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③ 7- Lead Development  
ASSOC.

to Ross, please pass along to  
JFK and J. L. R.

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21 June 1972

noted 6/28  
To J. L. R.  
J. L. R.  
Pls. return  
PER  
returned  
orig to  
PER or  
7-6-72 agl

Dear Phil,

I thought you might like to see the enclosed notes  
on a talk I gave at Copenhagen recently about lead  
pollution problems.

At the time I went into the problems at UK works  
in more detail, but I thought it wise not to say too  
much about them on paper.

Yours sincerely,

16/55  
R. L. Stubbs  
rls/ef

Dear Ross.  
Thought your Copenhagen  
comments covered the lead pollution  
very well indeed. As you indicate,  
the essence of the arguments more seems  
to lie with the health hazards in a  
variety of use and work situations.  
In circumstances, the  
situation seems to  
be.

## THE PROBLEMS OF LEAD POLLUTION

Notes for talk by

Mr. R.-L. Stubbs, Director-General, Lead Development Association, London,  
to European Tin and Lead Smelters Club, Copenhagen, 16 May 1972

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Everywhere growing concern about the human environment - how air, earth and water are being polluted. This concern has brought renewed attention lead - well-known for a long time as toxic in some of its forms.

Papers for Stockholm UN conference on human environment include lead in list of main pollutants, others being pesticides, polychlorinated biphenyls, mercury and cadmium. Also US Department of Health, Education and Welfare (under the Occupational Safety and Health Act) has included lead in list of five Target Health Hazards, others being carbon monoxide, asbestos, cotton dust and silica. Both in production and uses lead will be subjected to even greater scrutiny in future by environmentalists wanting tighter controls on amount of lead entering environment as well as higher standards for protection of workers engaged in production and processing of lead.

Problems at lead smelting and refining works should not be considered in isolation but be seen as part of overall situation of lead entering the environment and effects on health of excessive intakes of lead.

### How lead enters the environment

Lead widespread constituent of earth's crust - always present in soils; in rivers, lakes and seas; in air from burning of wood and coal; and in plants both edible and inedible. But lead compounds generally insoluble and poorly transferred from one medium to another. Thus concentrations in natural bodies of water extremely low.

Throughout history lead well-known and widely used by mankind and so over long period dispersed by man himself into the environment.

- from burning coal and other natural products (nb: each cigarette smoked said to release one microgram lead into air).
- from primary and secondary smelting operations.
- from fabricating processes.
- from ways lead used.
- from disposal of unwanted materials containing lead.

Entry of lead into environment from smelting and fabricating plants tend to be concentrated in comparatively few works and to be governed by strict regulations. But as well known this no guarantee that problems cannot arise. In contrast when lead enters environment from way in which used it tends to be widely dispersed and in low concentrations. In most of its uses little possibility of lead being released into environment in significant quantities, but several uses subject to criticism recently - lead water pipes, white lead paints, lead in glazes and ceramics, and lead in gasoline.

Well known that lead water pipes should not be used where water plumbo-solvent - this hazard common knowledge to water engineers throughout world. New installation lead water pipe small nowadays so problems generally arise from old installations.

Although white lead not much used in paint manufacture today, it was main pigment for paints until end 1930s. Much old white lead paintwork still in existence but generally covered by other paints. Nevertheless presents real danger in special circumstances and many cases have been reported of children suffering lead poisoning after chewing old woodwork. Red lead paints still widely used but generally as rust inhibiting priming coats on steelwork covered with other paints so not health hazard.

With ceramic glazes lead poisoning can arise only when glazes improperly formulated and fired - hazard comes mainly from activities of amateur potters.

Use of lead compounds in gasoline to raise octane ratings subject to worldwide examination. 350,000 tons of lead used in 1971 to make lead anti-knock compounds - 10 per cent free world lead consumption (20 per cent US consumption - 5 per cent of European). Quarter of lead in gasoline retained in engine, oils, filters, etc. Remainder dispersed with exhaust gases, half of which falls to ground within 100 metres of road then washed away into drains or dispersed into ground. Other half entering atmosphere may be carried considerable distance by air movement before being deposited. Consumption of lead in gasoline has increased in recent years but this lead appears to have been widely dispersed into the environment as fast as released and concentrations of lead in atmosphere rising only slowly if at all. Should be kept in mind that main pollutants from automobile exhausts are carbon monoxide, unburnt and partly burnt hydrocarbons and oxides of nitrogen. Growing concern about pollution from automobiles has caused some countries to impose new restrictions on use of lead in gasoline - first Sweden, then Germany, Japan, Switzerland, Austria and United States. These restrictions designed to reduce progressively amount of lead in gasoline and thus the amount of lead entering the environment from this source. Nevertheless not proved that use of lead in gasoline constitutes serious hazard to public health. Only primary lead used to make anti-knock compounds. No recovery of lead used in this way therefore reduction this market could change pattern of primary and secondary lead production and consumption.

#### Lead intake by people

About 80 per cent lead intake of general public comes from food and drink and about 20 per cent from inhalation. But peoples' eating and drinking habits vary widely so no

general agreement on average intake or what importance should be attached to various sources of intake.

Not all lead ingested is retained in blood and soft tissues where it can affect health. Part rejected and normally steady state reached with lead absorbed offset by lead rejected. Average absorption of lead is:

|                | From food and drink | From the air     |
|----------------|---------------------|------------------|
| Intake per day | about 300 $\mu$ g   | about 30 $\mu$ g |
| % absorbed     | 10                  | 25               |
| absorption     | 30 $\mu$ g          | 7.5 $\mu$ g      |

What are acceptable limits for lead in people? Emphasis placed nowadays on detecting evidence excessive exposure to lead, not on seeking symptoms lead poisoning. Amount of lead in blood - the blood/lead level - generally accepted best measure of absorption and hence of degree of exposure to lead.

For most people steady state of absorbed lead less than 40 micrograms per 100 millilitres of blood. People working in lead plants often have higher blood/lead levels, but illness almost unknown with blood/lead levels up to 80 $\mu$ g/100 ml. Cases recorded of even higher levels without health apparently being affected. Different people react differently to lead as, for example, to alcohol. Rational appraisal of meaning to health of blood/lead levels given in leaflet 'Lead and You' - published by the Chief Medical Officer of the UK Department of Employment for issuing to workers when blood/lead levels being checked (copy attached).

For young children blood/lead levels over 40 $\mu$ g/100 ml usually taken as indication action needed. Natural for children to chew various objects and to play with dirt and so to ingest more lead than adults. Moreover, some authorities take view that full effects lead in children may not become evident until later in life.

#### Incidents at UK and US leadworks

In UK until recently anti-lead campaigns aimed mainly at lead in gasoline and other uses. But now conditions in and around lead plants receiving much publicity. Hazard to health and facts being greatly exaggerated in national press but publicity has stimulated more stringent inspection of leadworks by government authorities, which in turn could bring tighter regulations. Main subjects of UK press reports as follows.

First incident to hit headlines in UK national press - December 1971 - was examination of 39 children living in the vicinity of Associated Lead Manufacturers' works in east London. Eighteen children reported to have blood/lead levels above normal and three to have exceptionally high levels. Ministry of Environment statement on findings attracted extensive publicity. But re-examination showed that

specimens - taken at the homes of the three children - had been contaminated by lead-containing dust : their fathers were employed at the lead works. As often happens correction of initial statements got much less press coverage.

Various views expressed on how children had ingested lead. Possible sources dust blown from lorries delivering scrap to works, dust in fathers' clothing wrongly taken home, and lead in soil around works accumulated over long period.

Then in January 1972 reported that over a period more than 100 workers at Avonmouth plant of Imperial Smelting Corporation had experienced high blood/lead levels. Announced that forthcoming shut-down for maintenance would be extended and improvements made to reduce health hazards within plant. As plant owned by RTZ - one of largest mining and metal groups in world - and publicised when opened few years ago as most modern zinc/lead smelter in world, pollution problems at Avonmouth hit headlines. Situation complicated by attitude of labour unions and by questions asked in Parliament. Then Royal Commission under Lord Windeyer set up to investigate situation. Commission's report still awaited, but plant now reopened with Commission's agreement.

Few weeks ago Capper Pass plant in Yorkshire, another RTZ subsidiary, in news because local residents had complained of excessive emissions from chimney. Amount of emissions did not exceed limits agreed with the authorities pending installation of new plant to control emissions more effectively. There have been incidents reported at other works in the UK but publicity confined to local press.

Recent major incidents reported US press concern Asarco's Omaha Smelter and their works at El Paso. In Omaha some workers reported to have high blood/lead levels and comment by US Environmental Protection Agency was that Asarco using workers to monitor lead levels inside plant.

At Smeltertown, El Paso, children in neighbourhood found to have high blood/lead levels. As recently as 1970 more than 500 tons/year lead in particles said to be emitted from chimneys. Top soil in Smeltertown said to contain up to 1% lead. Top soil since removed and emissions reduced but court cases against Asarco, by parents of children said to have suffered lead poisoning, still to be settled.

US regulations now under review.

#### Controls in the UK

All UK lead smelters and fabricators fully aware need to introduce higher standards of control in plant and over emissions. Government authorities, while pressing for higher standards, approaching situation with realistic understanding of problems involved. Form of existing controls as follows.

Department of Environment responsible, through its Alkali Inspectorate, for setting regulations to control emissions from lead smelters and other plants processing lead; and through its Air Pollution Control Unit for checking level of lead in the atmosphere around lead works and elsewhere.

In exercising control Alkali Inspectorate sets 'presumptive' standards and not regulations imposed in arbitrary manner. What is permitted at any particular plant usually decided after discussion between all parties concerned, taking into account such factors as technical possibilities, chimney height, cost, and current information on effects of pollutants on humans and on vegetation and odour thresholds. Guidance on permitted levels of lead emissions related to four sizes of work, as follows.

|                  | Emission volume<br>m <sup>3</sup> /minute | Limit to lead in emissions                                                                                              |                                |
|------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------------|
|                  |                                           | mg/m <sup>3</sup>                                                                                                       | Mass per 168<br>hour week - kg |
| Small works      | less than 85                              | 120                                                                                                                     | 45                             |
| Medium works     | 85 to 285                                 | 120                                                                                                                     | 180                            |
| Large works      | over 285                                  | 23                                                                                                                      | 450                            |
| Very large works | over 3000                                 | accepted difficult to limit to<br>450 kg/week. Latitude<br>allowed with compensating<br>increase in height of discharge |                                |

Emissions of lead would seem to be limited to about 1 lb. (0.5 kg) per ton of lead produced. Alkali Inspectorate has good reputation for applying regulations in commonsense manner.

Government laboratories now making extensive investigations around lead works. Preliminary reports show amounts lead in soil around some works comparatively high but recognised that this probably outcome of many years lead processing.

Department of Employment, through its Factory Inspectorate responsible for conditions inside works. Regular tests required on workers at lead plants to measure lead in urine and in haemoglobin of blood. But at most works blood/lead levels usually measured - as previously noted - since this check considered best indication of exposure to lead and its absorption. Generally 10 cc samples of blood taken and analysed by dithizone method, but atomic absorption method using very small samples - a pin prick - being increasingly used. Some concern that atomic absorption analysis tends to give higher readings - as much as 50 per cent more. Work being done to resolve discrepancy. (See 'Airborne lead in Perspective' an excellent publication issued by the National Research Council - National Academy of Sciences, Washington, DC, 1971 which includes a review of sampling and analytical methods for lead).

Factory Inspectorate accepts level of lead in air within works at not more than an average of 200 µg per cubic metre over a 168 hour week. Sweden reported to require not more than 150 µg. Russia and Czechoslovakia set limit of 10 µg, but seems improbable they meet this very low level.

Department of Health and Social Security responsible for general health of the population. Now showing keen interest in lead. Cooperates with other government departments concerned.

Activities of United States Environmental Protection Agency and various international bodies concerned with lead pollution could influence requirements of future national and international regulations. EPA will publish this year new regulations on emissions from non-ferrous metal works. Understood these regulations will limit particulates in emissions to one lb. per ton metal produced. At lead smelters half particulates usually lead. New regulations expected to apply at first to new primary and secondary smelters, with three years grace for old plants to come into line. Thought EPA will accept  $200 \mu\text{g}/\text{m}^3$  as safe limit lead in air of works.

EEC Commission considering harmonising regulations for pollution control in member countries. As first step is studying water and air pollution. Comite de Liaison des Industries des Metaux Non-Ferreux de la Communaute Europeenne has formed sub-committee to review pollution problems. The EEC Commission in conjunction with EPA holding symposium in Amsterdam 'Environmental Health Aspects of Lead' from 2-6 October.

Economic Commission for Europe planning conference in Yugoslavia on emissions from non-ferrous metals works but original October date now postponed.

#### Summing Up

Can be no doubt now general acceptance throughout industrialised world that time has come to clean up environment. More new measures will be taken and controls introduced to achieve this end. This situation could have big impact on lead production and its usage. We in lead industry will have to devote much time and effort to ensure that the approach to dealing with problems of lead pollution are kept on a rational basis.

We must accept challenge - a challenge that may well involve us in cost problems, both for lead production and lead usage.

R. L. Stubbs  
London  
June 1972