Appendix 1
Calculating Efficiency and Energy Use

This worksheet is useful for summarizing motor information and using it to calculate the efficiency and energy use in order to assess equipment.

Date _____

General Data

Serving Electrical Utility _____

Energy Rate ($/kWh) _____

Monthly Demand Charge ($/kW/mo.) _____

Application _____
Type of equipment that motor drives

Coupling Type _____

Motor Type (Design A,B,C,D AC, DC, etc.) _____

Motor Purchase Date / Age _____

Rewound ☐ Yes ☐ No

Motor Nameplate Data

1. **Manufacturer** _____
2. **Motor ID Number** _____
3. **Model** _____
4. **Serial Number** _____
5. **NEMA Design Type** _____
6. **Size (hp)** _____
7. **Enclosure Type** _____
8. **Synchronous Speed (RPM)** _____
9. **Full-Load Speed (RPM)** _____
10. **Voltage Rating** _____
11. **Frame Designation** _____
12. **Full-Load Amperage** _____
13. **Full-Load Power Factor (%)** _____
14. **Full-Load Efficiency (%)** _____
15. **Service Factor Rating** _____
16. **Temperature Rise** _____
17. **Insulation Class** _____
18. **kVA Code** _____

Motor Operating Profile

		Weekdays Days/Year	Wknd/Holiday Days/Year
Hours Per Day	1st Shift	_____	_____
	2nd Shift	_____	_____
	3rd Shift	_____	_____

Annual Operating Time _____ **hours/year**

Type of load (Place an "X" by the most appropriate type)

____ 1. **Load is quite steady, motor "On" during shift**

____ 2. **Load starts, stops, but is constant when "On"**

____ 3. **Load starts, stops, and fluctuates when "On"**

Answer the following only if #2 or #3 above was selected:

% of time load is "on" ____%

Answer the following only if #3 was selected:

Estimate average load as a % of motor size____%

Measured Data

Supply Voltage

By Voltmeter

Line-to-Line: V_{ab} _____, V_{bc} _____, V_{ca} _____

V_{avg} _____

Input Amps

By Ampmeter

A_a _____

A_b _____ A_{avg} _____

A_c _____

Power Factor (PF) _____

Input Power (kW) _____

If available. Otherwise equal to:

$$V_{avg} \times A_{avg} \times PF \times \sqrt{3} / 1000$$

Motor Operating Speed _____

By Tachometer

Driven Equipment Operating Speed _____

Basic Calculations for Motors

Calculating Annual Energy Use and Cost

Input Power (kW)_____

Annual Energy Use _____
Input Power x Annual Operating Hours

Annual Energy Cost _____
Annual Energy Use x Energy Rate

Annual Demand Cost _____
Input Power x Monthly Demand Charge x 12

Total Annual Cost _____
Annual Energy Cost + Annual Demand Cost

Determining Motor Load and Efficiency

Load _____
Input Power (kW) / [Motor size (HP) x 0.746 / Efficiency at Full Load]

Motor Efficiency at Operating Load _____
Obtain from manufacturer or Table of Average Efficiencies

Energy Savings and Value for Replacement Motors

kW Saved _____
Input Power – [Load x HP x 0.746 / Efficiency of Replacement Motor@ Load Point]

kWh Saved _____
kW saved x Annual Operating Hours

Total Annual Savings $ _____
(kW saved x 12 x Monthly Demand Charge) + (kWh saved x Energy Rate)

Economic Justification for Replacement Motors

Cost for Replacement Motor _____
(or Incremental Cost for New Motor)

Simple Payback (years)_____
(Cost for Replacement Motor + Installation Charge – Utility Rebate) / Total Annual Savings