

Since 1996, *IntelliOpt* has delivered proven Advanced Process Control & Optimization solutions to over 80 refining and chemical units worldwide. Its low cost multivariable predictive control, advisory systems, and neural network based solutions are delivered by a *global network of independent specialists*, assuring the highest value at the lowest cost.



**PUBLICATION:** ASTM Manual 58, Chapter 15, Modern Computer Process Control Refining Units



### SOLUTIONS

Our solutions are not limited by individual technologies and software packages. We can, and have developed solutions by using a best mix of technologies to overcome individual technology limitations:



- Domain of mathematical models,
- Near (but, not always global) optimization of heuristics.



### PRODUCTS

- GMAXC™, Multivariable Predictive Controller
- G-OPT, Global Real-Time Optimizer
- Z-Way™, Multivariable Fuzzy Logic Controller
- DEA™, Decipher for Events and Alarms, an Alarm Management System

Our products are designed for automation and optimization of your processes, instead of focusing on software functions and programming.



### SERVICES

- Advanced Process Control, Multivariable Predictive Control and Optimization
- Consulting – Modernization plans, Technology Evaluation, Bid Package Preparation, Contractor Selection
- Feasibility Studies
- Advisory/Expert Systems, Abnormal Situation Management (Gensym G2)
- Neural Networks based Property Estimation models
- Process Simulation Models
- Training – Loop Tuning, APC, MVPC, Advisory Systems, Neural Networks



### PROJECTS/EXPERIENCE

APC/MVPC	Optimization	Advisory Systems	Neural Networks
Acrylonitrile	Plant Steam System	Alkylation	Caustic Unit
Air Separation	Refinery Feasibility	FCCU	Crude Oil Wells (offshore)
Delayed Coker	Waste Incinerators	Hydrocracker	TA/PTA
Ethylene		H2 Plant	
Gas Plant		Reformer	
Hydrogen Plant		Sat Gas Plant	
LPG		Pipelines	
Methanol			
PolyCarbonate			
TA/PTA			

Typical Benefits:

- Throughput/Yield increase: 2% - 5%
- Energy Reduction: 4% - 10%
- Product Quality Variation Decrease: 30% - 60%
- Assist Operators for process monitoring and control

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*IntelliOpt's* software and services have been used worldwide:

- N. America: USA, Canada, Mexico
- S. America: Argentina, Venezuela
- Europe: Austria, Belgium, Denmark, France, Germany, Italy, Poland, Spain, Sweden
- Asia: China, India, Japan, Kuwait, S. Korea, Singapore, Thailand
- See Hydrocarbon Processing Advanced Control Handbook, 2004



# INTELLIOPT

## Intelligent Optimization Group

# ADVANCED AUTOMATION SOLUTIONS



## Real Time Solutions For Profitability

*IntelliOpt* specializes in:

- Improving the profitability of Process Plants by the applications of Advanced Automation Solutions





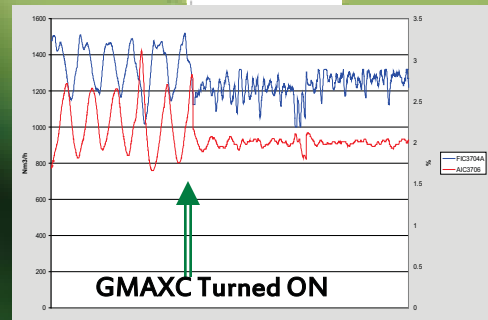
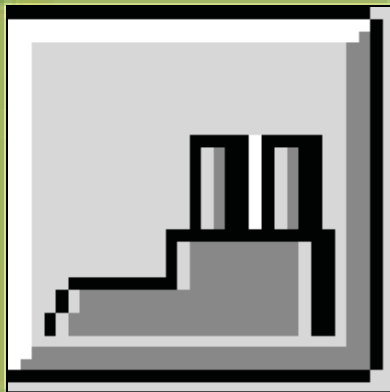
**GMAXC:** Unleash the power of **Multivariable Predictive Control (MVPC)** to realize process benefits in terms of:

- Increased throughput/capacity,
- Improved yield,
- Tighter product quality control,
- Reduced energy consumption, and
- Operator convenience

As a fully integrated package, GMAXC includes:

- **GMAXCID:** Simplified process identification with heuristic based data validation and collation. Combined with Box Factorial design of plant tests, GMAXCID can save plant testing times by up to 75% over conventional dynamic identification methods
- **SCRIPT** add-on option to allow process specific nonlinear control action and process event based *ad hoc* adaptation, including fast ramping capabilities
- **GMAXCOPC:** an OPC Client for simplified fill-in-the-blanks type configurable interface with plant DCS and database systems
- Non-linear optimization with control;
- Integration of Microsoft Access database type file for history collection with PC based online execution. The database can be used for controller performance analysis and audit.

**GMAXC** is specifically designed to offer MVPC technology at a commodity level for rapid assembly line type implementation, and can also replace other MVPC controllers to reduce life cycle costs



## GMAXC

Multivariable Predictive Controller with Script

## G-OPT

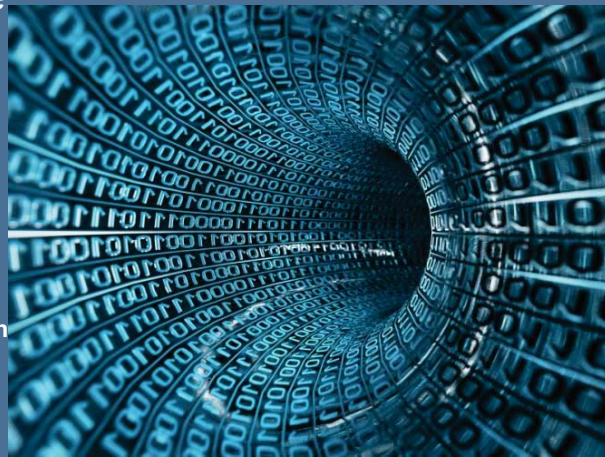
**G-OPT:** A General Purpose Optimizer program based on genetic algorithm for Real-Time Optimization (RTO):

Minimize  $F(X_1, X_2, \dots, X_n)$ , subject to:

- $X_{i,low} \leq X_i \leq X_{i,high}$   $1 \leq i \leq n$
  - $Y_{j,low} \leq Y = G_j(X_1, X_2, \dots, X_n) \leq Y_{j,high}$   $0 \leq j \leq m$
- where  $F$  and  $G$  functions can be nonlinear and discontinuous

- Model programming and customization with VBA script
- User specific steady state detection and ad hoc logic can be easily implemented
- Some independent variables may be specified as ZOOM – Zero or One Mixed Integer for ON/OFF type solutions
- Online Run frequency option along with Demand Run execution
- Multiple problem capability with Load/Save feature
- Microsoft Excel Interface option for data input/output

Ideal for process unit optimization and integration with MVPC (multivariable predictive controllers) like *IntelliOpt's* GMAXC.



**Z-Way:** An easy to apply **Fuzzy Logic Controller:**

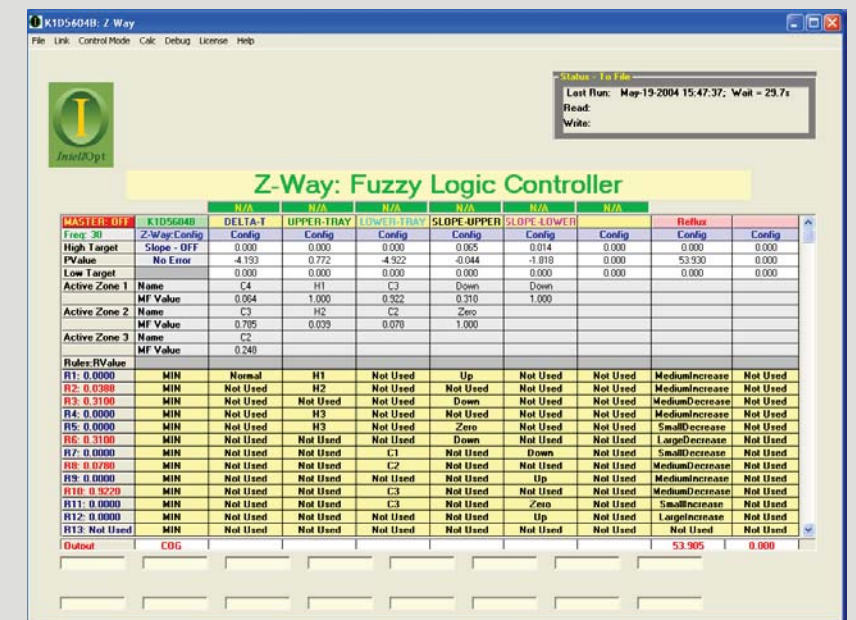
- Formulation Uses Operator Experiences and Basic Chemical Engineering
- Avoids Costly and Difficult Plant Tests
- Configuration based on Fill-in-the-Blanks and Click/Select Type options
- Reduces Application Implementation Time
- Field Proven and in-use on Commercial Distillation (Azeotropic) Towers

Technology: A four step approach to map input data nonlinearly into outputs:

- **Fuzzifier** - Models the behavior as a matter of degree, rather than in precise discrete categories
- **Rules** - Based on simple operating heuristics and engineering principles (e.g. If Tray is Cold Then Decrease Reflux by a Small Amount)
- **Inference Engine** - Based on the values of the inputs (e.g. multiple tray temperatures), the Z-Way controller checks all the rules and activates the sub-conditions to be made in the outputs (e.g. reflux flow, reboiler steam flow)
- **Defuzzifier** - Similar, but, opposite of Fuzzification, the output membership function is converted into a practical number which can be implemented by a PID controller

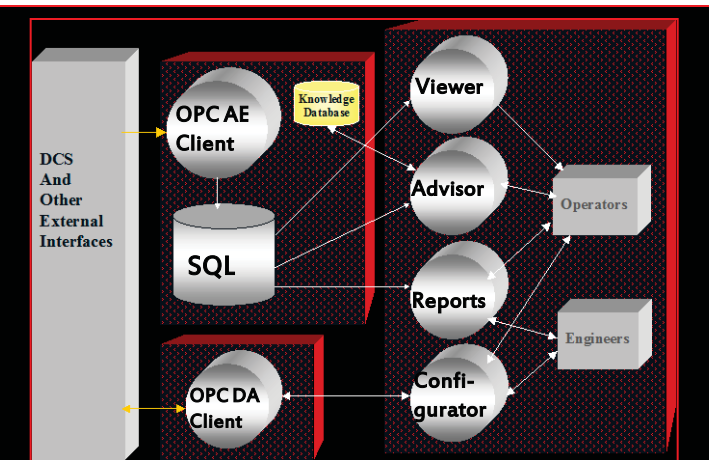
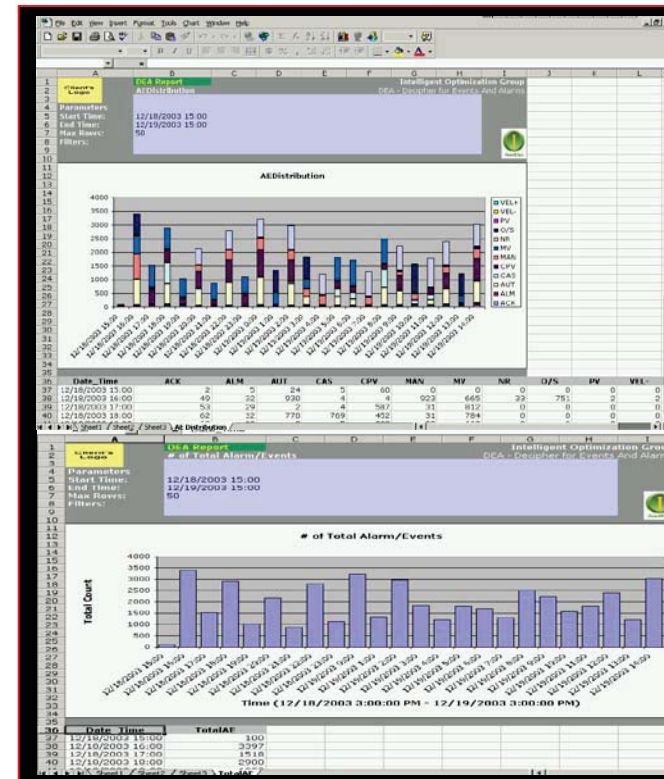
Advantages:

- Typical Implementation Time as Low as 1 Week
- Ideal for Control Problems Requiring multiple PIDs
- Time Based Hold on Output Option-Useful for Slow Processes
- Multivariable - 6 Inputs X 2 Outputs



- Includes:
- Script Option
  - Embedded OPC Client

## DEA



**DEA (Decipher for Events and Alarms) :** A Comprehensive Alarm Management System for Collecting, Archiving, Displaying, Interpreting and Managing Process Alarm and Events, including Metrics for Alarm System Performance:

- Real-Time Filtered Alarm Viewing,
- Excel Add-In (.xla) to Analyze and Interpret A&Es,
- Advisory system for root cause identification and corrective action

Benefits: Improves Operator Productivity, Raises Operational Safety Levels, Identifies Malfunctioning Instrumentation