

Building Control Using PLC's Control Systems

**Are
You
Missing
The
Boat ?**



Elemco Building Controls



Perceptions of Industrial Controls



Why does a facility use industrial controls on their equipment?

- **Highest quality products increase reliability**
- **Ease of use and maintenance - You can make changes yourself**
- **Local support for service and training**
- **Lower total cost of ownership**

These same reasons are just as important in selecting the controls for your facility!



Managing Your Facility Is Becoming More Important

- **Money Saved on Utilities flow directly to the bottom line**
- **Your facility controls can impact your performance, e.g.**
 - Chilled Water availability
 - Steam & Hot Water availability
 - Temperature & Humidity control
 - Room & Building Pressure
 - Lighting
- **Validation Requirements**
 - FDA
 - Other Process Reports
- **Utility deregulation presents opportunities for competitive advantage to those who manage their energy usage**



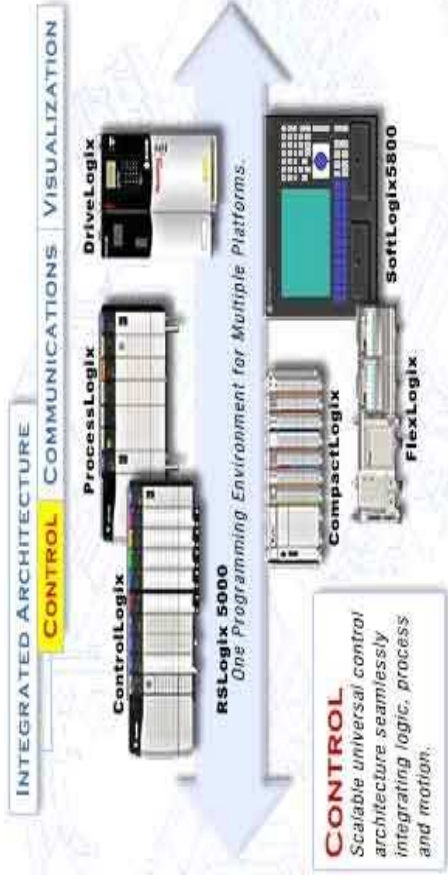
There Is A Boatload Of Money To Be Saved



- **Improved performance due to better technology**
- **Improved system reliability**
- **Improved self-sufficiency**
- **Cost allocation for true costs**



Industrial vs. Commercial Comparison



- **On Technical Merit**

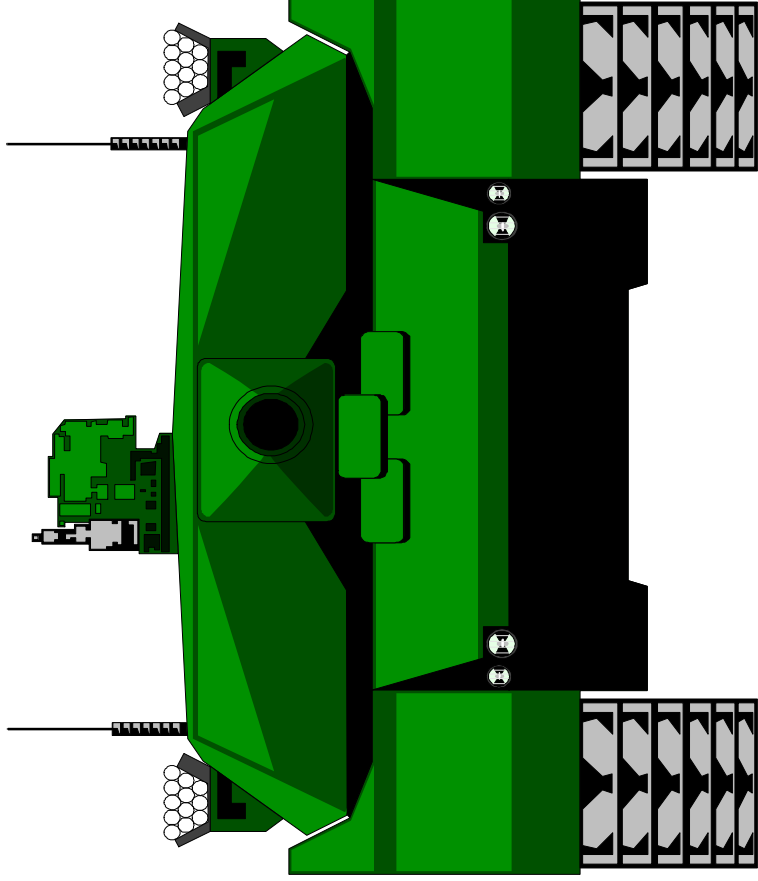
- **Industrial Examples**

- **In \$\$ and Sense**

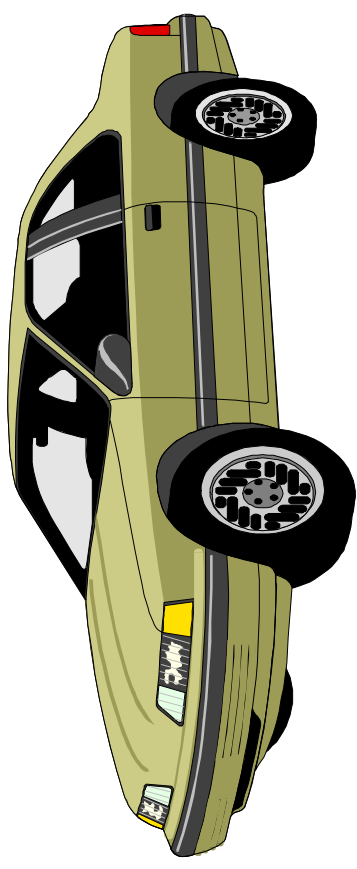


Which to choose???

- **Industrial Systems**



- **Commercial Systems**



Weigh the Differences - What fits for you!

- **The Industrial Story will be presented on the Left and in this color.**

- **The Commercial Story will be depicted in this color on the right.**



Technical Considerations



On Technical Merit



Looking @ The Big Picture

Automation

- Take control of the facility
- Equipment turned on/off automatically without operator intervention
- Systems are controlled not just equipment
- Optimization is an enhancement
- Savings are great and predictable

Optimization

- The main premise for the system
- Operators start/stop equipment
- Focus on controlling equipment rather than systems
- Savings are as good as the competency of the operators



Hardware Selection

- **Exact Application Fit**
- **Choose the right controllers for control, not data management**
- **Add or remove devices without impacting other devices in the system**
- **System can be installed piecemeal & bumpless**
- **Manufacturer will be around tomorrow**

- **Select what's available from the vendor**
- **Proprietary protocols prevent the mix-match of components**
- **Backwards compatibility issues**
- **New products tend to obsolete existing hardware**

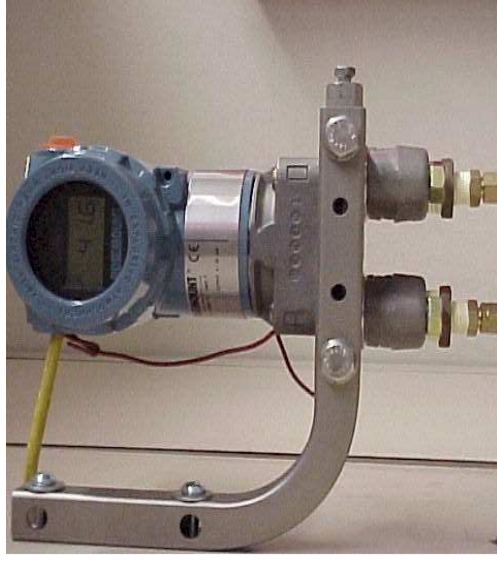


Instrumentation & Valves

ISA Standards - QUALITY

- **Reliability**
- **Life cycle cost**
- **Accuracy - resolution**
- **Repeatability**
- **Easily calibrated**

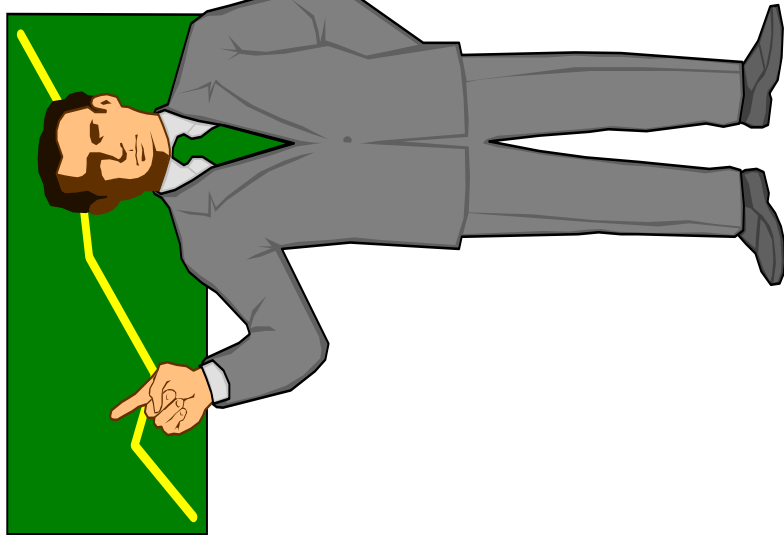
- **May be limited to Vendor**
- **Not interchangeable with other vendors**
- **First cost driven**
- **Life span is shorter**



Mean Time Between Failure (MTBF)

- Industrial Average
 - Measured in Years

- Commercial Average
 - Measured in Months



Reduced Downtime

- **Hardware easy to obtain**
- **Easily maintained**
- **In house expertise**
- **System can be designed to run in manual**

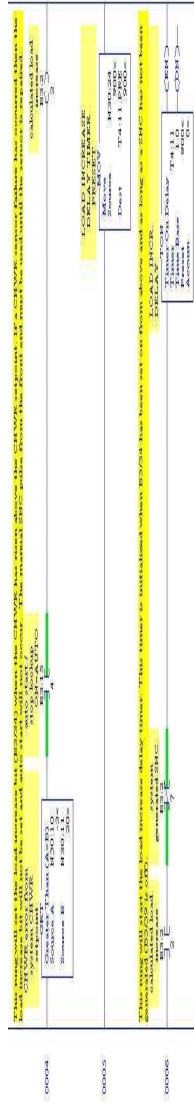
- **Must bring in outside help**
- **Parts availability impact on facility must be examined**
- **Manual overrides may not be available except through DDC**



Programming

- **Electrician's language - Major flexibility**
- **Timers**
- **Counters**
- **Proofs**
- **Last state or as you decide**
- **No re-programming for old nodes when adding new nodes**
- **Commented software - in your language**

- **Minimal or no documentation**
- **More configuration than programming**
- **Instruction set is smaller**
- **Lack of continuity of programming through out products**
- **Structured data table architecture missing**
- **On line programming ?**



Development Tools

Continuing Enhancement of the Application

- Use off-the-shelf HMI packages
- Visual Basic
- OPC
- C++
- Java
- VB script

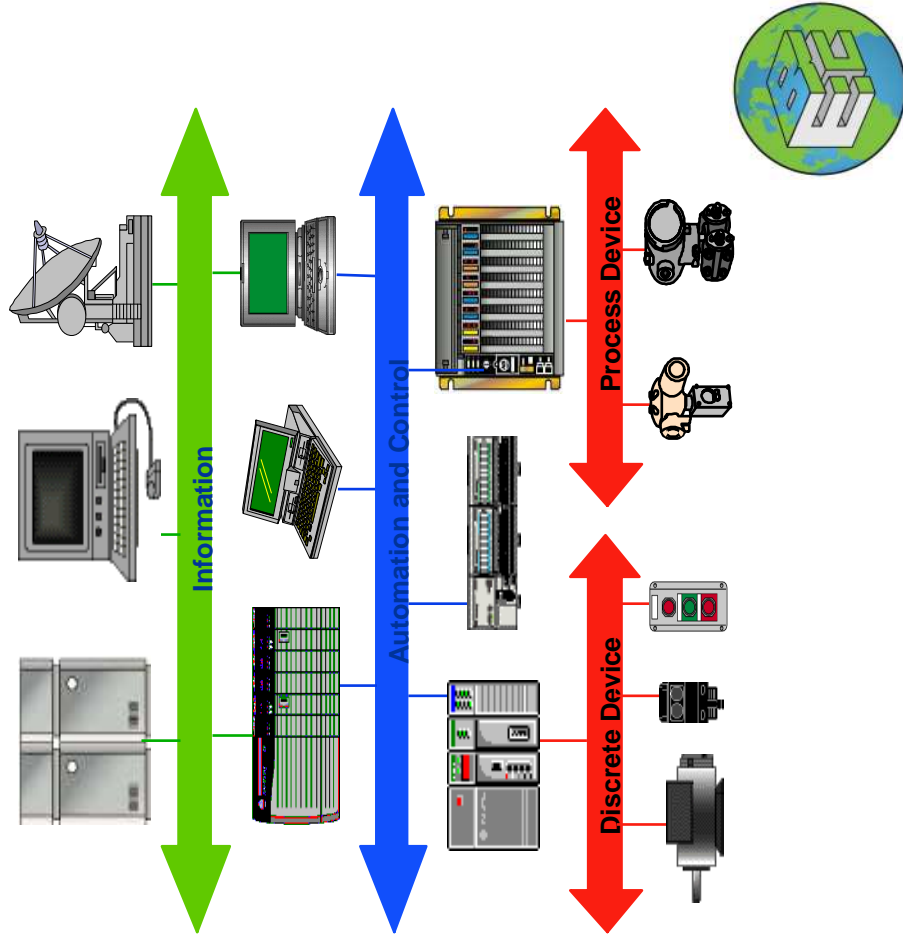
- Proprietary software keys kept by vendor
- Need to call in technician when adding a point
- Check flexibility and integration with other systems



Networks

- **Open networking standards**
- **Communications among multiple vendors**
- **Utilize next generation communication model (Producer/Consumer)**
- **Services are media independent**
- **Open connectivity throughout the enterprise**

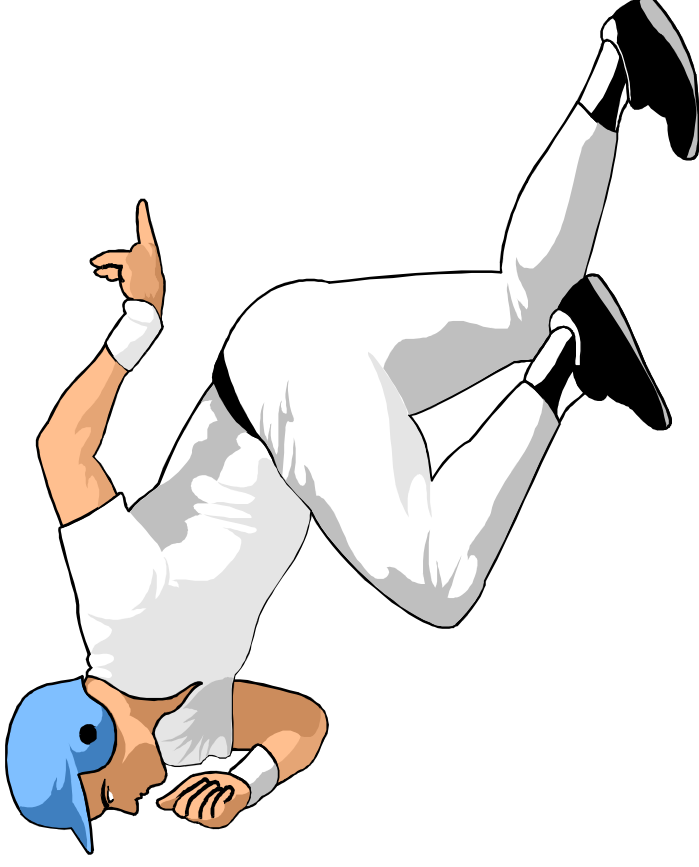
- **Proprietary**
- **Can get the “black box” which creates “open” protocol**



Speed On The Bases - Scan Rate

- Measured in milliseconds
- Why is that important?
 - Precise Control
 - React to system upsets
 - Permit Running on the Edge - Huge Savings

- How about one to three seconds, or we only look at it if the value changes by x%
- Control is less precise
- Compromise savings to run safely



Process Control

PID Control Loop

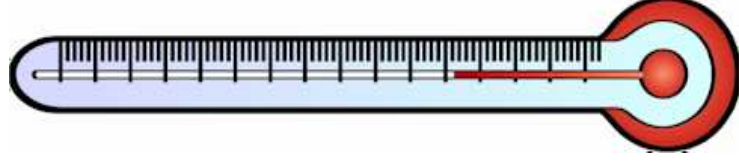
- Range limits
- Set point Ranges
- Buffering
- Scaling
- Cascading
- Anti-wind-up

- PI only?
- Slower reaction
- Less sophistication
- Limited to what has been configured (plug & play)
- May be difficult to accomplish unusual requirements



Accuracy - Tight Control - Consistency

- **Output in infinite analog steps**
- **Exact control**
- **Takes full advantage of process quality instrumentation**
- **Eliminates waste - no overshoot or undershoot**
- **No upsets to the system**



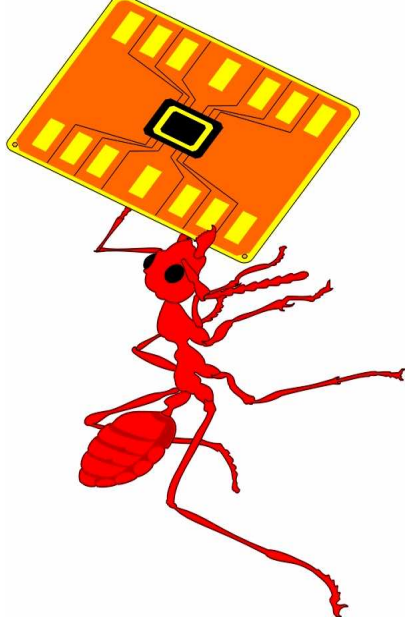
- **Output in discrete steps**
- **Approximate control**
- **Can't run systems on the edge as well**
- **Operators may incorporate band-aids**



Simulation - Factory Acceptance Test

- **Part of the process**
- **I/O checked**
- **Software exercised**
- **Digital & analog simulations**
- **Seq of ops check with the Operators**

- **Not in the commercial culture**
- **Field configuration**
- **Field test only**
- **Software added in the field to make it work**



Evasive Action Upon Mechanical Failures

- **Back-up modes Pre-programmed**
- **Alerts & alarms**
- **Start backup automatically**
- **Notification of failure**
- **Zero downtime - no upsets to the facility**

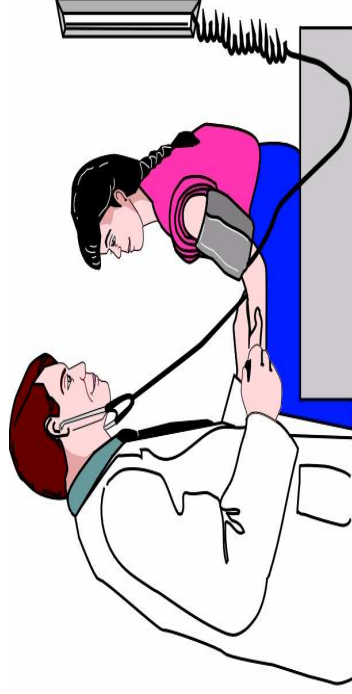
- Typically the process stops and a horn sounds
- Canned routines make it hard to customize evasive action
- Systems are built for optimization not true real time automation



Diagnostics

- **Monitor the performance of the system**
- **Alarm when beyond preset limits**
- **Predictive maintenance when mechanical performance begins to degrade**
- **Enhanced as soft spots become known**

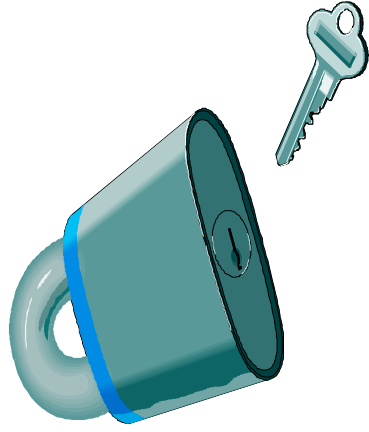
- Digital status might be output feedback
- Alarming only as intense as has been programmed to be configurable
- Can you look at code and add your own enhancements?



Who Owns The Smarts ?

- **End users own the:**
 - Protocol
 - Hardware
 - Software
 - Algorithms
 - Strategies

- The commercial vendor has the smarts and keeps the keys



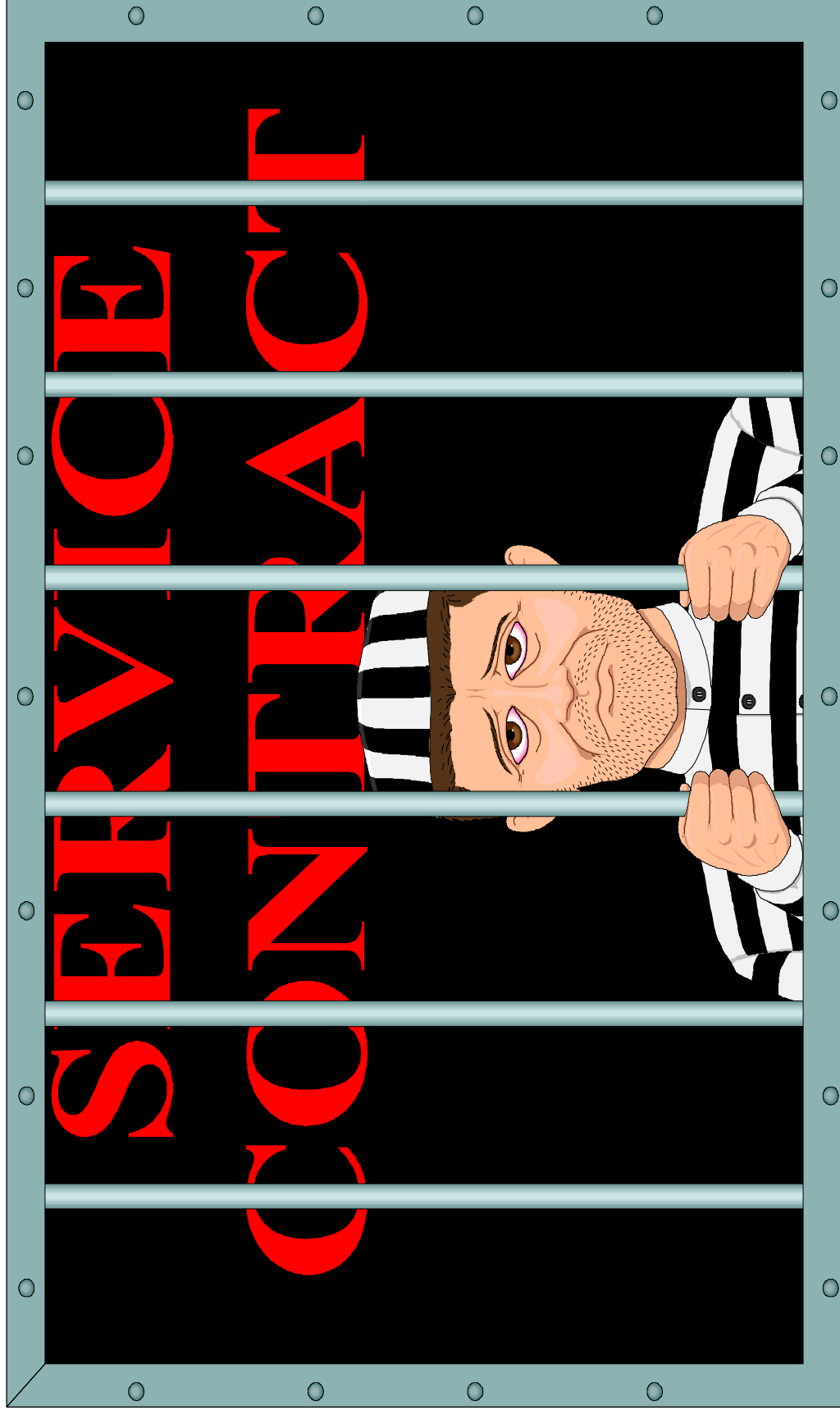
Who Takes Care Of The System ?

- **Owned by the Owner**
- **Multiple support sources**
- **Documentation allows independence**

- **Vendor has all the keys**
- **One source of support**
- **Documentation of mech/elec?**
- **Product life concerns**



**Expensive Service Contracts Do Not
Contribute To Self Sufficiency And Lower Costs**



Documentation

- **If it isn't documented its life is limited**
 - **P & I Diagrams - Your Facility**
 - **CAD drawings - Your Facility**
 - **ease of as-builts and future changes**
 - **Commented software - Your Program**

- **Plans & Specs**
- **Validation / commissioning issues**
- **As-builts only as good as the installer**
- **No software listing or comments**

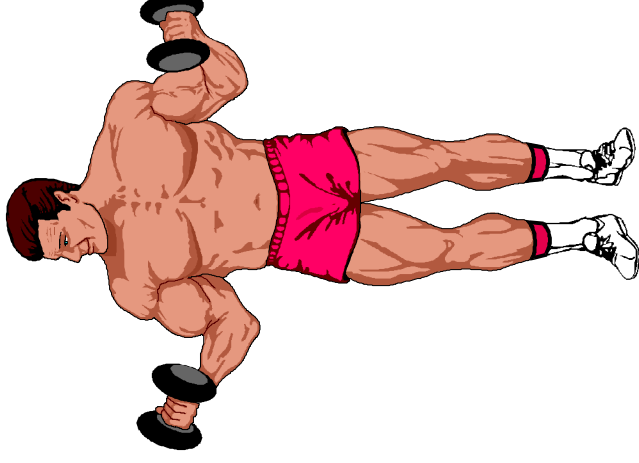


Training

Goal is for self-sufficiency

- **Factory Acceptance Test**
- **As part of the install**
- **Formal classroom**
- **User Guide for this “Unique System”**
- **After they become familiar**
- **Open line to any level of the integrator**

- Available from the vendor
- Typically no FAT
- Takes place after the install according to spec
- General O & M manual works for commercial applications



Support

- **Hardware IS A COMMODITY**
- **Software - documented**
- **Training from multiple sources**
- **Service from multiple sources**

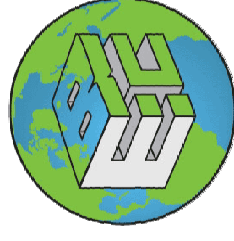
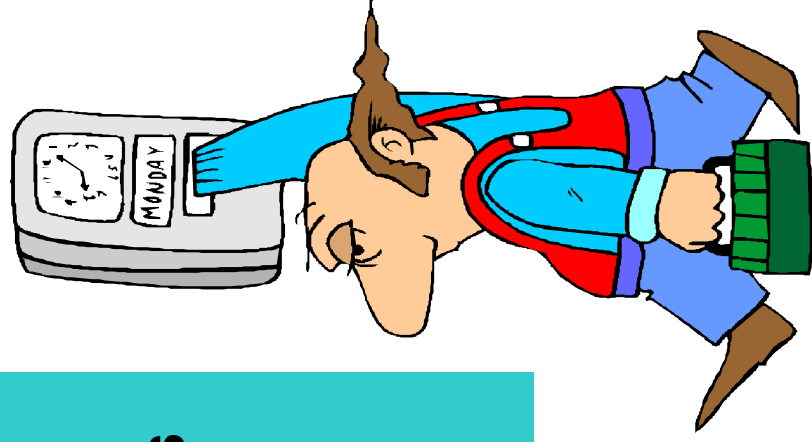
- **Sole source - get it only from the vendor**



People Power

- **Man power savings**
- **Remote/manual operation**
- **Expertise developed in house**
- **Embraced by the challenged**
- **Efficient operation is the net result**

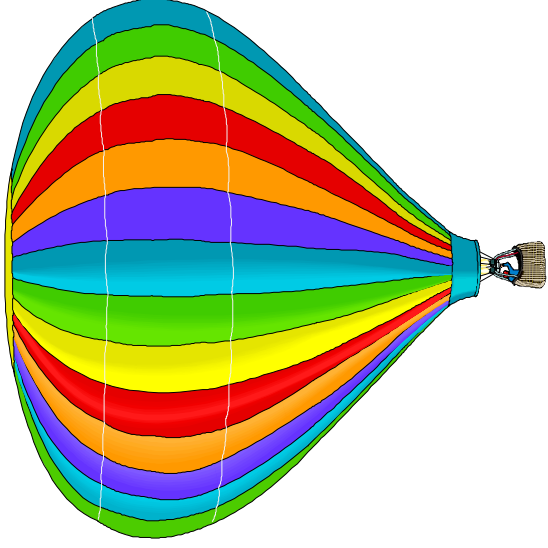
- **Doesn't replace anybody**
- **Typically optimizes rather than automates the system**
- **Good for low/no operations**
- **Needs full time maintenance person if you keep in-house**
- **Minor savings**



Vendor Independence

- **Hardware**
- **Software**
- **Training**
- **Service**

- **Need to stay with vendor or replace whole system**



Questions or Comments?

