HOW TO DETECT LOW SPEED BEARING FAULTS
BEFORE THEY BECOME A PROBLEM

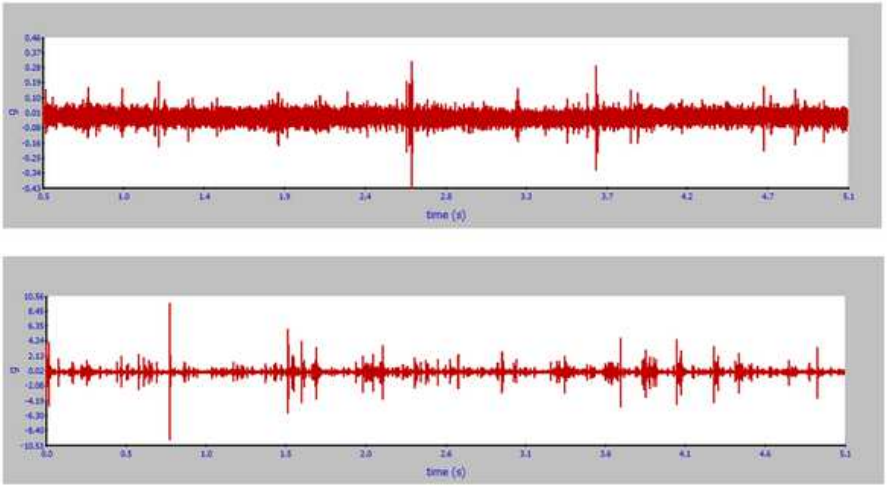
One of the perennial problems faced by production line maintenance engineers is how to diagnose faults in slow running bearings. Food production lines are a particular example, where in addition to motors running at relatively high speeds, there will also be much slower running assets such as conveyors, mixing vessels, roasters etc.

Low-cost vibration analysers, like the TPI 9080 for example, are designed to use an accelerometer to pick up vibration from motors, pumps and fans typically running above 600rpm. The TPI 9080 detects the high frequency bearing noise or "whine" of a worn bearing.
The problem is at very low run speeds there is virtually no bearing noise. You might get a few "clicks" from a badly worn bearing but those are likely to be very low level and infrequent, so you would have trouble picking them up with a low-cost instrument.

However, there is the alternative of using a relatively inexpensive, high resolution vibration analyser like the TPI 9043/Ultra III. Basically, by setting the TPI 9043 to a very high resolution and taking a long enough reading of say 5 to 10 seconds, it is possible to capture enough bearing "clicks" to diagnose a "bad" low speed bearing.

"Until now the only realistic way to monitor low-speed bearings was to use expensive, permanently installed systems"

By comparing the readings from known “good” and “bad” bearings, it’s possible to set some suitable alarm levels. This allows low-speed bearing faults to be identified well in advance of them becoming a problem! The time waveform plots shown below show the vibration signal captured with a 5 second reading for a “good” bearing (upper plot) and a “bad” bearing (lower plot). The signal spikes produced by the bearing clicks are more frequent and of higher amplitude for the “bad” bearing. (Note that the two plots have been auto scaled by the display software).



The difference between the two bearings becomes more apparent though when we look at the overall average (RMS) vibration readings for both. The TPI 9043/Ultra III displayed an overall g value of approximately 0.25g for the “bad” bearing, compared with 0.025g for the “good” bearing, a factor of 10 difference between the two. This makes setting some alarm levels relatively simple, a good starting point being perhaps 0.1g for a warning and 0.2g for a critical alert. The trick is of course to set the TPI 9043/Ultra III to a high resolution and therefore a longer sampling time. This is where a very powerful feature of the instrument comes to our aid, in that it can download “routes” of assets to be monitored. Each measurement point in the “route” is stored with its own instrument settings, so there is no adjustment of settings required between readings. The TPI 9043/Ultra III automatically adjusts its settings to those pre-chosen for each individual bearing. The benefit is you can measure both low-speed and high-speed bearings in the same route!

The TPI 9043/Ultra III is available with included C-Trend II PC-based trending and reporting software featuring everything needed to implement a full CBM strategy, including automatic email notification of alarms and report generation. Routes and readings can also be transferred to/from C-Trend II PC software and the TPI 9043/Ultra III via the cloud. This allows service personnel to be sent routes and return readings over the Internet, no matter where they are in the world.