Flat Panel Display Recycling

AERC RECYCLING SOLUTIONS

BIO:

Stephen Lefon – Director of Sustainability AERC Recycling Solution.

Employed by AERC since 2008. Oversaw VA region operations for both Electronics and Universal Waste Recycling.

Currently in charge of Sustainability: Compliance, Vendor Management, Quality Environmental, Health and Safety.

AERC: operates in FL, VA, PA, CA.

- VA is a transfer facility for UW and Electronic Waste Recycling Facility.
- CA has 2 facilities: Universal Waste processing facility, processing mercury lamps, and Electronic Waste Recycling Facility.
- FL has 2 facilities: Universal Waste processing facility, processing mercury lamps. Electronic Waste Recycling Facility.
- PA has 2 facilities: TSD Facility for the recycling of Mercury though Thermal Retort as well as processing mercury lamps. Also an Electronic Recycling Facility.

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Positive vs Recycling CRTs:

Resale Opportunity:

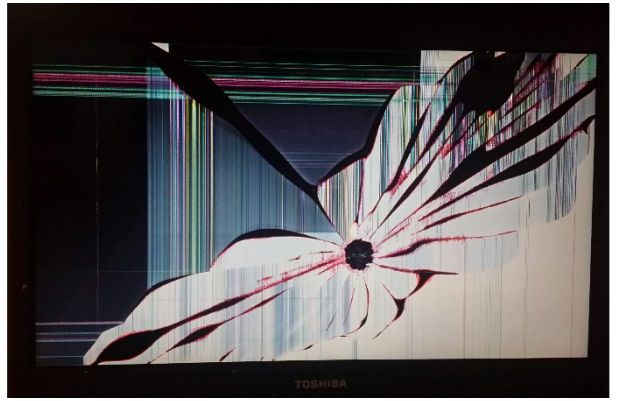
Flat Panels still have a viable re-sale market, for both parts and for the units themselves.

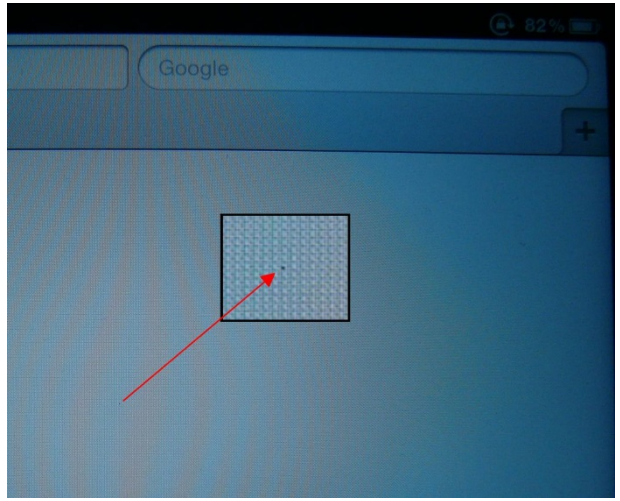
Conditions Considered to determine if units are viable for re-sale:

1. Is the Screen Cracked? If screen is cracked unit goes for recycling.
2. Is the screen blank?
3. Are there dead Pixels?
4. Cosmetic Damage to outer screen?

If issues 2-4 occur the unit still has a chance to go for Refurbishment/Repair.

Re-Use is the Best Option in Recycling. This is a big difference in FPD recycling vs CRT recycling where re-sale is not an option.





Similarity with CRT's – The Negative Cost to Recycle

Breakdown Project from 2015			**Commodity Breakdown**					
Units for Manual Breakdown	**760**		Total Weight	12836	%		Commodity Value	Total Com Value
Labor Hours	**145**		Plastic	4097	32%		$0.04	$163.88
Labor Cost $15/hr	**$15**		Steel	6720	52%		$0.02	$134.40
Total Labor Cost	**$2,175**		Aluminum	627	5%		$0.20	$125.40
Units Demanufactured/hr	**5.24**		Glass	519	4%		$0.00	$0.00
			Light Bulb	164	1%		-$8.75	-$1,435.00
Total Resale Commodities	**$916.48**		Circuit Board	626	5%		$3.00	$1,878.00
			Wire	83	1%		$0.60	$49.80
Profit Without Charge	**-$1,258.52**							

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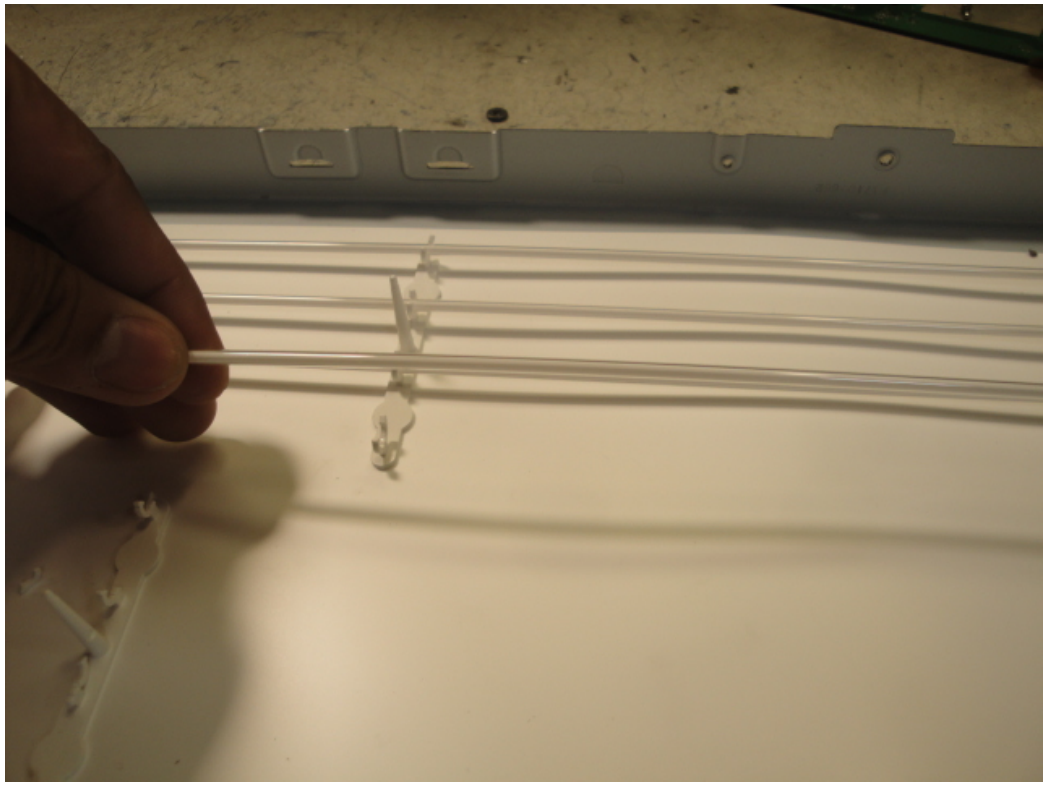
Why Manual Breakdown?

Flat Panel Displays have Mercury Bulbs that are very difficult to get to and difficult to remove.

They are also very delicate and easily breakable.



One Specialty Equipment Manufacturer claims to be able to process mercury containing devices and be able to capture and safely contain the hazardous waste through a shredding process.

- Problem does it really work?
- No Vendors I know of have it in use.
- The capital investment required.

AERC Flat Panel Breakdown Process

- Dismantling of the LCD Panels will only be completed in an area, i.e., workbench that provides adequate containment of materials in the event of glass breakage or rupture.
- Ensure that your poly pail or drum for lamps has a Universal Waste label, Accumulation Start Date, and has a sealable lid. Labeling of new containers must occur at first usage.
- Remove the Unit from Pallet or Gaylord Box.
- Lay the LCD Panel face down on the workbench and remove all of the screws from the sides, and the materials protecting the circuit boards

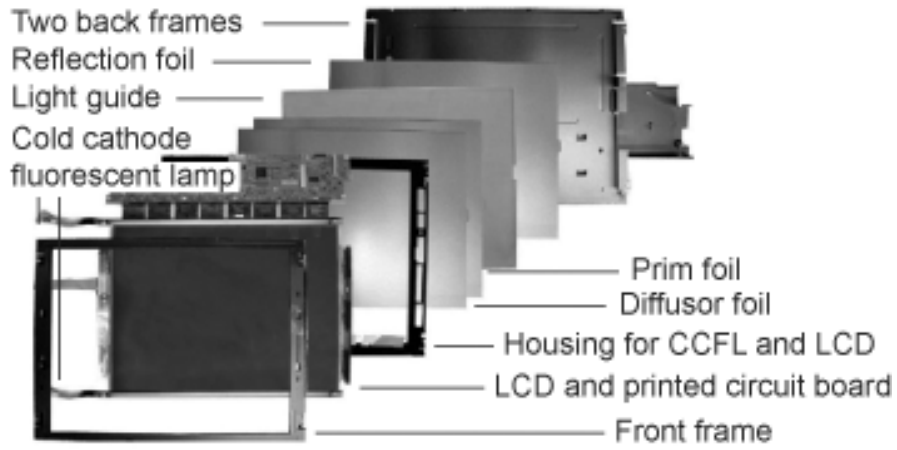


Figure 10. Components of a LCD module.

AERC Flat Panel Breakdown Process

- Remove/Pry open the trim surrounding the enclosure (Steel and Plastic).
- Turn over the unit and remove the LCD Glass, and the plastic sheeting protecting the CCFL (Cold Compact Fluorescent Lamps).
- Remove the plastic panels protecting the end of the CCFL and wires.

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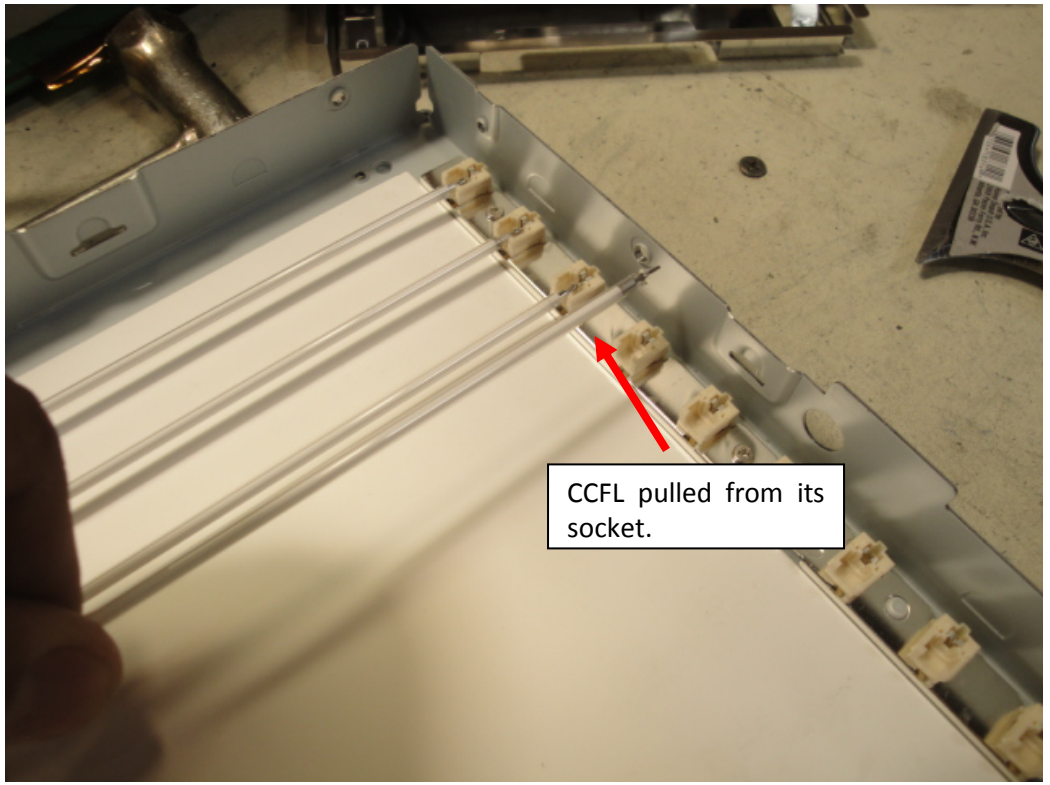
AERC Flat Panel Breakdown Process

- Gently remove the CCFLs.
- On LCD TV Panels with CCFL : U-Tubes type, the wires must be cut outside to Remove the CCFLs.
- On LCD TV Panels with straight tubes, gently lift up the center of the CCFL and pull the end towards the middle.
  - Once one side has been removed, the whole unit can be pulled out. (Other option is to pry open the ends).
- Packaging all CCFL lamps in a sealable drum or poly pail. Close and seal drum between usage.



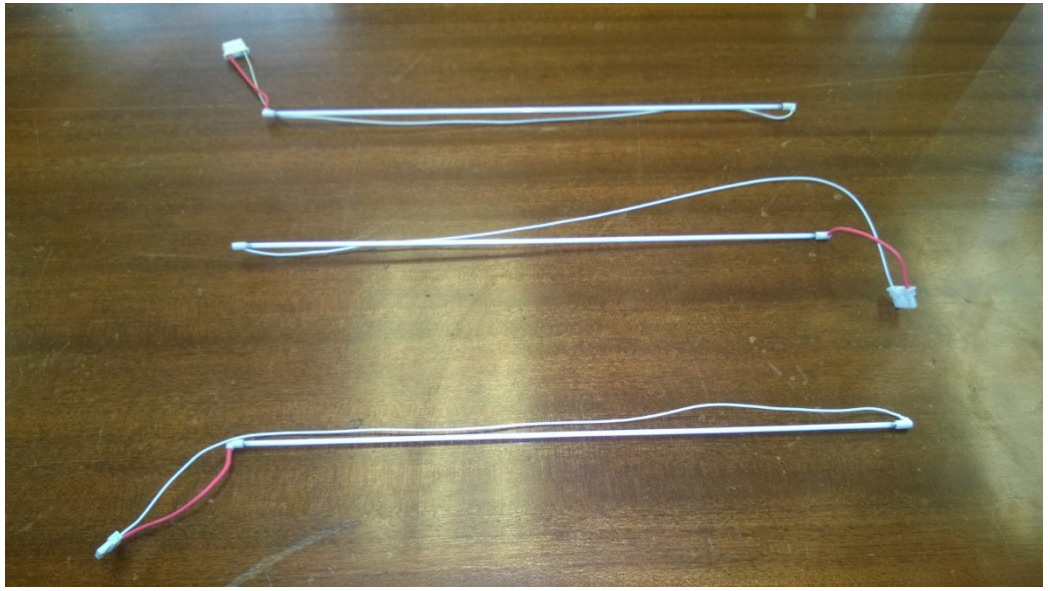
Mercury Lamps – Retort Process at Allentown PA Facility.

- This system is designed to thermally recover, through a heating and distillation process, Mercury.

- The retort units are used to thermally process devices, such as thermometers, switches, lamps, and other materials which contain mercury.
- The resultant mercury produced from the mercury retorts is commodity grade mercury, which is resold back to market.

Mercury Lamps – Retort Process

- Most of the materials are received in drums or other large containers, and require unpacking.
  - Prior to being placed in the retort, each object is manually inspected and prepared for the process. Generally, materials entering the retorts should be free from organic materials.
  - This may include removing nuts, bolts, fittings, rubber, plastic or non-metallic parts, etc.
- AERC has 2 price points for FPD Lamps for Retort: $8.75/lb. and $11.50/lb. Price depends have the wires been cut off the units?



Mercury Lamps – Retort Process

Objects and materials are then placed in metal trays or small bucket.

The retort chamber is then closed and evacuated of air, while heating up. Normally, it is maintained under a 28” vacuum and about 538 C (about 1000 F).

The average is approximately 8-10 hours. The equipment manufacturer provides various computer monitored electronic controls for vacuum, temperature, timing, etc.

During the processing, mercury vapors from the retorts are carried over to the water-cooled condenser system, and upon re-condensing flow to a holding vessel.

Outlook

Un-like CRT's the flat panel display recycling can be completed manually with very little start up cost.

They key is pricing. You have to charge. For the recycling of FPD's.

Plastics + Steel + Circuit Boards - Processing- Transportation- Handling – Lamp Retort = Negative Costs to Responsibly Recycle.

Questions?

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