M&M SYSTEMS™
control solutions

OPERATING COST REDUCTION USING EFFECTIVE TECHNOLOGY

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Introduction & Content

M&M Systems has incorporated energy savings tools to reduce power usage without sacrificing temperature control that will assist in providing a rapid return on your investment.

A M&M Control System can provide up to 25% energy savings over electro-mechanical controls and simple PLC systems.

By utilizing optional energy management features, a properly tuned M&M control system has been able to save an additional 10%.

- **Cost of Energy and Demand Charges**
  The first step in reducing your facilities energy usage is understanding how your bill is calculated from your energy provider.

- **Energy Management Control Tools**
  M&M Systems offers many control features to assist in lowering and monitoring energy usage while maintaining necessary operational temperatures.

- **Energy Savings Examples**
  Many customers have utilized M&M controls to reduce and monitor their energy usage. Energy saving examples of case studies and return on investments.

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Know How Your Electric Bill is Calculated

- Energy Plus Straight Demand
  - kWh Consumed During a Billing Period Multiplied by a Predetermined Cost per kWh
  - kWh Rate Can Be Different for Different Times of Day for On-Peak and Off-Peak Operation
  - Plus a Demand Charge (Demand kW X Cost Per Demand kW)
- Demand kW
  - Actual Highest On-Peak Demand for the Billing Period
  - Percentage of the Highest On-peak Demand During Preceding 11 Months (Ratchet Percentage)
- Energy Plus Multi-Tiered Demand
  - Similar to Straight Demand
  - Demand Rate is Partitioned at Different Levels
- Real Time Pricing (RTP)
  - Customer is Charged What Market will Sustain
  - Customer is Notified of Hourly Rates 24 Hours in Advance
  - Cost per kWh Vary Wildly Between On-Peak and Off-Peak Times

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Energy Plus Straight Demand Example

- Assume 3-100 Watt Lights on for 10 Hours
  - 3 Lights X 0.1 kW/Light X 10 Hours = 3 kWh
- Energy Plus and Demand Rates
  - Energy cost of $0.075/kWh
  - Straight Demand Charge of $8.00/kW
- Off-Peak - at Night - No Demand Charge
  - Energy Cost - 3kWh X $0.075/kWh = $0.235
- On-Peak - During Day - Demand Charge
  - Straight Energy Cost - 3kWh X $0.075/kWh = $0.235
  - Demand Cost - .3kW X $8.00/kW = $2.40
  - Total Cost - $2.635 (Over a 10X Increase)

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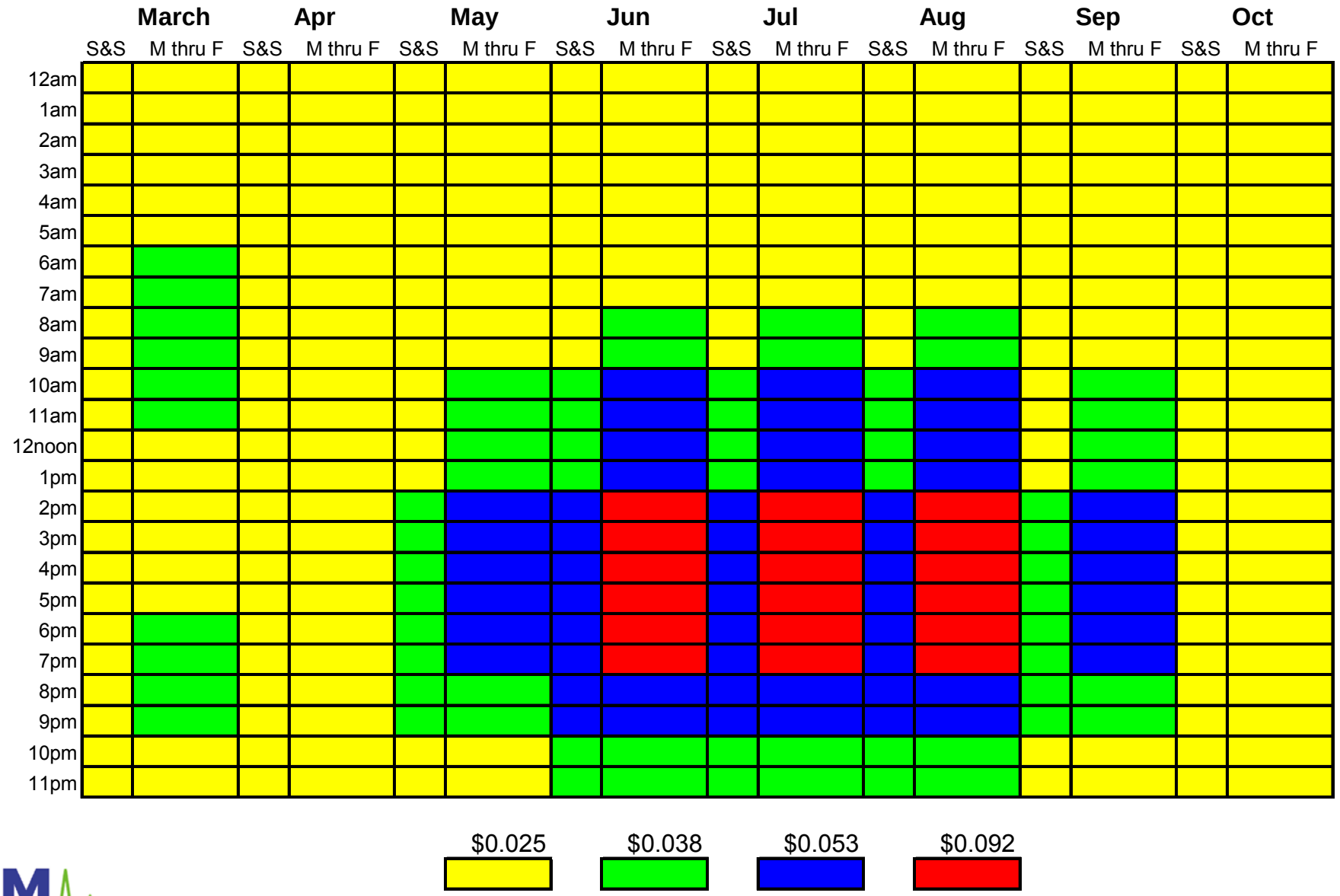
Energy Rates Example



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Methods Of Energy Management

- Monitor Energy Usage
- Peak Shifting - Do As Little Work As Possible During Peak Demand or High Rate Periods
  - Delaying Work a Short Time Could Result in Big Savings
  - Everybody Needs to Know the Rules and Work to a Plan
- Thermal Energy Storage - TES
  - Store Energy in Product When Power is Less Expensive
- Control System Automatic Assistance

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Standard Energy Management Tools

- Stand-Alone Compressor Controls
  - Scheduling Feature Provides Load Shifting Capabilities
  - Support for Variable Speed Motors to Optimize Compressor Efficiency
- Sequencer Control Features
  - Sequencer Assures Compressors are Running at Maximum Efficiency
  - Scheduling Allows Shifting of Load to Off-Peak Hours and Allows Use of Thermal Energy Storage
  - Multiple Sequencer Lead Lists Allows Specific Order of Compressor to be Scheduled for Shifting Loads
- Condenser Control Features
  - Wet Bulb Control Eliminates Wasted Horsepower
  - Support for Variable Frequency Drives to Reduce Horsepower. Utilizes PID Control Algorithm.

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Standard Energy Management Tools

- Evaporator Control Features
  - Scheduling to Shift Load to Off-Peak Hours and Use Thermal Energy Storage
  - Fan Cycling to Reduce Wasted Horsepower
  - Fan Power Fail Staging to Eliminate Power-On Demand Spikes
  - Support for Variable Frequency Drives to Reduce Horsepower. Utilizes PID Control Algorithm.
  - Fan Sampling Feature Provides Air Movement to Provide Accurate Temperature Readings When Zone is Satisfied
- Peak Hour Scheduling
  - Provides an Easy Way to Shutdown Anything During Peak Demand Periods

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Standard Energy Management Tools

- kW Monitoring - Monitor and View History
  - Calculation of Total Energy Used, Current Demand, kWh/day, kWh/week and kWh/year are Performed and Displayed
  - Tracks Highest Demand for the Day With Time of Occurrence
  - High Demand Alarm
  - kW Log Records Daily Totals
  - Historical and Real-Time Trend Plots Can Be Used for Analysis
- Load Shedding - Keeps Peak Demand Down by Automatically Shedding Zones and Other Selected Equipment
  - Uses kW Monitoring Data
  - Scheduling Allows the User to Select Between 4 Different Groups of Setpoints at Different Times of Day and Day of the Week
  - Three Different Daily Schedules Are Provided That Have up to Eight Different Time Slots Per Day
  - Different Schedule Can Be Assigned to Each Day of the Week
  - Zones and Equipment Shed Order Can Be User Prioritized

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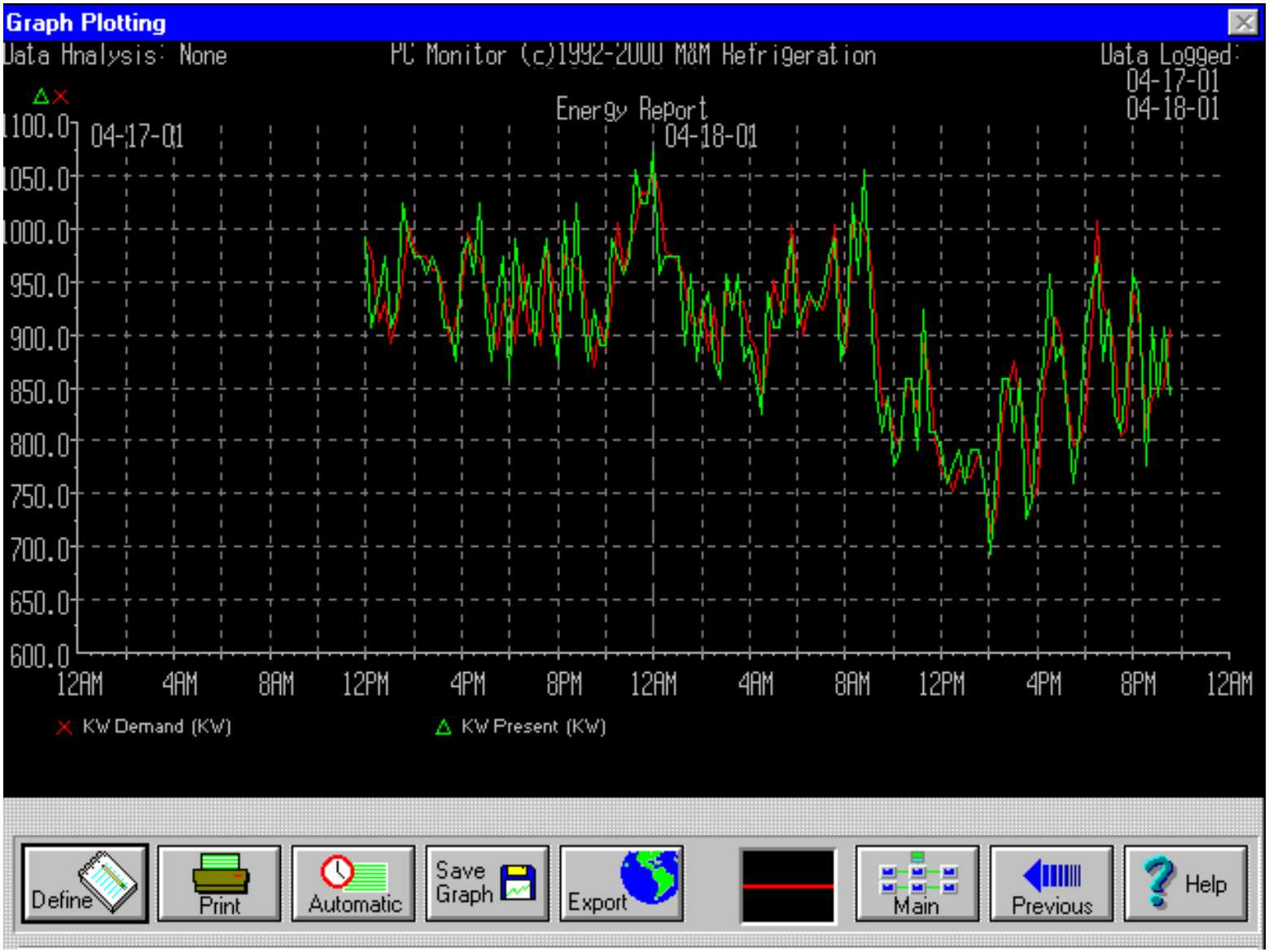
Present kW and Demand Plot



Custom Energy Management Features

- If You Can Dream It, We Can Do It
- The Simplest Things May Save Big $$$$
- Examples
  - Switching Lead List Based on a Plant Event
  - Shutting Down Zones Based on an Input
  - Staggered Blast Starts
  - Blast Hold During Peak Time
  - Blast VFD Control Based on Product Type
  - Total Plant Shutdown in a Controlled Manner on Requ
  - Automatic Generator Switch Over and Demand Limit
  - Office Receptacle Shutdown
  - Lighting Bank Shutdown

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Payback Computation

- The Cost Of Power
  - A Cold Storage Facility has a Monthly Bill of $33K and Reports the Typically Refrigeration Percentage as 60%. Lighting and Battery Charging are the Other Major Loads.
- The Savings
  - An M&M Control System with Standard Features can Save 35% Over Electro-Mechanical Controls and Simple PLC Systems
  - An M&M Control System Properly Tuned Utilizing Optional Energy Management Features Can Save an Additional 10%
  - If the Control System Takes Control of Lighting and Battery Charging the Scope of the Savings Grows Even More

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Payback Computation (Cont.)

- Payback - Electro Mechanical and Simple PLC to Standard M&M Controls
  - Assume $90K for New System
  - Monthly Savings = $33K X 0.60 X 0.35 = $6.9K/Month
  - Payback = $90K / $6.9K = 13 Months
- Payback - Electro-Mechanical and Simple PLC to Properly Tuned M&M Controls with All Energy Management Features
  - Assume $120K for New System
  - Monthly Savings = $33K X 0.65 X 0.45 = $9.6K/Month
  - Payback = $120K / $9.6K = 12.5 Months

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Energy Saving Examples

Dairy Processing Facility w/Existing PLC Air Unit Controls

- System Cost w/Installation = $293,000
- Monthly Power Savings = $28,000
- **Payback with 60% Power Company Rebate = 4.2 Months**
  - Facility has 3600 Tons of refrigeration capacity

Seafood Processing Facility w/Existing PLC Compressor Controls and Evaporator Time Clocks

- System Cost w/Installation = $78,000
- Monthly Power Savings = $4,146
- **Payback with 60% Power Company Rebate = 7.5 Months**
  - Facility has 96 Tons of refrigeration capacity

Cold Storage Warehouse w/Existing Full PLC System Controls

- System Cost w/Installation = $281,000
- Monthly Power Savings = $11,375
- **Payback with No Power Company Rebate = 24.7 Months**
  - Facility has 2540 Tons of refrigeration capacity
  - Increases: Energy rate by 5.71% and blast production by 31.5%.
  - **Normalizing payback with increases yields 18.9 Month payback**

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Energy Savings Case Study

(Fresh Seafood Processing – Northeast Coast USA)

Original Plant Configuration

- **Facility Type :** Fresh Seafood Processing
- **Compressors:** Two Frick RWB (D&B IDR) Screws with Electromechanical
- **Controls:** Two Frick Recip Compressors with Pressure Switches Only
- **Tonnage:** 96 Tons
- **Condenser:** 1 Fan & 2 Pumps
- **Vessels :** Pump Package with Float Controls Intercooler with Float Controls
- **Evaporators:** 3 HG Flooded, 3 HG DX & 1 Air DX Zone
- **NH3 Detection:** None
- **Controls:** Simple PLC on Compressors, Time Clocks for Evaporators & Condenser on Pressure Switches

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Energy Savings Case Study

(Fresh Seafood Processing – Northeast Coast USA)

Plant Updates

- **Compressors:** Updated Screws with M&M Retrofit Panels and Full Sensors, Replaced One Recip with Sabroe Unit and Added Temp Sensors to Both
- **Condenser:** Controls Only
- **Vessels:** Controls Only
- **Evaporators:** Controls and Room Temperature Sensors
- **NH3 Detection:** 8 Analog NH3 Detectors
- **Controls:** Full M&M Control Package, Sequencing of BSTR & HSTG Compressors, Condenser, Vessels, Evaporator, kW Monitoring, NH3 Detectors, PC Monitoring, Graphics, Plotting, System Logging & Reports
- **System Cost:** $78,000 with Installation
  (60% Rebate from Power Company)

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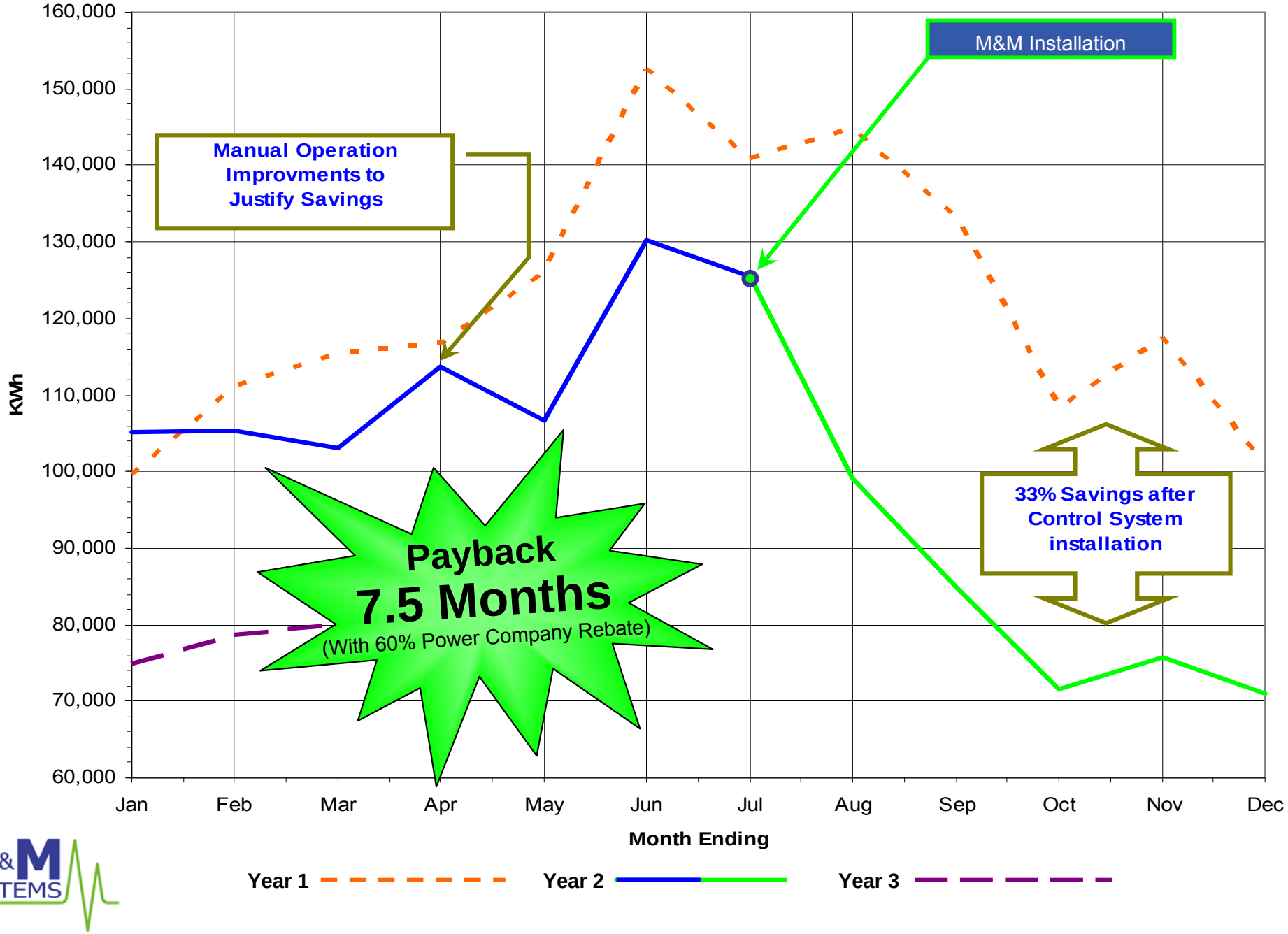
Energy Savings Case Study

(Fresh Seafood Processing)



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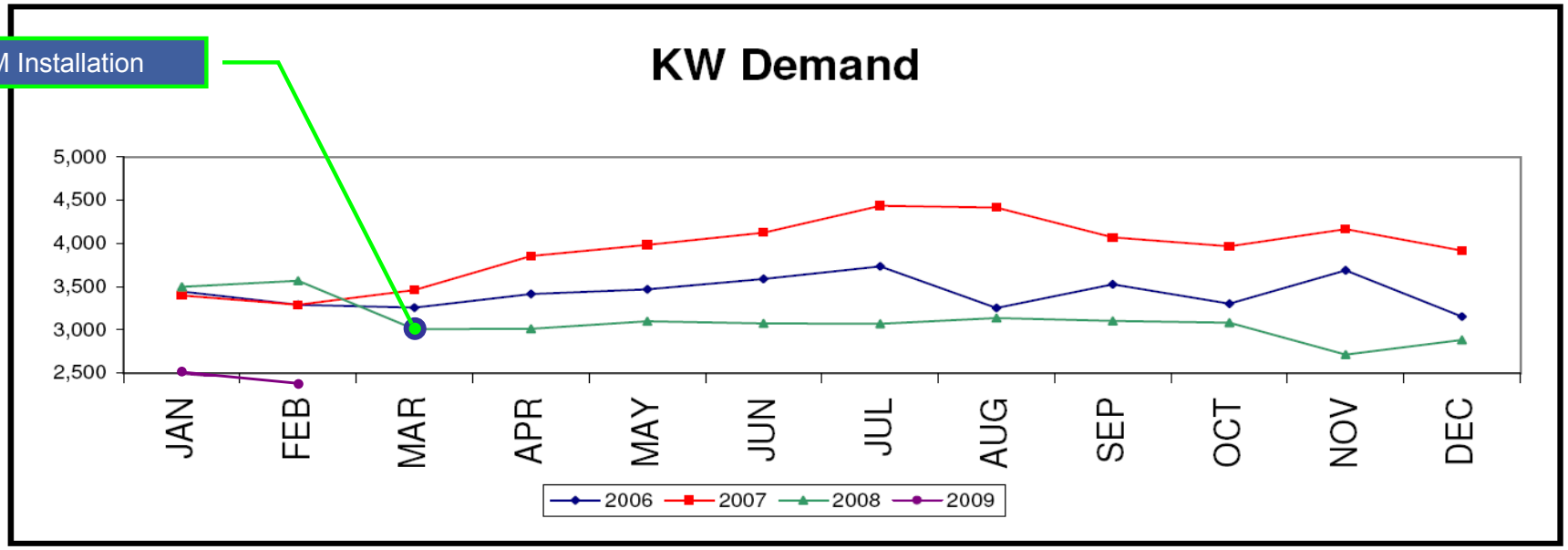
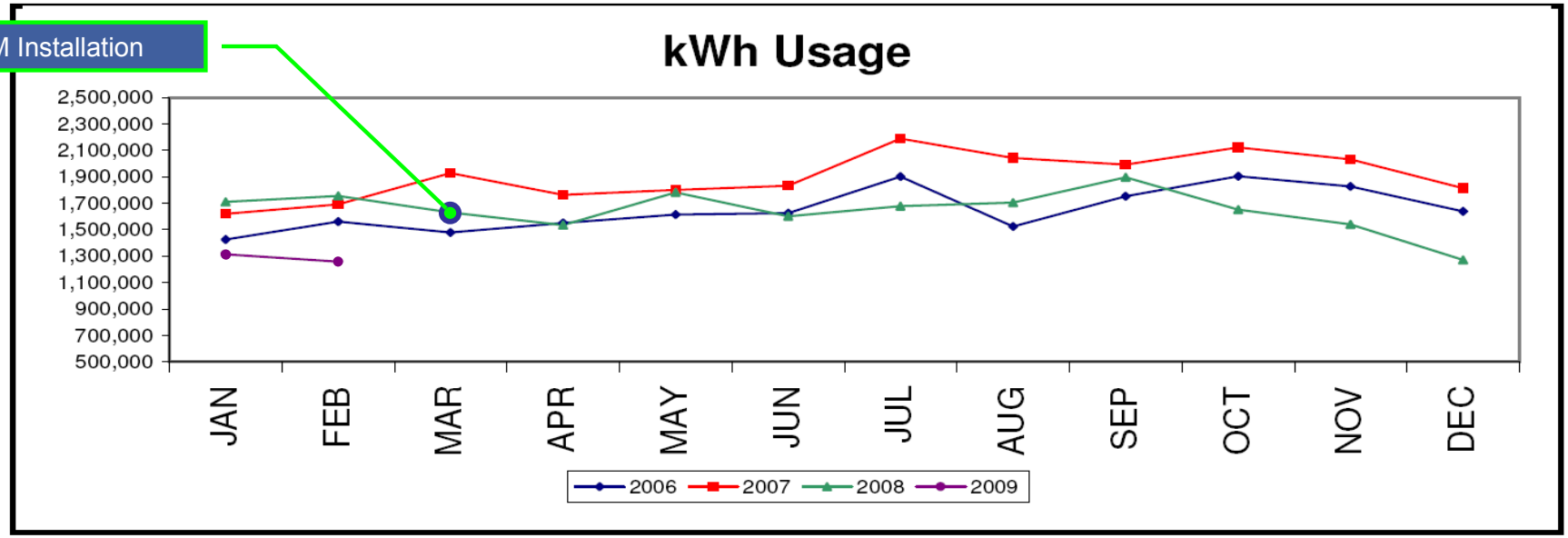
Energy Savings - PLC Replacement Example

(Cold Storage Facility – Central California)

M&M Installation



M&M Installation



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