Whole System Approach to Improving Efficiency in Industrial Facilities

Motor System Savings Opportunities post EISA

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Overview

- What are the implications & consequences of EISA
- What does the C&I motor population look like after a decade + of program influence?
- Where are the energy savings in motor systems now?
- Various approaches to energy savings and collaboration

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Implications of EISA

- NEMA Premium® became Federal standard on 19 December 2010 through EISA Legislation
  - Goal: Improve national motor efficiency over time through attrition
- EPAct class motors still for sale until inventories consumed
- Increased expense of NEMA may force end users to repair more old, inefficient motors versus replace
- Expanded coverage, but still does not cover all classes of motors

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NYS Motor Inventory Analysis

HP	Total Motors	Total F	Savings kW	Savings kWh
1	935	708	15.74	94,823.08
1.5	617	499	13.63	73,377.97
2	877	723	25.76	138,576.56
3	986	611	30.15	155,037.98
5	1,534	916	59.65	332,538.20
7.5	1,033	552	58.27	303,566.39
10	862	429	54.85	317,656.12
15	764	330	51.26	301,487.21
20	469	229	51.66	307,213.08
25	375	119	29.55	155,093.72
30	430	163	40.40	260,437.20
40	389	176	48.02	292,990.01
50	214	78	33.73	224,647.17
60	180	45	22.63	163,069.77
75	165	42	19.01	134,509.21
100	186	56	33.67	245,704.91
125	96	40	26.41	189,842.57
150	114	34	23.83	195,756.61
200	73	7	8.82	75,392.91
Total	10,299	5,757	647.06	3,961,720.68

% NEMA at Fail: 55.9%

Total kW Savings: 1,388.88

HP	Total R	Savings kW	Savings kWh
1	70	5.22	45,207.16
1.5	40	3.97	33,528.75
2	26	4.16	34,428.48
3	150	24.59	197,135.16
5	255	58.96	474,467.27
7.5	188	148.09	1,254,616.80
10	165	85.65	691,068.97
15	132	78.49	629,113.42
20	57	37.14	291,743.15
25	40	34.80	268,388.63
30	63	56.92	383,065.87
40	47	48.46	329,289.08
50	26	36.48	300,495.05
60	9	14.47	110,413.09
75	13	23.45	148,125.96
100	16	36.68	305,255.35
125	6	13.49	102,012.42
150	5	13.95	105,655.00
200	2	16.83	94,696.73
	1,310	741.82	5,798,706.35

% Retrofit: 12.7%

Total kWh Savings: 9,760,427.04

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Observations

- In NYS 80+% of motors are not NEMA Premium
  - Eventually will be replaced with NEMA Premium through attrition, BUT
  - Motors are being repaired, not replaced – could increase after EISA
  - Old, inventoried motors are being used as replacements
- NEMA Premium represents only a 0.5 – 4.0% efficiency gain
- System Approach can obtain 10-50+% efficiency gains
- 60+% of motors are driving centrifugal / variable loads
  - Yet, many of these applications are not controlled by VFD
- Existing and emerging technologies can be implemented

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Various Opportunities

- Retrofits to accelerate migration to NEMA Premium
- Definite and special purpose motors and Type 2 motors.
- Permanent Magnet motors
- System Approaches
  - VFD
  - Synchronous belting
  - Synthetic lubricants
  - Helical gearing
- Efficient motor repair
  - Even low HP motors are being rewound/repaired due to first cost, mis-information and not having analysis tools like Motor Master.
- Motor Inventories and Best Practice Motor Management Training

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Examples

- Properly programmed VFD can save 20-50%, including ability to stop the process when not in use.
- Synchronous belting can obtain 5+% in decreased losses
- Synthetic lubricants can obtain 5-10% in decreased losses
- Helical (vs. worm) gearing can save 20-30%
- Direct Drive PM motors (embedded controls) 20-50%*
- Hasbro, Longmeadow MA
  - Retrofit 40 air handlers with VFD and synchronous belting
  - Actual measured system savings of 20-30+%
  - Greatly reduced maintenance

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* Over replaced existing fixed speed

Value of Facility Assessments

- System opportunities can be obtained now, even though motor populations may be pre-NEMA for years to come.
- Using Motor Audits as a means of gaining access to facilities and personnel – Management, Purchasing, C-Level
- Best Practice Motor Management training
- Shepherd opportunities to DOE IAC, E3, Utility program, etc.
- Collaborative effort between end user and motor service provider

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Thank you

Questions or Comments?

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