

**Demonstrating Reliability course  
from Hobbs Engineering  
May 8 - 9, 2012**

CSZ's Test Laboratory will be hosting the Demonstrating Reliability training event at our Cincinnati, OH laboratory. The class will be taught by by Mr. Chet Haibel, M.S.E.E., through Hobbs Engineering.

Where:  
Cincinnati Sub-Zero  
12011 Mosteller Road  
Cincinnati, OH 45241  
Cost: \$1,195

Register Here:  
[http://www.hobbsengr.com/Demonstrating\\_Reliability.htm](http://www.hobbsengr.com/Demonstrating_Reliability.htm)  
Email: [learn@hobbsengr.com](mailto:learn@hobbsengr.com)  
Phone: 303-465-5988

This two-day seminar will equip participants with both theory and best practices in planning and executing good Reliability Demonstration tests. Such tests become necessary for one of two reasons. The first reason is that Wear-Out (end-of-life) failure modes are often not easily discovered by overstress tests such as HALT.

The second situation is where several failure modes have been discovered, the design has been improved, but it is not clear whether the design is good enough yet, or whether it's possibly "too good"; potentially weight, size, cost, or some other attribute can be traded off. Reliability must be quantified to move forward.

HALT deals wonderfully with design margin issues in electrical and mechanical devices, and with some overstress fatigue issues in mechanical devices, "surfacing" these issues so they can be understood and remedied. But what about cable flexing; connector insertion and extraction; battery recharging; switch cycling; belt, pulley, gear, and bearing wear; evaporation; corrosion; & many more "endurance" issues?

This seminar zooms in on those Wear-Out (end-of-life) failures that are caused by some "process" (failure mechanism) consuming some "reservoir" of material. What about product and process designs that have been improved? How good is good? What is the shortest, least expensive test to substantiate improvement? Can you place confidence in tests of small quantity samples with few failures or even in the absence of failures?

Starting with a review of the nature of failures and the mathematics that describe them, optimal test strategies are laid out to save you time and money. Various methods of reducing test time, number of cycles, and / or the number of samples are shown for many genres of devices.

Pass / fail tests of single-shot devices; sudden death testing of sample groups; (constant hazard rate) MTBF demonstrations; Sequential Probability Ratio Tests (SPRT); cycle tests of electrical, mechanical, and electro-mechanical components and assemblies; censored and interval testing; and many more techniques are presented.

For higher reliability and / or shorter tests, acceleration must be applied. This can be as simple as removing the dead time between cycles, but what are the risks of overlooking some failure modes or introducing foolish failures with this?

For higher acceleration, stresses must be applied. The standard known acceleration relations between stress and life are presented: Arrhenius (temperature acceleration) with examples of activation energies, Inverse Power Laws such as the Coffin-Manson relation for low cycle fatigue, Peck's modification of the Arrhenius relation to include effects of humidity, etc.

The class culminates with how to use several accelerating stresses (that are not independent) with unknown stress-life relations to demonstrate reliability.

**Attendee responsible for travel & hotel.**

**HOTEL INFORMATION:**

**Cincinnati Sub-Zero has a special hotel room rate at the Sharonville, OH Holiday Inn for \$69.00 per night plus tax.**

**You may reserve your room in our block by contacting the hotel directly at (513) 563-8330. *Please be sure to mention CSZ when making your reservation.***