variable (PV) deviates slightly from the SP, the controller will make larger moves to bring the PV within reasonable limits.

Another example is analyzer feedback, which is typically a process with slow responses and discontinuous feedback mechanism. Continuous control strategies tend to overshoot, as they will integrate based on a discontinuous input, whereas the control strategy should be discontinuous to match the input change frequency. Many analyzer feedback applications typically have a fairly large dead time (measured in minutes) before any control move is manifested in the measured PV and little to no integral action should be taken until the feedback from the move is measured.



Control logic algorithms are also essential for any advanced control scheme. The logic tag determines the run state of the current APC application. If the APC is activated by the operator, the logic will change the modes of the required controllers to get the APC application to the required run state. Once the APC is running, the logic tag will watchdog various modes and alarms, and if the operator breaks the control scheme (by changing a mode from CAS to AUTO for example) or a watchdog tag goes into alarm, the logic tag sheds all the associated tags to the configured shed modes.

#### Product Benefits:

- Assists operators in repeated tasks that are more efficiently performed by a program.
- Fine-tune critical variables to maximize operation of units without the complexity of multivariable of dynamic matrix control applications
- Control algorithms specifically suited to the various control objectives seen in many common unit operations

#### Product Features:

- Non-interactive gain, integral and derivative control action
- Discontinuous integral control action (watermark technology)
- Adaptive feedback tuning
- Feedback limiting
- Control inhibition of the advanced algorithms by other applications
- Multiple feed forward parameters with individual gain terms
- Decoupling action on controllers
- "Soft" limits of SP and Output (OP) parameters
- Minimum OP change limits



PROSYS CONSULTING SERVICES



# PROSYS CONSULTING SERVICES

For nearly 20 years, ProSys has focused solely on maximizing plant performance through innovative process control system solutions. Our wide range of experience and in-depth knowledge of process control in the refining and chemical industries make ProSys highly qualified to provide comprehensive, customized control system consulting services. Our professionals assist clients both in the United States and internationally in four areas that significantly affect operator and system performance:

- Basic Control
- Advanced Control
- Human-Machine Interface (HMI)
- Alarm Management

## Basic Control

A sound basic control system configuration will provide a profitable baseline for operation and enhance your return on investment in higher-level process controls. In order to help you establish this sound foundation, ProSys offers flexible and affordable solutions under our Basic Regulatory Control Services. Our attention to detail and robust software tools ensure faultless implementation, from control system configuration file creation to plant control documentation. Our Basic Control consulting services include:

- Control system hardware specification
- Control function definition and P&ID review
- Database definition, layout, and loading
- Controller configuration and programming
- Start-up assistance and control loop tuning

## Advanced Control

Advanced process controls seek to optimize plant operation according to specific, often complex goals. The ProSys consulting team has provided advanced control solutions to both Fortune 500 corporations and small companies in the refining and chemical industries. The ProSys consultants assigned to your project are highly qualified in providing reliable, uniquely adapted advanced control systems solutions. Our portfolio of Advanced Control solutions includes:

Advanced regulatory control consulting (utilizes dynamic compensation techniques and control software)

- Process analysis and P&ID review
- Advanced control application objective definition
- Sequence control program definition
- Database definition, layout, and loading

Advanced control application programming (control functions and application logic)

- Sequence control programming (sequence functions and logic)
- Advanced control application testing, tuning, and implementation
- Sequence control program testing and implementation

Model-based control

- Process/benefit analysis
- Step testing
- Implementation
- Tuning and model updates



# PROSYS CONSULTING SERVICES

## Human-Machine Interface (HMI)

Operator awareness of the process is important to plant safety and performance — therefore, the design of the operator's environment is critical. Informed by countless hours spent working with ProSys client personnel, our integrated HMI consulting services are oriented toward providing an optimized operator interface to:

- Safely operate the plant;
- Identify plant problems;
- Resolve plant problems;
- Efficiently operate the plant;
- Identify areas of the operation that are deviating from desired values; and
- Encourages operator response.

Our HMI consulting services include:

- Data Collection
- P&ID Reconciliation
- Display Philosophy Development
- Display Design and Sketch
- Display Drafting
- Display Testing
- Display Implementation
- Operator and Engineer Training

## Alarm Management

The process alarm interface has become one of the most important features of process control systems — and the proliferation of alarm capability and ease with which more alarms are being added is astounding.

ProSys is the established leader in the alarm management industry with experience on more than 100 process units worldwide. Our Alarm Dynamics software and consulting support services provide a robust solution for managing abnormal and normal situations. Our first successful Dynamic Alarm Management applications were implemented in 1990. We have continued to develop and enhance our technology, providing the most effective software and services available for managing alarm annunciation in all operating modes.

Our Alarm Management consulting solutions have effectively helped project managers, plant managers, and engineers address the following:

- Alarm management philosophy development
- Dynamic alarm design services
- Graphic interface enhancements
- Dynamic alarm management software and implementation
- Post-event audit
- Alarm management health check and tuning
- Process safety management (compliance with 29CFR1910.119)



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