May 2018 Newsletter

The AFE Chapter 140 newsletter is back. It not only includes greetings from our President Steve Bellemore, but member meeting details and schedule, chapter board meeting schedule, information on our certification programs, who our sponsors are and a technical paper. We are also looking for feedback as to what you would like to see included in the newsletter. We have a wide variety of technical white papers available. If you have a certain topic you would like to see covered, let us know. Please forward comments to either Steve Bellemore at steven.r.bellemore@baesystems.com, or Ed Gagnon at edgagnon78@gmail.com.

AFE Mission Statement

The Association for Facilities Engineering (AFE) is a professional membership and certification organization. We bring together professionals who ensure the optimal operation of high-rise commercial real estate, commercial and industrial plants, campuses of higher education, medical centers, offices at Fortune 500 companies, and (classified/non-classified) government facilities from around the world. All look to AFE as the leading technical and certification resource for facilities engineering. AFE's mission is to provide trade-craft related facilities maintenance to industry professionals worldwide.

President's Message

First, I would like to personally invite all members and guest members to join us for our exciting 2018 tours! I am excited to see what great tour this year will bring. It's always a great time socializing and networking with a wonderful group of professionals like the ones in Association for Facility Engineering chapter 140! We had several outstanding tours and we are very much looking forward to another successful year in 2018.

The Association for Facility Engineering (AFE) is all about networking and learning as a group of professionals. I have always said "You get out what you put in," and I encourage all of you to attend as many of our monthly meetings as possible and to give your Board of Directors feedback about what you want to see in future tours and meetings.

I ask you to please encourage the younger workforce and get them involved in the Chapter events — even if it's just forwarding our monthly newsletter so they see what fun we are having! We need more youth to help take on some roles and responsibilities going forward. Facilities professionals are retiring everyday with not enough qualified people to fill the spots.

Thank you to everyone who supported and contributed to the Association for Facility Engineering Chapter 140 in 2017! Please see our website for a list of supporting companies.

We are always looking for volunteers to become involved in the Board and help plan events and tours. If you are interested, please let one of the Board Members know at the next meeting.

I look forward to seeing all of you at our next meeting!

Steve

Steve Bellemore, CPMM
AFE Chapter 140 President
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Upcoming Chapter 140 Meetings and Events

Upcoming Monthly Meetings

May 2, 2018 – 5:30 PM
911 Emergency Call Center at 33 Hazen Drive, Concord, NH
Dinner technical presentation by Ed Gagnon on AFE's certification programs.

May 30, 2018 - Tour of Electronics for Imaging, Inc. in Londonderry

June 20, 2018 – Tour of new central distribution center of F.W. Webb in Londonderry

July 2018 – no meeting

August 2018 – Boat cruise on Sunapee Lake – date TBD

September 26, 2018 - Tour of the Micro Electronics Center at BAE Systems in Nashua

October 24, 2018 – Tour of Southern NH Hospital in Nashua

November/December 2018 – Member social date TBD

January 23, 2019 – Tour of Pat's Peak ski mountain operations in Henniker

View our calendar online.

If you have places of interest, or wish to host a tour of your facility, please contact any member of the AFE 140 Board of Directors.

Board Meeting Schedule

All AFE Chapter 140 members are welcome to attend any board meeting.

Meetings will be held at the new Electronics for Imaging facility at 12 Innovation Way in Londonderry, just off Pettengill Rd near the airport. Meetings start at 5:30 PM.

Dates are as follows:

5-9-18	8-1-18	11-7-18
6-6-18	9-5-18	12-5-18
7-11-18	10-3-18	

Our Sponsors

Companies wishing to place an ad in our newsletters good for 1 year for a price of $200, or by sponsoring a chapter meeting. Contact any board member for details on where to send a check and your company logo in jpg format.

Region 8 Events and News

Certification Programs

The Certified Professional Maintenance Manager (CPMM) Review Class and exam is scheduled for Waltham, MA on November 7-8-9, 2018 (Wednesday, Thursday and Friday). Cost is $1395.00 for non-members and $995.00 for AFE members

CPMM Review Class can come to you.
The CPMM review program is now available at your place of work. A minimum of 6 participants is required for this in-house program. This program saves companies the costs of employee travel and time. Contact CPMM instructor Ed Gagnon at edgagnon78@gmail.com for more information.

Certified Professional Supervisor (CPS) certification review and exam is coming to Region 8 in 2018. We are excited to be able to add this program to our portfolio of offerings to Region 8. The CPS program is good for new and experienced supervisors. Many supervisors are promoted or hired into their positions with little guidance or understanding on their role and more importantly the legal side of job they have just undertaken. Place and date TBD. More information will be available in the June Newsletter.

Region 8 Board Meeting

The date and place for the next Region 8 Board of Directors meeting will be an announced in the next few weeks. Tentative date is June 4th. All AFE members are welcome to attend these board meetings. An email to the Alan Ouellette, Region 8 VP, or to Ed Gagnon, is required for headcount purposes.

Other Region 8 News

A review of the membership list for all Region 8 members was done over the last few weeks and members who were assigned to inactive chapters or listed as regional "at large" members have been reassigned to the closest active chapter, based on their address in the AFE member database. Any member who wishes to be assigned to a different active chapter can contact Ed Gagnon at edgagnon78@gmail.com or Bridgett Owen, *AFE National's Membership Manager, at 571-395-8774 or bridgett.owen@afe.org*.

Region 8 is now also getting requests to present selected topics from the CPMM program to facilities personnel in private companies and public institutions. We are limiting the presentations to only one or two topics. The presentations do NOT count towards a CPMM

certification, but CEU's will be given for the presentation time. Each topic will encompass about one hour of presentation time.

One example of this new service is a current project with a public institution to provide training on the Safety and Documents sections of the CPMM program, with emphasis on the legal liabilities for facilities professionals in safety response and compliance documentation. Presentations are done by AFE authorized CPMM instructor Ed Gagnon. Contact Ed Gagnon at edgagnon78@gmail.com if you are interested in more information.

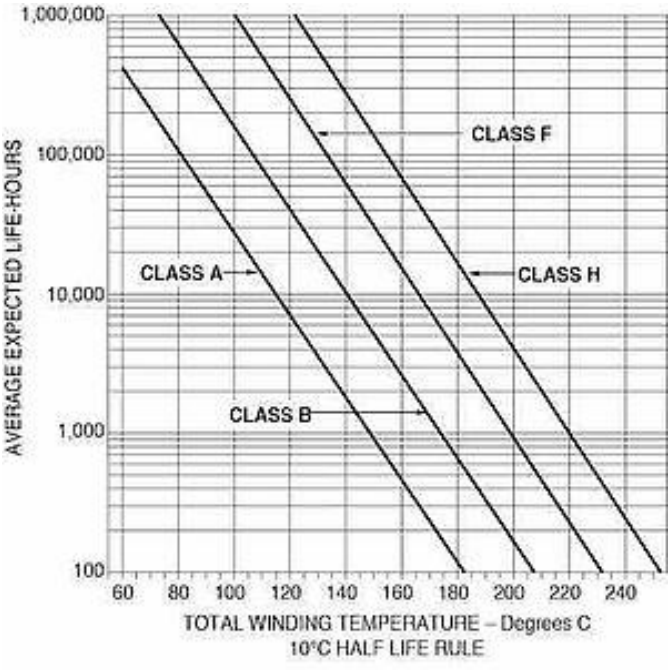
Technical Paper

From PlantEngineering.com; April 2018 Reprinted with permission.

Defining Motor Service Factor

Understanding the proper applications of motor service factor (SF) to maximize a motor's life expectancy and performance.

Jim Bryan, EASA
03/29/2018



There are many misconceptions about motor service factor (SF) in the industry. Some feel it is meant for temporary excursions into overload conditions, others consider it to be an allowance for permanent overload. The truth is that it is neither. NEMA Standard MG 1-2014: Motors & Generators defines service factor as: "*A multiplier which, when applied to rated power,*

indicates a permissible power loading that may be carried under the conditions specified for the service factor."

According to NEMA's theory of SF, a motor is thermally capable of overload to that point within the insulation class at normal service conditions.

Since any increase in load will increase the current, the SF overload condition will raise the operating temperature of the motor, which shortens its life. In fact, every increase of 10°C decreases the expected life of the motor winding by half, no matter what the cause-e.g., overload, poor ventilation, low voltage, or high ambient temperature, to name a few.

Source of heat produced in electric motors

Although motors convert input power (electricity) into mechanical work very efficiently, they, like all electromechanical devices, waste some energy in the process. This costs money and prompts lots of discussion about motor efficiency among end users and utilities. Motor efficiency can be expressed as:

% Eff = P_{out} / P_{in} or = (P_{in} - L) / P_{in}

Where:

P_{in} = Power in

P_{out} = Power out

L = Losses

The losses (L) constitute the inefficiency. Friction and windage account for some of these losses, but most of the inefficiency is due to core and winding losses (i.e., dissipated heat). The largest contributor is the winding loss, which can be expressed as:

$P_{losses} = I^2R$

Where: P_{losses} = Power lost

I = Motor load current

R = Motor winding resistance

The winding resistance (R) remains relatively constant and is a smaller factor than the load current (I). As this equation shows, the heat producing losses increase by the square of the increase in load current. The increase in current compared to load is nearly linear over short changes, so for a SF of 1.15, the load current will increase by ≈ 15%. The additional watts

produced will be 1.15^2 or 1.32 (a 32% increase), which will result in a similar increase in temperature. Table 1 shows this increase for several examples of totally enclosed fan cooled (TEFC) motors. TEFC motors will also have a greater increase in bearing temperatures than open motors because of the way they are cooled.

As mentioned earlier, every 10°C (18°F) increase in winding temperature decreases the thermal life of the insulation system by half (Figure 1), so the higher operating temperatures at SF can shorten motor life dramatically. For example, the temperature rise of the 50 hp (37.5 kW) motor in Table 1 is 75°C (135°F) at full load; if the load increases to the SF of 1.15 (57.5 hp/43 kW), it goes to 102°C (184°F)-an increase of 27°C (49°F). In that case, the motor may last only 15% as long as originally expected:

$Life_{1.15} = Life_{1.0} \times 0.5^{(\Delta T/10)} = 1 \times 0.5^{27/10} = 0.154$

Size/load	50%	100%	115%	125%
20 hp				
Avg. winding temp.	23	56	75	91
Max. rotor temp.	28	79	100	126
Max. bearing housing temp.	15	37	49	62
50 hp				
Avg. winding temp.	28	75	102	128
Max. rotor temp.	33	93	126	139
Max. bearing housing temp.	20	50	70	80
100 hp				
Avg. winding temp.	32	64	80	94
Max. rotor temp.	39	84	107	127
Max. bearing housing temp.	21	41	51	60
200 hp				
Avg. winding temp.	31	69	80	108
Max. rotor temp.	39	98	130	160
Max. bearing housing temp.	17	37	48	58

IEEE 841 TEFC, 4 pole, 460V
Notes: Bearing housing temperature is the drive end bearing. Maximum rotor temperature is in the rotor bar. These temperatures are the rise above ambient.

If the theoretical life expectancy of this motor was 10 years, it could be expected to last 1.5 years when operated continuously at the SF load. Although many other factors may also affect motor life, this example illustrates how important temperature considerations are in the proper application of the equipment.

A motor with Class F insulation can be rewound with Class H to help accommodate the higher temperature. This will improve the overall life expectancy of the motor, but will not lessen the impact of the overload condition. For instance, it may increase the theoretical expected life to 15 years, yet at SF the motor would only last 2.3 years.

Practical application of SF

As mentioned earlier, NEMA's definition of SF contains the phrase "normal service conditions." These conditions include operation at rated voltage and frequency, at a maximum of 40°C (104°F) ambient, and a maximum altitude of 3,300 ft (1,000 m). Only under these conditions is the motor capable of handling the full SF overload. According to NEMA, the motor can perform successfully at ±10% of rated voltage, it adds the caveat that operation at other than rated voltage may affect performance. SF is included in the performance that is affected.

Another way to view the SF is as protection for the motor's performance and life expectancy during excursions into other than normal service conditions. If a motor has a SF of 1.15 but operates at rated load, for instance, lower than rated voltage will not have much negative impact on performance. Since motors rarely operate at rated voltage, it is a poor design choice to have the motor operate continually in SF.

Operating in the SF also affects motor performance in other ways. NEMA MG 1-2014, 14.37.1 says:

"*When the motor is operated at any service factor greater than 1, it may have efficiency, power factor, and speed different from those at rated load, but the locked rotor torque and current and breakdown torque will remain unchanged. A motor operating continuously at any service factor greater than 1 will have a reduced life expectancy compared to operating at rated nameplate horsepower. Insulation life and bearing life are reduced by the service factor load*."

If an application requires 110 brake HP (82 kW), it may be tempting to reduce the initial cost of the project by using a 100 hp (75 kW) motor and operating it in SF. A much better choice for this application, however, would be a 125 hp (93 kW) motor. Correctly matching the motor to the load will help assure efficient, reliable, and low-cost operation. The motor will also last much longer than one continuously in SF. Further, since many motor designs achieve peak efficiency near 80% of rated load, it is best practice to increase the rating of the motor rather than operate continuously in SF.

Other considerations

Although a service center may not get involved in the motor applications' design and specifications, it is good to make them aware of motor failures associated with problem applications. Often, they can redesign a motor to meet the requirements of the application or provide a suitable replacement.

Many service centers may also be able to reduce the winding loss and temperature rise under a given load when they rewind older motors. Many of these motors have ample room in the winding slot for a larger wire size, which will allow operation at a higher overload or SF. However, keep in mind increasing the wire size or improving the temperature rating of the

insulation system will not increase the hp (kW) or torque. Other factors such as winding turn count and coil pitch must be changed to accomplish this.

By misunderstanding the proper application of SF, the system designer will often reduce reliability and increase operating cost for the sake of a lower initial project cost. A little foresight and a small investment increase will pay dividends for the application's lifespan.

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AFE Links

AFE National website: www.afe.org

AFE Region 8 website: https://afe8.org

AFE Chapter 140 website: http://www.afechapter140.org

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