Reshaping of plastic bottles

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Introduction & Motivation

- 160 million plastic bottles produced p.a.
- Global, only 20% recycled

Problems

- Pollution
  - Sea & Landscape
- Resource inefficiency
  - Plastic bottles are made of 25g Oil
Introduction & Motivation

Solution: Plastic recycling systems

- Plastic recycling systems extracting raw materials from waste
Introduction & Motivation

Recycling systems are a good way to avoid pollution and to save resources but these systems are connected with know how, high investments (equipment, infrastructure) and running costs.

Problem: Not in every area are recycling systems, but in all areas are plastic bottles.
Content

Introduction & Motivation

- Reshaping

Plastic bottle brick
Reshaping

- Reshaping as a new part of extending product life cycle
  
  - Where no recycling system exist, plastic bottles are just waste
  - Reshaping is a new part of value creation process
  - Different shapes for different needs
  - Independent of recycling systems
  - Longer product life cycle through multiple usages
Reshaping: Product life cycle

Adding a complementary life cycle to the existent cycle

- Extracting raw material
- Manufacturing
- Usage
- End of life treatment
- Environment
- Recycling (material)
- Reshaping

PET Granulate

Deposit refund system

Reshaping bottle for second life cycle

PET

PET Granulate
Content

Introduction & Motivation

Reshaping

- Plastic bottle brick
  - Technique
    - Social business & Social entrepreneurship
    - Disaster area
Plastic bottle brick

**Motivation**
- Worldwide over 100 million people are homeless
- Massive pollution through non recycled plastic bottles
- Erosion problems

**Approach**
- Reshape plastic bottles to bricks

**Benefits of plastic stone**
- Fireproof
- Cheap resources
- Isolation
- Unbreakable
Plastic bottle brick

- Why reshaping to bricks?
  - Houses/Walls
  - Erosion prevention

- Cubblestones prevent erosions
Plastic bottle brick: Technique

- Reshaping process
  - Bottles of PET deforms at 80°C.
  - 1.6% shrinkage based on volume change after filled with hot water.

- Put bottle in press
- Push press down and fill hot water over bottle opening into bottle
- Hold position and increase water pressure
- Fill cold water into bottle to solidify plastic

Source: [Ros-04]
Plastic bottle brick: Technique

- Plastic bottle brick manufacturing process
  - Filling sand, soil and water into bottle
  - Compressing to solid mass

Legend: = Process
Plastic bottle brick: Technique

- Manufacturing process of PET rocks can be realized with high and low technical know how, by different process accuracy.

**Low Tech**
- Manuell compression
- Hot Water

**High Tech**
- Stretch blow molding
- High accuracy

- Square brick
- Lego Brick
- T – H – Model
- The “united bottle”
  - Interlocking shape

- Needed know how
  - two different shapes fits into each other
  - Two presses needed
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Introduction & Motivation

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Plastic bottle brick: Social business & Social entrepreneurship

▶ Social business (Prof. Yunus)
  ▶ Social business is defined by three requirements:
  1. **social objectives**: it needs to have positive social objectives: e.g. health, education, poverty, environment or climate urgency
  2. **non-profit distribution**: investors can not take profits out of the enterprise as dividends
  3. A social business has to work economically efficient
     ▶ Investors could be governments, Founds, Non-Profit Organizations, ...

▶ Social entrepreneurship
  ▶ A Social entrepreneur try to solve a problem in order to earn money
     ▶ Privet Investments with dividends
Plastic bottle brick: Social business & Social entrepreneurship

<table>
<thead>
<tr>
<th>Social business</th>
<th>Social entrepreneurship</th>
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<tbody>
<tr>
<td><strong>Pro:</strong></td>
<td><strong>Pro:</strong></td>
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<tr>
<td>+ value adding in the regions of high pollution</td>
<td>+ Forms without mortal (interlocking)</td>
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<td>+ decentralized manufacture structures</td>
<td>+ mass product</td>
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<td>+ low investments and running costs</td>
<td>+ cross-subsidization (people buy it in non disaster areas, to support disaster areas)</td>
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<td>+ new jobs</td>
<td>+ lower transport cost of water bottles</td>
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<td>+ high social impact</td>
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<td>+ reduce of pollution</td>
<td></td>
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<td><strong>Contra:</strong></td>
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<tr>
<td>- Low productivity (piece/Time)</td>
<td>- less participators</td>
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<td>- high investments</td>
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<td>- infrastructure needed</td>
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The “united bottle”, design concept
Content

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Plastic bottle brick

Use in disaster areas

- Water is supplied in plastic bottles by disaster protection
  - Chile: 500,000 bottles from Argentina
  - Serbia: 208,000 Bottles
- At the same time, the number of homeless people rises
  - 1,5 Million in Haiti
- Recycling systems may collapse

Self-help culture

- Homeless & workless collect and converse bottles
- Way out of poverty & homelessness
- Less pollution
Conclusion

Reshaping process:

- Creates a value
- Prevents pollution
- Creates jobs
- Can be realized with low technical equipment

Reshaping is not:

- An alternative to existing recycling systems
It is possible...

The “united bottle”, design concept