Presentation Outline

- Reliability and maintenance issues.
- Dealing with extensive systems.
- Fault categorisation.
- Strategies for fault-finding and maintenance.
- Tools for fault finding & maintenance
  - ProfiTrace 2 (Ultra)
  - Fieldcare (FDT)
  - Mobile Fieldbus Diagnostics Module (DTM)
- Practical demonstration
PROFIBUS

- PROFIBUS is a very cost effective and reliable technology.
- However, extensive installations can have thousands of PROFIBUS devices operating on many networks.
- The reliable operation of these networks is essential to maintaining plant productivity.
- Further, the rapid diagnosis of faults on networks, devices, actuators and sensors is critical for minimising plant downtime.

Extensive Systems

- To understand the problem, consider a modest installation with 1000 devices installed:
  - Each device might exhibit a mean time to failure of 20 years.
  - On average we would therefore expect a failure every 20/1000 years, which is approximately a failure every week!
  - Without a well thought out maintenance strategy our plant will spend a lot of time out of service!
The most common problems in any fieldbus or high-speed digital communications system are:

1. Cabling and wiring faults:
   - Reflections, interference, cable routing and earthing faults etc.

2. Poor design and installation:
   - Lack of awareness of avoidable issues at design stage, poor routing, layout, untrained installers, inaccurate or insufficient system documentation.

3. Device and wiring failures:
   - Surprisingly rare but can lead to communications faults or peripheral faults.

Quite often 1. and 2. exist from the start.

Faults that occur during the operation of the plant can be broadly categorised as follows:

- **Peripheral faults**
  - Concerned with the sensor or actuator.
  - E.g. sensor wire break, loss of output power, sticking valve etc.
  - The devices are still communicating.

- **Communication faults**
  - Prevent signals reaching their destination, e.g. network wiring errors, interference pickup, reflections etc.
  - Communications are disrupted.
Peripheral Faults

- Because the communication remains operational, peripheral faults can often be located and diagnosed using the communications system itself.
- Tools and techniques that are useful for locating peripheral faults on PROFIBUS systems include:
  - Diagnostic reporting via engineering tools,
  - SCADA systems,
  - Protocol analysers etc.
- Most modern PA devices incorporate extensive self-diagnostic features that can help identify peripheral faults.

Communication faults

- Communication faults can be diagnosed using tools such as:
  - Protocol analysers and diagnostic tools.
  - Waveform visualisation tools such as oscilloscopes.
- Communication errors do not always produce loss of control. This is because modern fieldbus technologies are very robust to errors that can corrupt data.
Communication faults

• Quite often users are unaware that their system has communication errors because the robustness of PROFIUS can hide these faults.

Green light – all must be ok!

• Only when the rate of data corruption reaches a critical threshold will the fault become visible.

Fault categorisation

Installation faults
- Fix during commissioning

Operational faults
- Peripheral faults
- Comms. faults
- Non-critical faults
- Critical faults
- Routine maintenance
- Fix during normal operation
- Urgent fix required

System Health Check
ProfiTrace2
(Procentec)

- ProfiTrace2 is the latest in a range of fault finding and health checking tools from Procentec.
  - High-speed analyser for both DP and PA.
    - Extensive triggering and filtering capability.
    - PA probe available for PA segment connection.
  - Decoding of all telegrams (DPV0 and DPV2).
  - Built-in high-speed oscilloscope.
    - DP scope shows RS485 waveform at bus interface.
    - PA probe Ultra allows MBP waveform to be measured.
  - Rapid overview of network health
    - live list and bar chart
    - Health-checking and performance statistics.
  - Report generation for documentation.

- In addition ProfiTrace2 can be used as a Class1 and Class2 master for setting up and testing of both DP & PA devices.
  - DP/PA Coupler required for PA devices (MBP segments)
  - Simple set up and commissioning of cyclic data exchange
  - Acyclic services for DVP1 DP devices and PA devices.
The Fieldbus Diagnostic Module from Pepperl+Fuchs provides communications monitoring and diagnostics for PA segments.
- The device is available as a permanent fixture that plugs into a coupler base,
- or as a mobile unit that can be plugged into any PA segment.

Our Demo Setup

- We have a small system set up to demonstrate some of the engineering tools that are available:
  - Siemens S7-300 PLC
  - Pepperl+Fuchs DP/PA coupler
  - PROFIBUS PA MBP wiring
  - PROFIBUS DP RS485 wiring
  - Pressure transmitter
  - Temperature transmitter
  - Level transmitter
  - Master #1
**Our Demo Setup**

- **PA Probe Ultra**
- **ProfiTrace hardware**
- **Mobile Fieldbus Diagnostics Module**
- **USB cable to laptop**

**PROFIBUS PA** connections (MBP)

**PROFIBUS DP** connection (RS485)

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**FDT/DTM**

- The FDT (Field Device Tool) specification provides a standard interface between device specific Device Type Manager (DTM) software and the User.
- The DTM is a software component provided by the manufacturer of an intelligent device.
- The DTM provides all the functionality to configure, test and diagnose the device from a laptop or PC station.


Each device in the communication link has a DTM which deals with all functions of that interface.

Each field device has a DTM which deals with all functions of that device.

<table>
<thead>
<tr>
<th>Network Tag</th>
<th>Device Type</th>
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<tr>
<td>PRODVMV1</td>
<td>VEGA DIM PROFIBUS</td>
</tr>
<tr>
<td>LD 01000</td>
<td>HART Process V2*</td>
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<tr>
<td>LD 4100 HART A</td>
<td>V2*</td>
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<td>SAMSON 3700</td>
<td>V2*</td>
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<tr>
<td>LD 3100 HART S</td>
<td>V2*</td>
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<td>Microplast M / FMR 24 / FPA / V2.0K</td>
<td>V2.0K</td>
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**Live Demonstration**
Contact details

- A printable copy of this presentation can be downloaded from:
  www.VerwerTraining.com

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Questions?