LEAD INDUSTRIES ASSOCIATION, INC.
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September 1, 1964

SUBJECT: LEAD ZIRCONATE-TITANATE

To Members of the Lead Industries Association, Inc:

The attached reprint of an article that appeared recently in American Machinist magazine is highly favorable to a relatively new lead product - lead zirconate-titanate - the use of which is growing rapidly in competition with other piezoelectric materials because of its superior performance. Please note in particular the statement in the last paragraph of the first column of the second page. We estimate that this new material currently accounts for the consumption of between 500 and 1,000 tons of metallic lead annually and several additional companies have recently joined the list of its producers.

L.I.A. will use these reprints as an aid in answering inquiries on the subject. Members may obtain additional copies from us free in quantities up to 25 and at our cost of 2.5¢ per copy in larger quantities as long as our limited supply lasts.

Very truly yours,

Robert L. Zimmerman

Executive Vice President

RLZ:so
Enc.

Look Ahead with Lead

Cleaning radioactive parts

Growing use of radioisotopes by industry—for inspection or measuring wear, for example—is creating a new problem: How do you get rid of the radiation when it has served its purpose? Ultrasonic cleaning is one solution

The increasing use of radioactive isotopes by industry and by research laboratories has led to a widespread interest in ways and means of insuring that parts exposed to such radiation can be completely decontaminated.

On a somewhat different tack, low-level radiation is being used to check the efficiency of cleaning techniques used for air filters and instrument components. These components, which must be clean beyond the capabilities of most conventional equipment, are given a dose of radiation before cleaning; then, if the cleaning technique removes the radiation, the components must be "cleaner than clean."

Decontamination is a must

The hazards of radiation are well known, and in all industrial applications—part wear determinations, radiography, measurement of grinding wheel wear, and thickness measurement, to name a few—every precaution is taken to prevent contamination of tools, parts, and other elements near the source of radiation.

Radioactive devices are usually well sealed, but leakage is not an impossibility. Any part that becomes contaminated is a hazard to human life and health and thus requires an effective means of removing the contamination.

Human beings can, in general, be exposed without danger to radiation in amounts up to five roentgens per year. Average dose in ordinary surroundings (background level of radiation to which people are exposed daily) varies with geographic areas. In Southern California, for example, this level is 0.05 roentgens per year; in Denver it is 0.1.

Parts that have been exposed to excessive radioactivity must, therefore, be decontaminated to at least their particular background level. Generally, then, it is necessary to know what the background level is before cleaning the parts. This simply involves taking a dosimeter reading in the area.

Ultrasonic cleaning has been found to be the most practical means of removing radioactive particles from contaminated parts. The key to this is the tremendous force of cavitation within a liquid medium.

Since sound travels through all media in waves of compression and rarifaction, sound waves released under great power in a liquid will form small bubbles in the rarified portion of a wave. When the compression portion of the wave passes, these bubbles are compressed to

850-watt ultrasonic cleaning unit removes radiation from deeply recessed parts or threaded components

By Donald L Collins
President
The Landsverk Electrometer Co
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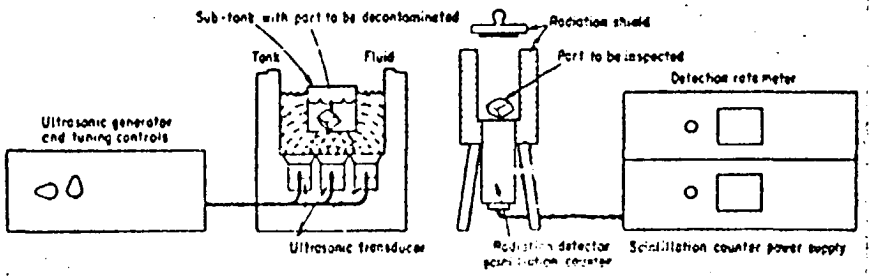

System for decontaminating radioactive parts and checking the effectiveness of decontamination consists of a Landsverk L 850 A ultrasonic cleaning unit and a radiation detector

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the point where they implode, that is, they burst inwards.

This cavitation effect-tremendous pressures and temperatures produced in the small areas where these bubbles are imploding-literally blasts microscopic particles of dirt and other foreign matter from otherwise inaccessible recesses in the parts being cleaned.

Greater power required

But decontamination of radioactive parts requires greater cleanliness, and this demands greater power and more uniform distribution of it than is normal for ultrasonically cleaning ordinary parts.

For example, Landsverk found that 850 watts were required to decontaminate lead bricks (used as shielding in a special radiation application) to the background level. Because ordinary ultrasonic cleaning setups provide only 100 to 200 watts and operate at about 50% efficiency, it was necessary to design a special system.

Efficiency of this special 850-watt system is 95%, mainly because of a lead-zirconate sandwich transducer that is more reliable than the usual piezoelectric transducer and more efficient than the magnetostrictive type. In the high-Q, low-impedance Landsverk transducer, piezoelectric crystals capable of withstanding temperatures to 300 F are sandwiched between two metal surfaces so that a metal-to-metal bond is achieved between the interface of the transducer and the radiating surface of the stainless steel cleaning tank.

A relatively low frequency of 25 kc provides a vigorous cleaning action yet is high enough to be out of the audible range. In many low-frequency ultrasonic cleaning operations, standing waves, which are produced at each half-wavelength within the liquid medium, result in "dead spots" where little or no cleaning action occurs.

This can be overcome in conventional systems by moving the work up and down in the liquid. The new system does away with this: it provides a slight frequency sweep that allows an overlapping of the standing waves. As a result, the cleaning power is evenly distributed, there are no dead spots, and there is no need for agitating the work.

Automatic tuning adjusts the generator frequency to compensate for changes in tank load or liquid level, liquid temperature, or type of liquid used.

Choice of cleaning solution and solvent is important if the contaminant is to be thoroughly removed. In most cases, water and Oakite 33 take care of radioactive particles efficiently. Trace amounts of radioactivity are usually drained away with the used solution in a normal manner, but solutions containing hazardous amounts of radioactivity are disposed of in accordance with law.

Threaded parts or parts with recesses can be effectively cleaned with this technique. After such parts are cleaned a wip test is usually made with a scintillation counter to get an immediate reading of any residual radiation.

Radiation checks cleaning

A switch sub-assembly, made up of a small bellows with a glass-to-metal seal and a flange soldered together, was found to be accumulating dirt and flux from handling and soldering. Trace amounts of radioactive material were added to these contaminants, and after assembly was completed the degree of residual radioactivity was measured with a scintillation counter. Ordinary ultrasonic cleaning was ineffective, but the new 850-watt unit removed all radiation. ■

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