



## *Cyclic Loads and SEL Motor Relays*

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### **INTRODUCTION**

Motor relays must adequately protect the motor from overheating when both constant and cyclic overloads occur. Conversely, the motor relay should not trip during cyclic overloads before the motor's thermal limit is exceeded. Examples of cyclic loads include:

- Crushers
- Oil Field Beam-Style Pumps
- Chippers
- Reciprocating Compressors

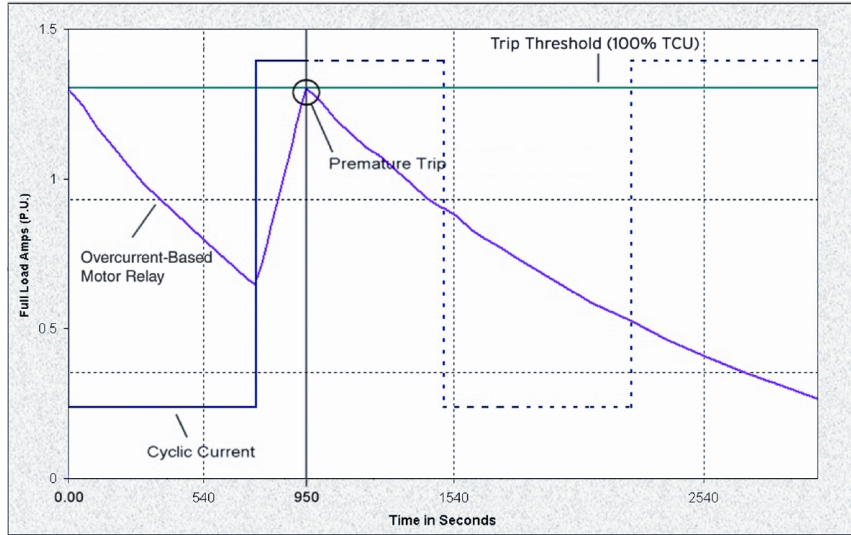
### **PROBLEM**

Protection engineers are quite familiar with coordinating overcurrent relays to provide fault protection. In addition to fault protection, induction motors require thermal protection to prevent overheating during starting and running conditions. Manufacturers specify the motor's thermal capability using thermal limit curves. Standard overcurrent relays do not account for thermal history or accurately track conductor temperature excursions. When a motor is subjected to cyclic loading during running conditions, a standard overcurrent relay will occasionally trip before the thermal capacity of the motor is exceeded.

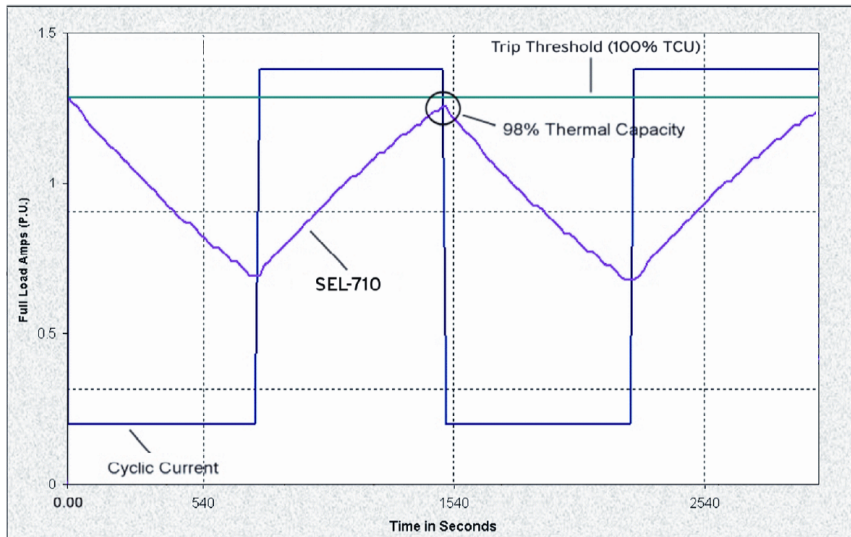
### **SEL SOLUTION(S)**

SEL motor relays calculate conductor temperature rise in real time, using a thermal model based on first order differential equations. The thermal model assures that the relay will not trip for steady or cyclic overloads until the motor's thermal limit is exceeded.

The excellent motor temperature tracking of the SEL thermal model is demonstrated for cyclic overloads. Cyclic overloads can cause a standard overcurrent relay to trip before the motor's thermal capacity is exceeded, resulting in unnecessary manufacturing process down time. Test data show how the SEL thermal model accurately tracks motor heating for a cyclic overload.



**Figure 1 Overcurrent-Based Relay False Trip**



**Figure 2 SEL Relay Proper Operation**

SEL motor relay datasheets and instruction manuals, and SEL technical papers provide a more complete explanation of the benefits associated with the SEL thermal model.

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