TIP SHEET
FUSE CONSIDERATION FOR PREMIUM EFFICIENCY MOTORS

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With the world transitioning to an energy efficient model to reduce energy consumption and energy cost there have been new standards introduced by the US Department of Energy. As of June 1, 2016 the US Department of Energy mandated that newly manufactured electric motors will need to meet NEMA Premium efficiency standards. Although motors manufactured prior to 2016 can still be sold, as time passes the NEMA Standard Efficiency motors will no longer be sold by motor manufactures. As the older style, Standard Efficiency motors reach their end-life these motors must be replaced. The individual in charge of the motor selection should be aware of the performance differences between the Standard Efficiency motors and the Premium Efficiency motors specifically the motor inrush current. We will discuss how the higher motor inrush current effects the selection of fuses that are in place to protect these motors.

Why do we need to consider the fuses when upgrading to these Premium efficiency motors? Above we mentioned how it is critical we understand the performance differences between Standard and Premium efficiency motors. According to The Motor Challenge Fact Sheet program by the U.S Department of Energy: Energy-efficient motors feature low electrical resistance and thus exhibit higher inrush currents than standard models (Source Energy.Gov). We must compare the inrush current of the motor vs the fuse time current curves to be sure the additional inrush produced by the Premium Efficiency motors does not lead to nuisance opening of the overcurrent protective devices. To understand why it its import to consider inrush current when replacing NEMA Standard Efficiency motors with Premium Efficiency motors let's look at a simple example utilizing Mersen's Product Recognition App.

We start with entering the values for the Motor we are protecting. In this example, we are going to select a Standard Efficiency 460V 3-Phase 150 HP motor with an amp rating of 180A and the Class J(AJT) for the fuse class. Based off the inputted data the product recommended is the AJT250.

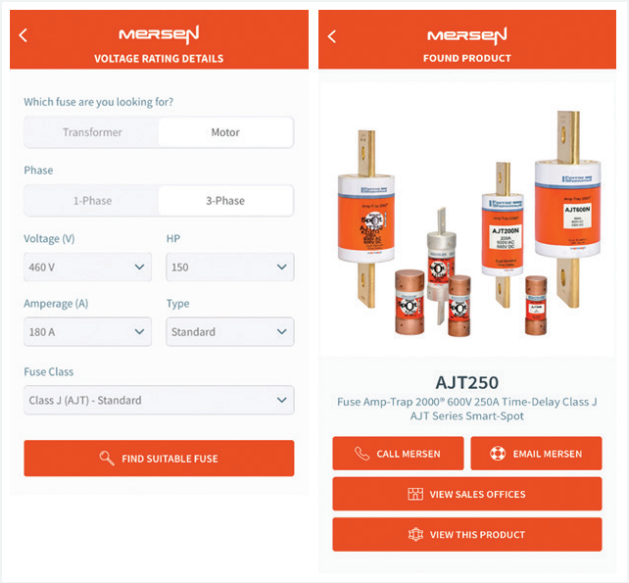

Figure 1

Let's enter the same values above but this time we will select a High Efficiency 460V 3-Phase 15 HP Motor with an amp rating of 180A and the Class J(AJT) for the fuse class. Based off the new inputted data (remember we have only changed the efficiency) the product recommended is the AJT350.

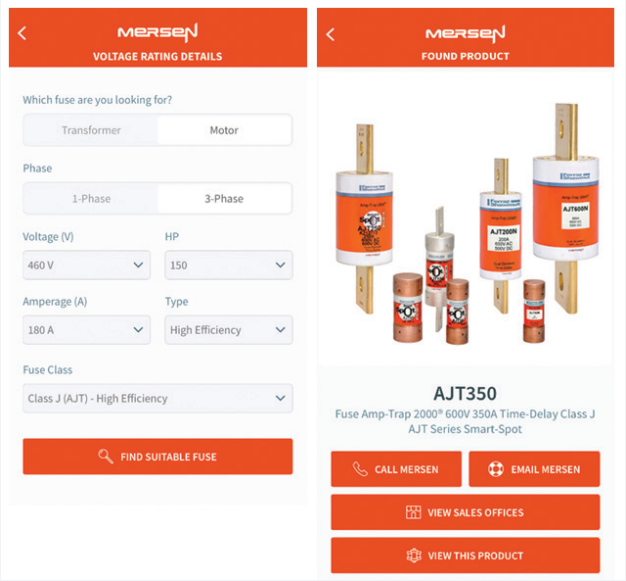

Figure 2

As you can see from the Figure 2, to properly protect the newly selected High Efficiency motor we must replace the AJT250 with the AJT350.

You may ask yourself, why have we increased the ampacity of the fuse? After all both motors are 460V 3-Phase 150 HP motors. To answer this question let's examine our example from above. The first motor (figure 1) is the Standard Efficiency motor and can be sized at 125% of the motor's rated current up to the next size fuse which gives us the AJT250. The second motor (figure 2) is a High Efficiency motor and we mentioned above these motors feature low electrical resistance which cause higher in-rush currents when compared to the Standard Efficiency models. This fuse has been sized according to the Section 430.52(C)(1), Exception 1 in the NEC which allows for Time-Delay Class R and J fuses to be sized at 175% of the rated motor current up to the next standard fuse size. The additional service factor allows us to account for the potential magnitude of the increased locked rotor current from the new High Efficiency motor.

With any electrical application, there can always be exception to rules. If you're upgrading your motors in your facility and would like assistance with selecting the proper overcurrent protection device. please contact our Tech Services department or your regional solutions engineer.

If you would like to cover this topic in more detail you can reference our Tip Sheet on Fuse Sizing Considerations For Higher Efficiency Motors.

References

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