Application Description AG/266PILD-EN Rev. B

2600T Series Pressure Transmitters
Plugged Impulse Line Detection Diagnostic

Pressure Measurement
Engineered solutions for all applications

Increase plant productivity
Process diagnostics warn the user of the plant before an abnormal event occurs allowing preventive maintenance.

Reduce maintenance costs
Maintenance can now be performed exactly when needed avoiding expensive periodic cleaning operations.

Protect your DP flow and pressure measurement
PILD surveillance protects the plant from unexpected downtime.

Power and productivity
for a better world™

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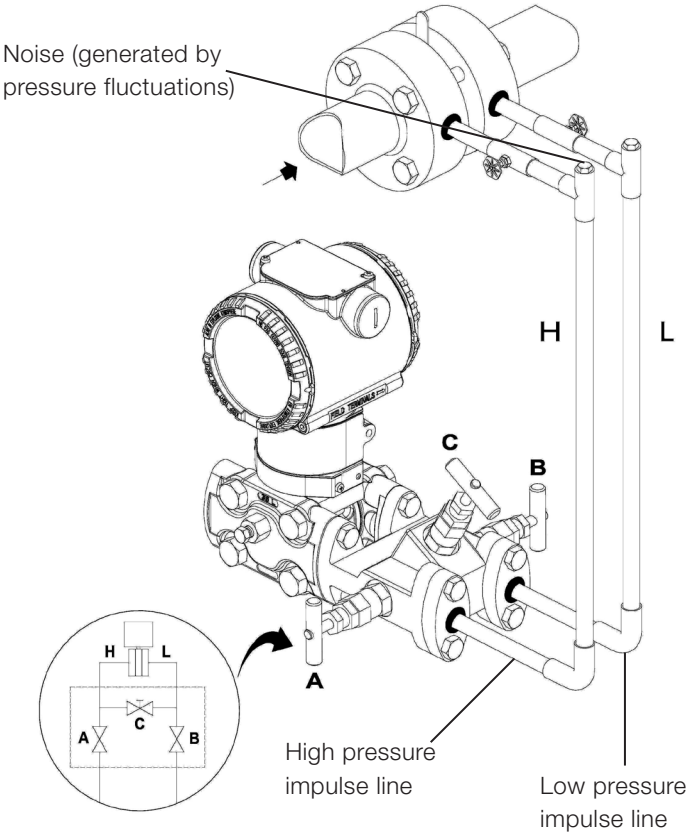
Plugged Impulse Line Detection Diagnostic

General description and introduction

One of the most costly events that may occur in a plant is the blockage of an impulse line to a measuring device. The causes may vary - sometimes in a very cold environment the process fluid may freeze in the impulse lines, while in other cases it may be clogged by solids in the process.

Such occurrences lead sometimes to quite expensive consequences as the measuring instrument which is supposed to deliver an output signal proportional to a certain characteristic of the process fluid, is instead transmitting unreliable information which is used to control the process. It is easy to understand that controlling the process with an unreliable input is not acceptable. To prevent this, users tend to implement specific maintenance and cleaning programs which are carried out periodically; this periodic maintenance represents an additional cost which affects the productivity of the plant.



Process diagnostic

The reduction of costs related to the additional maintenance expense involved with these classic plugging problems is the basis for Plugged Impulse Line Detection (PILD) technology. This new evolution in pressure sensing technology enabled the ABB Research and Development team to implement diagnostics not only to protect the transmitter sensor and electronics but also to offer some predictive diagnostic capability to the individual measurement loop. For example, the pressure sensor of the transmitter not only picks up the pressure variable in a pipe but a number of other parameters which are normally filtered out.

The PILD algorithm is based on the fact that every dynamic process has a specific detectable noise signature, wherein the noise frequency indicates that something is happening in the device itself or in the process.

After considerable research, ABB Engineers have identified the best methodology to acquire, in a reliable and repeatable way, the required information.

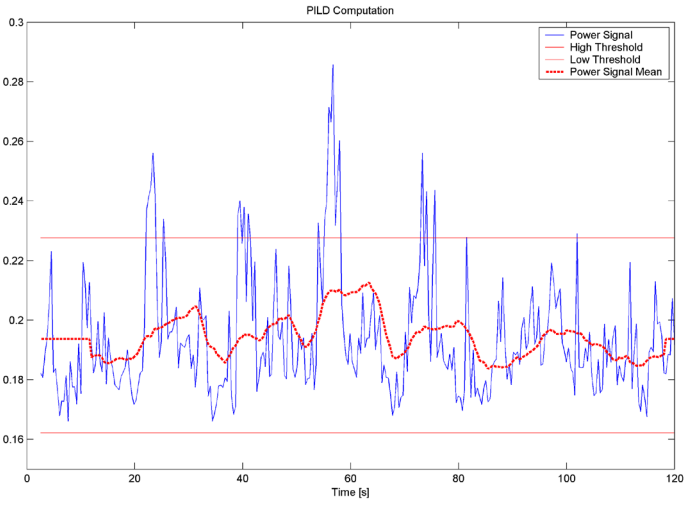


Figure 1: PILD Computation. This graph represents the noise signature performed by the transmitter

PILD working principle

The PILD working principle can be divided into two phases: “Training” and “Normal Operation”. During the “training phase”, the pressure sensor samples its process variable up to 100 times per second, while the electronics of the transmitter analyses the noise spectrum and defines a specific noise signature, which will be used as a reference for the normal plant operation.

Once the basic noise spectrum is identified, the transmitter will pass to the “normal operation” phase.
During “normal operation” phase, the PILD diagnostics continuously monitors the process, detecting any deviation from the baseline noise value. Even if the pressure value acquired by the transmitter remains unchanged during operation, the detected background noise value may be altered when the impulse lines are getting clogged.
Once the PILD diagnostic detects that noise value has significantly changed and has reached the threshold point the alarm is enabled. The PILD diagnostic is able to discriminate which of the impulse lines is being affected by a blocking action and as a result, the alarm activated will specify which one of the lines (High or Low) is being affected by the abnormal condition.

Enabling the PILD in your 266 Transmitter.

Every 266 transmitter delivered comes with the PILD algorithm loaded but not enabled. Not all applications are compatible with this process diagnostic. Typical installations that demonstrate the effectiveness of the PILD diagnostic are DP flow measurements or line pressure measurements.
The base conditions for the PILD to work correctly are that the plant generates background noise. In an application without process noise like a tank level measurement, the spectral analysis performed during the “training phase” will lead to an unsuccessful training result or to a non reliable diagnostic function. Before connecting the transmitter to the process it is recommended to check if the impulse lines are clean and free from debris or partial blockage. Once this has been verified and the transmitter has been properly hydraulically installed (impulse lines properly vented) and connected to the power supply, the transmitter will work delivering an output corresponding to the process variable. A 266 transmitter alone is capable of monitoring and detecting possible clogging on the high or low pressure port impulse lines and displaying a diagnostic message on the display while sending a digital and/or analog alarm. In order to activate the PILD diagnostic an external configuration tool that supports device descriptions e.g. ABB DHH800 or ABB 691HT hand held terminals (for HART versions) or Asset Vision Basic software (for HART, Foundation Fieldbus and Profibus) equipped with the proper DTM is required. Asset Vision Basic software is available free of charge for download at www.abb.com.

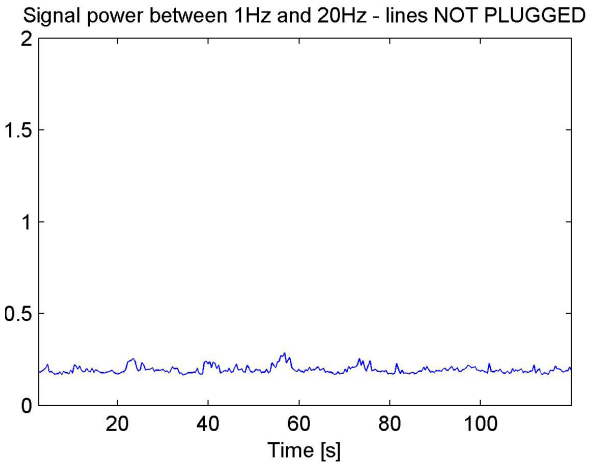


Figure 2: Normal plant conditions. Lines not plugged.

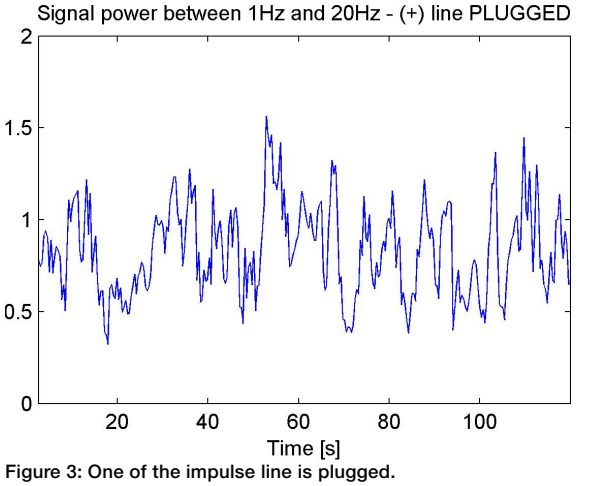


Figure 3: One of the impulse line is plugged.

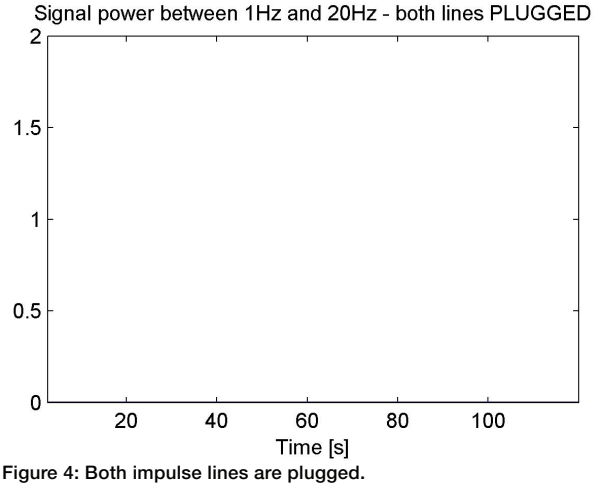


Figure 4: Both impulse lines are plugged.

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Configuration example

Activate the “Training Phase”

Enabling the training phase involves starting the transmitter noise signal acquisition and analysis. The PILD reference base line threshold point will be identified and saved automatically in the device. Once the “Training phase” is successfully completed, the transmitter automatically switches to the “Operating Phase”.

PILD detection capability test

After a positive result from the “Training Phase”, it is recommended at the first installation to test the proper functionality of the PILD.
Using the instrument manifold, gradually close the isolation valve to approximately 80% closed and wait 5 minutes (or the specified detection time selected in the Training Phase parameterization). The transmitter PILD will detect the blockage and send out an alarm.
On transmitters equipped with a local indicator, the alarm will be shown as “Process”. By selecting the detailed information button on your handheld terminal or Asset Vision software, the display will indicate “PILD”.
If at the time of the test you still have the local configuration tool connected, the alarm will also be shown there.

“Training Phase” result fail

There could be a case where the “Training phase” will not be successful. The configuration tool will display a warning message and the PILD diagnostic will not be operative.
This could be caused by insufficient dynamics in the process. In this case the PILD diagnostics can not be activated as the detection capability would be unreliable.

“Operation Phase”

Once in operation, the PILD diagnostic continuously mmonitors the spectral analysis of the background noise and compares it with the reference base line values.
Anytime that the process fluid dynamics change (significant line pressure of process fluid density or viscosity change) it is recommended to repeat the Training procedure to adapt the base line data to the new conditions.

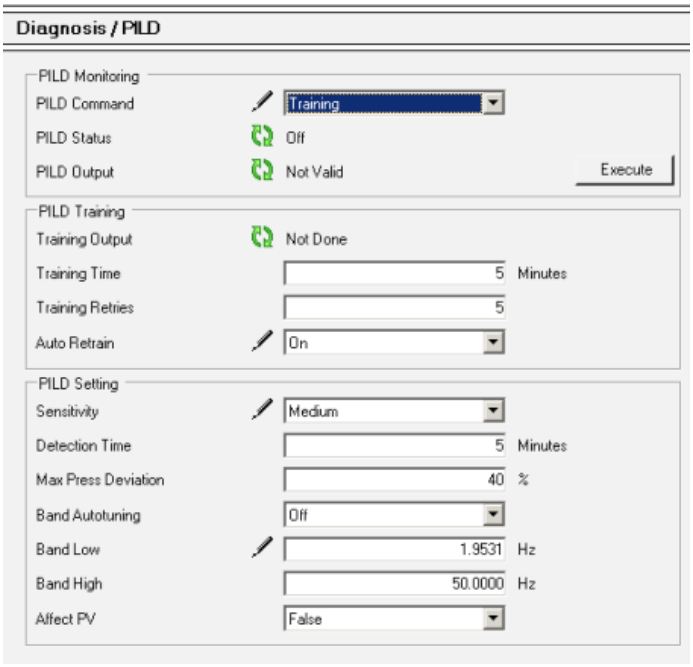

Figure 5: Screenshot of the 266 PILD configuration page on Asset Vision

General notes and recommendations

As the PILD functionality is based on statistical monitoring of the noise produced by the process fluid, and since the process fluid fluctuations may change greatly, the detection accuracy of the PILD algorithm can not be guaranteed in every operation condition.

During the operation phase it may occur that a false PILD alarm is generated. This may be caused by a rapid change in either one of the following:
– Line pressure drops close to the limit of the diagnostic capability
– A noise generator (e.g. a compressor or an agitator) is shut down.
– The flow rate decreases (typically 25%) from the one used as reference during the “training phase”
– It is important to remove any air or gas bubbles that may be entrapped inside the impulse lines because they may interfere with the detection capability of the algorithm.

Note

Contact us

To find your local ABB contact visit
www.abb.com/contact

For more product information visit
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