FLUKE®

Malfunctioning traffic light

Application Note

Power Quality **Case Study**

Measuring tools: Fluke 43B Power Quality Analyzer

Operator: Electric utility engineer

Features used: Voltage, transient capture

Problem description

This case history came from an electric utility engineer assigned to maintain the power systems for several small towns in the western U.S. The engineer carries a Fluke 43B on all trouble calls, because it provides a graphical display that allows customers to see a "picture" of the problem.

The case history began with a call from a local police department. The officer explained that the traffic light at the main intersection of town was randomly malfunctioning. Sometimes it worked fine, while other times it generated unacceptably long delays in one direction or the other.

Normally when a traffic light fails, it will not work at all. In this case, however, the problem was intermittent. Therefore, the engineer suspected the problem was due to an interaction with the power system, rather than a failure within the traffic light itself. The engineer's investigation showed that three facilities (a barbershop, a small café and an automotive machine shop) shared the transformer secondary that supplied power to the traffic light. See Fig. 1.

One of the keys to troubleshooting a problem is determining what changed just prior to the appearance of the problem. Visits to the barbershop and café didn't reveal anything meaningful. The machine shop, however, had a different story. The shop had just installed a new brake lathe they were using to resurface brake drums and rotors for cars and trucks. The lathe was equipped with a dc motor powered by a dc adjustable speed drive.

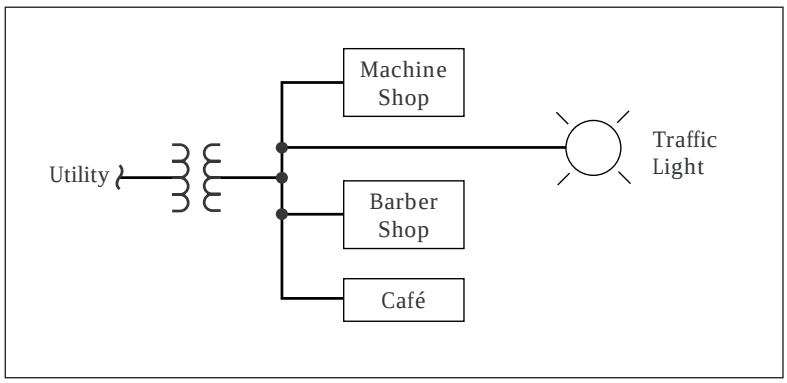

Fig. 1 One-line diagram showing power supplied to the traffic light

Measurements

The engineer connected his 43B to the machine shop's service entrance, line-to-line with "Transient Capture" mode activated. The 43B recorded large voltage spikes whenever the lathe was operating. See Fig. 2.

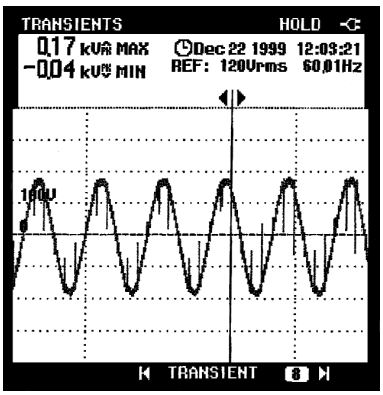

Fig. 2 Voltage spikes from a dc adjustable speed drive

Theory and analysis

Machine tool applications need high torque at low speeds, and dc motor/drive configurations serve this need well. Thus, machine tools commonly have dc motors and drives. The input rectifier circuit in a dc drive is designed to provide variable amounts of current to meet the torque and speed requirements of the motor. A commonly used circuit configuration uses silicon controlled rectifiers (SCRs) to provide the variable current. The SCR circuit produces commutating spikes as one rectifier is turned off before the next rectifier is turned on. In this case, the spikes generated when the lathe was operating were large enough to disrupt the traffic light.

Solution

The engineer ordered a new transformer and separate feeder connection for the traffic light. This new configuration provided enough isolation to keep things running normally.

Fluke. *Keeping your world up and running.*

Fluke Corporation
PO Box 9090, Everett, WA USA 98206

Fluke Europe B.V.
PO Box 1186, 5602 BD
Eindhoven, The Netherlands

For more information call:
In the U.S.A. (800) 443-5853 or
Fax (425) 446-5116
In Europe/M-East/Africa (31 40) 2 675 200 or
Fax (31 40) 2 675 222
In Canada (800)-36-FLUKE or
Fax (905) 890-6866
From other countries +1 (425) 446-5500 or
Fax +1 (425) 446-5116
Web access: http://www.fluke.com/

Printed in U.S.A. 8/2003 2103520 A-ENG-N Rev A