

# Managing machines that run the gamut of manufacturing processes

## Application Note



### Testing Functions Case Study

### Behind the scenes at L&L Products

Every time you speed down the freeway or fly in the stratosphere, chances are your trip is made possible in part by technologies from L&L Products. L&L offers unique expertise in static sealing, acoustics, vibration reduction, and composite components used in automotive, aerospace, large commercial vehicles, and other industrial applications. In just 15 years the company has been awarded more than 200 patents for material formulations, engineering designs, and manufacturing processes.

L&L has production facilities in the United States, Europe, China, India, Australia, the Czech Republic, Turkey, and Brazil; sales locations in seventeen countries; and engineering in fifteen of those countries. Many of those locations also have R&D groups, and each has its own production support team to ensure that all processes meet stringent standards. In its US headquarters in Romeo, Michigan, that job is done by controls engineers and a machine repair and maintenance staff of technicians.

### Flexible products and processes

Although L&L's products are categorized as rubber and plastics, the manufacturing process is very different than with typical rubber and plastics makers. L&L designs its products to activate at the temperatures of its customers' paint curing ovens, which are much lower than for most rubber and plastics. Other major design considerations include flexibility and size. The machines run many different setups, so they must be

quite flexible. Also, with the high cost of manufacturing floor space, each machine needs to have as small a footprint as possible.

The facility in Romeo covers 200,000 square feet (18.58 square meters) and manufactures the chemical formulations, shapes those formulations, and assembles them into parts. Its customers use those parts to seal; dampen noise, vibration, and harshness; and improve structural integrity. The plant also makes products that shield against high temperatures for industrial equipment, and makes noise reducers and lightweight trim and structural components for the aerospace industry.

### Expanding the realm of possibilities

Derek Forsythe, Electrical Controls Engineer for L&L, and his team spend most of their time supporting the equipment on the manufacturing floor and managing the retrofitting and upgrading of those machines. The machines run the gamut of manufacturing processes.

**Tools:** Fluke T5-1000 Electrical Testers, Fluke 87 Series III, Digital Multimeter Fluke 289 Digital Multimeter, and 199C ScopeMeter® Test Tool

**Operator:** Derek Forsythe, Electrical Controls Engineer for L&L Products

**Applications:** Troubleshoot relays, current monitoring devices, temperature controllers, and field devices



The Fluke 199C ScopeMeter is Derek Forsythe's tool of choice when he needs to check the signal response on this material feed control panel. Derek always makes the choice to work safe. Even though this cabinet is rated at a category 0 arc flash hazard, Derek suits up and uses proper PPE, just in case.

"Our R&D and product development teams are always trying to come up with new ways to solve our customers' problems, which means that our machines sometimes need to be modified to accomplish those changes," says Forsythe. "We often retrofit a 'standard' machine to run our specialized formulations or deal with specific characteristics of our processes. For example, we might have to add a heat circuit, extend an extruder for greater mixing capabilities, or add a product feeder."

Fluke tools—ranging from T5-1000 electrical testers to Fluke 87 Series III and Fluke 289 Digital Multimeters (DMMs), to the 199C ScopeMeter® Test Tool—play an important role for Forsythe and his team. He was first introduced to Fluke meters in high school and got his first Fluke 87 for Christmas at the age of 15, more than two decades ago.

"It's up to the individual what test tools they want to use; but when someone here needs a new test tool, they come to engineering and our first choice is typically Fluke," says Forsythe.

### Maintaining accurate temperatures

Most L&L products are subject to heat processing, so troubleshooting solid state and mercury relays, current monitoring devices, and temperature controllers is a major part of the job. The company uses both 0 to 10 V dc and 4 to 20 mA analog signaling, so the support team needs to measure dc voltage and current along with any electrical noise associated with those signals.



The Fluke 289 Digital Multimeter is used all over the factory: for Derek Forsythe, it is his "go to" meter. Derek designs, installs, and commissions many types of manufacturing equipment in L&L Products facilities. When he needs to double-check that any of the processes are running with the greatest efficiency and that there is no down time, Derek turns to his Fluke tools. In this film monitoring control cabinet he uses his Fluke 289 DMM to look at the 120 volt input as well as the 24 volt signal.

The Fluke 289 has the accuracy Derek needs to troubleshoot the 24 volt signal inside this flow transmitter intrinsically safe enclosure, which controls the flow rate of an extrusion machine.



For that, Forsythe uses the Fluke ScopeMeter® 199C. “The ScopeMeter® is good for checking for noise and comparing two signals over time,” says Forsythe. “I use it to compare the ‘on’ command signal of the heat circuit to the signal sent to the PLC from the current monitoring circuit.” He also uses his ScopeMeter® test tool to compare the input to the relay coil with the output contact to check whether the contacts of a relay turn on and off when the coil is commanded.

Non-PLC-controlled circuits require a bit more troubleshooting. “We use a Fluke T5-1000 to measure voltage to the power circuit before and after the fuses, and to measure voltage out of the solid state, mechanical, or mercury relays,” says Forsythe. “We also use it to measure resistance on the heaters to check for opens and shorts, to measure current when the heater is commanded ‘on’, and to verify the proper operation of thermocouples.”

### Troubleshooting versatility required

To troubleshoot failures of field devices such as valves; pressure, proximity, and optical sensors and switches; and ac and dc motors, the production support team uses the Fluke 87 III or 289 DMMs. “When a low-voltage device like a switch, sensor, or valve does not work, I typically start at the end of the line, checking to make sure the appropriate power is there and working my way back through all termination points and eventually back to the final termination—the PLC I/O card, relay, or fuse,” says Forsythe. “Fluke tools are rugged, reliable, and have many options for leads that help us diagnose issues with a high level of confidence in their accuracy and safety.”

With higher-current devices and motors, Forsythe starts at the main power source and measures voltage across and current through the circuitry to the final device. A heat circuit that gets too hot typically indicates a solid

state relay that has stuck on or a cooling water valve with a faulty solenoid or blown fuse. A heat circuit that is too cool is often a blown fuse, faulty solid state relay, or an open heater. “Occasionally a cooling valve will mechanically stick in the ‘on’ position. Measuring the voltage across the solenoid will tell me if it is being commanded to open,” says Forsythe.

When it comes to troubleshooting variable frequency drives and servo drives, Forsythe uses a Fluke 289 to check motors for open or shorted leads or shorts to ground. He also uses it to measure incoming ac power, the dc bus, and the output stage of the drive to check for balanced phases.

Derek recently installed this solid state relay panel. As equipment gets moved and added to the panel, Derek has to go back and check the current on the load side as well as the current draw on the individual relays that control heating circuits. For that he often grabs his Fluke T5. Fast accurate measurements in tight places are what makes his job go quickly so he can move on to the next issue in the factory.

“I use Fluke because the products are reliable and the support is great,” says Forsythe. To demonstrate what he means by reliability, Forsythe still has that Fluke 87 he got for Christmas those decades ago and is passing it on to the next generation. “I used my Fluke 87 a few months ago to teach my son how to use a multimeter to read voltage and current for his science project, which involved testing the output voltage and current produced by apples, oranges, potatoes, and grapefruit. I also used it to teach my Webelos Cub Scout den how to read voltage for their Scientist and Engineering activity pins,” says Forsythe.

We look forward to hearing from those new users in the years to come.



**Fluke.** *Keeping your world up and running.®*

**Fluke Corporation**

PO Box 9090, Everett, WA 98206 U.S.A.

**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 (0) 40 2675 200 or Fax +31 (0) 40 2675 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>

©2014 Fluke Corporation. Specifications subject to change without notice. Printed in U.S.A. 3/2014 6003053A\_EN

**Modification of this document is not permitted without written permission from Fluke Corporation.**