Circular Economy ELV and WEEE Plastics
- an Industry Wish List -
Agenda

- ELV and WEEE Recycling
- Quantitative analysis
  - „forward“
  - „reverse“
- Qualitative approach
- Environmental Science approach
- Disturbing substances
  And the complexity of legislation
- Circular Economy Wish list
ELV - End-of-Life Vehicle Recycling

De-Pollution (all liquids, batteries, catalysor, tyres) 5%

Shredder -> Ferrous metals (70%) -> Steelmills

Shredder Residues -> NF-Metalls (10%) -> Smelters

Plastics/Rubbers -> Recycling/Energy (10%)

Landfill (5%)

Since 2015: 85% Recycling 95% Recovery (Recycling and Energy)
De-registrations close to 12 mio Vehicles/year
Losses from the EU Urban Mine -> 4 Mio ELV‘s/year
Estimated volume plastics from ELV 1,2 Mio MT/yr
Today only limited recycling volumes of ELV plastics
The WEEE Recycling Process

1. De-Pollution by „Smashing“ (MGG patent)
2. Shredder (EVA) → Ferrous-Metals → Steelmills
3. Non-FE Separations → Non-Fe Metals → Smelters
4. Plastic recycling → Polymer pellets end-of-waste
“Forward” Approach
Plastics volume in terms of demand for EEE

- The demand for EEE is approximately 2.5 Mio MT’s
- The demand in the Automotive sector is close to 4 Mio MT
“Reverse” Approach
Estimating the quantity of plastics in WEEE

European Market | Mio MT | in % |
--- | --- | --- |
Placed on Market (POM) EEE | 9,50 | |
Officially reported collections/recycling | 3,30 | 35% |
Informal collections/recycling | 3,20 | 34% |
Exports (of which 1,3 Mio MT not documented) | 1,50 | 16% |
"Scavenging" for parts | 0,75 | 8% |
Losses (such as through waste bin) | 0,75 | 8% |

Plastic Content in WEEE per category

| Category | % |
--- | --- |
SDA | 30% |
LDA | 15% |
ICT | 20% |
Tools | 10% |
Temp Control Equipm. | 25% |
Screens | 20% |

WEEE Plastics some 1,2 Mio Metric Tons

Quellen: CWIT – MBA Polymers
Qualitative Approach
Average composition of WEEE plastics for recycling

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<thead>
<tr>
<th>WEEE Plastics</th>
<th>Percentage</th>
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<td>ABS</td>
<td>24%</td>
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<td>HIPS</td>
<td>27%</td>
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<td>Polyolefines</td>
<td>7%</td>
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<tr>
<td>PC and PC-ABS</td>
<td>7%</td>
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<tr>
<td>Other plastics incl. BFR</td>
<td>29%</td>
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<td>Parts and metals</td>
<td>4%</td>
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<td>Other (mainly wood)</td>
<td>2%</td>
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Source: MBA Polymers
Scientific Approach

LCA PCR WEEE Plastic versus

1. Incineration of WEEE plastic and

   Recycling PCR WEEE recycling option 6-10 times better than producing virgin plastics

2. Production virgin plastics

   Recycling PCR WEEE plastics 4 times better than Municipal Solid Waste Incineration

So plastic recycling makes a lot of sense...

- **EU Targets not possible without plastics recycling**
  - ELV and WEEE Directives set clear recycling targets
  - WEEE – 75 % (Small Domestic Appliances)
  - ELV – 85 %

- **Increasing pressure from the market and NGO’s**
  - NGO’s (Greenpeace, BAN and sonstige Eco-Organizations)
  - Consumers are increasingly interested in „green products“
  - „Circular Economy“ & „Recycling society“

Why is there so little of it?
Separation of plastic is difficult

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Metalle

Titanium

Aluminium

Magnesium

Water

Source: Mike Biddle, TED Talk
“The ways of plastics....”

Resulting in losses of well over 1 Mio MT from the EU Urban WEEE Mine
The supply chain of WEEE plastics recycling

1. De-pollution
2. Shredder
3. Non-Ferrous Separation
4. Manual dismantling
5. Ferrous metals
6. Non-ferrous metals
7. Pre-processing of WEEE Plastics
   - Separation Non target plastics and substances as BFR's and Cd
8. End-processing PCR plastics & Extrusion
Many types of WEEE plastics.....
The complexity of the legal framework

**EU Legislation**
- EU Waste Framework Directive
- EU Waste Shipment Regulation
- EU WEEE Directive

**UN Conventions**
- Basel Convention -> transboundary shipments of waste
- Stockholm Convention -> POP’s
- Rotterdam Convention -> hazardous substances & chemicals

**Product Legislation**
- EU General Product Safety Directive (GPSD)
- REACH Regulation
- RoHS Directive for EEE
Some BFR’s are hazardous substances

- PBB Polybrominated Biphenyl – POP and PIC listed
- PBB is chemically a completely different family compared to PBDE
- Penta-BDE are POP listed (not present in WEEE)
- Octa- BDE – POP listed (can be present in CRT and copiers, but very limited)
- HBCD is now POP-listed threshold 1000 ppm in waste
- But HBCD in product – now in EU parliament for 100 ppm in product
- Cannot be used in products anymore (RoHS and REACH)

A different discussion is taking place on Deca-PBDE

- Deca PBDE – long time not POP nor PIC nor REACH listed
- Deca-BDE is now evaluated by ECHA and SEAC – many studies
- As BFR very efficient and heavily used, so clearly there as legacy substance
- Of all analyses, deca-BDE is there at 55 % of all PBDE’s
Legislation overview and BFR’s

1. Products

- IT electronics
  - (microprocessors, computer servers, modems, printers, copy machines...)
- Consumer electronics
  - (hair dryers, heaters, TV sets, laptops...)
- White goods
  - (tumble dryers, dishwashers, washing machines...)

2. Plastic Parts

- Housing
- Printed circuit boards
- Cables
- Connectors

3. BFR’s

- DecaBDE
- c-PentaBDE
- c-OctaBDE
- BDP
- RDP
- TBBPA
- DOPO
- EBP
- ATH
- MDH
- ATO
- Br’d PS
- Mel.Cyanurate
- HBCD
- POP under Stockholm
- Restriction under RoHS
- Restriction under REACH
- No restriction

4. Regulations

- Annex XIV
- POP under Stockholm
- Restriction under RoHS
- Restriction under REACH

Source: EFRA
Two examples of good applications of PCR Plastics in EEE
Circular Economy and PCR plastics recyclers wish list

► Fast Track Notifications
  - For input material to pre-consented recyclers
  - Creating new Waste Codes for high value mixed recyclable materials

► Demand creation for Post-Consumer Recycled plastics
  - In the public procurement sector (see EPEAT in the USA)
  - Reward based positive incentives in the private sectors

► Enabling factors for a step change in the development PCR plastic recycling
  - Realistic thresholds for legacy substances are a minimum requirement
  - Legal clarity and certainty in the setting of these thresholds

The Circular Economy is a major chance for these desired changes
One critical success factor of the Circular Economy

Closing the missing link in the Circular Economy
So, let's put our teeth into this Circular Economy

But let's not lose them........ Thank you