A person is using a portable X-ray fluorescence (XRF) device to analyze a row of colorful interlocking foam blocks. The device is held in the person's hand and is emitting a red light. The blocks are arranged to spell out the word 'TOXIC' in large, colorful letters. The background shows a person's hand and a laptop on a table.

Using Portable X-ray
Fluorescence (XRF)
technology to get data
about chemicals in
products and the
environment

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The problem

- Lack of safety testing for most chemicals
- Underestimate harm of substances
- Exposure during manufacture, use, wastes
- Inadequate incentive to eliminate toxic substances



Option #1: Measuring substances

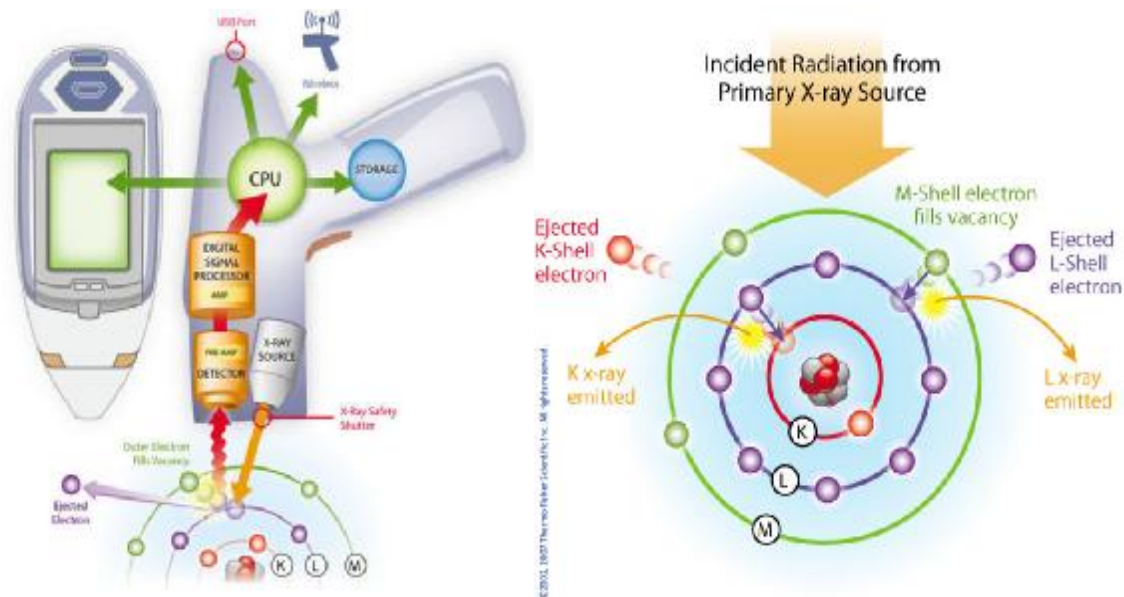


Option #2: Measuring substances



What does a XRF do?

- Shoots X-ray beam into material
- Detects released X-ray fluorescence (characteristic atomic relaxation)
- Measures ~ 20 elements
- Mercury, lead, cadmium, bromine, chlorine, others



What result a XRF gives?

Reading No	Time	Dwel_id	Units	Pb	Pb Error	MoMo Error	ZrZr Error	Sr Sr Error			
5	10/26/2008 5:13	B054	ppm	26.4	16.46	24.04	11.72	268.51	22.74	44.82	8.85
102	10/26/2008 6:41	B077	ppm	27.73	14.92	18.28	9.89	< LOD	13.95	42.22	7.93
170	10/26/2008 8:01	B049	ppm	35.68	14.96	19.6	9.45	21.32	8.89	< LOD	6.17
194	10/26/2008 8:20	B053	ppm	35.92	21.21	< LOD	18.08	45.94	17.97	238.13	22.27
92	10/26/2008 6:25	B066	ppm	45.86	19.31	< LOD	15.81	293.36	24.62	210.04	17.6
293	10/26/2008 9:52	B136	ppm	49.3	28.08	< LOD	19.77	170.71	31.46	576.26	38.97
16	10/26/2008 5:21	B055	ppm	51.77	19.75	< LOD	17.14	436.39	28.04	92.59	12.07
188	10/26/2008 8:14	B052	ppm	54.32	30.61	< LOD	23.89	471.04	43.78	321.43	31.29
79	10/26/2008 6:15	B064	ppm	58.44	33.94	< LOD	21.66	72.66	35.12	978.55	55.21
71	10/26/2008 6:09	B063	ppm	73.74	46.21	< LOD	30.79	423.28	69.18	2043.31	97.16
233	10/26/2008 9:00	B126	ppm	74.93	42.68	< LOD	28.93	130.22	45.29	1124.91	67.69
206	10/26/2008 8:39	B092	ppm	80.12	34.38	< LOD	22.22	155.89	29.15	219.12	25.79
260	10/26/2008 9:23	B089	ppm	83.48	35.65	< LOD	20.55	216.43	34.6	422.21	35.1
195	10/26/2008 8:20	B053	ppm	85.72	20.99	15.36	9.57	122.35	14.9	84.44	10.14
60	10/26/2008 6:01	B069	ppm	91.19	21.39	21.97	9.5	47.03	10.5	8.59	4.44
54	10/26/2008 5:54	B067	ppm	101.45	27	< LOD	14.08	33.87	16.45	335.26	22.93
7	10/26/2008 5:14	B054	ppm	104.72	23.72	< LOD	14.26	137.42	15.59	29.67	6.81
13	10/26/2008 5:20	B055	ppm	109.1	26.93	< LOD	16.3	188.01	21.03	194.88	16.95
62	10/26/2008 6:02	B069	ppm	109.2	23.92	< LOD	14.2	111.3	14.37	41.61	7.61
286	10/26/2008 9:48	B137	ppm	110.12	31.3	< LOD	17.13	201.45	25.79	277.42	23.16

Advantages of XRF

- Non-destructive
- Can screen finished products
- Fast, 30 seconds
- Portable
- “Low cost”
- Can measure elements in soil, alloys, plastics, fabric, dried paints, etc.
- Results correlate well with traditional methods



XRF testing safety concerns

- X-rays (penetrating radiation, radionuclides)
- Grinding and sifting dried samples produces dust



XRF common uses

- Testing consumer products (toys, jewellery, clothing, electronics)
- Testing for lead in paint
- Testing soils
- Testing dust
- Testing particulates in air



Commonly available factory-calibrations:

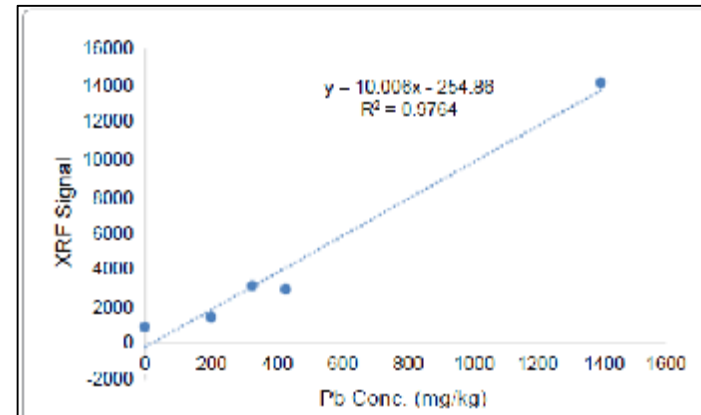
- Soil Environmental
- Consumer Products
- ROHS (hazardous elements in electronic products based on IEC Guidelines)
- Filters (hazardous elements in fine particles in wipes or filters)
- Others (Alloy, Mining, Precious Metals)

Re-calibration is not necessary!

Daily calibration check and standardization is needed though!

On-site calibration

- XRF can be calibrated on-site using reference materials (standards)



- Certified results are compared to XRF results
- Correlation factors are computed and entered into XRF

Standard methods

Standard methods of testing are based on established guidelines and norms

- Soil: EPA Method 6200
- Electronics: IEC (ROHS)
- Toys: CPSC, EN-71, ASTM
- Pb-in-Paint: HUD

Conflicts with established methods

- No matter how sensitive an XRF is, it recognized as a screening tool only
- Total content vs. migratory (extracted) content
- ppm (by default) vs. ug/cm² (Lead in Paint)

NGO uses

- Products testing for heavy metals
 - PVC identification
 - Recycled products and waste screening for BFRs
 - Lead in wall paint testing
 - Soil, air, and dust testing for heavy metals
- > Citizen regulators
- > Regulatory policy



How do we conduct XRF campaign?

- Identify consumer good of concern / pollution hot-spot
- Conduct test buys / environmental sampling
- Screen products/samples using XRF (sometimes send samples to the lab)
- Interpret the data
- Publicize findings through the media
- Coordinate with government for action (request for confirmatory analysis, request for recall action, request for policy action etc.)
- Push for policies and regulations (national, international)

How to select goods to test?

- Pick popular products in season
- Select products that might pose serious potential health effects
- Choose products that will help to push policy change

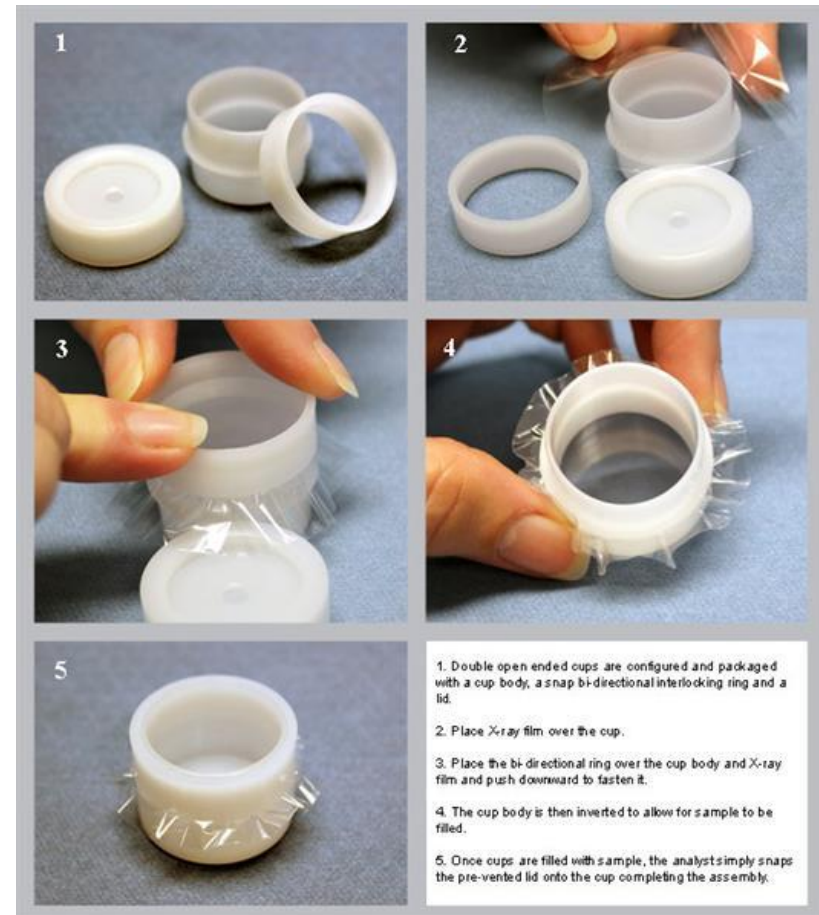


Soil (sediment, sewage) sample preparation can increase accuracy

- Separate out the larger pieces (stones, organic matter...)
- Grind the sample (mortar and pestle, grinding mill)
- Sift at least 10 grams of the sample through 250 μm and 125 μm mesh
- Place the sample into XRF sample cup

Fully prepared sample:

- dried, crushed, ground, sieved, and loaded into a sample cup



IPEN&Arnika campaign

POPS RECYCLING CONTAMINATES CHILDREN'S TOYS

Recycling e-waste that contains toxic flame retardants contaminates new products, continues exposure, and undermines the credibility of recycling.

CHILDREN
Brominated flame retardants are distributed from recycled e-waste plastics into children's toys. These chemicals are known to disrupt human hormone systems, adversely impacting the development of the nervous system and children's intelligence.

TOXIC PRODUCTS IN OUR HOMES

FAMILIES
OctaBDE, DecaBDE, and HBCD have been used as flame retardants in a variety of electronic products for many years. These chemicals were recognized as POPs of global concern that need to be eliminated just like other POPs listed in the Stockholm Convention.

PLASTIC RECYCLING
E-waste recycling is spreading poisons in informal recycling sites and exposed workers' bodies.

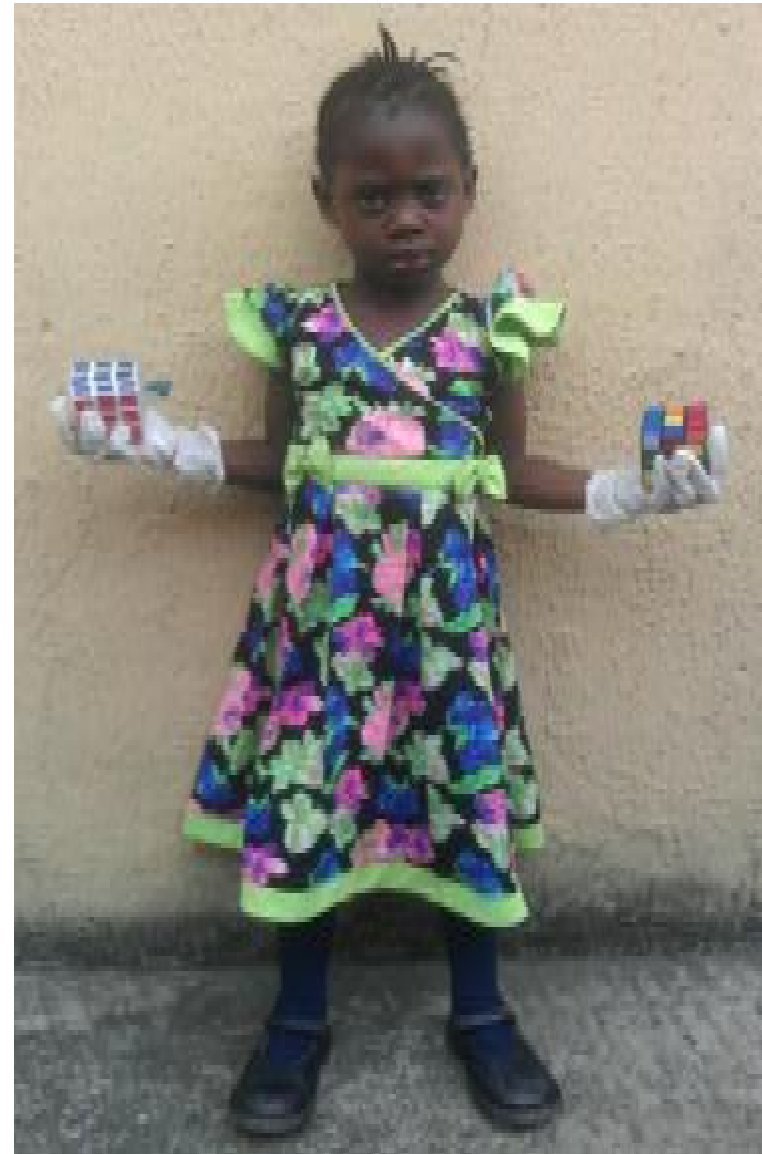
WORKERS

E-WASTE TRAFFICKING
E-waste is often trafficked to low and middle income countries that do not have capacities to deal with them.

LOW INCOME COUNTRIES

The POPs Treaty needs to stop recycling exemptions and establish strict hazardous waste limits to discontinue use and global distribution of POPs.

IPEN
International POPs Institute





DEMONSTRATION...

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