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SHOT PEENING PIONEER DIES AT 81

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Henry O. Fuchs, internationally known expert on fatigue in materials, died Tuesday, Jan. 17, at Stanford University Hospital following heart surgery. He was 81.

A Stanford professor of mechanical engineering since 1964, Fuchs and John Almen of General Motors pioneered the process known as shot peening, where metal parts are bombarded with thousands of pellets.

This process has been widely used to strengthen car bodies, springs and engines. It also led to the use of aluminum wings in B-52 bombers and other aircraft.

Between 1936 and 1978, Fuchs obtained 24 patents for shock absorbers, steering linkages, power take-off mechanisms, car doors, coil springs and shot peening devices.

Fuchs was co-author with R. I. Stephens of a widely used text, Metal Fatigue in Engineering, published in 1980. He also wrote, edited or supervised the production of more than 200 case studies now used in engineering schools across the country. Case studies help students learn that " engineering is not a neat and concise profession," he once observed. Case studies show "the lack of information, unexpected conclusions and the extreme importance of non-technical and illogical aspects which face an engineer every day."

Born May 27, 1907, Fuchs received his diploma in Latin and languages at the University of Strasbourg, France, in 1923 and his diploma in philosophy there in 1924. He received his diploma in engineering in 1929 and his doctorate in 1932 from the Technical University of Karlsruhe, Germany. His thesis was on "The Effect of Shock Absorbers on Ride."

He was an engineer with General Motors from 1933 to 1945, designing shock absorbers used in Buicks for many years. He was president of Metal Improvement Co. in Los Angeles from 1946 to 1960, where he made many important contributions to the shot peening process. He became professor emeritus in 1973, but continued lecturing until the mid-1980's and advised students on design projects and research until shortly before his death.

Following is a list of Dr. Fuch's publications and patents in the area of shot peening. Copies of those publications marked with an "*" are available through The Shot Peener library. The Shot Peener library welcomes additions of those publications not currently on file.

"Model Laws and Tests for Predicting Performance" Product Engineering, October, 1942

"Notes on Secondary Stresses in Volute Springs" Trans. of ASME, Vol. 65, No. 5, pp. 543-551, July, 1943

"A Design Method for Volute Springs"
SAE Journal Transactions, Vol. 51, No. 9, pp. 317-328, September, 1943

"Volute Spring Design Data"
Product Engineering, February, 1944

*"Measurement of Residual Stresses in Torsion Bar Springs" H. O. Fuchs, R. L. Mattson

Proceedings of the Soc. for Experimental Stress Analysis Vol. IV, pp. 64-73, 1946

*"Trapped Stresses," Machine Design, July, 1948

"Three Methods of Spring Stress Calculation"
The Mainspring, February, 1948

"What Goes on in a Spring During Presetting?"
The Mainspring, April, 1949

*"Research and Development in a Peening Job Shop"
Reprint of a paper, presented at meeting of Division XX of the SAE, ISTC Committee, Homestead, Virginia, October 25, 1956

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Quantification of the effects of various levels of several critical shot peen process variables on workpiece surface integrity and the resultant effect on workpiece fatigue life behavior.

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Abstract: The purpose of this program is to acquire a statistical data base from which a mathematical model can be established to define the fatigue behavior of several materials that were prepared with various levels of shot peen process parameters. The objective of the model is to establish those shot peening process parameters that will produce optimum fatigue behavior in a variety of commonly used materials.

During the program, fatigue performance data was collected from 1148 specimens made from 11 materials. Shot peening parameters included variations in shot intensity, shot media and size, Almen saturation, broken particle content, impact angle and initial specimen surface condition. The fatigue performance data indicated that an optimum fatigue life could be obtained with variations in intensity. Typically, relatively low levels of shot peening intensity produced the longest fatigue life and increased peening coverage and intensity reduced the life; in some cases, dramatic decreases in life occurred with increases in coverage.

An important realization that should be derived from the Phase I and Phase II data as well as other technical publications, is that the very simple charts that can be found in a majority of military and industry specifications listing prescribed peening intensity ranges are clearly inadequate for prescribing shot peen process as a means of reliably reproducing certain desired levels of workpiece fatigue strength benefit, several factors above and beyond material type and hardness must be considered. While elegant in their simplicity, arriving at optimal shot peen parameter values and insuring that the desired benefit level is attainable at both extremes of cumulative acceptable process variable tolerance limits is technically a much more complex challenge than the typical military and/or industry specification's table of prescribed peening intensities would indicate.

It is important to note that the authors in no way suggest using the optimum shot peen process variable values defined for the test conditions of either Phase I or Phase II of this program as universal prescription for intensity optimums on the material types investigated. The workpiece chemical and physical characteristics and the particulars of the operational load and operating environment for the workpiece in question must be taken into consideration.