

Application of RLC filters and analog circuits for increasing information bandwidth of channels of data acquisition units

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Fatigue cracks can be detected and monitored by using resistive crack propagation gages (CPG). Usually the sensor is composed by a series of conductive strands connected in parallel. When the crack propagates underneath the sensor, subsequent strands of the sensor are breaking down which results in increase of the sensor's resistance. Therefore, by tracking the resistance of the sensor, the condition of the structure being monitored can be inferred. However, due to nonlinear behavior of the parallel connection resistance, usually CPG sensors are unidirectional only, unless the geometry of individual sensor's strands is designed properly. Also, the result of the measurement can be influenced by many factors, e.g. the temperature, acting not only on the sensor itself, but also on other elements of the measuring system, which can bias the results and increase risk of false calls. In the paper the design of an analog device capable to track integrity of every strand of CPG sensor or make measurements of several CPGs using single analog input channel is presented. The underlying idea is based on properly designed RLC band-pass filter. An example of the implementation as well as the first laboratory results compared with computer simulations of the device operation are also delivered in the paper.

*Keywords: damage detection, crack propagation monitoring, RLC band-pass filters, Structural Health Monitoring*