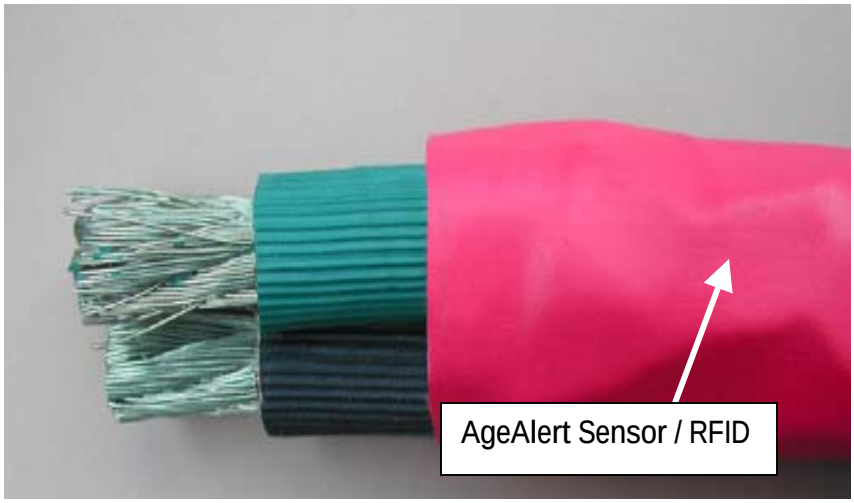
Technology Update

AgeAlert™

Recent research by Polymer Aging Concepts, Inc. shows that simple, low-cost electrical resistivity measurements predict remaining life of wire and cable insulation.



RFID reader can query wireless age sensor remotely. Alternatively, lower cost contact ohm reader queries sensors by direct contact to wire or cable. (Aged cable shown here incorporates passive RFID AgeAlert sensor.)

Research conducted on EPR, Silicone Rubber (SR), and XLPE, combined with nano particles of carbon black filler showed a dramatic decrease in electrical resistivity as the insulation aged. When the electrical resistivity data was used in an Arrhenius plot, it actually predicted the remaining life of the insulation.

Low-cost carbon black particles, embedded in the insulation material (or a small portion of the insulation material), function as a sensor to track minute changes in the insulation as it ages. Consequently, the AgeAlert sensor monitors the *actual* state of the insulation material itself rather than modeling the changes that *may* be taking place based on input from environmental sensors in the area.

Extensive research in cooperation with Georgia Tech indicates that AgeAlert accurately monitors the degradation state and predicts remaining life for EPR, silicone rubber and XLPE insulation; additionally, initial research indicates that the AgeAlert technology will monitor the degradation state of virtually any polymer (most any material that is not ceramic or metal). Consequently, we expect AgeAlert to predict remaining life for any wire/cable insulation material.

Features and Benefits

The benefits of the patent-pending AgeAlert technology include:

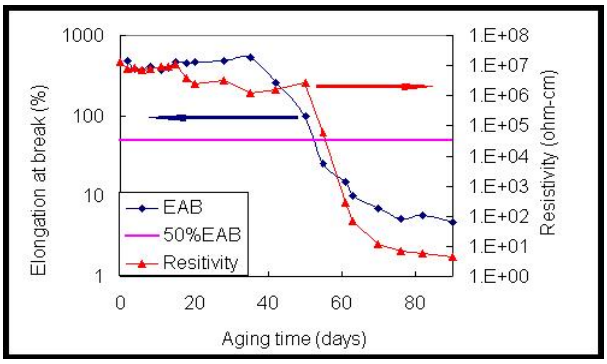
- Improved safety and reduced costs from unplanned shutdowns. AgeAlert accurately monitors the degradation of the product from *actual* use and storage conditions, allowing replacement before product failure.
- Easy to use. AgeAlert provides *objective* results (good/bad, percentage degraded, *or* remaining life).
- Product flexibility. Multiple methods of product-sensor integration and sensor communication allow use with a wide range of wire and cable products.
- Compatible with passive RFIDs. Simple resistance output requires no batteries and provides "life cycle" cable identification *and* status.
- Low cost sensor. Use of low-cost carbon black and the actual insulation material as the sensor results in very low sensor costs as compared to time-temperature integrators. Testing costs are substantially reduced.

AgeAlert Technology Update for Wire and Cable

How AgeAlert Works

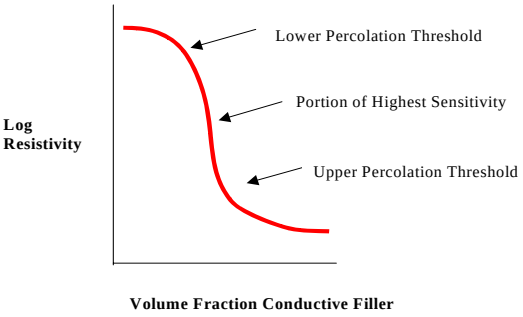
AgeAlert™, a low-cost conductive composite sensor, precisely measures the degradation state of virtually any degradable product. As the product ages, the polymeric components of the product shrink very slightly. At the same time, the polymeric components of the AgeAlert™ sensor also shrink, precisely mimicking the changes in the product.

AgeAlert™ essentially tracks the very minute change in shrinkage through change in electrical resistivity. For example, as a polymer ages, AgeAlert™ monitors how much the product has aged by monitoring the electrical resistivity in the sensor.

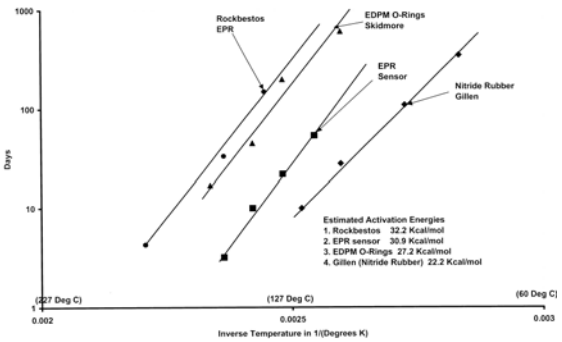


As aging occurs, the resistivity of composite structures correlates strongly with mechanical properties such as elongation at break. (Research conducted by GA Tech and Polymer Aging Concepts, Inc.)

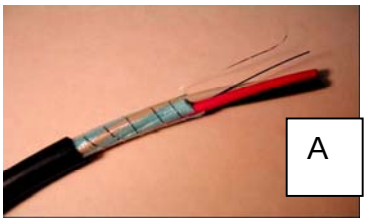
Percolation Curve for Age Sensor



Minute changes in product polymer shrinkage during aging provide large changes in resistance output of the sensor.



By using the Arrhenius equation, the change in electrical resistivity predicts remaining life of the polymer insulation material.

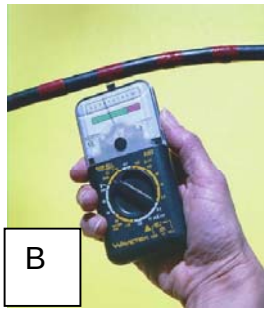


AgeAlert sensor communications can take three forms:

1. Sensor strip integrated into the cable inside the wire/cable jacket connects directly to a terminal box/reader (see A);

2. Sensor particles embedded in outer layer of wire/cable insulation are used with a contact reader (see B);

3. Combined AgeAlert sensor / RFID tag (C) integrates into cable inside the jacket (front cover photo), as wire/cable tag, or onto component housing. Passive RFID tag communicates with remote (wireless) RFID reader.



Polymer Aging Concepts, Inc.
706 864 6304 kwatkins@PolymerAgingConcepts.com
372 River Dr., Dahlonega, GA 30533
www.PolymerAgingConcepts.com

Printed in USA
WC-001-05