The Lead Education and Abatement Design Group
Working to eliminate lead poisoning globally and to protect the environment from lead in all its uses: past, current and new uses
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The Cradle to Grave Impacts of Lead in Petrol

by Elizabeth O'Brien, Project Coordinator, NSW Community Lead Advisory Service

It's hard to separate the cradle to grave impacts of the lead additive for petrol from the cradle to grave impacts of both lead and the whole product, ie leaded petrol, but then again it's way too big a task to tell you about all the problems with petrol. Also, the community newspaper *Hell on Wheels,* published in Sydney, is already making a good fist of it, so at least this is a start.

The table on the following four pages is the start of a superficial analysis - a real Life Cycle Assessment (LCA) would include data. The table holds Stage 1 (environmental loads of lead additive) and Stage 2 a) (impacts of the loads). It is more of an example of a cradle to grave philosophy than an actual LCA, to encourage you to adopt cradle to grave thinking and make informed consumer and political choices which respond to the planet's needs.

Where there is no entry in the table below, it does not mean there is no impact, it simply means your guess is as good as mine.

Stage 2 b) (evaluation of impacts) and Stage 3 (opportunities for improvements) are presented below, ahead of the table, so that you get to read the conclusions first!

Conclusions

2 b) My evaluation of whether the production and use of lead additive in petrol is justified is of course that it isn't.

Some of the above impacts are more important than others but while people are unaware of all or most of them, the consumer can hardly make an informed decision about whether they can justify their own use of leaded petrol, nor whether they are happy with a government which does not act to remove the product from the market.

Stage 3 - Opportunities for Improvements

At the third and final stage of life cycle assessment, the opportunities available to bring about environmental (and hopefully health and social) improvements are assessed. That's easy - ban leaded petrol worldwide now! It's a cinch to justify the complete removal of lead from petrol on cost benefit grounds and if developed countries don't act quickly to phase out leaded petrol they'll be overtaken by World Bank programs in developing countries to do just that (see LEAD Action News v4n2 "Why Lead Should be Removed from Gasoline" by Magda Lovei, World Bank).

While the Federal Government realised $152m from the tax on leaded petrol in 1995, it could not apparently justify giving any money back to the community for lead poisoning prevention programs in urban areas. (See Letters from Paul Zammit and Federal Environment Minister Robert Hill on p17 of this newsletter). Giving (perhaps means-tested) government subsidies for clean-up of roof dusts contaminated by the lead from petrol in urban areas, is just one possibility. Funding the national LEADLINE advisory service is another. Giving confidence to the electorate by extending the new National Environmental Protection Measures legislation to encompass air toxics, could be given a brilliant head start by banning lead in petrol Australia-wide.

Besides, many governments have made recommendations to themselves to speed the phase out of leaded petrol and could gain credibility in their electorates by following them. For example the NSW Parliamentary

Select Committee Upon Lead Pollution (1994, p46) gives as one of its *Recommendations* [regarding] *Lead Emissions from Motor Vehicles*:

3.6.5 "The Recommendation of the Select Committee upon Motor Vehicle Emissions:

...2. "that the NSW Government review the levels of lead currently allowed in petrol in NSW with a view to eliminating lead in petrol altogether by 1996."

It's only when the flow of lead from petrol emissions is turned off that individuals and government agencies who are responsible for housing or childcare centres, can effectively take on the awesome task of cleaning up the scattered thousands of tonnes of lead that have been emitted from cars in urban areas. The lead abatement industry awaits eagerly to make safe or remove the leaded soil, and to take the leaded dust to have the lead extracted from it at the recyclers in Alexandria (ARA).

It is to the NSW government's credit that it has funded the Lead Reference Centre to drive policy to do all these things, has also funded Environmental Lead Centres (ELCs) in Broken Hill and Boolaroo, and is considering funding an ELC in inner Sydney. When governments work cooperatively with the community, eg the NSW EPA funding The LEAD Group to run the NSW Community Lead Advisory Service, opportunities for improvements are optimised.

Stage 1 - Environmental Loads	**Stage 2 - Environmental, social and health impacts of the loads**
At the first stage of a life cycle assessment, the environmental loads of the product (tetra ethyl lead - the anti-knock lead additive in petrol) are identified (and usually more thoroughly quantified) - ie 1a) the energy used, 1b) the raw materials used, and 1c) the emissions and wastes consequently released.	At the second stage of life cycle assessment the potential environmental impacts of the above loads are a) assessed and b) evaluated. In my view the potential health and social impacts must also be assessed and evaluated.
ENERGY USED	**IMPACTS of ENERGY used**
1a) To produce and use lead additive in petrol you need or you previously needed <u>energy</u> for:	**2 a) The environmental, social and health impacts of the <u>energy</u> use include:**
running a media and political campaign to ensure the early (1920's) ban on lead additive was lifted and to cover up the deaths and suicides due to insanity caused by exposure of workers to tetra ethyl lead	citizen cynicism when it is realised that health recommendations of pre-eminent occupational physicians can be ignored when political pressure is brought to bear
manufacture of the lead additive (tetra-ethyl lead)	lost opportunities for making the MTBE (methyl tertiary butyl ether) or other non-lead additives which can replace the tetra-ethyl lead in petrol.
safety precautions during shipping / storage including: making protective clothing and breathing apparatus, fire safety precautions and emergency responses	while contact with tetra-ethyl lead is fatal, by comparison, contact with MTBE causes headaches. All petroleum products need energy expended on fire safety precautions so, reducing petrol use, reduces this cost.
safety precautions (include space suits) to ensure no human contact with lead additive until it reaches the service station	space suits can be isolating! But petrol bowser operators don't get this luxury. One $220,000 compensation claim in Australia says they might need them.
repeated million dollar media campaigns to advise those people who can use unleaded petrol (ULP) in their cars to stop using leaded petrol. More taxpayers money has to be spent to counter the lead additive manufacturers media campaigns which try to persuade people that leaded petrol is safer than unleaded, when in Australia the opposite	government taxes have paid for education campaigns when government legislation **could** be forcing petrol companies to use non-lead additives like MTBE. People become cynical about government's ability to make cost-effective decisions and to fight vested interests on behalf of the people.

is true.	
making and maintaining storage tanks and equipment to measure the additive out	this contaminated storage equipment must be dumped when tetra-ethyl lead is phased out and new equipment with resulting energy expenditure will be required to replace it.
transport of lead additive throughout the globe - including shipping from the only 2 places in the world where it is made	lost opportunities to transport other more environmentally friendly products
building and maintaining service stations, including underground storage tanks	storage tanks often leak (see LEAD Action News v3n2 "Leakage of Underground Petrol Storage Tanks"), and sometimes they leak dramatically causing an explosion hazard such as in Newcastle on 26 February 1997.
manufacturing particulate masks for cyclists and runners who exercise in heavily trafficked areas	
health system to deal with miscarriages, strokes, heart attacks in adults, and blood lead testing and treatment	when money is wasted treating preventable illness, less money is available for prevention programs which already get less than 3% of health expenditure. Children's blood lead levels rise 1 µg/dL for every 10,000 cars per day going past their homes (see Cowie study, Sydney 1996). A US Centers for Disease Control document estimated the average benefits in 1991 of preventing blood lead levels from rising above 24 µg/dL in avoided medical costs, as being US$1,300 per child.
remedial education. Lead poisoned children need special consideration at school (see LEAD Action News v2n3 "The Early Lead Poisoned Child in the Classroom: Symptomatology and Intervention for School Psychologists and School-based Personnel") and generally require remedial maths, reading and learning skills.	children's blood lead levels rise 1 µg/dL for every 10,000 cars per day going past their homes (Cowie study, Sydney 1996). A US Centers for Disease Control document estimated the average benefits in 1991 of preventing blood lead levels from rising above 24 µg/dL in avoided special education costs as US$3,331 per child.
exhaust and engine repairs due to the build-up of lead from petrol, in the engine. Using ULP (unleaded petrol) reduces the damage to engines.	see "A Heavy Responsibility" on page 13 in this newsletter
manufacturing brominated and chlorinated additives ("lead scavengers" intended to reduce this lead build-up in engines, and to reduce therefore the contamination of used engine oil)	see LEAD Action News v2n4 "Unleaded Petrol Reduces Dioxin Levels in Air"
the getting of raw materials to make lead scavengers	
dealing with chemical spills	
cleaning up fallout from petrol emissions	housekeepers need to spend several hours twice a week cleaning leaded dust from every surface their young child might touch. Leaded ceiling dust removal costs around $1000 per house (payable by the householder with no government subsidies yet available).
RAW MATERIALS USED	**IMPACTS of RAW MATERIALS used**
1b) For the lead additive to be in petrol you need the following <u>raw materials:</u>	**2 a) The environmental, social and health impacts of the <u>raw materials</u> consumption include:**
lead. who knows whether it is Australian lead that poisons children through leaded petrol emissions	While lead is left in the ground it is safe and there remains the possibility of it being put to good use by

all over the world?	future generations. With the current lack of cradle to grave management, whenever lead is mined, smelted and incorporated into consumer products, second class citizens are being created, people (especially children) are being poisoned and the environment is being contaminated
tetra ethyl lead precursor	who knows?
lead scavenger raw materials - bromine, chlorine, ethylene, what else?	
Iron ore etc to make dedicated tetra-ethyl lead transport containers and feeder pipes at the refinery	
healthy workers; mostly males, sterile females	see "Lead - From the Boolaroo Smelter to Your Car" on p4 of this newsletter.
WASTES and EMISSIONS PRODUCED	**IMPACTS of WASTES and EMISSIONS**
1c) During the manufacture of the lead additive and the addition of it to petrol, its transport and its use as an auto fuel the following <u>emissions and wastes</u> are produced:	**2 a) The environmental, social and health impacts of the production of <u>wastes and emissions</u> include:**
waste and emissions from manufacturing processes for lead additive and lead scavenger	
emissions from transport vehicles - ships, trucks transporting leaded petrol	
vehicle emissions of dioxins (from the lead scavengers)	dioxins are carcinogenic
Air lead levels inside the vehicle can be markedly raised as a result of leaks in the petrol inlet or exhaust outlet of the car.	children with parents who drive cars and don't use unleaded petrol, have a statistically significant higher blood lead level than children travelling on public transport or in ULP cars
greater emissions of hydrocarbons due to lack of opportunity to use a catalytic converter (which would be poisoned by the lead). In some developing countries, catalytic converter technology is precluded even in new imported cars, because ULP is not yet available.	Political questions are raised about the ethics of developed countries manufacturing and exporting cars to developing countries, which run on leaded petrol and could not legally be sold at home. Is Australia one of these countries?
vehicle emissions of lead.	lead in air in road tunnels is a major concern of the residents who live near the portals, the vents such as those in the Sydney Harbour Bridge pylons, or the proposed 6 storey high stacks for the Eastern Distributor tunnels in Sydney's south east. None of the tunnels in Sydney has filters or scrubbers (even in the proposed stacks) to remove the lead from the tunnel emissions
due to interchangeable use of fuel and transport facilities - all ULP has some lead contamination	here is as good a place as any to mention that although sniffing any petrol is harmful to health, its the **lead** in petrol that kills or leaves sniffers with permanent brain damage.
some catalytic converters die young due to lead poisoning (either from misfuelling or from lead in air in heavy traffic being taken into the catalytic converter)	lack of confidence in Australian made catalytic converters. Disposal problems for dead catalytic converters.
leaded street dusts, ceiling void dusts and sediments in urban areas with heavy traffic from	increased blood lead levels in populations exposed to heavy traffic leading to a wide range of adverse

historical and current leaded petrol emissions from cars.	health effects; including increased tooth decay, heart attack and stroke from increased blood pressure, also reduced fertility, decreased growth in foetuses and children, decreased hearing acuity, greater aggression and delinquency rates. Decreased bio-diversity in urban communities through lead's effect on endocrine and reproductive systems in soil microbial and sediment microbial populations.
Lead-contaminated soil alongside busy roads	such soil is an enormous urban waste problem because of its bulk. House prices are reduced when the contamination is realised - social impact that poorer people are forced to live in the cheaper properties on busy roads or to go to outer car-dependent suburbs to get their children away from pollution.
lead in urban run-off	raised heavy metal content of fish and shellfish in waterways suffering pollution from mines, smelters and urban run-off, and increased heavy metals in humans eating them
leaded exhaust systems of old cars and leaded engines of old cars	auto mechanics get lead poisoned and also take the dust home on their clothes to unwittingly poison their children.
unhealthy workers	lead poisoning and dioxin-induced cancers contribute to unhealthy workers being thrown on the scrap heap
contamination from the recycling of cars - the whole car is placed in a high friction crusher which becomes so hot that seating and interior materials are burned up, leaving only a pot-pourri of metals including lead	
emission of lead and dioxins when cars are burned eg by vandals or in crashes	
25% of the lead in petrol remains in the vehicle, much of it in the (now) leaded engine oil	used oil is said (on the transport trucks) to be "recycled" but in NSW it is not actually filtered before re-use as industrial fuel, at, for example, dairy food manufacturing facilities.
emission of lead when reuse engine oil is burned as a fuel in industrial processes	
lead in soil when reuse engine oil is applied to soil to damp down the dust	
lead vapour is emitted when reuse engine oil is painted onto fences and lead is emitted when the timber is later burned. The timber so treated is leaded waste and the ash from burning is leaded.	
leaded fuel sludge is a waste product of leaded fuel storage. Storage tanks require disposal as do feeder pipes	the only Australian "standards" for cleaning of tanks and disposal of this sludge are written by Associated Octel, who manufacture the lead additive.
dusty products in shops alongside busy roads become a waste product if not sold	
in developing countries, milk can be refused at market (and becomes a waste product) because cows graze alongside busy roads	the produce which is not tested is presumably consumed