FLUKE®

# Europe's foremost manufacturer of plastic piping **nips industrial bus problems in the bud**

## Application Note

Testing Functions

**Case Study**

**Tools:** 225C Color ScopeMeter

**Operator:** Plant engineers at the Wavin company, in Hardenberg, The Netherlands

**Measurements:** Profibus signal quality analysis, using the ScopeMeter bus health test to compare against standards

The Wavin company provides above and below ground solutions for hot and cold tap water, surface heating and cooling, soil and waste, rainwater management and last mile telecom. The company's end-to-end solutions include consultation, design, implementation and aftersales service. Customers are building and civil wholesalers, plumbing merchants, civil contractors, housing developers, large installers, utility companies and municipalities.

One department of its factory in Hardenberg, The Netherlands, had recently undergone a major transition, including the installation of a new PLC-based control system and replacement of the original hardwired networking system by a new Profibus network. The transition from a traditional control system to bus control offered a lot of benefits, including significant saving on wiring and better and more reliable control. On top of that, the bus system offered diagnostics capabilities not available with traditional control systems, and allowed for data exchange through an ethernet-link with the company's management- and ERP-systems.

To avoid potential problems, Wavin engineers initiated a preventive maintenance program. The company already used Fluke handheld ScopeMeters for general electrical and electronic maintenance tasks, but for this task, it tried out the Fluke 225C ScopeMeter® Test Tool with the new bus health test function.

### Spotting hidden problems

The Profibus network within the Wavin factory supports over a hundred stations and, at the time, had been operating without problems for several months.

### Top causes of bus health issues

Three things can either prevent bus signals from getting through or make them unrecognizeable when they do:

1. Signal non-compliance
2. Electrical disturbances
3. Induced noise

**Top causes:**

- Temperature and humidity extremes
  - Corrosion and cable impedance changes, intermittent connections and equipment failures
- Heavy duty machinery-induced power disturbances, noise, and electrical interferences
  - Intermittent performance, random equipment shutdowns and failures
- Unpredictable installation environment: Long cable runs, abuse from heavy duty machinery, vibration, and other common factors
  - Infrastructure breakdowns

Nevertheless, measurements made with the 225C revealed an anomaly on the signals passing through the network at one particular station, located in the mixer area. The ScopeMeter showed an overshoot reading that was far too high, with an average value of 47 percent, and a peak value of 51.4 percent. This was the first indication that something was not right (see Figure 1).

Based on these findings, Wavin service engineers investigated the hardware in this section of the bus system further and found two violations of the Profibus standards:

- At the last station, the required bus terminators had not been switched on
- The length of the cable sections between the last four stations, which were all built in a single cabinet near the mixers, was far shorter than the required minimum length of 1 meter per section

The service engineers replaced the cable sections with longer runs and switched on the bus terminators. Then, they repeated the bus health tests. The results, displayed in Figure 2, showed significant improvement.

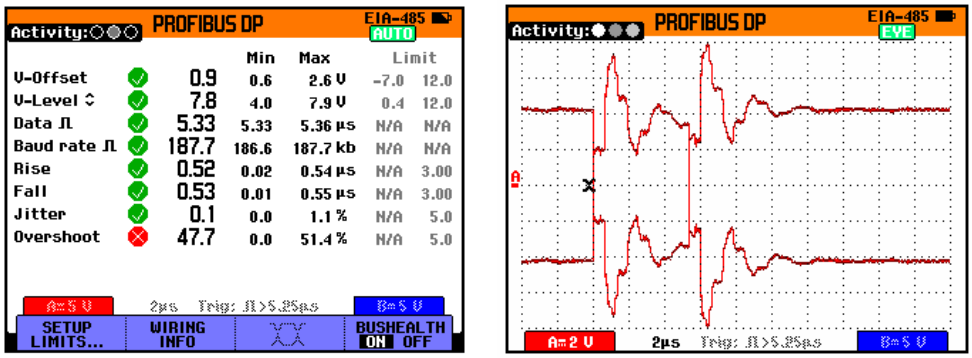


**Figure 1.** Left: The overshoot reading at this station is so high that an error in the network is likely and calls for further investigation. Right: The alternative way of looking at the bus signals using the eye-pattern mode shows that pulses are largely distorted, making it clear that there is an aberration on the signal at this location.

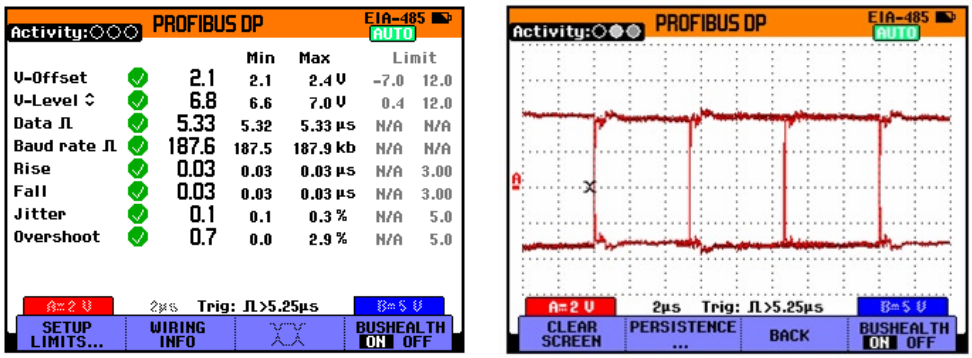


**Figure 2.** After making corrections to the Profibus network, new screen images of the Bus Health parameter screen (left) and the eye-pattern screen (right) were recorded. These clearly show improved network performance, with all parameters meeting requirements and well formed square wave pulses.

## Conclusion

From this test, Wavin engineers saw the potential to get both early warnings of potential bus problems and to avoid production stoppages. Wavin's preventive maintenance program now includes a regular health check at every station on the bus. The Fluke 225C ScopeMeter® Test Tool helps technicians ensure that all signals remain within specifications and spot drifts over time that could lead to problems.

## Bus health measurements with the Fluke ScopeMeter

Instead of relying on proprietary diagnostic tools designed for specific bus systems, the Fluke 225C, 215C, and 125C ScopeMeter® test tools provide quick, easy assessment of signal quality on a range of buses and networks.

These new ScopeMeter models are designed for technicians who may deal with several different industrial buses and networks within a plant, as well as general electronics. They perform 'physical layer tests' to verify the electrical signal quality of Profibus, Foundation Fieldbus, Ethernet, CAN-bus, AS-I bus and RS-485 networks, among others. Most importantly, the tool summarizes bus health results in a go/no-go view for easy interpretation—without analyzing waveforms.

To get started, connect the scope, initiate the Industrial Bus Health function, select the bus type, and the tool will evaluate the network against industry standards. Switch over to the so-called 'eye-pattern mode' to see a waveform display of successive pulses, displayed with selectable persistence. As the waveforms overlap each other, disturbances or other anomalies in overall signal quality are readily visible. The eye-pattern view is particularly useful for detecting external electromagnetic influences caused by, for example, large power lines or motors in the vicinity, which may induce noise onto bus wiring.

**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