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Ambient Temperature Dependence of Magnetoelastic Response in Steel Torque Transducers PATRICK SZCZYPINSKI, Western Illinois University, JASON ORRIS, MARK BOLEY — Changes in magnetoelastic response with ambient temperature of three commonly applied steel torque transducers, PMT-15, Kapstar, and ESR-420 are investigated. Applications of these transducers in real mechanical settings are often in an immersed fluid environment (such as engine coolant or engine oil) where the ambient temperature can fluctuate between 0 $^\circ$C and 100 $^\circ$C on an irregular basis. Reliability in such a setting will be dependent on the designer mapping magnetoelastic response in the applicable temperature regions and programming this map into the associated sensory electronics. Our studies over the easily attainable ambient temperature ranges in our laboratory from 20 $^\circ$C to 56 $^\circ$C clearly show that in these three samples there is little or no gain or loss to magnetoelastic response to applied torque (less than 0.1 mG/N-m/ $^\circ$C in either direction), but rather that the magnetic background signal in these transducers has a very definite positive slope with temperature of around 10 mG/ $^\circ$C. Our laboratory tests were performed first with the sensor torqued on the upstroke and released from torque on the downstroke, then with the test repeated in the reverse case. Thus, appropriately programming the transducer's sensory electronics to include the slope of magnetic background signal with temperature, will ensure transducer reliability.

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