Appendix
# C

# MotorMaster Plus

STEP BY STEP INSTRUCTIONS ON HOW TO CREATE A MOTOR INVENTORY

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# CREATING A MOTOR INVENTORY

In this section we will learn how to create:

- a *Company,*

- *a Facility* within the company,

- three *Department's* within the facility and ,

- several example *Process's* to help demonstrate the hierarchy of the program.


Once the hierarchy is set up and the sample raw data entered we can determine:

- annual energy consumption,

- annual demand and,

- annual operating costs for each unit

## CREATING A COMPANY MOTOR INVENTORY DATABASE:

To familiarize yourselves with the features of the software, MotorMaster+ is equipped with a sample database containing over 100 in-service and spare motors.  The measured data used with these motors was extracted from 3 actual industrial audits.

**Click** on the motor **_Inventory_** button, then on the **_Hierarchy_** button on the toolbar (It looks a bit like a tree).  You can then observe how the sample database is structured-------facilities are displayed at the left margin, then departments, processes, and finally motors.

**Double Click** on a motor name (they are in bold).
Now the **_Motor Inventory-View_** screen for that motor appears.  The **_Hierarchy_** button not only displays how motors are assigned, but also functions as a search tool.
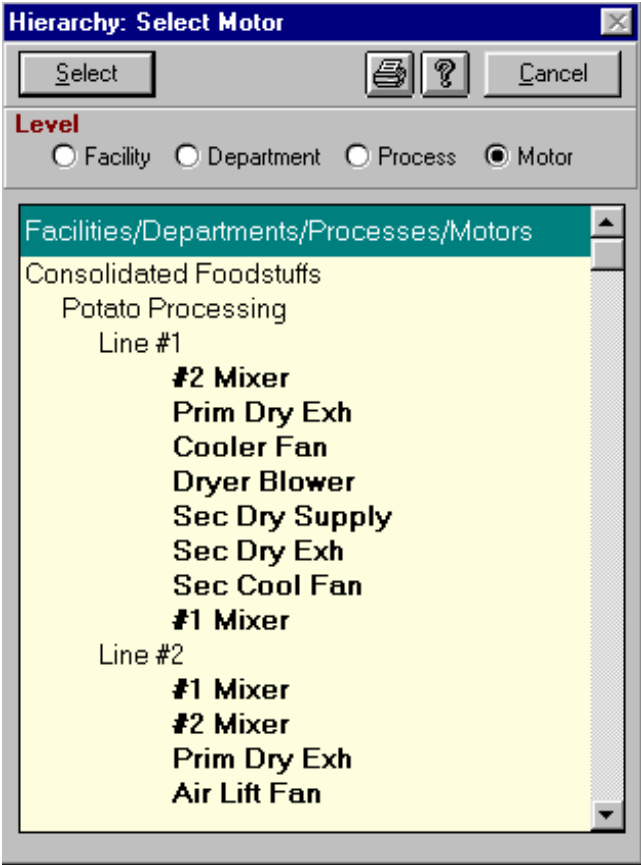
## CREATING A COMPANY MOTOR INVENTORY DATABASE

## STEP One:

Creating the *Company* database.
**Exit** to the Main Menu, then click on the *Company* destination button.

To initialize the **General Industries** database, click on the familiar *"Add"*

 *Icon*.

The display is cleared and the cursor is located at the *Company Name* box..

*Type in* the company name *General Industries*, and the specific information required to finish the input screen.

*Click* on the *"Save"*  *Icon*.

*Type in* your preferred File Name (try "GenInd" when the Create New Company Database window appears).  Then *click OK*.

Now the *Company-View* window appears with *General Industries* loaded into the Company Database box and *GENIND.MDB* appearing as the *Disk File Name*.

## CREATING A COMPANY MOTOR INVENTORY DATABASE

**Return** to the *Main Menu*.  Notice that several of the destination buttons appear gray and are *"off-limits"*.  You have to create a department before you create your process as processes are assigned to particular departments.

## CREATING A COMPANY MOTOR INVENTORY DATABASE

**STEP Two:**

The **General Industries' Corporation** has one Facility, the **Kent Fabrication Plant**

**Click** on the **Facilities** destination box , next **click** on the **"Add" Icon**.

.

Then **type in** the Facility Name **Kent Fabrication Plant** , also include address, contact name and phone number.

**Next Select** the **Local Utility** at the *Utility Name* combo box, then choose **Large Service**. The imprint of our previously created rate schedule appears.

**Click** on the **"Save"** **Icon**.

# CREATING A COMPANY MOTOR INVENTORY DATABASE

## STEP Three:
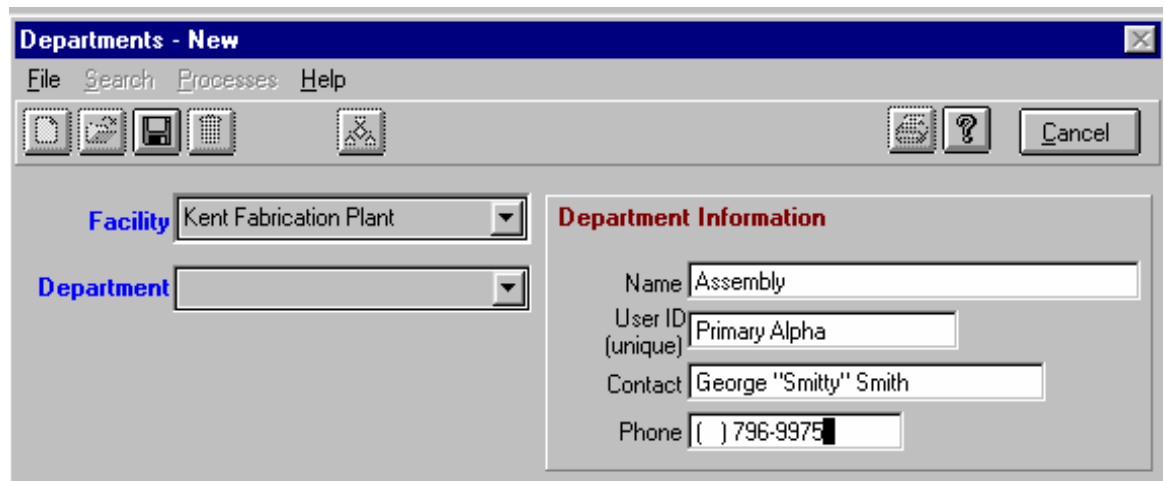
Return to the *Main Menu*.  Notice that the Department destination box is now accessible.

The *General Industries' Kent Fabrication Plant* has one *Department, Assembly*.

**Click** on the *Department* destination box.   Next **click** on the *"Add"* **Icon**.

Then *type in* the *Department* name **Assembly** . This **Department** *(Assembly)* is now linked to the indicated Facility--- the **Kent Fabrication Plant**.

*Click* on the *"Save"* **Icon**.

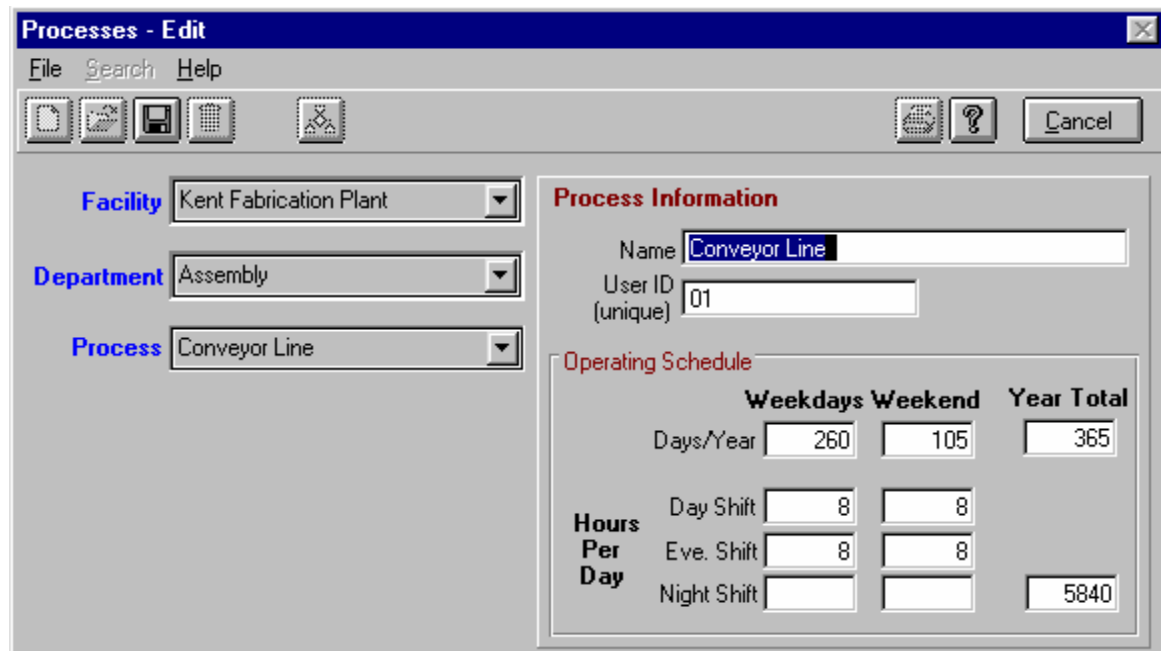# CREATING A COMPANY MOTOR INVENTORY DATABASE

## STEP Four:

Return to the **Main.**    Notice that the Processes destination box is now accessible **Click** on the *Processes* destination box.

**Click** on *"Add"* [ ] *Icon*.

Now  enter the Process name (**Conveyor Line**) and Operating Schedule values below.

Lets assume the **Conveyor Line** runs *2 shifts (weekdays and weekends),*

[*Conveyor Line* runs - 2 shifts for 260 week days, and 105 weekend days which equals *5840 hrs*.]

### Processes - Edit

File    Search    Help

| | Facility | Kent Fabrication Plant | | Process Information | | |
|---|---|---|---|---|---|---|
| | | | | Name | Conveyor Line | |
| | Department | Assembly | | User ID (unique) | 01 | |
| | Process | Conveyor Line | | Operating Schedule | | |

| | Weekdays | Weekend | Year Total |
|---|---|---|---|
| Days/Year | 260 | 105 | 365 |
| Day Shift | 8 | 8 | |
| Eve. Shift | 8 | 8 | |
| Night Shift | | | 5840 |

(Hours Per Day)

After we  enter the Process name and Operating Schedule values,

**Click** on the *"Save"* [ ] *Icon*.

When you are finished, **click** on the down arrow at the *Process* combo box.  **Click** on any process to view its associated operating schedule.

# CREATING A COMPANY MOTOR INVENTORY DATABASE

## STEP Five:

Next lets create the HVAC process:

**Click** on *"Add"* [Icon] ***Icon***.

Now enter the Process name (HVAC) and Operating Schedule values below.

Lets assume the HVAC runs *3 shifts (weekdays and weekends)*, for 365 days per year.
[The **HVAC runs -** 3 shifts for 260 week days, and 105 weekend days which equals *8760 hrs*.]



After we enter the Process name and Operating Schedule values,

***Click*** on the *"Save"* [Icon] ***Icon***.

When you are finished, **click** on the down arrow at the ***Process*** combo box. **Click** on any process to view its associated operating schedule.

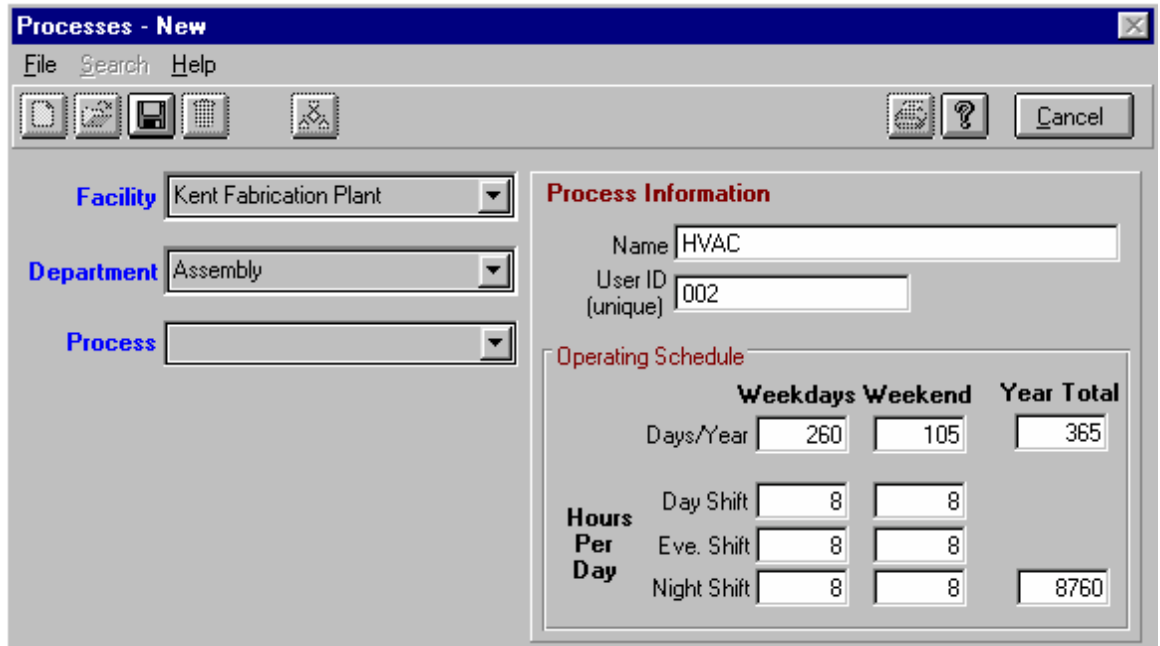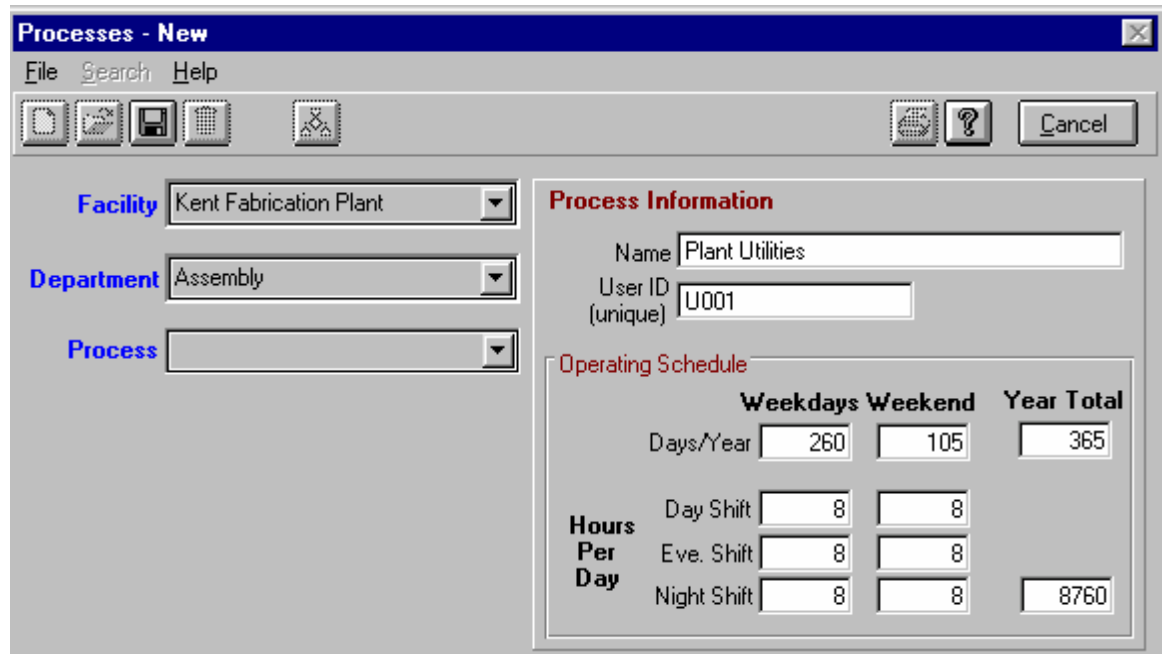# CREATING A COMPANY MOTOR INVENTORY DATABASE

## STEP Six:

Next lets create the **Plant *Utilities*** process:

**Click** on the *"Add"* [icon] *Icon*.

Now  enter the Process name (Plant ***Utilities)*** and Operating Schedule values below.

Lets assume the **Plant *Utilities*** run ***3 shifts (weekdays and weekends)***, for 365 days per year.

[**Plant *Utilities*** run  - 3 shifts for 260 week days, and 105 weekend days which equals ***8760 hrs***]



After we  enter the Process name and Operating Schedule values,

***Click*** on the *"Save"* [icon] *Icon*.

When you are finished, **click** on the down arrow at the ***Process*** combo box.  **Click** on any process to view its associated operating schedule.

# CREATING A COMPANY MOTOR INVENTORY DATABASE

## Operating Schedule Reference:

52 weeks / yr., 365 days/yr. **equals** 260 week days, and 105 weekend days

1 shift @ 08 hrs. **equals** 2080 hrs.
Add weekends @ 840 hrs.
Combined **equals** 2920 hrs.

2 shifts @ 16 hrs. **equals** 4160 hrs.
Add weekends @ 1680 hrs.
Combined **equals** 5840 hrs.

3 shifts @ 24 hrs. **equals** 6240 hrs.
Add weekends @ 2520 hrs.
Combined **equals** 8760 hrs.

## THE MOTOR INVENTORY:

Below is a table of  sample motor nameplate information and field test results.  Enter this
*"raw data"* into the forms following the table, and use the completed forms as a reference to complete the motor inventory screens.

**Note: All motors are *Design B*, with *totally enclosed fan cooled* (TEFC) enclosures.**

## General Data:

|  | Motor #1 | Motor #2 | Motor #3 | Motor #4 |
|---|---|---|---|---|
| **Process:** | Conveyor | HVAC | Conveyor | Utilities |
| **Motor Name** | Hydraulic | Supply Fan | Spray Booth | Boiler Fan |
| **Manufacturer** | Lincoln | Reliance | GE | Toshiba |
| **Frame Number** | 445T | 405T | 326T | 364T |
| **Size (hp)** | 150 | 100 | 50 | 60 |
| **Sync Speed (RPM)** | 1800 | 1800 | 1800 | 1800 |
| **Voltage Rating** | 460 | 230/460 | 460 | 230/460 |
| **Wired for** | 460 | 460 | 460 | 460 |
| **F.L. Amps** | 169.0 | 115.0 | 60.0 | 69.5 |
| **F.L. Speed** | 1750 | 1760 | 1750 | 1775 |
| **F.L. Power Factor** | 90.0 | 85.0 | 75.0 | 86.0 |
| **F.L. Efficiency(%)** | 93.5 | 92.1 | 91.0 | 95.0 |
| **Service Factor** | 1.15 | 1.10 | 1.15 | 1.15 |
| **Rewound** | Yes | Yes | Yes | Yes |
| **Yr. Installed** | 1986 | 1978 | 1983 | 1994 |
| **Load Type** | Pump | Fan | Fan | Fan |

## Measured Values:

|  | Motor #1 | Motor #2 | Motor #3 | Motor #4 |
|---|---|---|---|---|
| **Line-line Voltage:** | 472/468/490 | 480/482/484 | 468/483/482 | 485/481/483 |
| **Amps** | 145/144/143 | N/A | 38/38/38 | 61.5/61/62 |
| **Power Factor** | 85.0 | 68.0 | N/A | 82.0 |
| **Operating RPM:** | N/A | 1788 | N/A | N/A |
| **Input Power (KW)** | N/A | N/A | N/A | N/A |

# MotortMaster Plus -

**Facility/**_____

**Raw DATA Sheet**                               **Dept./**_____

**Process/**_____

| **Name Plate Data** | **Operating Profile** |
|---|---|

**Manufacturer Name -**                          **Year Installed -**          19_____

_____

**Model -**                                       **Location of Unit -**

_____                          _____

**Serial Number -**                               **Load Type -**

_____                          _____

**Frame Number -**                                **Coupling Type -**

_____                          _____

**Motor Type - <u>NEMA Design B</u>**

**Synch. Speed      (RPM)**                          **Rotating Equipment**
900**[ ]**                                        Speed - [        ]
1200         **[ ]**
1800         **[ ]**                                 **Load Characteristics**
-
3600         **[ ]**                              **(  )Steady -** On during
shift
**Size (HP) -**                                   **(  )Starts / Stops** - Steady
while on

on/off                                            **(  )Starts / Stops** - Fluctuates
**Synch Speed (RPM)**

_____

**Enclosure Type:**  ODP  **[  ]**   TEFC **[  ]**   EP   **[  ]**   NV   **[  ]**

**Voltage Rating -**  **[         ]**   **@ Full Load:** AMPS **[      ]** Power Factor
%**[     ]**
**Wired for Volts -**  **[        ]**              RPM   **[       ]** Efficiency %
**[    ]**

**Service Factor** _____      **Temp Rise** _____

**KVA Code** _____        **Insulation class**_____

# MotortMaster Plus - Raw DATA Sheet cont.

| Measurements |
|---|

## <u>VOLTAGE</u>

Supply Voltage ab -     **[        ]**

Supply Voltage bc -     **[        ]**

Supply Voltage cd -     **[        ]**

## <u>AMPS</u>

Line Current a -     **[        ]**

Line Current b -     **[        ]**

Line Current c -     **[        ]**

**Power Factor (PF)[        ]**

**Speed(rpm)          [        ]**

**Power Draw kW   [        ]**

# CREATING A MOTOR INVENTORY cont.

## ENTERING MOTOR DATA:
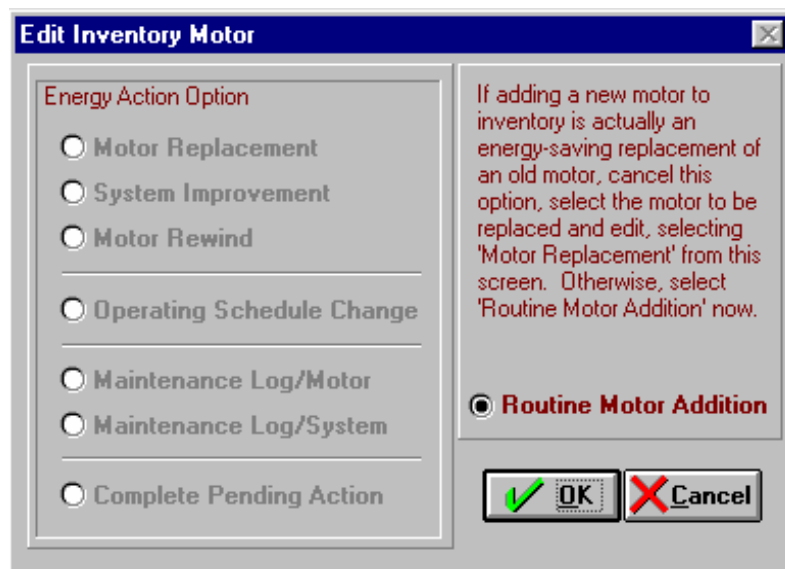
**Click** on the Inventory destination button at the Main Menu.

**Select** the **Kent Fabrication Plant** at the *Facility* box and,

**Select** *Assembly* at the *Department* box and,

**Select** *Conveyor Line* at the Process box, then **click** on the *"Add" Icon*.

**Click** *OK* for a routine motor addition when the **Edit Inventory Motor** pop-up box appears.

ENTERING MOTOR DATA cont.

Next, **click** on the **_Description_** box and **enter** the first motor name---**_Hydraulic Motor_**.



This motor will automatically be assigned to the Conveyor Line process after you complete the rest of the entries. . . . **Hit** the **_Tab key twice_** to highlight the Manufacturer entry box.

*Note*:   The first Tab keystroke places you at the motor Status box.  The default here is **_In-Service,_** information can, of course, be entered for spare motors.

Use your **_Tab key_** and down arrows at the choice boxes to enter descriptive and full load performance information for your motor.  Notice the **_Rewound Motor check box_** in the top right hand corner of the Nameplate screen - check this box if the candidate motor has been rewound.

## ENTERING MOTOR DATA cont.

When you've finished entering name plate values, **click** on the ***Operating Profile*** tab.

Now **Enter** the year the motor was installed, its location in the plant, and its priority in the process.

ENTERING MOTOR DATA cont.

When you have finished entering the Operating Profile values, click on the **Load Status** tab.

Now **Select** the load type (**Centrifugal Pump)** from the pull down menu., and indicate whether the motor is used in conjunction with an adjustable speed drive (ASD). Note that the Coupling Type and Rotating Equipment Speed are optional boxes - the information may be entered and stored but is not used for any calculation or as a search criteria. Next **Indicate** that the motor *Load Characteristics* are **Steady, ON** during shift.

# CREATING A MOTOR INVENTORY cont.

Now **click** on the **<u>Field Measurements</u>** tab.

**Enter** the date the measurements were taken, then input the measured values available for each motor. When you've finished, note that the motor load, efficiency at that load point, annual energy use, and annual operating costs have been calculated.



The energy and demand rates in effect for the ***Kent Fabrication plant*** are used in determining annual operating costs and are displayed in the lower right hand corner of the screen.

The software compares the nameplate full-load efficiency value against the NEMA 12-10 energy efficient motor standard and has determined that the Hydraulic motor is a standard efficiency unit.

Now that we have entered all the information and raw data for the

hydraulic motor, we are ready to ***Click*** on the ***"Save"*** [icon] ***Icon.***

# CREATING A MOTOR INVENTORY cont.

Observe (at the Nameplate tab) that the Hydraulic motor has been assigned ID #1 and that the motor Description appears in the Motor select box at the top of the screen.

Motor class information **hp, speed, and enclosure type,** is now prominently displayed on the ID line.

# CREATING A MOTOR INVENTORY cont.

## *Now lets repeat the data entry procedure for motors number two(2) through four(4)*.

*Note:* MotorMaster+ is equipped with several internal consistency checks. For instance, full-load voltage, amperage and power factor values are compared against the hp rating of the motor.  A warning appears when the values exceed preset tolerances.

**Click** on the [icon] **Edit** icon on the toolbar if you wish to modify any data.

Indicate **Routine Data Update--OK** when the **Edit Inventory Motor** popup screen appears.
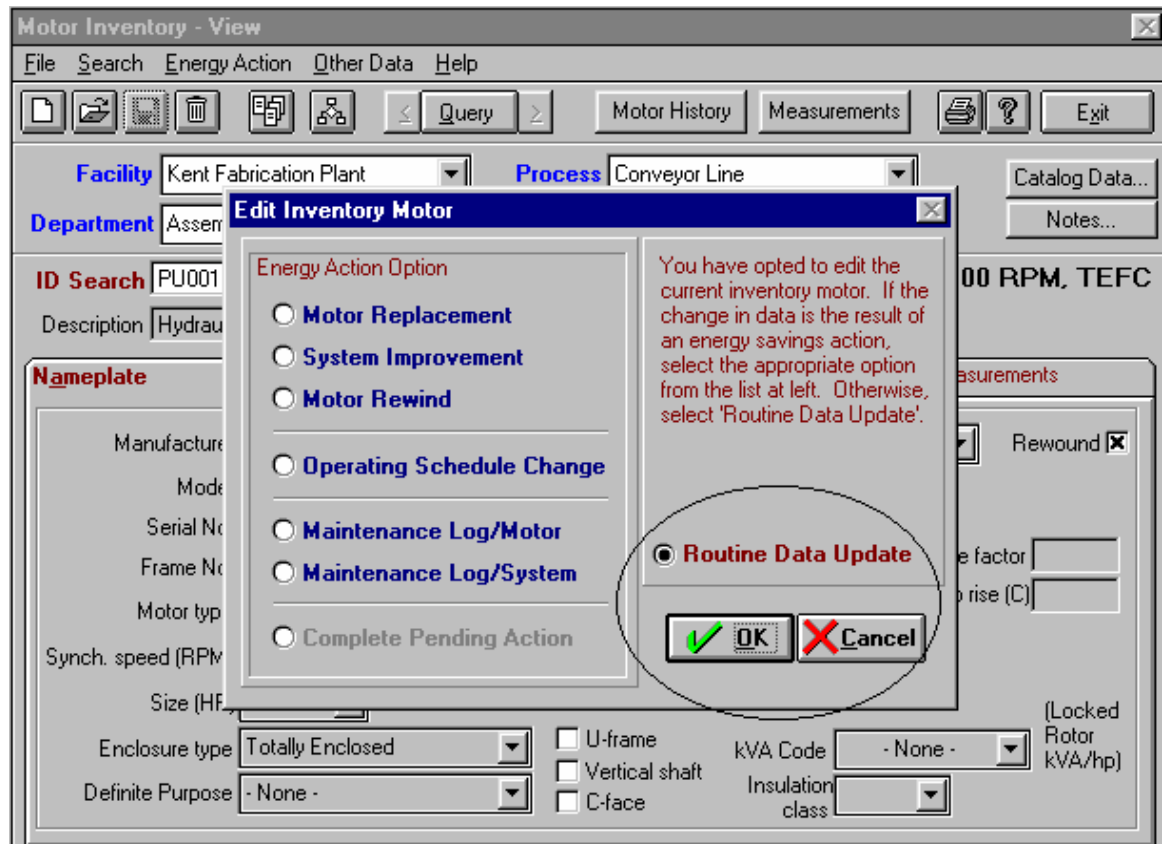
# CREATING A MOTOR INVENTORY cont.

**Replacing a Motor from the Inventory -**

Now lets return to the main menu and **click** on *Company*, and chose *General Distribution, Inc.* then return to the main menu. From the main menu press *Inventory*, and chose *motor # 90* - then from the menu bar chose "*Energy Action"*.

Under *Energy Action*, chose *Replace Motor*:
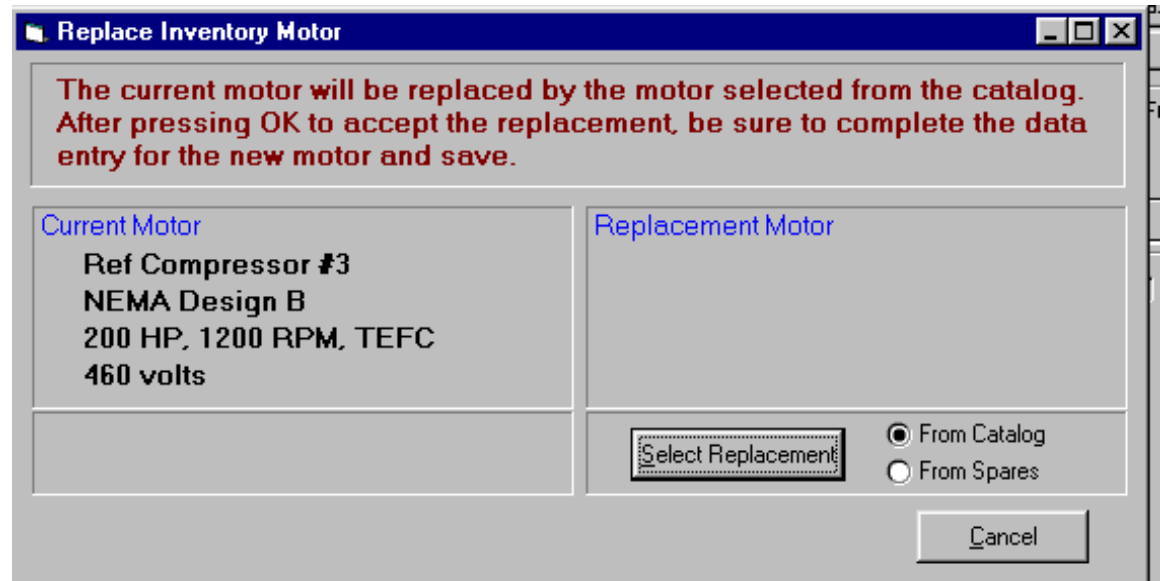


At this point you have two choices: one, select a replacement motor from the internal catalog, or from a spare from within the motor inventory.

Lets try a replacement from the Catalog, press on the "*Select Replacement*" bar, when the list appears - **chose** a replacement motor - try the Reliance P44G, highlight it and double click to lock it into the box, next press the OK bar - notice how the measurement screen opens, which requires new measurements to be taken to complete the process. Once the new voltage, current, power factor(PF), measured speed(RPM), and power draw(kW) values are known, then those values should be entered and the entire file resaved to complete the exercise. Once saved, an "Energy Action" screen appears which shows an old and new comparison of the replacement of the motor.

# Instructions for the Use of the MotorMaster Plus Condition Analysis Screens

**Presented By**

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To assist in predictive maintenance operations, MotorMaster+ now allows the user to conduct queries and print reports of motors, which exceed service limits in their most recent predictive maintenance tests. The predictive maintenance query function is accessible from either Inventory or Batch Analysis. The new query and reporting feature is organized into three predictive maintenance categories; Phase Balance, which accommodates surge test or other motor circuit analyses; Insulation Resistance, and Vibration. Separate queries and reports can be performed for each of these categories.

Select Query, then Other Criteria and check the Predictive maintenance analysis box. The Predictive Maintenance Analysis Parameters screen will appear. Select either Phase Balance (previously limited only to surge test), Insulation Resistance, or Vibration. Enter range limits as desired for the query.

To generate a report, click the printer icon when query results are listed on your screen. Then select the Predictive Maintenance Analysis "radio button" on the Print Reports screen.

Phase Balance data and query fields accept unbalance values normally expressed as a percentage. These fields are labeled for surge test or common motor circuit analyzer parameters. They may be used and queried for any parameters with values from 0.1 to 999.9.

Insulation Resistance on the Predictive Maintenance Analysis Parameters screen allows one query range value. But, there are three data cells in the Insulation Resistance data entry screen. Usually only data cell A is used, but three cells have been provided for the uncommon circumstance of users isolating phases during insulation testing. The query will list a motor if any cells, A, B, or C have a non-zero value lower than the query range value. The fields and query may be used for any parameters or units with values from 0.1 to 9999.9.

The Vibration Test data and query function are also flexible with respect to parameters and units. The data entry screen has been modified to show that the second column may be used either for the end bracket of a frequency range or another parameter such as ODE axial vibration. The vibration test allows one to four frequency bands to be used in a single record. The query operates from a single range limit per column and checks to see if any line in the column contains an over-range value. The variables have been dual-labeled for consistency with past labeling and newer conventions. Actually, the user may utilize the data fields for any parameters or units with values from 0.0001 to 9999.9999.

This predictive maintenance feature is less restrictive in terms of parameters than earlier versions. Labeling convention retains a connection to earlier versions while also showing newer conventions. Any parameters and units can be stored in the data entry fields and the query range fields as long as consistency is maintained.

Data Input

From the main screen select "**Inventory**"



Once all of the data has been entered into inventory, select the **Energy Action** pull-down menu in the inventory screen for the motor that you are entering data for. Select **Maintenance Log/ Motor** from the pull-down list.
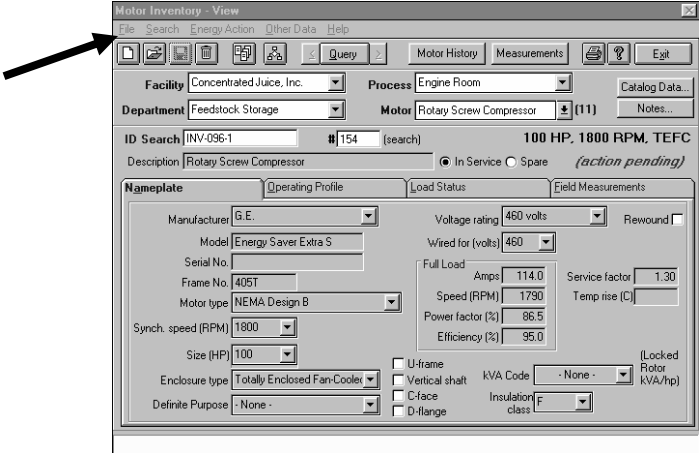


You will end up in the Motor Maintenance Management screen:

You must enter a title for this screen.  You may also enter notes and any associated costs for the analysis.

First, select Insulation Resistance to enter your Meg-Ohm readings:



Enter the Meg-Ohm test voltage and winding temperature, if available. You can enter the Meg-Ohm value for the motor in any or all three of the fields labeled A; B; and , C.  The minimum acceptable value is an option.

When finished, close this form by selecting **OK** and then select **Surge**. Surge is the Phase balance portion of the data entry.

For the purposes of the PAT, the DC test voltage is not required.  Enter in your maximum percent unbalance for resistance, inductance and impedance in the appropriate fields.  If you are using the TREND 2000 software, enter in the values from R4, L4 and Z4 in the motor table.

| wr | R4 | Z4 | L4 |
|---|---|---|---|
|  | 0.09 | 1 | 1.02 |
|  | 0.01 | 1 | 1.36 |
|  | 0.05 | 1 | 1.36 |

Note that all the fields do not need to be filled in, nor do all of the tests. Close the form by selecting **OK.**

Open the Vibration Analysis portion by selecting **Vibration** in the Motor Maintenance Log screen.

Enter the appropriate data and select **OK.** In the Motor Maintenance screen, select the save icon and continue.

Batch Analysis

In the main MotorMaster Plus screen, select **Batch Analysis.**



In the Batch Analysis screen, first select **Clear**, enter in your criteria, then select **Other Criteria**
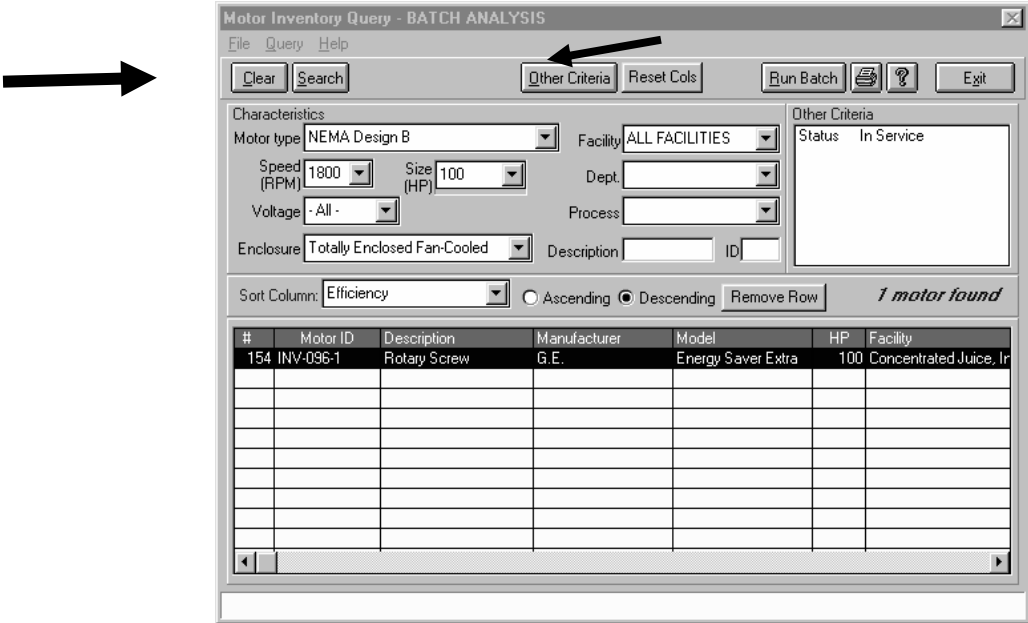


In this screen, select your voltage unbalance, etc., as necessary, then select **Predictive Maintenance Analysis**. In this screen, you will only be

able to select one kind of analysis at a time, such as **Phase Balance**, **Insulation Resistance** or **Vibration**. Enter in one or all readings for each selection, then select **OK**. Continue with the Batch Analysis as you would otherwise. It will only select the motors that fall outside your criteria.

ADDITONAL REPORT GENERATION

**MotorMaster+ Report Generation**

The analysis procedure will consist of using MotorMaster+ to generate a sequence of Lists and Reports that will be included as attachments to the PAT customer report. In this document, a "List" is defined as simply a list of motors that meet certain criteria. A "Report" is a list of motors that meet certain criteria along with an economic evaluation of replacing these motors either now or in the future with higher efficiency motors.

It is anticipated that the analysis procedure will be carried out by generating the following lists and reports in this sequence.

- **Surveyed Motors List** – List of all motors surveyed.

- **Collected Data List** – List of all motor data collected.

- **Voltage Unbalance List** – List of all motors with a voltage unbalance at or above a set criterion.

- **Oversized/underloaded Motor Report** - Report of all oversized motors at or above a set criterion.

- **Overloaded Motor Report** - Report of all motors overloaded at or above a set criterion.

- **Vibration Unbalance List** – List of all motors with vibration levels at or above a set criterion.

- **Phase Unbalance Test Report** - Report of all motors with a phase unbalance at or above a set criterion.

- **Meg-Ohm Meter Test Report** - Report of all motors with a Meg-Ohm meter test reading at or below a set criterion.

- **Replace Existing Motor Report –** Batch analysis on the whole population of motors excluding the ones identified for other action in the above reports.

**Surveyed Motor List**

The following are the steps required to generate the list of surveyed motors:

1) From the main MotorMaster+ window click on the "Inventory" Button. This will bring up the Motor Inventory window.

2) From the Motor Inventory window click on the "Query" button. This will bring up the Motor Inventory Query window.

3) From the Motor Inventory Query window click on the "Clear" button followed by the "Search" button. When these actions are completed a message will appear indicating the number of motor found. This number should correspond to the total number of motors surveyed and entered into the Inventory.

4) Sort the motors in ascending order by Facility/Dept/Process by selecting this option from the sorting controls.

5) Click on the "print" icon to bring up the "Print Reports" window. The input field labeled "Title 1" will be displaying a message stating "Inventory Query – List". Replace this title with the Company Name or Facility Name. Type "Surveyed Motors List" in the input field labeled "Title 2". Fill in the input fields labeled "Prepared for" and "Prepared by" with the appropriate information.

6) Click on the "Print" button. This will bring up the "Print Preview" window with the message "Preparing report".

7) Click on the "Print" button and the Surveyed Motors List will be printed.

**Collected Data List**

To generate this list, follow the steps outlined for generating the Surveyed Motors List with the following exception.

Step 5 In the "Print Reports" window, select the "Measurements/Calculations" report by clicking on the radio button opposite this selection.

The input field labeled "Title 1" will be displaying a message stating "Inventory Query – Measurements/Calculations". Replace this title with the Company Name or Facility Name. Type "Surveyed Motors – Measurements/Calculations" in the input field labeled "Title 2".

**Voltage Unbalance List Generation Procedure**

The Voltage Unbalance List should be used to alert the user to a potential problem with a motor and/or the electrical supply system and serve as an indicator for an Advanced Survey. Including this list in the PAT report gives the customer a list of motors that bear further scrutiny or monitoring.

The following are the steps required to generate the Voltage Unbalance List:

1) From the main MotorMaster window click on the "Inventory" button. This will bring up the Motor Inventory window.

2) From the Motor Inventory window click on the "Query" button. This will bring up the Motor Inventory Query window.

3) From the Motor Inventory Query window click on the "Clear" button followed by the "Other Criteria" button. When these actions are completed, the "Additional Inventory Query Parameters" window will be opened.

4) Under the window area labeled "Range Checks" is an input field labeled "Voltage Unbalance (%) >=". Enter percentage voltage unbalance threshold value (5% recommended as typical value) in this field and then click on the "OK" icon. When these actions are complete, the Motor Inventory Query window will again be displayed with all the motors that have a voltage unbalance at or above the threshold value.

5) Now sort the motors in ascending order by Facility/Dept/Process by selecting this option from the sorting controls.

6) Now click on the "Print" icon to bring up the "Print Reports" window.

7) In the "Print Reports" window select the "Motor Inventory Query – List" report by clicking on the radio button opposite this selection. The input field labeled "Title 1" will be displaying a message stating "Inventory Query – List". Replace this title with the Company Name or Facility Name. Type "Motors With Voltage Unbalances Exceeding [threshold]" in the input field labeled "Title 2". Fill in the input fields labeled "Prepared for" and "Prepared by" with the appropriate information.

8) Click on the "Print" button. This will bring up the "Print Preview" window with the message "Preparing report".

9) Click on the "Print" button and the report will be printed.

**Oversized/Underloaded Motors Report Generation Procedure**

The Oversized/underloaded Report serves both as a list of the motors that meet this criterion and as a report on the cost and energy savings that will result through an efficiency upgrade.

In generating this report the assumption is being made that all the motors that meet the set criterion are candidates for immediate replacement. Therefore, we will be running a batch analysis report using the "Batch Analysis"/"Replace" option. The Replace analysis considers the installation costs which are incurred.

Steps required to generate the Oversized/underloaded Report:

1) From the main MotorMaster window click on the "Batch Analysis" button. This will bring up the "Motor Inventory – Batch Analysis" window.

2) From this window, click on the "Clear" button followed by the "Other Criteria" button. When these actions are completed the "Additional Inventory Query Parameters" window will be opened.

3) Under the window area labeled "Range Checks" is an input field labeled "Oversized/underloaded (%) <=". Enter the threshold value (40% suggested) in this field and then click on the "OK" icon. When these actions are complete the "Motor Inventory Query – Batch Analysis" window will again be displayed with all the motors that meet or fall below the selected threshold value.

4) Sort the motors in ascending order by Facility/Dept/Process by selecting these options from the sorting controls.

5) Click on the "Run Batch" icon. This will bring up the "Batch Analysis Setup" window.

6) In the "Batch Analysis Setup" window under the window area titled "Load Estimation Technique", click on the "kW calculation" radio button and the check box labeled "use default load for missing value". In the window area titled "Defaults" set the appropriate default load (75% suggested) and the maximum allowable years for a payback. Now click on the "Replace Existing" radio button and then click on the "Batch Run" button. This will bring up the "Print Batch Analysis Report" window.

7) In the "Print Batch Analysis Report" window, the input field labeled "Title 1" will be displaying a message stating "Inventory Query – Batch Analysis". Replace this title with the Company Name or Facility Name. Type "Oversized/underloaded Motors" in the input field labeled "Title 2". Fill in the input fields labeled "Prepared for" and "Prepared by" with the appropriate information.

8) Click on the "Print" button. This will bring up the "Print Preview" window with the message "Preparing report". This message will be displayed until all calculations have been completed.

9) In the "Print Preview" window, click on the "Report" button and then on the printer icon. The report will now be printed.

**Overloaded Motors Report Generation Procedure**

The Overloaded Motors Report serves both as a list of the motors that are overloaded above the set criterion and as a report on the cost and energy savings that will result through an efficiency upgrade.

It should be noted that the report generated by MotorMaster+ will list all the motors that meet the specified criterion, some of which will have a message stating "No payback yielded by motors compared". This statement does not mean that the motor should not be replaced, it simply means that no energy or cost savings are available through an efficiency upgrade.

In order to generate this report, follow the same procedure as outlined for the Oversized/underloaded Report with the following exceptions:

- **Step 3:** Under the window area labeled "Range Checks" is an input field labeled "Overloaded (%) >=". Enter the threshold value (105% suggested) in this field and then click on the "OK" icon. When these actions are complete the "Motor Inventory Query – Batch Analysis" window will again be displayed with all the motors that meet or fall below the selected threshold value.

- **Step 7:** In the "Batch Print Analysis Report" the input field labeled "Title 1" will be displaying a message stating "Inventory Query – Batch Analysis". Replace this title with the Company Name or Facility Name. Type "Overloaded Motors" in the input field labeled "Title 2". Fill in the input fields labeled "Prepared for" and "Prepared by" with the appropriate information.

**Elevated Vibration List Generation Procedure**

In order to generate this list, follow the same procedure as outlined for the Voltage Unbalance List with the following exceptions:

- **Step 3:** Under the window area labeled "Range Checks" is an input field labeled "Vibration (in/sec) >=". Enter the threshold value in this field and then click on the "OK" icon. When these actions are complete, the Motor Inventory Query window will again be displayed with all the motors that meet or fall above the selected threshold value.

- **Step 6:** In the "Print Reports" window select the "Motor Inventory Query – List" report by clicking on the radio button opposite this selection. The input field labeled "Title 1" will be displaying a message stating "Inventory Query – List". Replace this title with the Company Name or Facility Name. Type "Motors with Elevated Vibration Levels" in the input field labeled "Title 2". Fill in the input fields labeled "Prepared for" and "Prepared by" with the appropriate information.

**Phase Unbalance Report Generation Procedure**

The Phase Unbalance Report serves both as a list of the motors that have a phase unbalance above the set criterion and as a report on the cost and energy savings that will result through an efficiency upgrade.

It should be noted that the report generated by MotorMaster+ will list all the motors that meet the specified criterion, some of which will have a message stating "No payback yielded by motors compared". This statement does not mean that the motor should not be replaced, it simply means that no energy or cost savings are available through an efficiency upgrade.

In order to generate this report, follow the same procedure as outlined for the Oversized/underloaded Report with the following exceptions:

- **Step 3**:Under the window area labeled "Range Checks" is an input field labeled "Phase Unbalance (%) >=". Enter the threshold value in this field and then click on the "OK" icon. When these actions are complete the "Motor Inventory Query – Batch Analysis" window will again be displayed with all the motors that meet or fall below the selected threshold value.

- **Step 7**:In the "Batch Print Analysis Report" the input field labeled "Title 1" will be displaying a message stating "Inventory Query – Batch Analysis". Replace this title with the Company Name or Facility Name. Type "Motors with Phase Unbalance" in the input field labeled "Title 2".

**Meg-Ohm Meter Test Report Generation Procedure**

The Meg-Ohm Meter Report serves both as a list of the motors that have a Meg-Ohm meter reading above the set criterion and as a report on the cost and energy savings that will result through an efficiency upgrade.

It should be noted that the report generated by MotorMaster+ will list all the motors that meet the specified criterion, some of which will have a message stating "No payback yielded by motors compared". This statement does not mean that the motor should not be replaced, it simply means that no energy or cost savings are available through an efficiency upgrade.

In order to generate this report, follow the same procedure as outlined for the Oversized/underloaded Report, with the following exceptions:

- **Step 3**:Under the window area labeled "Range Checks" is an input field labeled "Meg-Ohms <=". Enter the threshold value in this field and then click on the "OK" icon. When these actions are complete the "Motor Inventory Query – Batch Analysis" window will again be

displayed with all the motors that meet or fall below the selected threshold value.

- **Step 7**:In the "Batch Print Analysis Report" the input field labeled "Title 1" will be displaying a message stating "Inventory Query – Batch Analysis". Replace this title with the Company Name or Facility Name. Type "Motors with Low Meg-Ohm Meter Readings" in the input field labeled "Title 2".

## Replace Existing Motors Report Generation Procedure

The steps required to generate the Replace Existing Motor Report are as follows:

1) From the main MotorMaster window click on the "Batch Analysis" button. This will bring up the "Motor Inventory – Batch Analysis" window.

2) From this window click on the "Clear" button followed by the "Search" button.

3) Sort the listed motors in ascending order by Motor # or Motor ID by selecting these options from the sorting controls. Review the motors listed in previous reports, locate them in the list and highlight the row by clicking on that row. Remove the selected motor by clicking on the "Remove Row" button. Continue removing rows until all previously reported motors are eliminated.

4) Click on the "Run Batch" icon. This will bring up the "Batch Analysis Setup" window.

5) In the "Batch Analysis Setup" window under the area titled "Load Estimation Technique" click on the "kW calculation" radio button and the check box labeled "use default load for missing value". In the window area titled "Defaults" set the appropriate default load (75% suggested) and the maximum allowable years for a payback.  Now click on the "Replace Existing" radio button  and then click on the "Batch Run" button. This will bring up the "Print Batch Analysis Report" window.

6) In the "Print Batch Analysis Report" window, the input field labeled "Title 1" will be displaying a message stating "Inventory Query – Batch Analysis". Replace this title with the Company Name or Facility Name. Type "Replace Existing Motors Analysis" in the input field labeled "Title 2". Fill in the input fields labeled "Prepared for" and "Prepared by" with the appropriate information.

7) Click on the "Print" button. This will bring up the "Print Preview" window with the message "Preparing report". This message will be displayed until all calculations have been completed.

8) In the "Print Preview" window, click on the "Report" button and then on the printer icon. The report will now be printed.