

Metrix Instrument Co. Houston, Texas

About Impact Monitoring

Impact monitoring has proven itself to be a sound measurement for detecting mechanical looseness on compressor cylinders at early stages of development. An impact sensor is placed on the cross-head or extension piece to make this measurement. Mechanical conditions such as loose rod nuts, loose bolts, excessive slipper clearance, worn pins and liquid in the process are routinely detected on reciprocating compressors using impact monitoring.

Impact is typically used for safety shutdown because mechanical looseness can develop quickly.

There is a significant difference between a vibration signal and an impact signal. A vibration signal is considered to be steady state or “stationary” and conventional measurement and analysis techniques can be applied. An impact signal is “non-stationary” so conventional measurement and analysis techniques cannot be used. An example of an impact signal is shown in the time waveform.

The impact signal has high amplitude, short duration portions of the signal (referred to later as events) that appear occasionally. This measurement must be made using peak g=s (acceleration) in order to detect these events.

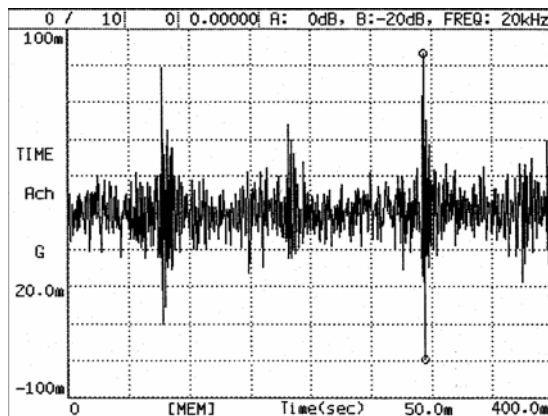


Figure 1, Actual low level impact signal from a typical compressor cylinder.

The impact sensor is placed normal to the direction of motion of the rod. (If we wanted to measure vibration, we would not place it in that direction). It is typically installed on top of the cross-head or extension piece where it will be out of the way of routine work or inspection. This measurement takes advantage of the mechanical transfer of energy, caused by impacts resulting from looseness, through the machine case.

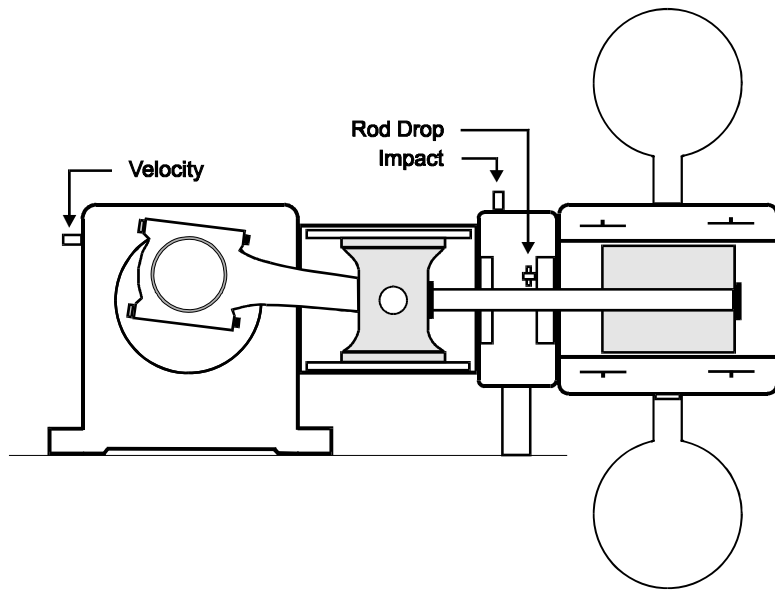


Figure 2, Compressor sketch showing the location of typical measurements

While measuring peak g=s to detect mechanical looseness is a valid technique, by itself, it is not enough. To increase the reliability of the measurement a technique was developed that qualifies the impacting events. This avoids nuisance alarms. The measurement is made with a special detection circuit that was designed for this application. The qualification of the measurement is based on both amplitude and whether or not the events are singular events or repeated events. Upon detection, and meeting level threshold requirements, the events are counted within a time “window”. The time window is called the reset time and is set based on running speed. Now here is where there is a division between traditional impact monitoring systems and the new Metrix transmitter.

Traditional Method – If the designated count is not reached, the counter resets and waits to be activated again. If the designated count is reached, trip circuits are activated. Typically, two alarm levels, alert and danger, (or high and high high) are provided. Separate threshold level and count criteria are used for alert and danger alarms, which will provide credible notification of machine problems.

Metrix Transmitter Method – It was decided to give the user a 4-20 mA signal that contained an accurate measurement of mechanical looseness and not just relay contact closures. The Metrix Impact Transmitter measures the impact signal and counts those events that exceed a set threshold level. It uses a time window that is set based on running speed (so far this is the same as the traditional method). Now it outputs a current level based on the registered number of events that occurred within the time window. Metrix calls this a measurement of “impact severity”. An output of 4 mA indicates no events occurred over the threshold level, within the time window. An output of 6 mA indicates 2 events, 8 mA indicates 4 events, etc., up to 20 mA for 16 events. The

PLC, or other recording instrument, determines the course of action based on impact severity.

The size of the compressor and the application will determine what level of impact severity would be used to send an alert message to operators and what level would be used for safety shutdown, for example. Metrix application engineers and industry advisors will help users set the response parameters based on impact severity.

The Impact Transmitter combines a field proven measurement technique for detecting mechanical looseness with the convenience of loop powered transmitter technology.