WHITEpaper

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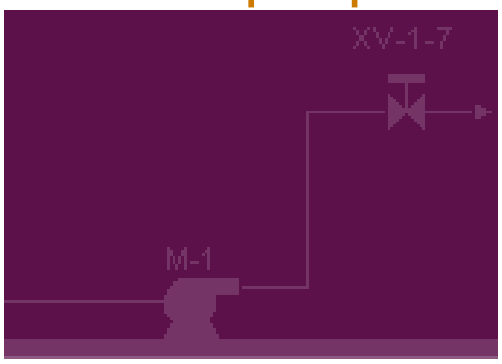

MYNAH℠

Powerful Solutions For Digital Plants

3rd Generation Simulation Solves Process Industry Challenges

Process Industry Challenges

Operations staff in the process industry face increased competitive demand for skilled plant operators. Additionally, increased government oversight, regulation, and fiduciary liability make operations challenges costly.

Competitive pressures from a global marketplace are compelling plant managers to make automation investments and develop strategies for optimizing plants. Aging equipment requires control loop modifications and enhancements.

However, plants have a zero tolerance for downtime, requiring that control system changes implement successfully the first time. Plant operators have difficulty using existing automation systems and learning new technology. To make matters worse, simulation vendors have not delivered as promised, instead delivering expensive, complicated, unusable, proprietary solutions.

Operations Managers Require Offline Training Systems

More than ever before, operations managers need to be able to train operators in a safe, off-line environment. That environment must have the integrity and appearance of the production process automation system including identical operator graphics, alarm system, process control responses, and start-up/shutdown/interlock response systems.

This realistic training environment requires simulation systems that provide non-intrusive interfaces that allow realistic off-line training systems identical to the plant environment. Non-intrusive simulation interfaces provide virtual IO interfaces that allow the unmodified application software to run in a normal mode during training so that the off-line system application software is identical to the production application software.

Another requirement for operations managers is that the simulated process needs to be accurate and dynamic so that operators can work with the control system in a realistic manner in support of unit operating procedures.

Operations managers need to train operators before the startup of new units and also re-train and qualify operators on existing operations.

Operations must be able to track and monitor operator skills and competencies to accomplish unit operation procedures and correct upset responses.

Operations Managers Require Offline Testing

In addition, Operations needs to take advantage of new technology and process control techniques. Modifications to the control system environment must be tested thoroughly before being applied to working units. The off-line testing environment must support thorough, realistic testing of the automation platform without any

modifications to the control system application software.

Operations Managers need simulation software that handles the testing and operator training process differently than in the past, in a way that saves time and expense.

They need simulation software that allows complete testing of the automation system application software during Capital projects. It must also be usable for testing automation system enhancements and additions after startup is complete. After testing and making all the necessary configuration corrections, the tested control system configuration should be loaded into the productions system without requiring any additional modifications and retesting.

Lastly, because of tighter margins and overhead as well as oversight, regulation, and fiduciary liability, the test environment must be effective for reducing process and safety risk from the automation system.

Operations Managers Require a Comprehensive Approach

The faster a plant is up and running, the faster it generates revenue and improves the return on investment (ROI). Therefore, to reduce commissioning time and cost, operations managers require that the development of simulation models, testing, and training be part of the overall automation project lifecycle management strategy.

The use of simulation for system testing and training is best accomplished with an incremental approach, tightly integrated with the automation project lifecycle. This "ground up" testing facilitates identification and elimination of errors early in the project cycle before being propagated throughout the system.

Catching errors early reduces the overall cost of the project and brings a plant online faster. In addition, ground up testing allows plant personnel to gain familiarity with the automation system throughout the entire project instead of at the just the final acceptance testing.

Best practices require tight integration between simulation model development, testing, and training throughout the automation project. Simulation model development must be comprehensive to include all the elements of the real process.

Requiring Use of the Actual Automation System

Operations Managers also need simulation software that works effectively with the actual automation system controllers or equivalent soft controllers and application software with a simulation companion system.

This configuration allows effective testing and training on HMI use, display access familiarity, process and emergency procedures, response to process upsets, and control system dynamics. This approach builds automation system confidence in operations staff, resulting in more effective use of the automation system for improved performance and greater profitability.

Satisfying Requirements of Validated Industries

Operations managers in the validated industries have additional unique regulatory compliance issues associated with the production of their products. These requirements must be met in their simulation software solution. Automation system users and integrators must consider the ramifications of the GAMP4 Guidelines when applying simulation systems to their automation projects.

The GAMP4 Guidelines permit the use of simulation systems for automation system testing with several requirements. The guideline requires that the application software be "frozen" prior to Software Integration and System Acceptance Testing. It also requires the removal of dead code prior to testing. These requirements are satisfied with the use of non-intrusive simulation interfaces.

The GAMP4 Guidelines stipulates that suppliers of simulation systems must have a documented quality and software development program in line with industry best practices. The simulation software should be specifically for process control system testing and operator training. The product used should also be a commercial

off-the-self (COTS) tool, delivered in validated, tested object code.

Requirements to Meet Industry Needs for Simulation

These operational requirements for a simulation system must be met in order to be successful. Some of these requirements have been met with first and second generation simulation systems; however, the solution provided by first-generation and most second generation simulation solutions is inadequate for the increasing demands of operations managers.

First-generation solutions used microcomputers to compile Fortran and C subroutines for process and IO models. Second-generation systems (existing simulation products on the market today) are Windows-based, using menus and dialog boxes for configuring process and IO models. This was a good step in the right direction, but many of these solutions are time consuming and costly, requiring weeks of simulation effort and great expense for high-fidelity modeling.

Third-generation .NET simulation software answers these challenges. It is graphical, flexible, powerful, and dynamic . . . the solution for automation system software acceptance testing and operator training.

Third-generation simulation software was built specifically to address these operational needs for software acceptance testing and operator training. Third-generation simulation software feature non-intrusive simulation interfaces that support plant operations goals for greater automation system return on investment. It allows for operator training and system testing at all points of the system lifecycle. Most importantly, it protects control system integrity.

New Requirement for Ease of Use

In the past, operations may have taken months or years to learn and train on the use of a simulation system. Because of the problems identified earlier in this paper, including the retirement of up to 50% of their staff in the next 5-6 years, operations managers need a simulation system that is designed for use by the end-user and integrator and does not need a simulation consultant or senior control systems engineer to run it. The bottom line is that the system must be easy to use.

This requirement means that the simulation system must automatically integrate with the control system. Additionally, it needs to automatically generate a simulation database. Operations does not have time to manually generate a simulation database and complete a lot of custom integration work. Instead, they need a shrink-wrapped configurable product. Third-generation simulation software meets these requirements.

Requirement for Simulation that is Flexible, Powerful, Dynamic

In smaller applications, operators do not need a high-fidelity complex simulation system. A simple and easy-to-use system is preferred. On the other hand, when a high-fidelity dynamic modeling system is needed, operators do not want the expense and hassle of implementing a complex system that requires the costs of engineers and system integrators.

Operations need simulation systems that are scalable from small to large applications. They need to be able to selectively apply dynamic, accurate simulation modeling functions as needed for the unit operation. Complex units operations, such as distillation, need to be addressed with easy-to-use high-fidelity application packages. Third-generation simulation accomplishes this as well.

Latest Simulation Technology

To address these industry challenges and fulfill operations' requirements and specifications simulation software, third-generation simulation incorporates all of the latest technology for speed, compatibility, and universality. This includes:

- .NET Graphical User Interfaces
- XML data exchange
- OPC DA (and eventually UA) access and integration for all data
- IEC function block simulation objects
- MS SQL Server Open Database
- Scalable, multiprocessor support
- MS Remote Access and Server Support

MiMiC v3: Graphical, Flexible, Powerful, and Dynamic

MiMiC v3 is the first release of this third-generation simulation software concept to solve the industry's complex needs for simulation. It was designed with the end user and integrator in mind, based upon extensive user feedback and industry experience of MYNAH engineers. This product offers greater return than competitive solutions at a fraction of the cost.

MiMiC v3 Explorer – The MiMiC interface allows for complete management of the simulation environment from one .NET window:

- One-click start/stop of simulations
- XML Import/Export of any system components
- Integrated update and support notifications

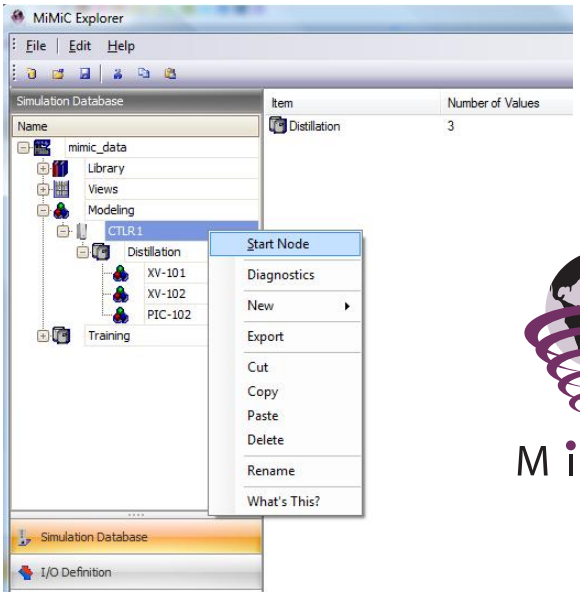

Figure 1: MiMiC Explorer

MiMiC v3 Simulation Studio - MiMiC's Simulation Studio enables graphical development of simulation models using IEC1131 function blocks:

- Offline and online viewing of all models
- Automatic unit conversions
- First principles modeling functions
- Integrated Properties / Steam Tables

MiMiC v3 Data Views – MiMiC provides user-configurable views of dynamic MiMiC or OPC data:

- Views configured for simulated IO, model, or training scenario data
- Data Views - Tabular real-time data Trend Views – Dynamic trends
- Graphical (Process) Views – Dynamic process flow diagrams

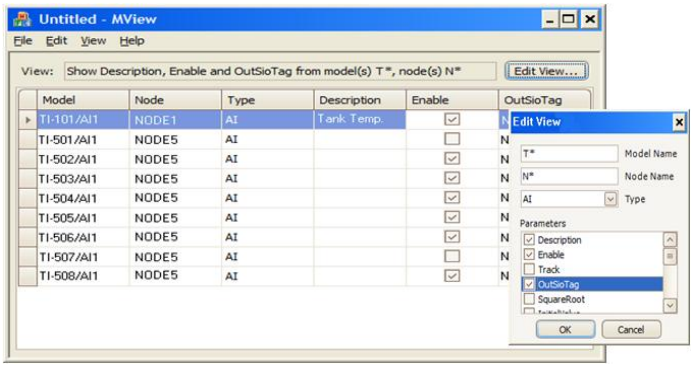

Figure 2: MiMiC Data View

MiMiC v3 Advanced Modeling Package

MiMiC delivers dynamic, high-fidelity unit operations modeling:

- Intuitive wizard-driven configuration
- Powerful data visualization tools

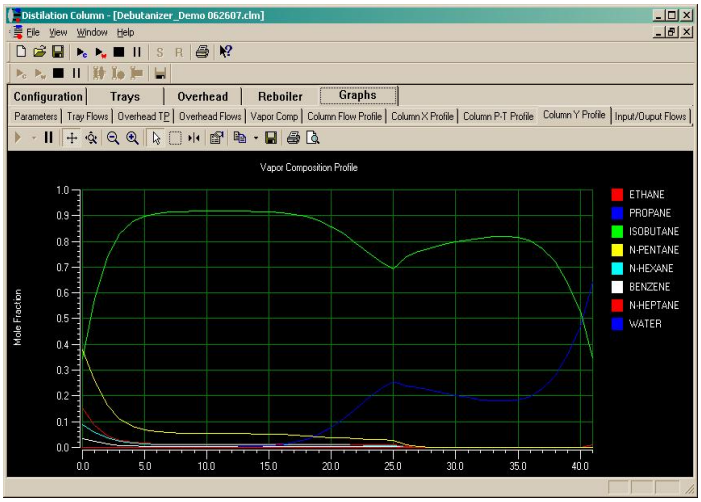

Figure 3: MiMiC Distillation Column

MiMiC v3 Operator Training Management – MiMiC provides tools to develop structured operator training systems:

- User-configurable scenarios, malfunctions, training events
- Integrated session scoring and student evaluation
- Process SNAPSHOT Freeze/Save/Restore controls
- Training session reports in MS Word, XML format

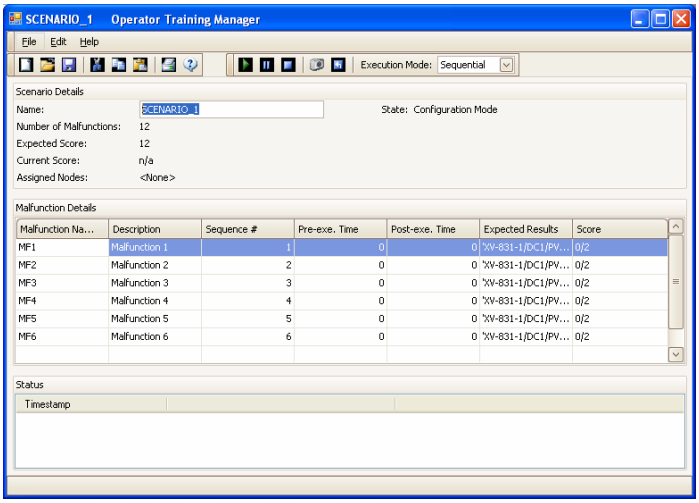

Figure 4: MiMiC Operator Training Manager

Reaping Substantial Business Benefits and ROI through Simulation

In summary, the return on investment in simulation systems has been proven to be effectual and substantial across all process industries from batch to continuous processes. The improvements manifested in a third-generation system are even more profound.

Savings result from identifying and correcting automation system errors in a low-cost, off-line environment prior to system startup and commissioning, and by identifying sleeping errors or inadequacies in the automation system application software.

Identifying and Correcting Errors Offline Saves 10-100 Times the Cost

The cost of investment in office space, simulation hardware and software licenses, and engineering costs for the off-line simulation system is a fraction of the infrastructure cost associated with a process facility.

In addition, identifying and correcting automation system errors in an off-line environment allows rapid testing and correction without halting plant operations, disrupting operations support staff, or jeopardizing safety standards. Offline identification and correction of errors in an off-line simulation system costs 10-100 times less than in the online plant.

Minimizing Risk with Simulation

One of the greatest risks of automating a process facility is the quality of the automation system application software. Without using a simulation system, the user has no ability to test the application software thoroughly before actual start-up and production.

By testing the automation system with a simulation system for normal, abnormal, and upset conditions, the user can verify that the application software has been designed and implemented to meet the functional needs of the process.

Proven Benefits of an Offline Simulation System

The benefits for using an off-line simulation system are seen in quicker time to market, better product quality, reduction of unscheduled downtime, and reduced failures and incidents.

Quicker Time to Market – Using simulation systems has been proven to reduce commissioning and validation time of automation system application software, resulting in savings of $100-500K / day.

Product Quality – Extensive testing of automation system application software has been proven to reduce off-spec product, resulting in savings of $50K-$1MM / run or batch.

Operating Cost – Training plant operations staff with simulation systems has been proven to reduce operations-induced unscheduled downtime, resulting in savings of $5-100K / hour.

Mitigate Risk –Simulation systems identify and reduce "sleeping" errors in the automation system, resulting in savings of $50K - $1MM / incident.

MiMiC v3 Simulation Software: The Proven Solution

Using simulation for testing and training for automation systems has proven benefits for capital project execution (CAPEX) and operational excellence (OPEX) initiatives.

MiMiC v3 is currently the only third-generation simulation software of its kind to solve the industry's complex needs and deliver significant results with minimal risk and investment.

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