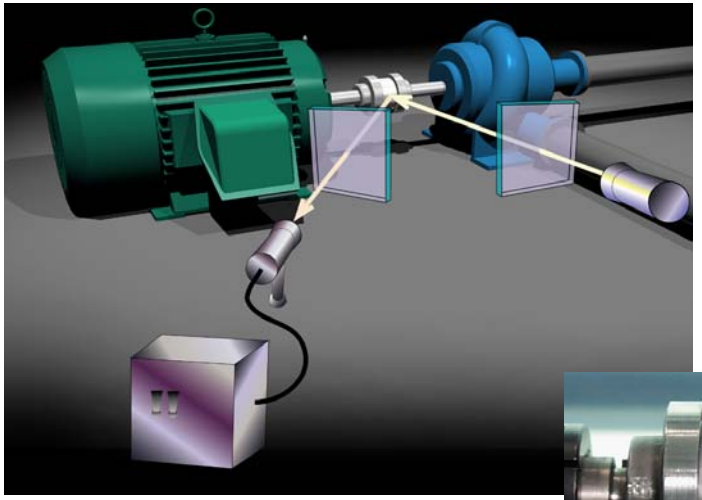
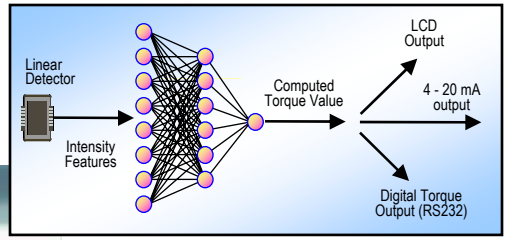
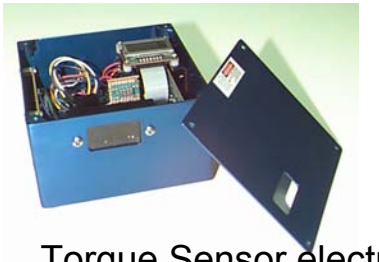
Neural-Net Non-Contact Optical Torque Sensor

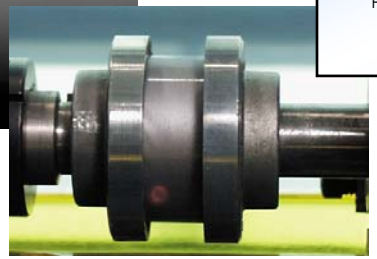


Artificial Neural Net interprets fringe pattern and computes torque





Torque Sensor electronics, display, & communications



Torque-Sensing Coupling

Photo-elastic material generates bi-refringence pattern

Torque Sensor-

- Greater than 100x higher bandwidth than commercial products.
- Use as a coupling (shown), sleeve, or embedded product.
- Cost estimate is less than 1/10 existing products
- Eliminates coupling & reliability problems with conventional devices – high reliability
- Unprecedented capabilities for diagnosis of connected machinery.
- Wireless, self-powered device enables remote diagnosis & prognosis.

"Low-Cost Optical Neural-Net Torque Transducer", F.M. Discenzo, F.F.Merat, D.Chung, P.J. Unsworth, IEE Intelligent Sensors Workshop, Oxford, UK. 1999

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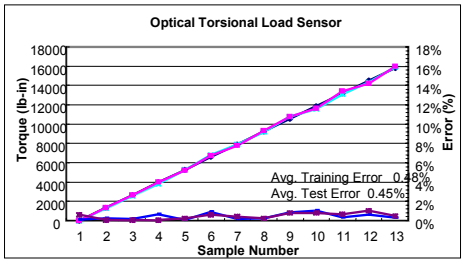
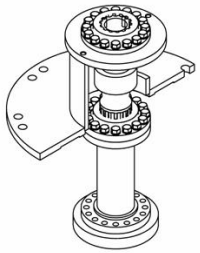
Non-Contact Optical Torque Sensor – Application Example

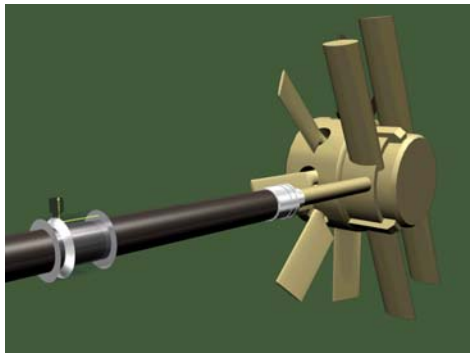




Optical Torque Sensor Integrated with Composite Shaft

$$N = 2tK(\varepsilon_1 - \varepsilon_2) / \lambda$$

Calculation for Number of Fringes



Fringe order for composite shaft experiment is 7 (radial beam path) or 21 (axial beam path)

Torsional load from 0 to 15,821 in-lb

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