



OPENING SHOT

Jack Champaigne | Editor | *The Shot Peener*

Homage to John O. Almen

LEARNING IS A NEVER-ENDING OPPORTUNITY. John Otto Almen invented the gage we use today for shot peening process consistency. While struggling with early fatigue failures of automotive valve springs, he decided to “shot blast” the springs to remove the scale from the springs. The blasted springs lasted much longer on the fatigue testing machine and now he needed a way to consistently “blast” the springs. He filed his patent for a gage in 1942 and it was granted in 1944 (Patent Number 2,350,440). I found a copy of a General Motors drawing dated November of 1943 showing a new generation of gage that already used four-ball support instead of two-knife edges. A graphic was created to allow conversion of measurements made on either test strip.

The advantage of the four-ball support was that it accounted for the combined length and width curvature of the strip. The original method of determining intensity required blasting strips for longer time periods and creating a graph of the arc height readings—“Intensity is the arc height of the graph at the knee of the curve.” That was a little subjective so a method to assign a mathematical answer to intensity was created using the 10% rule. The first point on the curve that increases only by 10% when the exposure time is doubled is considered the intensity of the process.

Professor David Kirk developed the Almen Saturation Curve Solver Program that automatically determines the Almen intensity and creates smooth fitted curves that could identify the intensity of the saturation time T1. Dale Lombardo of General Electric collected saturation curve programs from multiple sources and helped create the SAE document J2597 titled “Computer Generated Shot Peening Saturation Curves” in 2010. Any algorithm that could achieve the answers to a battery of arc height data within a tolerance band could declare compliance with J2597.

Newer versions of curve solvers continue to be developed; some with capabilities of selecting the proper algorithms depending on the number of data points (more is better). We now see peening operations that require extremely tight consistency performance for periodic testing such as ± 0.001 inch repeatability. Plotting this data into SPC charts helps confirm if the process is in control or needs attention. I’m sure John Almen would be pleased to see what we have done with his pioneering work. ●

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This image is from John Almen’s patent. The patent and many other articles on John Almen and the original Almen gage are available in the library at www.shotpeener.com. A sampling of these articles include:

- “Peening Intensity Measurement,” 1945, by R. L. Mattson and H. E. Fonda with GE
- “The Almen Gage and Almen Strip” by Jack Champaigne (*The Shot Peener* magazine, Spring 1990)
- “The Care and Feeding of Your Almen Gage” by Jack Champaigne

