

THE ITL EXPANDING CIRCLE OF TECHNOLOGY PULSED SURFACE INTERROGATION INCREASES QUALITY IN PRODUCTS AND SYSTEMS



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Non-contact measuring instruments can be applied to give narrow band process results from rapid, instantaneous interrogation of high volume production products and high speed processing systems. Reliance ITL has the methodology required to apply instruments to create a sample data system of a continuum of process information. The following are only a few examples of how ITL methodology can be applied.

TURBINE BLADE RADIUS MEASUREMENT

The radius of axial turbine blades cannot be accurately measured while the rotor is stationary, and until now could not be measured accurately while moving. Smaller clearances achieved by non-contact measuring of the moving blades result in increased thrust or improved SFC.

USING MACHINE BEHAVIOR TO PREDICT FAILURE

Measurement devices and instrumentation can recognize normal pattern behavior in production machinery (i.e. punch presses) and moving devices (i.e. bearing races). Deviations from the normal pattern, and impending failure, can be spotted before systems fail or accidents occur. In effect, machines diagnose their own levels of performance and prevent their own failure.

MAINTAINING DIMENSIONS IN UNIT MANUFACTURING

Because dimensions of fast moving parts produced can be interrogated by non-contact measurement devices, information bits can be used as a form of sample data. This system spots production errors and corrects machining for rapid restoration of dimensions within extremely fine tolerances.

Non-contact instrumentation can be applied to a variety of production equipment to measure shock effects on products, product dimensions, flutter in strip or web and vibration and chatter in machinery. It is also applicable to automatic tool tip positioning and measuring wobble in rotating shafts, couplings and large rotors.

ITL, an advanced technology arm of Reliance research and development, will apply its abilities such as non-contact measuring to your problems under the terms of a "guaranteed results" agreement. For more information, write or call George Foster, Director, Instrument Technology Laboratory, Reliance Electric Co., 4550 Indianola Avenue, Columbus, Ohio 43224, Phone: 614/885-0421.



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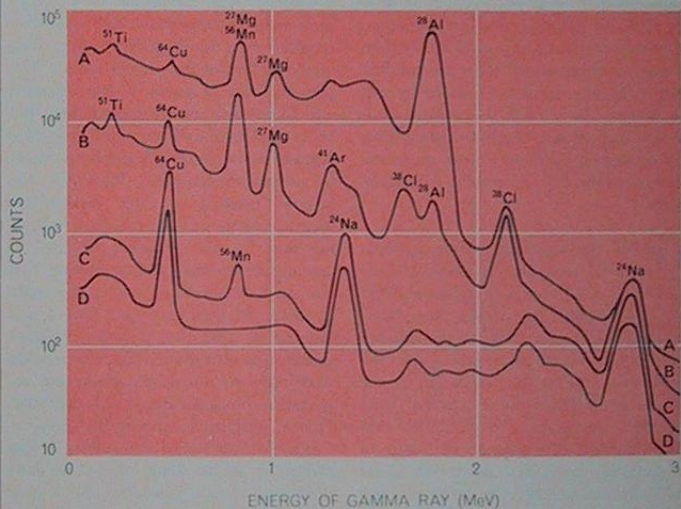
paring the paint with the paint of authenticated works.

Most of the trace-element analyses performed by the neutron-activation technique are of course more mundane than the ones just described. Nonetheless, the technique has played a key role in solving many important technological problems. For example, it has been used in the development of purer materials for manufacturing transistors, high-strength metal alloys and plastics. One noteworthy problem that was solved had to do with certain epoxy resins, which originally had a short and unpredictable shelf life. A neutron-activation analysis of these resins revealed the presence of very small amounts of a number of metals. When these trace contaminants were removed, the shelf life of the resins was extended considerably. Apparently the trace contaminants had catalyzed the fixing of the resin.

Neutron-activation techniques are also used to characterize raw materials by their trace-element content. In one of our studies at Union Carbide we discovered that the trace-element content

of the mineral chromite in ore deposits is constant within a given deposit but is quite different from that found in other deposits. This information is useful for measuring the extent of a given deposit and for determining why one source of ore gives rise to a better product than another. Petroleum geologists, using a similar approach, employ trace-metal analysis to determine the extent of oil reserves, the stratigraphic position of oil traps, the age of crude oils and the fundamental principles governing the origin, migration and alteration of petroleum. Soils from widely separated locations also show large variations in trace-element concentrations; as a result vegetation exhibits trace-element characteristics peculiar to the area in which it grows. Such information is used by geologists to locate new ore deposits, by ecologists to study the relation between the growth of certain trees and shrubs and their environment, and by official investigators to identify the original source of raw opium that has been confiscated.

The neutron-activation technique has developed into one of the most sensitive,



RADIONUCLIDE	HALF-LIFE	RADIONUCLIDE	HALF-LIFE
ALUMINUM 28 (²⁸ Al)	2.3 MINUTES	ARGON 41 (⁴¹ Ar)	1.83 HOURS
TITANIUM 51 (⁵¹ Ti)	5.8 MINUTES	MANGANESE 56 (⁵⁶ Mn)	2.58 HOURS
MAGNESIUM 27 (²⁷ Mg)	9.5 MINUTES	COPPER 64 (⁶⁴ Cu)	12.9 HOURS
CHLORINE 38 (³⁸ Cl)	37.3 MINUTES	SODIUM 24 (²⁴ Na)	15 HOURS

SIMULTANEOUS ANALYSIS of a number of elements in a sample is possible using their gamma ray spectra. The spectra shown here were recorded for a neutron-irradiated piece of paper after decay periods of three minutes (A), 10 minutes (B), four hours (C) and 24 hours (D). The peaks in the spectra can be identified by referring to the key at bottom. Because of the different half-lives of the elements, the analysis of a particular element can be facilitated by choosing a decay time when the emissions from the "indicator" radionuclide are least interfered with by the emissions from other radionuclides in the sample.