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April 4-5, 2000, SAE FD&E Committee meeting, Cedar Falls, IA

Fatigue Life Prediction Division Minutes --Technical Session, 4/4/2000

October 1999 minutes were approved.

Chin-Chan Chu announced that Al Conle has agreed to serve as vice chairman of the Fatigue Life Prediction Division.

Charles Sieck (Cat) presented "Variability Does Drive Uncertainty":

Deterministic analysis takes discrete values and calculates discrete answers, where probabilistic analysis uses probability distributions to calculate probability of failures. Considering costs as a constraint, then there is some optimum number of loads to measure. But cost is not the only factor. That is, if we just looked at number of loads measured versus cost, it would indicate we should measure no loads. If we consider sources of uncertainty like variations of inputs, customer applications, material strengths, and manufacturing in our calculations and put these variations into a Monte Carlo simulation, we might determine that four or five load measurements would be optimum. It is very rare that we get data based on 100 test samples. A plot of Cost vs No. Loads Measured showed 3 curves of different confidence. The lowest point on each curve represented a minimum cost for each desired confidence level. Challenges: 1. A sample of 10 with mean 30 and std.dev. of 10 is different than a sample of 100 with same mean & deviation.  
2. How much uncertainty is in our Life Prediction?

Russ Chernenkoff gave an updates on "Effects of High Mean Stress Study."

- a literature survey has been done
- testing has started at Ford
- from the earlier project on A356-T6 FDE round robin we had 7 samples left over, and used them in periodic overload tests similar to John Bonnen's /Dave DuQuesnay tests. They use Miner's rule to calculate equivalent cycles to failure by subtracting the damage done by small number of overload cycles. Results: curve 50% below the fatigue limit - should be a bound on mean stress effects.
- cast iron testing at Ford is showing similar effect.

Russ promised to post his test data on the web site for simulation/prediction by the group members.

Al Conle gave a brief update on "Standard file formats for Load Histories and Material Properties." Try the routine to create a digital curve for use in simple analysis tools that is on the website at [fde.uwaterloo.ca](http://fde.uwaterloo.ca).

(ed.Note: A standard FDE file format proposal has been posted at: [http://fde.uwaterloo.ca/Fde/fde\\_short\\_loadhist.txt](http://fde.uwaterloo.ca/Fde/fde_short_loadhist.txt) but a plot tool is still in development)

-- Planning Session, 4/5/2000

Russ's high mean stress test with overload data will be posted on the uwaterloo site.

Tom Cordes of Deere will use the 'corrected strain-life curve' method to see whether they can correctly predict failure.

Chin-Chan Chu will use the 'closure method' to predict.

Dan Lingenfelser of Cat. said he could probably use crack propagation method to predict life. Results and comparisons will be reported next meeting.

Chu: we have delivered two new tools to the experimental web site; one on digital curves, and another on Mohr's circle. We need some feedback on whats on the site. The group was polled as to how many people checked the <http://fde.uwaterloo.ca> site: 3 or 4 responded.

Dan Lingenfelser asked if we could get a Listserv? Al Conle said he would try to start one by next meeting.

Not many people had ventured to the uwaterloo web site to try out the tools we posted.

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