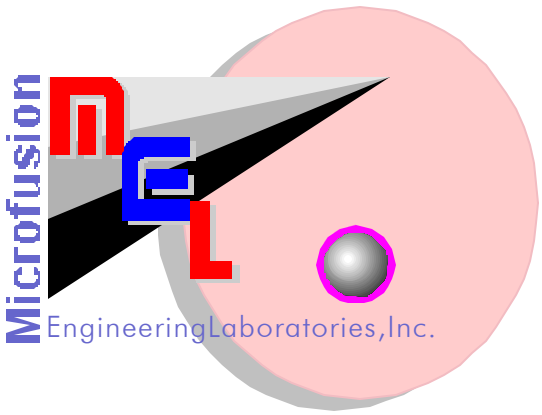
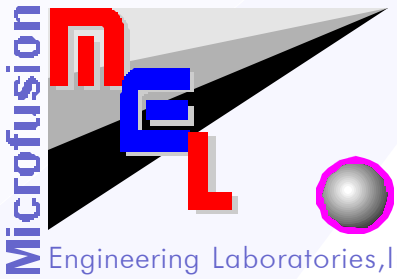
Microfusion Engineering Laboratories



Providing Dynamic Simulation and Control SystemSolutions

THINK™



Microfusion Engineering Laboratories, Inc

the POWERS of

Control System Solutions

ACompany Overview

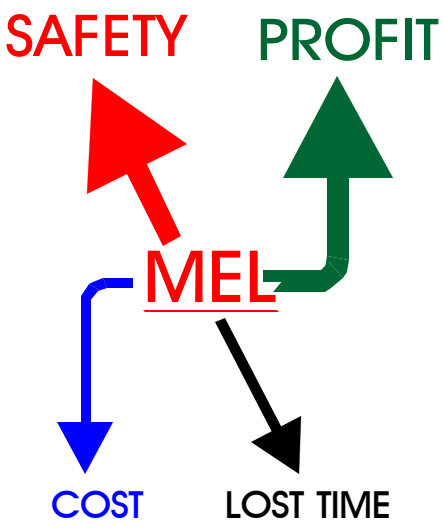
Microfusion Engineering Laboratories, Inc.

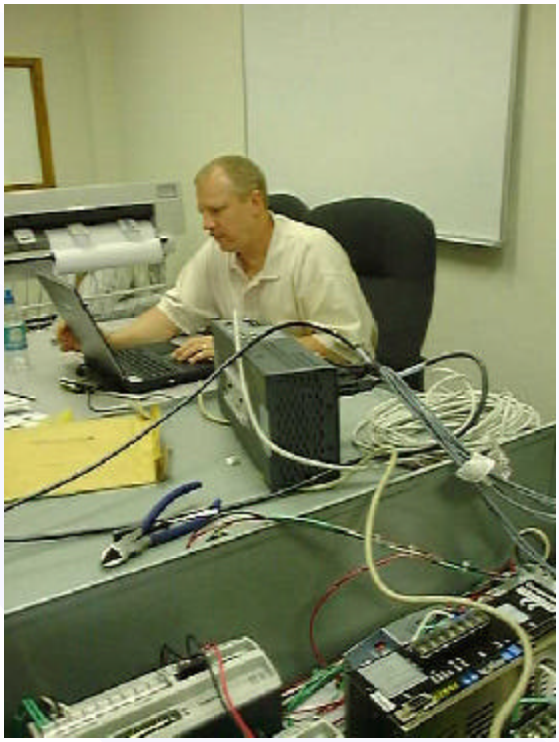
Providing Dynamic Simulation and Control Solutions

Overview

HowcanMELhelpYOU?

- WithSimulationTools
- WithInterfaceSolutions
- WithProcessControl





Microfusion Engineering Laboratories (MEL) was incorporated in 1995 to provide advanced process controls to industry via the use of mathematics based dynamic simulation models. In the short time since then, MEL has broadened into a solutions provider across the range of all process control requirements, from basic process design and configuration to the implementation of advanced control concepts.

Our focus is on providing industry with automation and simulation based solutions, utilizing off-the-shelf hardware and software operating systems, that reduce risk (cost) and add value (profit) to the activities associated with the design, start-up, interfacing, training and maintenance of process and control systems.

We provide this focus by applying our experience in science and industry to your situation, by putting ourselves in your shoes and viewing the problem from your viewpoint. Chances are excellent that one of our associates has been in your position before. In a perfect world there might be many solutions; however, given the restrictions you are working with, we can help you find the optimum.

How do we do this?

- By drawing on hundreds of years of experience in industry and science. As process designers, control system designers, system integrators and specialists, as system start-up engineers and industrial employees, we have provided solutions to problems like yours.

- By providing services to to you. MEL can provide the definition, the planning and the execution required to design and configure your process control system. Or to provide the custom interface between your different proprietary control schemes and networks.

- By providing dynamic simulation products tailored to your particular process or system. MEL provides two real time, dynamic simulation tools, THINK™ and POWERS™ which were developed within MEL and are used by our experts to model your system before you build it. This simulated environment can be used to eliminate process bottlenecks, to train operators and to provide analysis of both simple and complex processes.

Headquartered in North Atlanta, MEL uses modern Internet technology to coordinate its business and design activities, thus insuring that geography does not keep us from having the best minds working on projects. This approach also insures that we are but a few clicks away whenever you need a solution for your problem.

Let's look a little closer at how MEL can help you.....

Microfusion MEL Engineering Laboratories, Inc.

PROVIDING ADVANCED SIMULATION SOLUTIONS FOR THE PROCESS INDUSTRIES

SIMULATION

DynamicSimulations:

- ProcessDesign
- ControlSystem Checkout
- ReduceStartupRisksandCosts
- ProvideRealisticOperatorTraining

MEL OFFERS A REAL TIME, DYNAMIC SIMULATOR THAT CAN BE APPLIED IN NUMEROUS WAYS TO ADD VALUE TO A PROJECT OR A BUSINESS OPERATION.

MANY PROCESS SIMULATORS OFFER A STATIC "SNAPSHOT" OF A PROCESS OR SITUATION. THESE MODELS RELY ON EQUATIONS THAT NEGLECT TIME; SIMPLY PLUG IN THE PARAMETERS AND VALUES WILL BE CALCULATED.

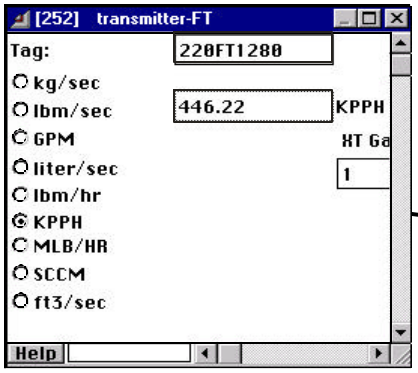
OTHER SIMULATORS ARE VERY SPECIFIC; THEY MAY BE TIME DEPENDENT, BUT THE EQUATIONS ARE LIMITED TO A PARTICULAR EVENT. A FLIGHT SIMULATOR FOR AN AIR FORCE FIGHTER IS AN EXAMPLE: IF YOU USE THIS TO TRY TO LEARN HOW TO FLY A 747 PASSENGER PLANE, YOU MIGHT GET THE IDEA BUT YOU WILL IN NO WAY SIMULATE THE TRUE EVENT.

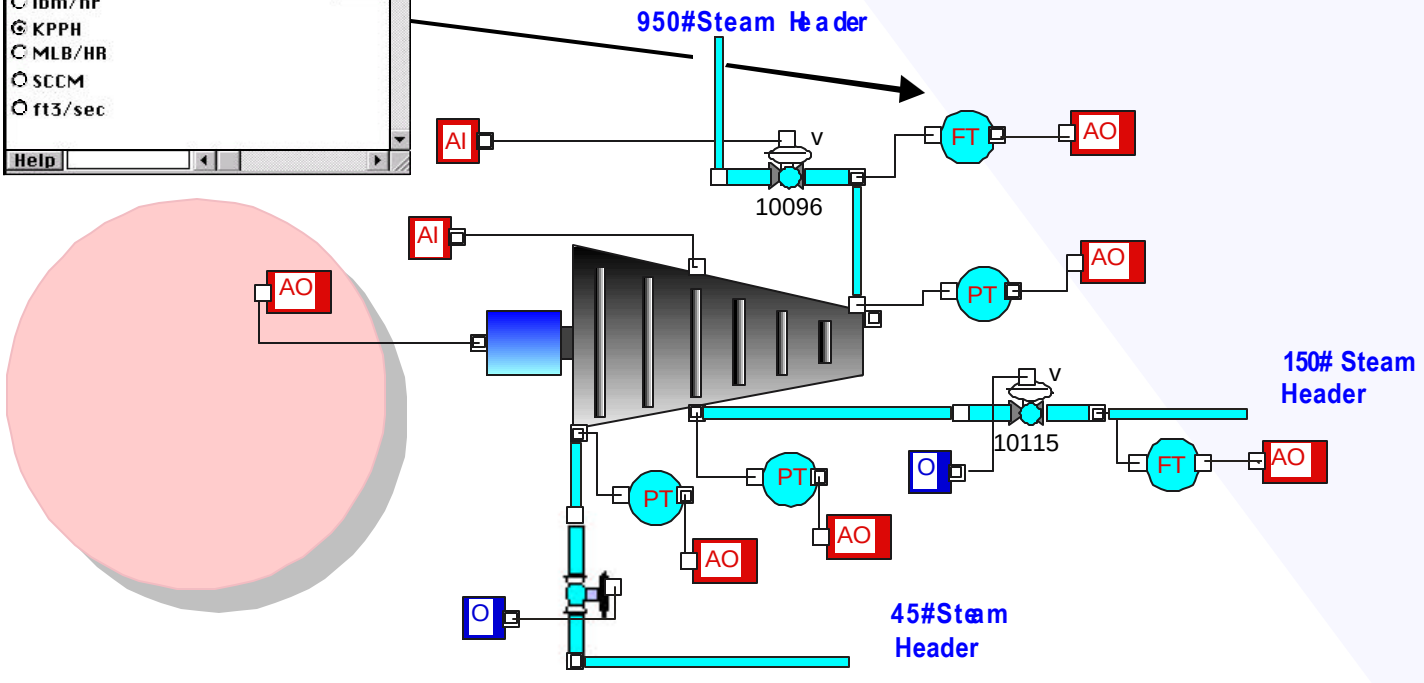
ON THE OTHER HAND, MEL HAS TWO REAL TIME, DYNAMIC SIMULATOR PRODUCTS THAT CAN BE ACCURATELY ADAPTED TO VIRTUALLY ANY PROCESS OR ELECTRICAL SYSTEM. THESE MODELS, THINK AND POWERS, UTILIZE AN EXTENSIVE LIBRARY OF MATERIALS AND PHYSICAL VALUES. THESE WORK IN CONJUNCTION WITH AN ARRAY OF OBJECTS DEFINED AS VARIOUS PIECES OF EQUIPMENT AND SYSTEMS FOUND IN VIRTUALLY ALL PROCESSES. WHEN A MEL ENGINEER MODELS YOUR PROCESS USING THESE TOOLS, THE RESULT IS A MATHEMATICAL REPRESENTATION OF YOUR SITUATION THAT WILL SHOW DYNAMIC CHANGES IN REAL TIME.

JUST LIKE IN REAL LIFE.

THE SIMULATOR CAN BE APPLIED AS A CONTROL SYSTEM STAGING TOOL, AS A TRAINER, OR FOR DESIGN AND SYSTEM OPTIMIZATION. AS WE'LL SEE, THESE ARE TOOLS THAT WILL SAVE YOU TIME AND MONEY!

Model of a Typical Turbine. Each of theicons,whether it be an FT, a length of pipe, or a piece of equipment, hasdesignparameters defined.





Integrated Staging

EQUIPMENTLAYOUT

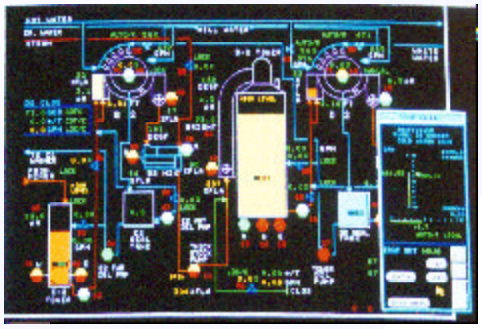
Control Processors:

- Without Real I/O

Operator Interfaces:

- Actual Consoles

- THINK/POWERS Simulation Engines
- Communication Interface to Controllers



Integrated staging is the process of checking to see if the control system works as you want. As the system is staged, problems are uncovered in design philosophy, in documentation, in equipment operation and in many other areas. You can use the process itself to do this, or you can use a simulation of it. MEL's simulation tools allow you to see how you process will operate real time in a dynamic environment before you go to the field. Once there, you'll know with confidence that any problems that surface are related to the equipment in the facility (i.e. cables) and not with the control scheme.

MEL's simulation models are typically built from completed PFD's, P&ID's and device specifications and other documents. The same equipment names, numbers, and P&ID numbers are used for identification to make it easy to go back and forth from model to documentation.

The initial model is built using simulated controls (from the MEL controls library) to tune and verify the model operation against specifications. Once the model operation is validated they will be replaced with control system communication objects. These will be tagged based on the plant tagging convention, and cross references are automatically provided. This cross-reference tag list will then be used to fill in the tagged communication objects with the specific control system I/O dialog items. This allows the simulation to be built before the control system configuration has been completed, thus allowing testing to begin as soon as configuration is done.

The documentation to be verified is the I/O list, the P&ID's, control system graphics, and logic diagrams. The control system configuration and operation is checked against each of these documents. As each point and control loop is verified it is checked off in the control system documentation. Configuration problems are corrected as checkout progresses and the documentation/design is changed as needed.

By using MEL's dynamic simulator for staging the problems are found in the test area, not in the field on the process itself. This saves time, money and is less dangerous and potentially harmful than testing on a live system.

Microfusion MEL Engineering Laboratories, Inc.

PROVIDING ADVANCED SIMULATION SOLUTIONS FOR THE PROCESS INDUSTRIES

TRAINING SIMULATION

ACADEMIC AND PROFESSIONAL STUDIES HAVE CONFIRMED THAT THE USE OF A SIMULATOR PROVIDE A MORE EFFECTIVE TRAINING ENVIRONMENT THAN TRADITIONAL METHOD.

DynamicSimulatorsFamiliarize Operators With:

- Startup-Shutdown Procedures
- Normal Operation Procedures
- Process Upset Recovery Procedures
- Improved Operator Awareness of Process Dynamics
- System Interlocks and Alarm Limit Settings

CAUSEOFPLANTDISTURBANCES

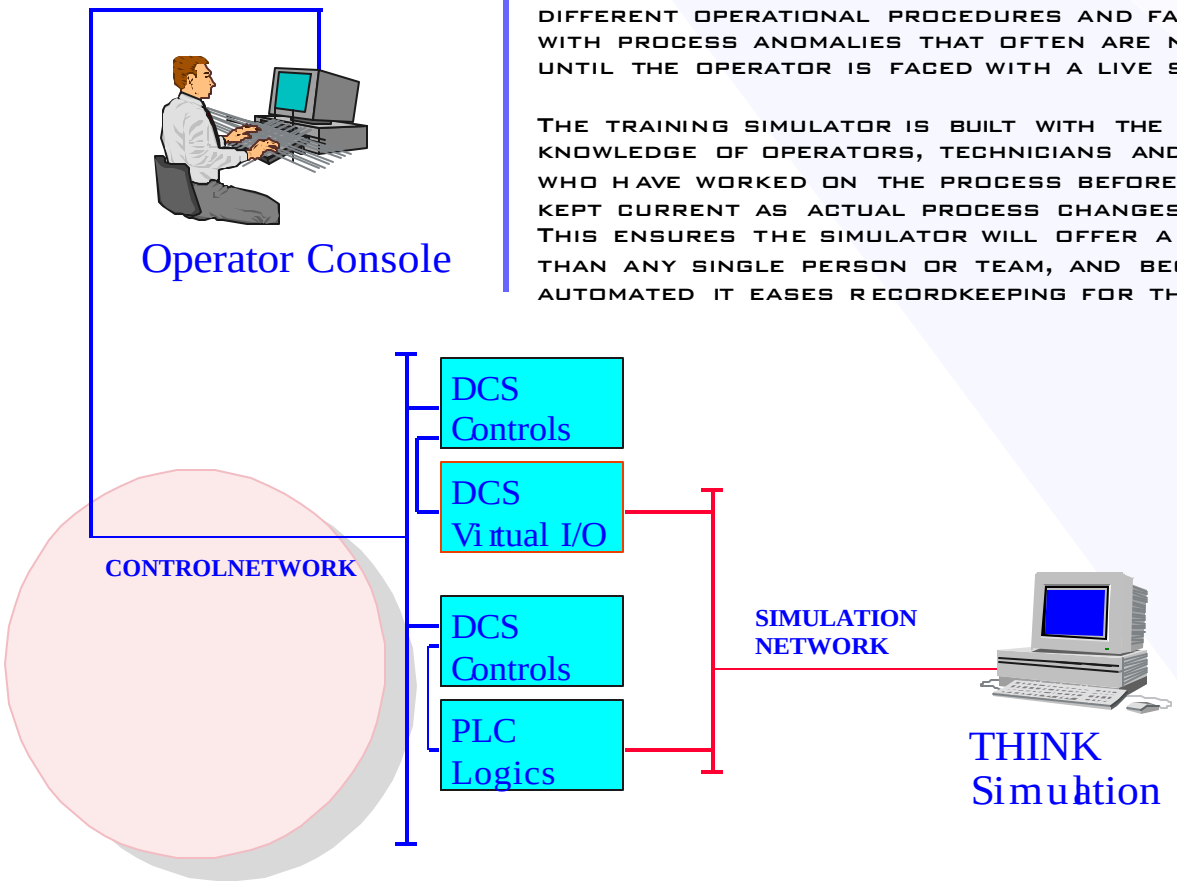
(PublishedbyProtectionConsultants,1990)

Operational Errors	26%
Design Failure	4%
NaturalDisaster	7%
ProcessVariation	10%
Mechanical Failure	38%
Sabotage	3%
Others	12%
TOTAL	100%

AS CAN BE SEEN FROM THE ABOVE CHART, OPERATIONAL AND OTHER DISTURBANCES THAT CAN BE ELIMINATED WITH A GOOD TRAINING PROGRAM ACCOUNT FOR ABOUT 40% OF A FACILITY'S LOSSES.

APPLICATION OF MEL SIMULATION TOOLS AND SERVICES MINIMIZES OPERATIONAL ERRORS AND PRODUCTION LOSSES. ALL PROCESS SCENARIOS AS WELL AS THE EXPERIENCE OF PLANT PERSONNEL ARE INCORPORATED IN THE TRAINER. REALISTIC SIMULATION TRAINERS ALLOW OPERATORS TO TEST DIFFERENT OPERATIONAL PROCEDURES AND FAMILIARIZES THEM WITH PROCESS ANOMALIES THAT OFTEN ARE NOT APPARENT UNTIL THE OPERATOR IS FACED WITH A LIVE SYSTEM.

THE TRAINING SIMULATOR IS BUILT WITH THE ACCUMULATED KNOWLEDGE OF OPERATORS, TECHNICIANS AND ENGINEERS WHO HAVE WORKED ON THE PROCESS BEFORE, AND IS EASILY KEPT CURRENT AS ACTUAL PROCESS CHANGES ARE MADE. THIS ENSURES THE SIMULATOR WILL OFFER A BROADER TEST THAN ANY SINGLE PERSON OR TEAM, AND BECAUSE IT IS AUTOMATED IT EASES RECORDKEEPING FOR THE INSTRUCTOR.



THINK TrainingSimulator Setup

Design & Optimization

Using Simulation for Design

- Attain higher performance from process control systems.
- MEL simulation technologies minimizing risks associated with control system development at low cost.
- "What-if" analysis is easily performed.

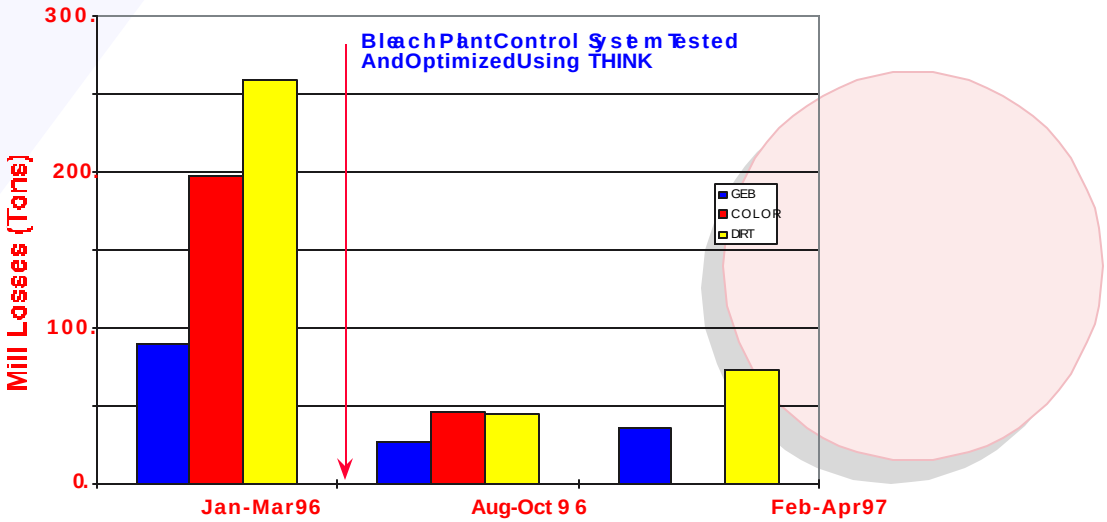
Operational performance of a process plant can be improved by studying the plant dynamics and its transient behaviors. Traditionally the operating conditions of a process and modifying production procedures are determined by running the plant under different conditions until an optimum configuration is found. In practice, this opportunity is seldom available to plant operations for a variety of reasons-the potential of introducing major plant upsets, or a lack of equipment availability for test purposes, or simply the need to get production out of the door.

A cost effective and risk free method of process optimization is the development of a real-time dynamic simulation model of the plant. Operational strategies are performed in a trial and error mode on the simulation model. Different operation parameters can be tested on the model interactively until an optimum set of parameters is obtained. These values are then transferred to the plant online control system as the actual operation set points to optimize plant performance.

MEL developed its model to be capable of producing high fidelity dynamic simulation models quickly and accurately. The THINK simulation engine is designed for the study of process transients and can be used in design for equipment sizing and operation stability analysis, debottlenecking studies and training and staging as mentioned before.

Simulation models are used to optimize plant operation and performance, reduce design costs and better understand plant dynamic behavior. They can also generate input data necessary for control system design packages, test of control strategies prior to plant implementation, assist in controller tuning, and operator training.

Only MEL's THINK simulation engine offers the real-time dynamics of your process, rather than a "snapshot" offered by a static model.



Control Strategy and System Design Using Simulation

Microfusion
EngineeringLaboratories,Inc.

PROVIDING ADVANCED SIMULATION SOLUTIONS
FOR THE PROCESS INDUSTRIES

SIMULATION TESTING BENEFITS

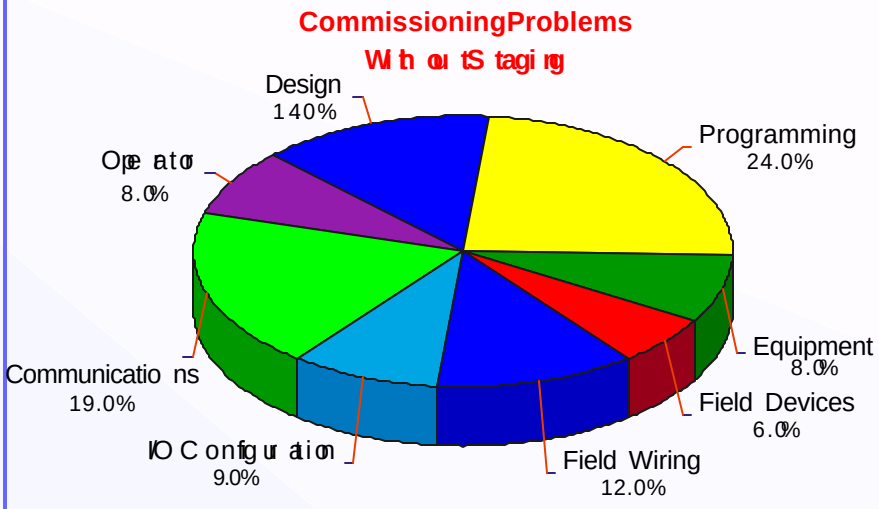
DynamicSimulator FamiliarizesThe OperatorsWith:

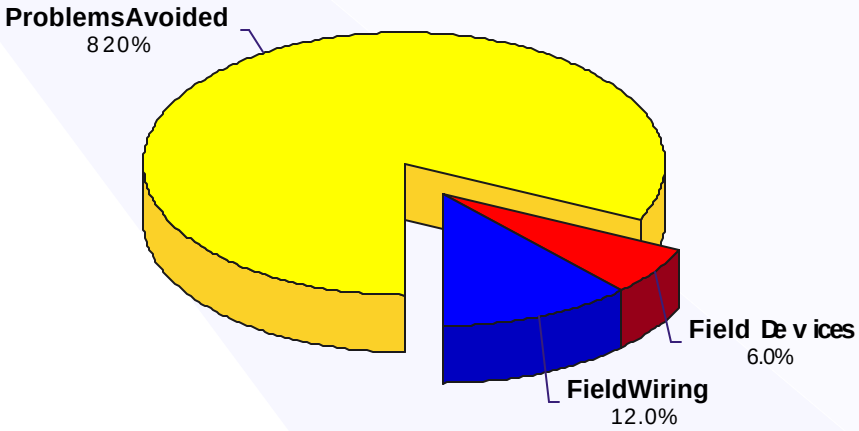
- Interlocks
- MotorControls
- Regulatory Controls
- Advanced Controls, e.g.Batch
- Communications
  - DCStoPLC
  - Gateways
- OperatorConsole Graphics

- System Interlocksand Alarm Limit Settings
- Startup-Shutdown Procedures
- Normal Operation Procedures
- Process Upset Recovery Procedures
- Improved Awarenessof Process Dynamics

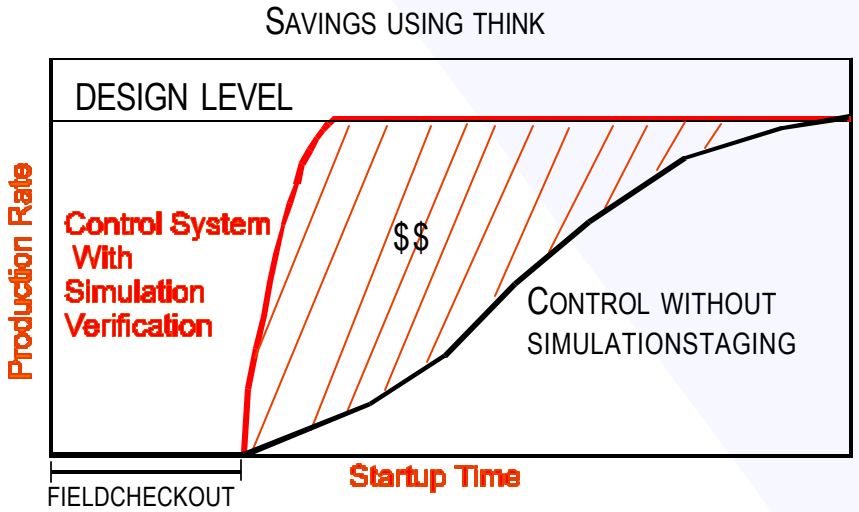
The Results Are In Savings of

- Avoiding 82%ofProblemsat Startup
- ReductionofEffortWasted on Unnecessary Problem Solving
- FasterTimetoFullProduction
- ReductioninProductWaste
- FasterTimetoMarket





CommissioningProblems
Remaining afterStaging

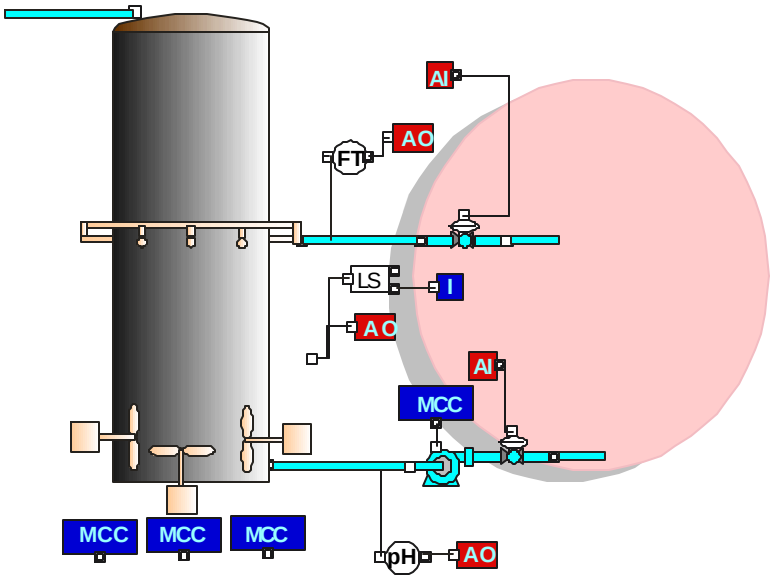


THINK

THINK (Thermal Hydraulic Integrated NetworK) is an advanced, first principles, precision simulation engine and is used for modeling boilers, piping, pumps, valves, turbines, condensers and h eat exchangers. Developed by MEL engineers and scientists, THINK solves the time and spatially dependent equations for the conservation of mass, momentum, and energy. THINK uses a modification of the Finite Element Method (FEM) that is extensively used in the Aerospace industry, and it is based on proven thermal hydraulic computer codes used extensively for safety analysis and high fidelity simulator modeling in the Nuclear Power industry. The modified FEM method allows THINK to conserve mass, momentum, and energy with the highest degree of precision for high fidelity simulation of any process plant, including energy, pulp and paper, chemical, specialty chemical processes and water systems.

THINK also uses an implicit method for integrating the equations intimein order to allow large, 1-10 second, time steps for real or faster than real time simulation. This is very important for plants who need to t rain operators in a short space of time to go through startup operations that can last for days, and for facilities that exhibit large time lag in their control loops (i.e. water treatment facilities).

THINK allows any state of a process fluid to be modeled including the noncondensibles and solids present with stream. THINK can model a subcooled fluid, with the fluid at a much lower temperature than that of saturation, two-phase conditions with f luid and vapor present, and a lso a superheated vapor state. THINK models the full range of convective and boiling heat transfer for any component. THINK uses advanced methods to decompose mixture flow into the basic component liquid and vapor flow rates. THINK has been used in all our task-specific simulators, covering a wide range of applications in pulp and paper, specialty chemical, and energy industries.



THINK Features

Advanced Solution

- First Principles
- Modified Finite Element Method
- Conservation of Mass, Energy and Momentum
- Crash Proof Simulation Numerics

High Fidelity Simulation for Process Plant:

- Power
- Pulp and Paper
- Chemical/Specialty Chemical
- Food & Beverage
- Water and Steam Systems

Advanced Dynamics Modeling

- Subcooled Fluids/Superheated Vapor
- Track Multiple Components
- Chemical Reactions

Microfusion EngineeringLaboratories,Inc.

PROVIDING DYNAMIC SIMULATION AND CONTROL SOLUTIONS

POWERS

POWERS Features

Components:

- Resistors
- Inductors
- Capacitors
- Switches
- Turbine-Generators
- Transformers

SolutionMethods:

- Finite Element Method
- First Principles

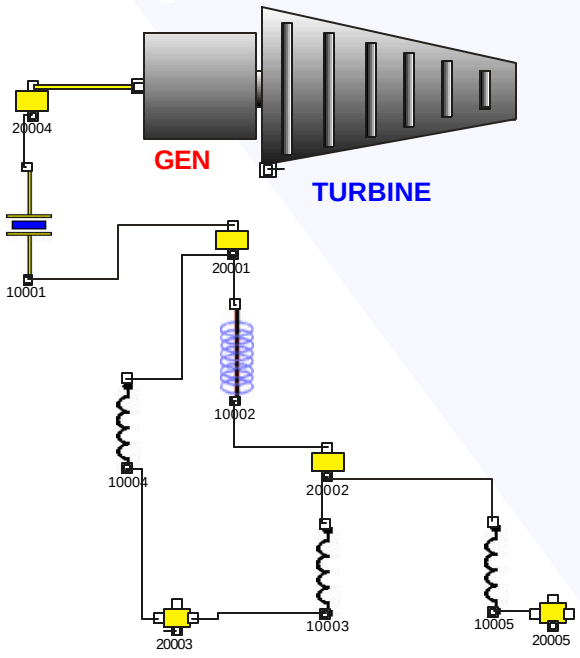
Simulation for anyPowerSystems:

- Switchyards
- Utility
- Pulp and Paper
- Chemical
- Food & Beverage

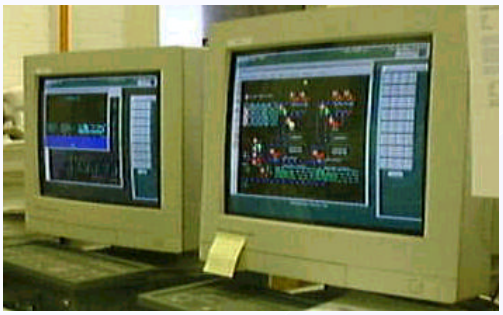
POWERS(POWER SYSTEMS) IS AN ELECTRICAL DISTRIBUTION NETWORKSIMULATION CODE. ELECTRICAL NETWORKS ARE MODELED BY USING THE FINITE ELEMENT METHOD FOR BASIC COMPONENTS S UCH AS RESISTORS, INDUCTORS, AND CAPACITORS. ALL COMPONENTS ARE MODELED AS TIME-DEPENDENT ELEMENTS. THESE P IECES CAN THEN BE USED TO BUILD MORE COMPLEX ELECTRICAL COMPONENTS SUCH AS BREAKERS AN D GENERATOR BUSES.

THE LEAST-SQUARES FORM OF THE FINITE ELEMENT METHOD IS USED IN POWERS, WHICH RESULTS IN A SYMMETRIC LOCAL ELEMENT FORMULATION. THIS MINIMIZES THE AMOUNT OF W ORK THAT HAS TO BE PERFORMED FOR THE S OLUTION METHODS THAT ARE USED FOR ENHANCED SIMULATION STABILITY. THE LOCAL ELEMENT MATRICES FOR EACH COMPONENT ARE A 2 X 2 STRUCTURE AND JOINED TOGETHER TO FORM A SYMMETRIC SYSTEM MATRIX, FOR THE ELECTRICAL NETWORK, SIMILAR TO USING S MALL BUILDING B LOCKS TO ERECT A LARGE STRUCTURE. ALL THE DEGREES O F FREEDOM FOR THE ELECTRICAL SYSTEM ARE OBTAINED FROM T HE MATRIX INVERSION A ND BACK SUBSTITUTION.

POWERS HAS A HIGH DEGREE OF ACCURACY AND CAN BE EASILY MODIFIED TO MODEL ANY ELECTRICAL NETWORKS. THE SYMMETRIC NATURE OF THE FINITE ELEMENT METHOD AND ITS BASIC BUILDING B LOCK CHARACTER RESULTS IN HIGH SY STEM FIDELITY, FAST EXECUTION TIME AND THE FLEXIBILITY OF INTERACTIVE MODEL BUILDING AND TESTING.



COMMUNICATIONS INTERFACES



MEL develops interfaces to allow different software systems to talk to each other.

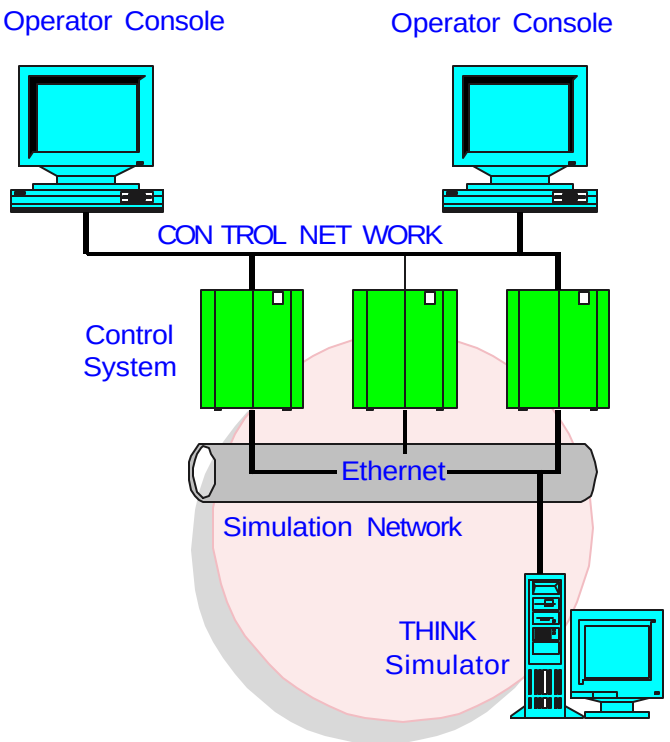
Process control equipment is made by many suppliers, and in many cases the communication protocols of these systems are proprietary. In other cases they are open protocols but different from each other. When these control systems are required to communicate with other data processing units such as MIS, accounting and simulation systems, custom "communication interfaces" must be developed.

Over the years, MEL has developed a number of communication drivers and interfaces for its integrated staging and testing of process control systems. The use of these drivers and new ones developed by our engineers have become more widespread as users required that their system operate as one integrated unit.

When used with a simulator, the communication interface is designed to bypass the control systems physical I/O system. This allows the control system to be tested without having the I/O hardware. This reduces the space required for testing and allows many control systems to be tested in an office environment.

Communication Interfaces

- Allen-Bradley PLC5's
- Bailey Infi-90
- ESSCOR FSIM (Foxboro IA CP emulator)
- Foxboro IA
- Honeywell TDC3000
- Honeywell Plantscape
- Moore APAC
- Fisher ProVox IFC's
- Fisher Provox DeltaV
- RosemountSystem3
- ABBMaster
- Valmet Damatic
- Johnson-YokogawaCentrum
- Modicon 984PLC's
- Carrier Chiller System
- YorkChillerSystem
- OPCinterface



Microfusion
EngineeringLaboratories,Inc.

Providing Advanced Simulation Solutions
For The Process Industries

MEL Consultant Experience:

- Simulation
- Controls
- System Integration
- Millwide Information Systems
- Industrial Automation

System Configuration

Configuring process control systems is labor intensive and intellectually demanding. The quality of the resulting control system performance is highly dependent on the experience of the engineers involved. Experience is the single most important factor inensuring the success of the final outcome.

In recent years, MEL has established a consulting group o f experienced personnel that are available for work on a range of control systems including,

- Fisher ProVox
- Allen-Bradley PLC5
- Modicon PLC
- ABB-Bailey Infi-90
- Foxboro IA
- Honeywell TDC3000
- Rosemount System 3
- Siemens
- DeltaV

Sample of Process Control Systems Configured

- Batch digesters-conventional and RDH
- R8 ClO_2 plant
- Continuous digester
- Paper machine stock blending
- High temperature optical fiber furnace
- Mag/newsprint deink plant
- Recovery boilers
- O_2 Delignification and Kappa optimization
- Kiln operation and temperature profiling
- Fiber glass preform sintering process
- Gas turbine controls
- Fluidized bed boilers
- Precision motion controls
- Brewing process
- Bleach Plant , Evaps, Water Treatment

Experience

Microfusion Engineering Laboratories is ready to provide full service process control solutions for you.

We have an extensive client list, ranging from large pulp and paper companies such as International Paper to large power companies like Virginia Power. We provide solutions for manufacturers such as Lucent Technologies and facilities such as Georgia Tech. We also work with other process control system providers to enhance the base systems that they provide as their forte with the advanced interfaces, models and controls which is the strength of MEL.

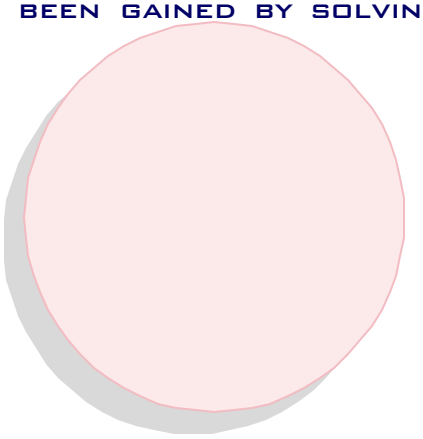
Champion International
International Paper
Union Camp Corporation
Weyerhaeuser Company
Virginia Power Company
Lucent Technologies
ABB
And on.....

As with our client list, our process list is quite extensive, covering virtually all of the processes and systems found in our client's plants, mills and manufacturing facilities..

Pulp Mills
Bleach Plants
Boiler Operations
Kiln/Causticizers
Batch Operations
Building Systems
Turbine Ssytems
Water Treatment Facilities
And your process.....

The experience list of the associates at MEL parallels that of our clients and their processes. This experience has been gained by solving problems.

Put our expertise to work for you.



Microfusion Engineering Laboratories, Inc.

3250-I Peachtree Corners Circle
Norcross, GA 30092
email:info@microfusionlab.com
web: http://www.microfusionlab.com