



Battery Production and Recycling

Control Strategies and Policies for the Recycling of Used Lead Acid Batteries in the Informal Sector

1. Introduction

It is very easy when pursuing policies and programs to improve environmental performance and reduce population exposure to pollutants to overlook the social impacts of decisions taken. While nobody would knowingly defer projects and technologies designed to raise the standards of environmental performance, it is important to take into account the social needs, priorities and aspirations of those people directly affected by Government policies, national legislation, new technologies and changes in trading patterns. This is certainly true when consideration is given to the most appropriate strategies to ensure that used lead acid batteries (ULAB) are recycled in an environmentally sound manner.

2. Why is Recycling Important?

Firstly, for many developing countries there is a battery manufacturing sector that provides "locally produced" automotive components for either use in car assembly plants or for cheaper replacement car batteries.

Most countries do not have any natural deposits of lead ore and so the secondary industry provides the only local source of lead bullion.

Indigenous battery industries can only survive if primary lead is imported or local secondary industries can recycle sufficient quantities of ULAB to meet the demand for refined lead.

The recycling of used lead acid batteries (ULAB) reduces the risk of environmental and population lead exposure from the millions of automotive batteries discarded every year.

3. Lead Supply

Domestic lead supplies are generated by recycling used lead acid batteries in the "Formal" lead recycling sector, that is usually licensed and Government regulated, and the "Informal", that is the unregulated and often illegal back-street operations.

If lead imports are required to supplement any locally produced secondary lead it will invariably be in the form of either primary refined lead ingots or imported used lead acid batteries. In many cases the imported used lead acid batteries will be drained of electrolyte prior to shipment and then transported to the recycling plant in a dry state.

Social Impacts

In most countries it is possible, one way or another, to calculate the tonnages of lead bullion produced by the informal sector and the magnitude of the lead output will provide a very useful guide to the economic impact of the informal sector and the extent of its influence in social interactions.



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Those companies involved in the Formal sector are the licensed battery recyclers and battery retailers that return ULAB to the regulated secondary smelters. These organizations are large, often multinational corporations, employing a relatively small number of people either directly, indirectly or part time.

In complete contrast the Informal sector comprises of "backyard smelters" and battery reconditioners usually owned and managed by small family groups, but employing many thousands through elaborate networks that source and deliver the used lead acid batteries. In many developing countries the income generated by this sector will run into millions of dollars, albeit much of it within the "black economy" thereby denying national Governments valuable tax revenues. Nevertheless, the personal incomes of those working in the informal sector are usually only just sufficient to keep their families above the subsistence level.

4. Environmental Impacts

Whilst the income generated by the families in the informal sector is vital to their daily survival, this sector has been found to be responsible for virtually all of the pollution arising from the recycling of ULAB in most developing countries. Operating practices and working conditions in the informal sector vary tremendously, but on the whole:

There are little or no facilities for the neutralization and safe disposal of battery electrolyte. Hence acidic effluent percolates into the water table, rivers and sanitary system.

Occupational hygiene is poor and few operators wear little more than a wet towel to protect themselves from the lead fumes.

There are few furnace exhaust control systems to prevent atmospheric pollution.

Furnace residues are unstable and leachable, and tend to have a high lead content. The residues are dumped indiscriminately either around the premises of the unlicensed smelter or are sent to landfill.

Many of the informal operations are located close to shops and homes increasing the risk of population lead exposure.

5. Inter-Relationships

So where do unlicensed secondary smelters obtain their scrap materials and where do they sell their lead ingots? The ULAB supply train and the sales outlets for the informal sector follows a familiar trail in many countries in the developing world.

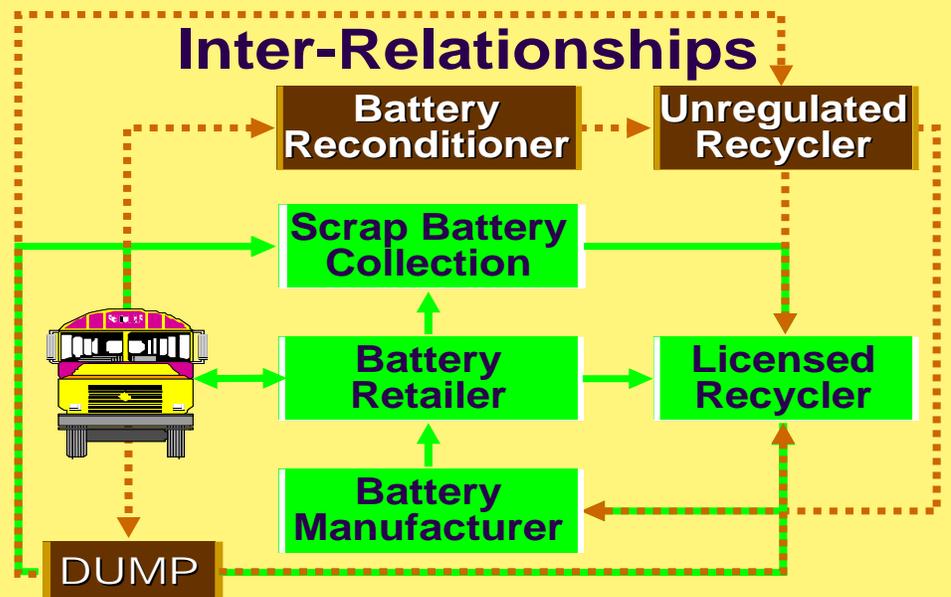
For example:

- A battery manufacturer will sell a battery to a retailer.
- The retailer will sell the battery to the owner of a vehicle.
- When the battery is "spent" the vehicle owner will need a replacement and he could return the used battery to the retailer for recycling and a possible discount on the new battery.



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- In which case the retailer will send the battery to a licensed recycler and the recovered lead will be sold to the manufacturer. The non-metal components will also be treated in an environmentally sound manner, some recycled, others neutralized prior to disposal.
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- In which case the retailer will send the battery to a licensed recycler and the recovered lead will be sold to the manufacturer. The non-metal components will also be treated in an environmentally sound manner, some recycled, others neutralized prior to disposal.
- However, the retailer might not take back used batteries and the vehicle owner may have to take the used battery to a suitable used battery collection point.
- The battery scrap collector will then send the used batteries to the licensed recycler for recovery of the recyclable materials.
- However, depending on the prevailing market conditions there might be a better financial reward for the vehicle owner if the used battery was sold to a battery reconditioner. Sometimes a reconditioner can reclaim a used battery by cannibalizing another and using those components with some "life" left in them. These reconditioned batteries will not have a long life, but often find a ready market amongst the poorest in society.
- Those "spent" components that the reconditioner cannot reuse are usually sold to an unlicensed recycler, often referred to as a "back yard" recycler. This secondary lead sector of the industry is called the "informal" sector, although a more appropriate term would be "unregulated" as operating practices will rarely conform to sound environmental and occupational performance standards.



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- In order to establish an accurate picture of the life of a battery in a particular country or region account must be taken of all of the possible scenarios outlined above.
- Nevertheless, the informal secondary lead sector will often supply the battery manufacturers and the licensed recyclers with unrefined lead bullion. Another outlet for the lead bullion produced by the informal sector is fishing sinkers.
- Sometimes the vehicle owner is unable to take a used battery to any recycling collection point and the battery is disposed of in the nearest municipal "dump". This scenario not only poses serious long-term problems for the environment, but is a loss of a valuable resource.
- Where municipal authorities have sorting facilities, any used batteries are segregated and either sent to the nearest used battery collection point for shipment to a licensed recycler or directly to the licensed recycler.
- In many cases, particularly in the developing world, scavengers scouring rubbish dumps for anything of value will recover the used battery as a saleable recyclable commodity and sell it to a secondary lead plant, usually an unlicensed recycler.

6. Informal Characterization

In many of the major cities of the developing world there are hundreds, possibly thousands of small battery reconditioners providing valuable employment for many of the local people. The typical battery reconditioner occupies a small motor accessory or repair shop located along main city roadways with street access and is usually found amongst other shops selling a variety of provisions, fast foods, and domestic and consumer goods.

Battery reconditioners perform two main tasks, namely recharging "flat" batteries and rebuilding batteries that are "spent" by cannibalizing "good" cells from one battery to replace those that are "dud" in the spent battery. Despite the fact that reconditioned batteries have a very short life compared to a new battery, particularly in hot climates, trade thrives, especially in the poorer areas of cities.

The small recyclers have their own collection infrastructure to snare those batteries that are not returned to the major battery retailers for recycling and they also purchase and smelt the "spent" cell plates from the reconditioners. At best the Smaller Battery Recyclers probably recover about 90% of the available lead in the grids and battery paste.

The informal sector's environmental performance is usually very poor, but despite this they do bring some benefits to the recycling process. The reconditioners provide a valuable recharging service that increases battery life and thereby reduces the recycling burden. The Smaller Battery Recyclers collect batteries that are uneconomic for the major secondary smelters to recover and at least prevent them from being dumped in landfill sites.



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7. Short Term Improvements

However, if the informal sector is to retain its "niche" place in the life cycle of the lead acid battery there has to be a dramatic improvement in environmental performance and occupational health practices. In the short term there is a need to introduce or upgrade the environmental control systems and regimes to reduce furnace emissions, prevent contaminated effluent polluting the waterways and entering the sanitation systems, and ensure that the leachable solid residues are either, not produced, are contained or converted to a stable inert state.

In addition it must be borne in mind that such improvements will only be effective if there is a complimentary and comprehensive education program to educate those who work in the industry and their families to reduce the risk of occupational and population lead exposure by following safe working practices.

The Ten Golden Rules

Any education and awareness program should focus on the following "10 Commandments" to reduce the risk of lead exposure:

- I. Make respirators available, ensure they are worn during charging & tapping*
- II. Operators must only wear work clothes in the workplace*
- III. Shower after every shift and whenever contamination risks have been high*
- IV. Change into clean work-wear every day or shift*
- V. Avoid procedures that generate high levels of exposure*
- VI. Segregate working and clean eating areas*
- VII. Keep eating and drinking areas clean and lead free*
- VIII. Wash hands and face prior to eating at work*
- IX. Keep homes clean and lead free, do not take work-wear home*
- X. Do not smoke in a lead recycling plant*

8. Long-Term Restructuring Option

Long term solutions to improve the environmental performance of the recycling industry and reduce the risk of occupational and population lead exposure fall into four distinct categories:

Reduce Lead Recovery in the Informal Sector

The first stage must be the introduction of long life batteries that provides up to 5 years of reliable service thereby reducing the number of batteries in the recycle loop and rendering the reconditioned battery poor value for money.

Raise Domestic Collection Rates

It would be beneficial for the small recyclers to be located in regions of the a country where it is unprofitable for retailers to economically return small quantities of ULAB for recycling. Ideally located in unpopulated rural areas and employing new technologies that enable environmentally sound secondary plants to be designed on a smaller scale.



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Define A Role For The Small Recycler

Consideration should be given to setting up Regional Secondary Lead Consortia between the battery manufacturers and smaller battery recyclers so that battery scrap can be collected and segregated, electrolyte neutralized, lead scrap toll processed, and clean polypropylene and lead ingots shipped to the manufacturers for reuse

Further Integrate Recycling in the Philippine Republic

Governments have a key role in this process to ensure that assistance is available to provide relocation incentives and technology transfer to those small recyclers receptive to environmental improvements to complete their transition to from the informal and unregulated, to the formal and regulated sector of the industry.

9. National Strategy and Policies

For those countries with significant battery manufacturing industries a move by the manufacturers to purchase more primary lead at the expense of secondary lead could lead to a sizeable adverse change in the balance of payments. Accordingly when Governments are devising a National strategy to improve environmental performance in the lead industry must take these factors into account.

For that reason Governments will want to maximize the number of domestic ULAB collected and recycled and should be formulating strategies that provide economic incentives for batteries to be recovered, even in remote areas, in conjunction with the formation of manufacturing and toll based recycling consortiums.

In order to further reduce the pressures on the domestic lead supply/demand gap the Government should try to initiate ways of extending automotive battery life beyond the current average of one to two years in some developing countries.

In return for assisting those recyclers in the informal sector the government should introduce a formal licensing scheme for all battery reconditioners, smelters, retailers and collectors so that the industry can be properly monitored.

Above all, however, the Government and the Industry should work together to eliminate all unsound operations and practices in the secondary lead and battery reconditioning businesses.

10. Benefits

The benefits to the Countries adopting these strategies and policies are fourfold:

- a. The environment will be better protected from the adverse effects of ULAB recycling.
- b. Occupational and population lead exposure will be reduced.



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- c. Immediate and severe financial hardship will not be inflicted on the many people in the local populations involved in battery recycling and who might be adversely affected economically and socially by the immediate imposition of improved environmental performance.
- d. Economies will be less reliant on the import of primary lead to meet the shortfall of secondary lead.

September 2001