



Engineering challenges and context for informal e-waste recycling

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E-waste Recycling



E-waste Cycle



E-waste Cycle

Waste Generation



E-waste Cycle



E-waste Cycle



Waste Generation



Waste Collection



Demanufacturing



E-waste Cycle



Waste Generation



Waste Collection



Demanufacturing



Reengineering

Stakeholders

- Informal Recyclers
- Waste Collectors
- Medium-size recyclers
- Formal Recyclers
- OEM's
- Government

Demanufacturing



Demanufacturing



Copper



Plastic



PCB's



Demanufacturing



Copper



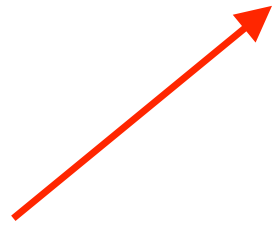
Plastic



Steel



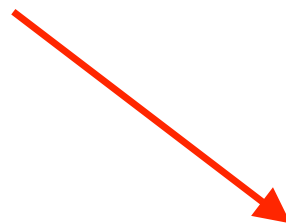
Demanufacturing



Copper



Plastic



Steel



Metrics

- Recovery Rate
- Throughput
- Safety
- Usability
- Profit

Process

Dismantling	Shredding	Separation
<ul style="list-style-type: none">• Manual	<ul style="list-style-type: none">• Shredder• Crusher	<ul style="list-style-type: none">• Magnet• Eddy Current• Air Separation• Density Separation• Screen

Process

Dismantling	Shredding	Separation
<ul style="list-style-type: none">• Manual	<ul style="list-style-type: none">• Shredder• Crusher	<ul style="list-style-type: none">• Magnet• Eddy Current• Air Separation• Density Separation• Screen

Informal


Process

Dismantling	Shredding	Separation
<ul style="list-style-type: none">• Manual	<ul style="list-style-type: none">• Shredder• Crusher	<ul style="list-style-type: none">• Magnet• Eddy Current• Air Separation• Density Separation• Screen

Formal

Process

Dismantling	Shredding	Separation
<ul style="list-style-type: none">• Manual	<ul style="list-style-type: none">• Shredder• Crusher	<ul style="list-style-type: none">• Magnet• Eddy Current• Air Separation• Separation• Screen



Opportunity

Improving throughput, safety, and usability
of manual dismantling process

TV Dismantling

1. Remove casing (unscrew with manual screwdriver or drop TV)
2. Snip wires to prevent shock from electricity currents
3. Remove controller board
4. Remove speakers (unscrew)
5. Remove DVD player
6. Remove degaussing coil (copper)
7. Separate deflection yoke from TV (hammer off)
8. Break yoke to get to copper coils (hammer/break yoke)
9. Manually separate copper from yoke scraps

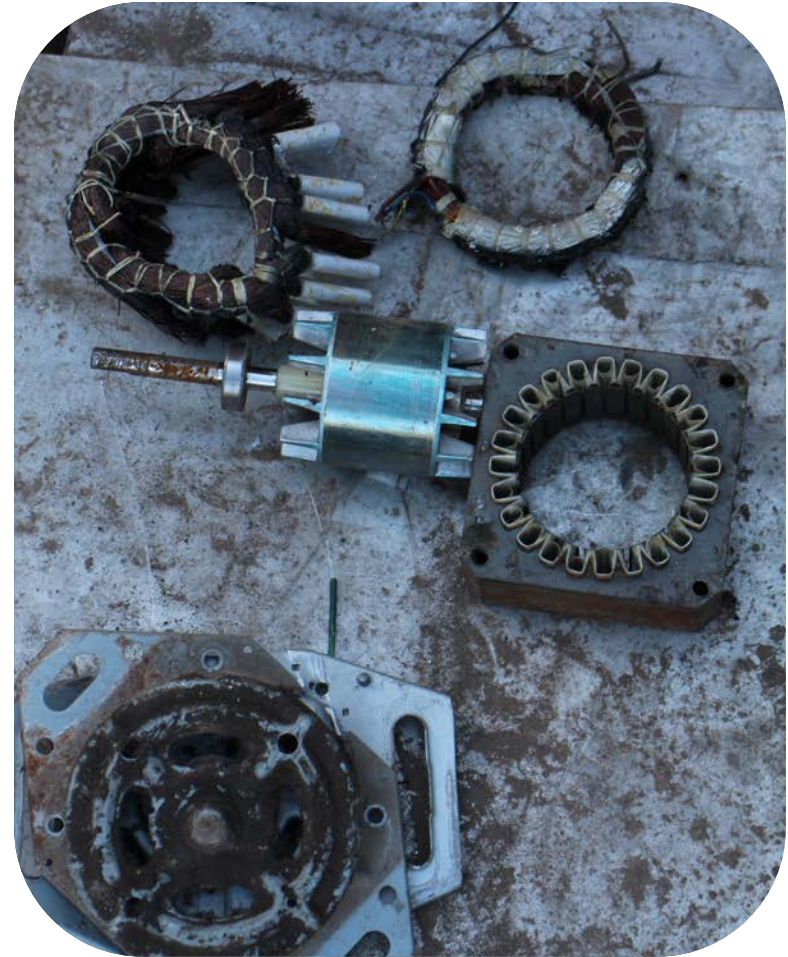
Throughput: 7-20 min per TV

Safety: cuts from glass, lead exposure

Washing Machines Dismantling



Washing Machines Dismantling



Challenges & Opportunities



Challenges & Opportunities



Challenges & Opportunities



Interdisciplinary Aspects

- What is the value proposition for stakeholders?
- Translating safety, profit, social benefit
- What system dynamics can impact interventions?
- Variation in users, operating context