SOME NEW DEVELOPMENTS IN LEAD*

Report of the Technical Director
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Gentlemen, I have been asked by the Secretary to expand on the important new developments in lead which have come to our attention this year in order to point out that the possibilities for lead are by no means exhausted but in fact are on the upturn. As industry representatives, technically speaking, we know where we've been, where we are, and perhaps less, where we are going. Considerable attention has been given recently to the so-called exotic metals and their newly found markets and to other technological accomplishments — to the comparative exclusion of lead. Technical firsts last year have been many and varied and are, I believe, the best indication of where we are going as a technical-minded nation and industry. Our space accomplishments need no further comment and as significant as these and other developments are, the revelations with respect to lead are in the very least and contrary to popular belief, proportionately as great.

Lead's firsts would have to include a newly developed use in connection with a high temperature structural material, its first practical use as a superconductor, the realization if not the revelation that a certain lead compound is virtually a black body, that lead has an important place in the future of electronic or electroluminescent lighting, and that lead as an anode has found use in cathodic protection circles, that lead because of sound attenuation properties has developed as a requisite material for missile guidance and control system calibration studies, and that lead alone or in combination with various organic materials has found new applications in the nuclear field. Of these latter uses, one in particular may be as explosive in impact to the lead industry as the application is to the purpose for which it is intended.

To further elaborate, the implications with respect to the above firsts in terms of lead tonnages consumed might be considerable and on the other hand they may not. What I have to say will in the very least arouse your imagination and will indicate clearly that the future for lead is indeed a bright one.

Offhand, it would be difficult to imagine a structural application for lead in excess of 1,000°F. However, it has developed that titanium, a modern metal, is benefited by as much as two weight percent lead at high temperatures. Lead has the ability, because of diffusion and solubility characteristics, to move with imperfections or dislocations in the metal and thereby maintain the properties of the bulk material. Tonnagewise, in this case, we are geared to titanium consumption which may or again may not be larger.

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You may also be aware of the superconductive behavior of lead at low temperatures, on the order of -452°F., and the difficulty in finding a practical use for such an elegant property. But, IBM reports lead's use as a durable superconducting connection to solder or film-coated wire for various electronic uses, an indication of things to come.

I think you have all heard of or had experience with radiant heating, that is, the heating of home or factory by heat emitted from the walls, floors and ceilings. Little do we realize that we can absorb useful heat only as a minor fraction of that produced by such means. In a sense, comfortwise, we respond to only a very limited portion of the heat spectrum. To expand further, as based on the behavior of white lead which is virtually a black body, it appears that lead compounds or combinations of them can be manufactured to absorb perfectly and emit characteristic or important frequencies of radiation and as such would be infinitely more efficient than existing materials for this purpose. One can cite the heat trap devices slated for the future home, which in daylight would be used to absorb, use and transmit to storage excess heat from the sun for heating purposes. In the same sense, lead compound coatings for walls or decorations, heated electrically, might be used as inconspicuous radiators at unheard-of efficiencies. To further explore this possibility the LIA has under consideration specific research proposals. Needless to say, tonnages could be considerable. The efficacy of heat or comfort in the home, factory or office at low cost is always attractive to the consumer or builder.

Electronic lighting, a large potential consuming industry for phosphor compounds holds promise for lead, again as an additive or making up approximately two mole percent of the total used. Such companies as Westinghouse, General Electric and Sylvania are active in this field -- which have in the offing as consumer products, multicolored wall-hung or ceiling panels for decorative and lighting purposes, wall-hung T.V. and so forth. Lead has the ability in this case to enable the tungstate phosphors or compounds to operate at peak luminous efficiency. Again it is too soon to tell, but already such electroluminescent panels are being used on dial radios and cabinets for both decorative and functional purposes. In future we may be able to light up our walls and ceilings at the flick of a switch thus dispensing with such unnecessaries as the floor lamp. The February issue of "Readers' Digest" has an excellent coverage of this "new kind of light." This feature of lead is also being considered by LIA as an area for research.

Our English friends have brought forth the use of lead as an insoluble anode for cathodic protection purposes. They are now being used or engineered for use by American firms, Ebasco in particular, for ship hull, steel pier and pipe line protection purposes. Lead has always been important in the areas of general chemical, water and soil corrosion and its use as an impressed current anode serves to round out the applications picture.

Concomitant with the demands of the space age, lead has moved into the "white noise" room at Minneapolis-Honeywell Regulator Co.'s new Florida Inertial Guidance Center at St. Petersburg. This particular installation uses approximately 25 tons of lead as part of a mass balanced on a knife edge, for the support of vibration equipment. This use of lead is quite unique as it forms

part of a sandwich construction, the purpose of which is twofold, (1) to isolate transmission of vibration to adjacent ground and structure and (2) to assist in preventing undesired planes of vibration in missile component test equipment so that the vibratory motion will be confined to a single plane. This new and provocative use harks back to the older use of lead for vibration damping in building construction.

And finally, in the areas of shielding, I can offer two new items differing both in importance and potential consumption. First, I should mention lead's use in connection with neutron reflection which is new to a material heretofore used primarily as a gamma shield. Atomics International is producing a portable research reactor making use of this property — 3,800 lb. of it. Secondly, the use of lead-impregnated plastic to shield components sensitive to radiation levels lower than those that affect man. In this regard, all I can say is that the University of California Radiation Laboratory at Berkeley has the material under study for classified purposes. But it remains as a new and practical use.