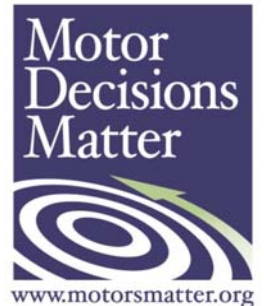


Motor Energy Management: Opportunities for Energy and Cost Savings

Bill Colton

District Manager

Baldor Electric Company

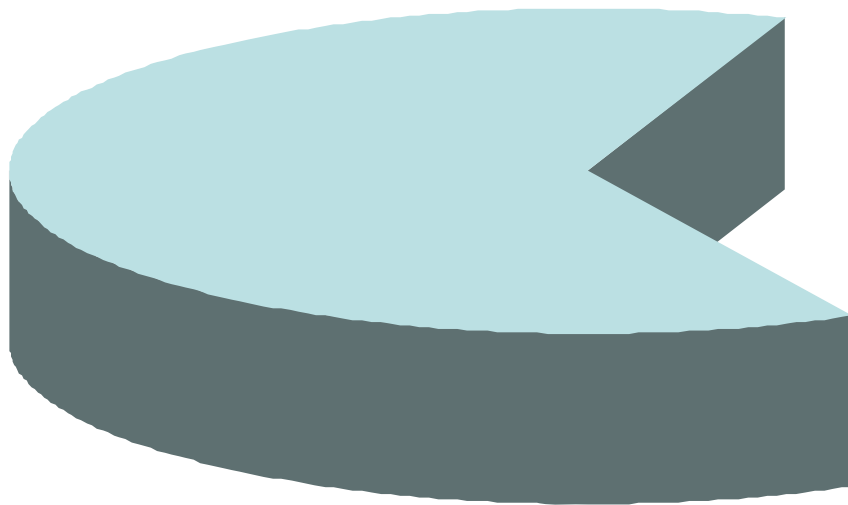


Presentation Outline

- Estimating Lifetime Motor Costs
- Understanding NEMA Premium motors
- Motor System Optimization Opportunities
- Energy Independence and Security Act of 2007



Why Energy Efficient Electric Motors?



Electric motors consume
63% of the electricity
used by American
industry

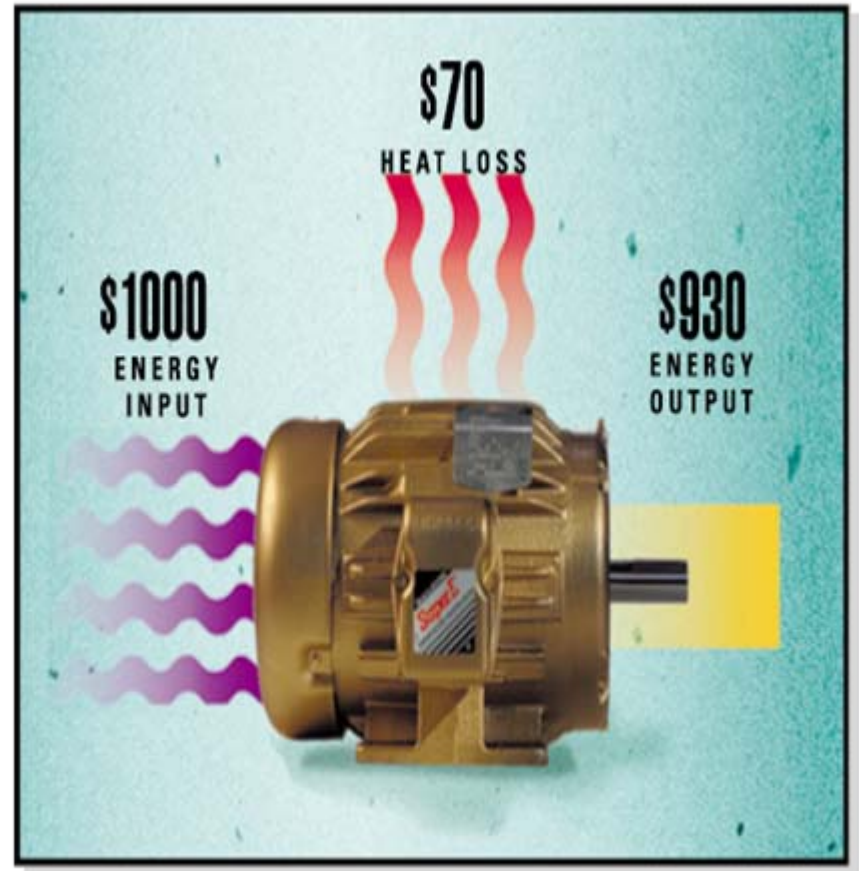
Source: U.S. Department of Energy, 2002

Savings Opportunity

- U.S. DOE estimated annual savings:
 - 62 – 104 billion kWh in electricity
 - 15.3 – 26 million metric tons of carbon CO₂
 - Remove 3.2 – 5.4 million cars from the road
 - \$3 – 5 billion savings

Motor Electricity Usage

- All of the electricity that enters a motor is either lost as heat or converted into mechanical energy (torque).
- The heat produced must be removed.



Compare Auto Life Cycle Costs

	Pickup	Hybrid Auto
Purchase Price	\$18,995	\$22,600
Less federal rebate	\$0	\$525-\$2,100
Net purchase price	\$18,995	\$20,500-\$22,075
Annual use	15,000mi.	15,000 mi.
Efficiency	17 MPG	45 MPG
Fuel/Energy Cost	\$4.00/gal.	\$4.00/gal.
Annual operating cost	\$3,528	\$1,332
5 year operating cost	\$17,640	\$6,660
Less than 17 months to pay back additional cost of more expensive hybrid auto.		

Compare Auto Costs to Motor Costs

	Hybrid Auto	50 HP motor
Purchase Price	\$22,600	\$2,280
Less federal rebate	\$525-\$2100	\$0
Net purchase price	\$20,500-\$22,075	\$2,330
Annual use	15,000 mi.	8760 hrs.
Efficiency	45 MPG	0.936
Fuel/Energy Cost	\$4.00/gal.	\$0.08/kWh
Annual operating cost	\$1,332	\$25,932
Annual operating cost as a % of purchase price	~6.0-6.5%	~11.2 times

Compare Auto Costs to Motor Costs

	Hybrid Auto	50 HP motor
Purchase Price	\$22,600	\$2,280
Less federal rebate	\$525-\$2100	\$0
Net purchase price	\$20,500-\$22,075	\$2,330
Lifetime Use	150,000 Miles	131,400 hrs.
Efficiency	45 MPG	0.936
Fuel/Energy Cost	\$4.00/gal.	\$0.08/kWh
Lifetime operating cost	\$13,333	\$388,980
Energy as percentage in cost of ownership	39%	99.40%

Life Cycle Cost Energy Savings

200 HP, 4 pole operating costs	Pre-EPAct efficiency (average)	EPAct efficiency motor	NEMA Premium® Efficiency motor
Efficiency	93.5	95.0	96.2
Est. Op. Cost/Yr.: <i>Continuous op. at \$0.10/kWh</i>	\$139,785	\$137,578	\$135,862
Est. Annual Savings		\$2,207	\$3,923
Est. Savings over motor life (20yrs.)		\$44,140	\$78,460

More to the Story

- Premium Efficient Motors run cooler (less losses)
 - Increase in motor insulation life
 - Decrease in heat related bearing grease degradation
 - Generally run cooler on Adjustable Speed Drives due to lower eddy current losses

More to the Story

- Part of life cycle cost is disruption to work due to downtime.
- Keeping equipment running increases the efficiency of your operation
 - Helps meet customer deadlines
 - Reduces employee stress
 - Increases Bottom line

Use a Systems Approach

- Look for system losses and attack areas of wasted energy
 - Sharp bends and restrictions in piping and duct work
 - Efficiency of gearing and power transmission
 - Turn off when not needed! A non energized motor is 100% efficient
 - Consider the potential of speed adjustment on processes and energy consumption



NEMA

- Who is NEMA
 - National Electrical Manufacturer's Association
- Are there others and are they the same?
 - IEC
 - JEC
- What is NEMA Premium?
- How do I know if a motor meets this?

Energy Independence and Security Act of 2007

- Effective Date
 - December 19, 2010
- What are the efficiency standards
 - Nema Premium – Standard 3 digit frames
 - Energy Efficient – previously uncovered motors (Epact)
 - U-Frames
 - Design C
 - Close-coupled pump motor
 - Footless motor
 - 8 pole motor

Energy Independence and Security Act of 2007

- Motors NOT covered by EISA
 - Design D – high slip
 - Adjustable speed with optimized windings
 - Custom OEM mountings
 - Intermittent Duty
 - Submersible
- Are motors on OEM equipment included?
 - Yes

Energy Independence and Security Act of 2007

- Does EISA include IEC frames?
- Does EISA include both stock and custom motors?
- Does EISA apply to motors manufactured outside the USA and imported for domestic use?
- Does EISA require any motors in use to be replaced?