October 1970 Brief 70-10533



AEC-NASA TECH BRIEF



AEC-NASA Tech Briefs announce new technology derived from the research and development program of the U.S. AEC or from AEC-NASA interagency efforts. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Division, NASA, Code UT, Washington, D.C. 20546.

Electronic Flaw Simulator for Eddy Current Probe Calibration

The problem:

Eddy current probes are effective tools for the nondestructive location of flaws in materials. In the past the calibration of probes has consisted of passing the probe coils over materials containing flaws of known dimensions. The major disadvantage is that these reference flaws change in time due to undetected dust collection, chipping, and handling wear.

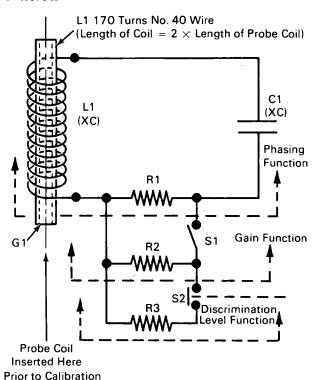
The solution:

An electronic flaw simulator cycled into the eddy current system using switches.

How it's done:

As shown in the figure, the eddy probe coil is inserted into sleeve G1 which is a flaw-free material identical to the material being tested. Next, the probe rf bridge is balanced in the proper phase using the null network (G1, L1, R1 and C1). The proper phase is an optimized reference point of operation, well within the linear response range of the rf bridge, and at the midpoint of the typical variation realized for conductivity effect. System gain adjustment is accomplished by switching S1-R2 into the tank circuit and loading the probe to a selected level within the operating range of the rf bridge. The gain adjustment is included as an integral part of the simulator to assure day-to-day consistency in the operation.

The simulation of a flaw is accomplished by intermittent loading of the probe through a variation in the impedance of the tank circuit. The mechanism by which the probe motion past a flaw is simulated is shown as switch S2; the impedance variation is simulated by R3. The magnitude of the simulated flaw is a reference equivalent volume obtained by measuring the rf bridge sensitivity to a selected physical standard.



A discrimination level reference is thus established wherein any flaws with an equivalent volume equal to or greater than the reference will be recognized.

Notes:

- 1. This technique provides a system calibration time saving of 1/5 over prior methods.
- 2. The first electronic simulator has been in use since 1968 without measurable change in performance. Minor maintenance has not adversely affected calibration.

(continued overleaf)

This document was prepared under the sponsorship of the Atomic Energy Commission and/or the National Aeronautics and Space Administration. Neither the United States Government nor any person acting on behalf of the United States Government assumes any liability resulting from the use of the information contained in this document, or warrants that the use of any information, apparatus, method, or process disclosed in this document may not infringe privately owned rights.

3. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer AEC-NASA Space Nuclear Propulsion Office U.S. Atomic Energy Commission Washington, D.C. 20545

Washington, D.C. 20545 Reference: B70-10533

Patent status:

No patent action is contemplated by the AEC or NASA.

Source: C.D. Cowfer and L.J. Almasy of

Westinghouse Astronuclear Lab.

under contract to

Space Nuclear Propulsion Office

(NUC-10211)