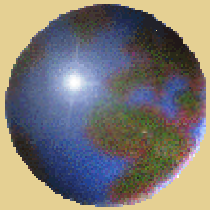
IEEE SC-2 10/4/2005 Meeting
Ft Lauderdale, FL



Non-Conservatisms in Aging Analysis Using IEEE-101 Guidance

SCIENTECH

Background

- Exelon QA Acceptance of Aging Analysis Software Revealed Inconsistencies
- Ea of 1.13, 150 F ambient, material aged at 120 C for 1049 hours
  - IEEE-101 basis → QL of 25.63 yrs
  - No round off → QL of 25.21 yrs

IEEE Std 101

- ***IEEE Std 101-1972 reaffirmed in 1980***
- **Incorporated into *IEEE Std 101-1987***
- ***IEEE Std 101-1987 reaffirmed in 2004***
- ***IEEE Std 101 recommends using:***

  T (Kelvin) = T (Centigrade+ 273)

- ***Conventional conversion is:***

  T (Kelvin) = T (Centigrade+ 273.15)

Variation with Activation Energy

For a material aged at 120 C for 1050 hours and operating at an ambient temperature of <u>150 F</u>:

- **Activation Energy = 0.75**
  QL = 4.22 years (IEEE-101)
  QL = 4.17 years (*no round off)*

- **Activation Energy = 1.0**
  QL = 13.84 years (IEEE-101)
  QL = 13.62 years (*no round off)*

- **Activation Energy = 1.25**
  QL = 45.35 years (IEEE-101)
  QL = 44.48 years (*no round off)*

Variation with Activation Energy

For a material aged at 120 C for 1050 hours and operating at an ambient temperature of <u>140 F</u>:

- **Activation Energy = 0.75**
  QL = 6.48 years (IEEE-101)
  QL = 6.41 years (*no round off)*

- **Activation Energy = 1.0**
  QL = 24.51 years (IEEE-101)
  QL = 24.13 years (*no round off)*

- **Activation Energy = 1.25**
  QL = 92.69 years (IEEE-101)
  QL = 90.89 years (*no round off)*

Conclusions/Recommendations

- The small differences in the IEEE-101 conversion factor can make a significant difference in the qualified life at higher Ea and lower ambient temperatures
- No safety issue, as Arrhenius methodology underestimates qualified life
- T. Hencey to send letter to SC-2 recommending that the committee identify the issue to the IEEE-101 WG Chairman
- SC-2 should establish a position whether to address the issue in the next revision of IEEE 323