Detection of Harmful Resonance Frequencies on Pipes

VIM3 12 kHz Vibration Sensor with Blob Data Transfer for Downtime Prevention

At a Glance

- Avoid cost and failure risks with condition-based pipe monitoring
- Detection of critical frequencies in the range up to 12 kHz
- High-resolution raw acceleration data via IO-Link
- 64 kHz sampling rate for precise measurements
- Simple integration due to IO-Link communication
- Quick mounting with magnetic adapter



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The Application

Pipelines are essential components in nearly all production processes—wherever liquids, oils, gases, powders, or granulates need to be transported. In the food industry, for example, they are used to transport liquid ingredients that are first delivered by tanker truck and then pumped into intermediate storage tanks via a pipe system. From there, they later enter the production process. These pipe systems often extend over several kilometers within a plant.

The Goal

Pipe systems form the backbone of production. A failure of this infrastructure, for example due to mechanical defects or material fatigue, can lead to a complete production standstill. Despite their comparatively low material value, damaged pipes carry the risk of considerable follow-up costs. The excitation of pipes at their resonance frequency is particularly critical, for example when liquids are pumped through the pipes at an unfavorable speed. This leads to undesirable vibrations, comparable to a swing that swings higher and higher due to targeted impulses. In the long term, this can lead to structural weakening, increased wear, or complete breakage of the connection points. Regular, preventive condition monitoring is therefore essential, although this is traditionally labor-intensive and costly.

The Solution

The VIM3 series 12 kHz vibration sensors with blob function data transfer from Pepperl+Fuchs enable reliable condition monitoring of pipelines. They record precise acceleration and vibration values that can be used to evaluate the operating conditions. The decisive factor here is not only the vibration amplitude, but also the frequency with which a pipe segment is excited, as this can vary greatly depending on the structure. The sensors provide high-resolution raw data, which serves as the basis for calculating critical frequencies.

The Benefits

The measurement data is transmitted via IO-Link, which simplifies integration and avoids additional hardware costs. The sensor samples the acceleration data at 64 kHz and stores it internally. Using BLOB transfer, the data packets can be read out without disturbing the ongoing signal measurement. Subsequent analysis using FFT (Fast Fourier Transformation) makes it possible to detect whether a pipe system is in the range of a critical resonance frequency. This allows maintenance work to be planned as required and potential damage to be avoided.

Technical Features

- Measuring range: ±48 g for raw acceleration data
- Frequency range: 1 ... 12 kHz
- Standardized vibration evaluation according to ISO 1081/20816
- Data transmission via IO-Link
- BLOB data transfer for raw data
- Configurable switching limits
- Robust stainless steel housing in V2A, V4A, or duplex design



For more information, visit: **pepperl-fuchs.com/px-vim3-pp**