

Case Study: Transportation - Motor contactor burnt up

Summary

A transportation service company has a plant that is using a 40 HP 460 volt air compressor to force air into the earth through a piping system. The motor contactor for the compressor has burnt up and welded itself closed three or four times since the compressor was installed a year ago in 1998. The 40 HP motor was replaced several months ago in the mistaken belief that the motor was causing the contactor to burn up. After the motor was replaced, the contactor burnt up again. The customer said that after the first contactor burnt up, the compressor representatives suggested that the voltage may be too high. The company then requested that the utility company lower the voltage on the delivery by changing the tap positions on the utility's transformer bank. After this was done, problems continued. The utility company was then asked to help investigate. In the investigation, the PQ Engineer found that the cause of problem was excessively low contactor control voltage when the motor started. This caused the contactor to "bounce" and burn up. He recommended that a Knowtrip contactor ride through device be installed on the motor contactor for the compressor and that the customer request the utility company to do a tap position change on the service transformers to raise the voltage.

Investigative Approach

The PQ Engineer met with the customer at the site and inspected the installation and made some voltage and current spot check readings. Three dataloggers were set to monitor voltage at the meter, at the compressor and at the 115 v. control voltage for the compressor. A Dranetz 658 monitor was temporarily set to capture a motor starting event.

Observations / Findings

From the datalogger's data, the Engineer saw excessive voltage drop during motor starting. It was due to the distance between the compressor and the utility's service transformers and also to the size of the 3 -10 kva transformers used to serve this 40 HP motor. The voltage during motor starting at the compressor went from 442 volts to 323 volts and at the compressor controls the voltage went from 117 volts to 84 volts. (See Figures 1 and 2) Monitoring with the Dranetz showed what appears to be contactor bounce or "chattering" during motor starting as the current flow was interrupted for a few half cycles during the first four or five cycles of the motor start (See Figure 3).

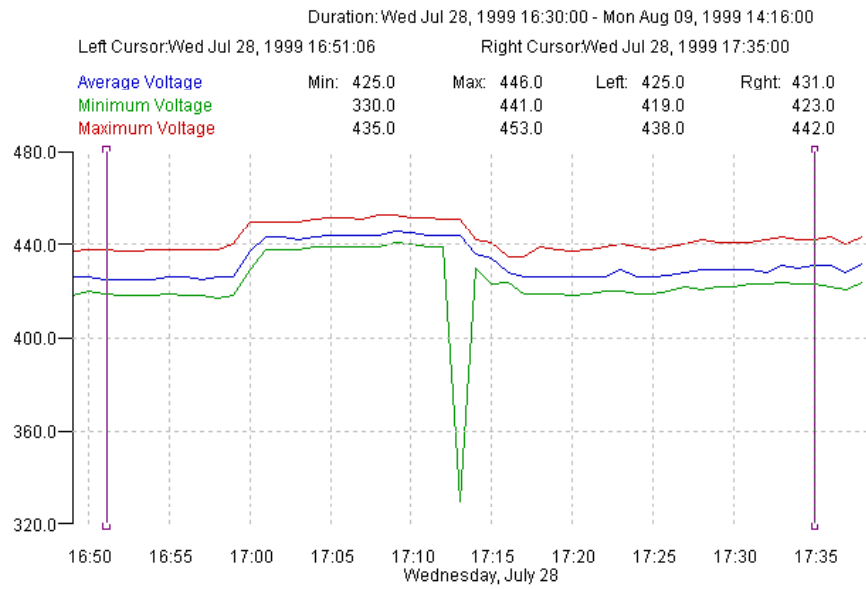


Figure 1: Voltage At The Compressor During A Motor Start

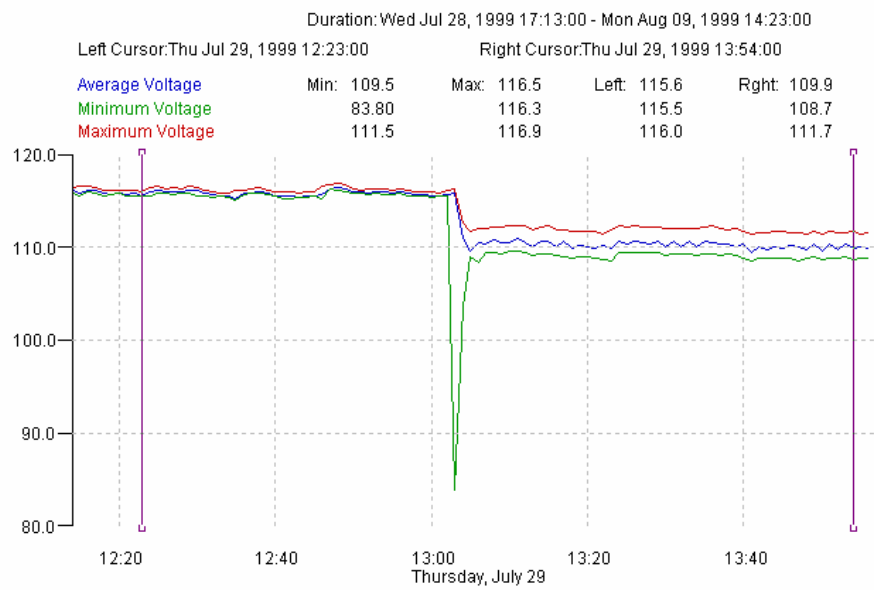


Figure 2: Voltage At The Controls During A Motor Start

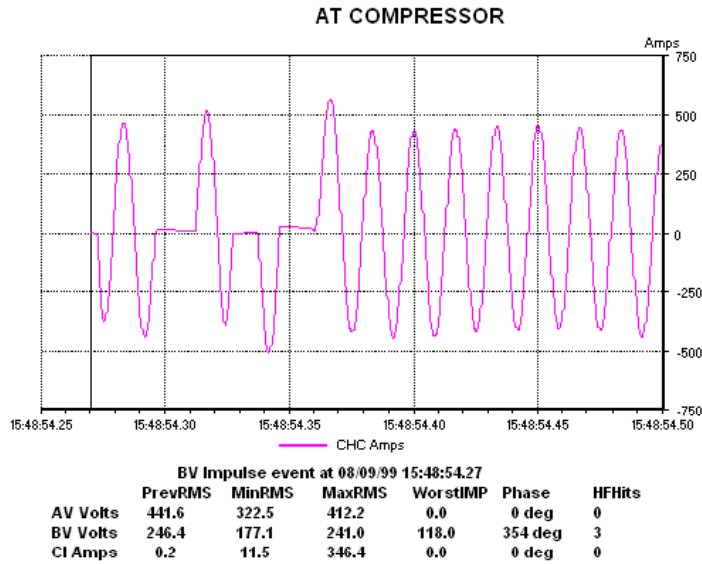


Figure 3: Current At The Compressor Disconnect During A Motor Start

Recommendations

The Engineer recommended to the customer that a Knowtrip contactor ride through device be installed on the motor contactor for the compressor. Contactor dropout, because of power line brownouts, will be eliminated when a KnowTrip is added to the contactor. He also recommended that the customer request the utility company to do a tap position change on the service transformers to raise the voltage.