Packaging Waste Management in Germany:
Expectations, Results, and Lessons learned

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Overview

• EPR for packaging
  – Objective and introduction
  – Household collection of packaging waste
  – Recycling system (quotas, technology)
  – Quality ≠ quantity (limitations)
  – Results and lessons learned

• Deposit systems for beverage containers
  – Refillable bottles
  – Non-refillable (one-way) beverage packaging
  – Results and lessons learned
Introduction of EPR for Packaging

• 1991: German Packaging Ordinance started
• Obligation for manufacturers to make the necessary arrangements with a collection and disposal system to manage all the one-way packaging that is placed in the market to “private consumers”
• Objectives:
  – Avoid, reduce, recycle packaging (strict hierarchy)
  – Protect Re-use systems
  – Reduce packaging waste generation
  – Increase high quality recycling of packaging waste
Introduction of EPR for Packaging

• In the beginning one (Duales System), Ende 2008 nine competing companies offer manufacturers to organize collection, sorting, recycling and disposal of packaging for a fee (depending on weight and type of material)

• In addition: industrial specific solutions (payback of fee for proven collection and recycling of packaging material)

• Recovery and recycling targets for all packaging material
  – Glass: 75%
  – Aluminum: 60%
  – steel or “tinplate”: 70%
  – Paper, cardboard: 70%
  – Composites: 60%
  – Plastics: 60% recovery; 36% material recycling
Scope of the EPR System

Within the scope:

- Sales packaging:
  Packaging that is made available as a sales unit for the final consumer
- Secondary packaging:
  Packaging that is used as additional packaging for transfer to the final consumer for reasons of hygiene, durability or the protection of goods from damage or contamination
Scope of the EPR System

Out of scope:

- Sales packaging which is not disposed of by a private consumer
- Transport packaging
- Single-use packaging for beverages with a mandatory deposit
- Exemption of packaging made of biodegradable plastic (until December 31, 2012)
- Refillable packaging with deposit
Funding Mechanisms

• The Green Dot system is funded through service fees that are charged to participating manufacturers
• The fee is included in the product price
• The amount of the fee is based on the material used, and the weight

<table>
<thead>
<tr>
<th>Material</th>
<th>USD Cent/lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>16.3</td>
</tr>
<tr>
<td>Paper/board/cardboard</td>
<td>38.6</td>
</tr>
<tr>
<td>Tinplate</td>
<td>60.0</td>
</tr>
<tr>
<td>Aluminum, other metals</td>
<td>161.6</td>
</tr>
<tr>
<td>Plastic</td>
<td>285.7</td>
</tr>
<tr>
<td>Composite cartons (LPB) with special acceptance and recycling guarantee</td>
<td>165.8</td>
</tr>
<tr>
<td>Other composites</td>
<td>223.5</td>
</tr>
<tr>
<td>Natural materials</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Source: DSD, 2008
Curb Side Collection of Packaging Waste
Curb Side Collection of Packaging Waste
Sorting the Collected Packaging Waste
Recycling of the Collected Packaging Waste

- Recovered packaging materials
- Packaging waste generation

Diagram showing the recovery of packaging waste materials from 1991 to 2006.
Recycling of the Collected Packaging Waste from Private Households

Source: BMU (2008)

* Packaging from private consumers and small companies
Recycling and Recovery of the Collected Packaging Waste

- The collected materials are recovered – either via material recovery (recycling) or energy recovery (conversion to energy). Hier the official numbers (in reality the rates are 10 – 30% smaller)

<table>
<thead>
<tr>
<th>Material</th>
<th>Recycling in %</th>
<th>Total recovery in % (recycling + energy recovery)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>82,4</td>
<td>82,4</td>
</tr>
<tr>
<td>Plastics</td>
<td>38,1</td>
<td>55,7</td>
</tr>
<tr>
<td>Paper, Carton</td>
<td>79,6</td>
<td>88,7</td>
</tr>
<tr>
<td>Aluminum</td>
<td>76,6</td>
<td>76,6</td>
</tr>
<tr>
<td>Steel</td>
<td>90,2</td>
<td>90,2</td>
</tr>
<tr>
<td>Wood</td>
<td>28,9</td>
<td>68,0</td>
</tr>
<tr>
<td>Total</td>
<td>65,6</td>
<td>78,8</td>
</tr>
</tbody>
</table>
EPR System for Packaging Waste in Germany: Results …

- Only at the beginning for some years a small reduction but midterm stabilization of packaging waste generation
- Increased recycling and recovery of packaging waste – but in the last years rates and quality of recycling are going down
- Development of advanced environmental technologies for sorting and recycling
- Due to quality reasons: Necessity for separate collection of glass and paper in addition to “dry collection” of lightweight packaging and other valuables
EPR System for Packaging Waste in Germany: Results ...
EPR System for Packaging Waste in Germany: … and Lessons learned 1/2

- Quantity-based quotas for recovery do not consider quality aspects of the recycling, e.g.
  - bottle-to-bottle recycling of PET bottles from the “yellow bin” is not possible
  - only the paper fraction of the beverage containers are recycled into new material – the aluminum and plastics fractions are being “recycled” as reducing agents in cement kilns

- Synergy effects for separate collection not used: The Green Dot system for lightweight packaging waste (yellow bin) does not collect similar non-packaging materials (e.g. plastic toys, steel forks)

- Service fees too low in order to significantly reduce the used quantity of packaging materials
EPR System for Packaging Waste in Germany: … and Lessons learned 2/2

• Weak control of the Green Dot System by state, taking over of DSD by Private Equity (KKR) and competition between nine companies destroyed recovery and recycling services and quality

• Recently many recycling companies fail (i.e. spring 2009 the biggest beverage cartons (i.e. TetraPak) Recycler in Finland went bankrupt

• Main interest in quantities – the german implementation of EPR has problems to promote Prevention
Part two
Deposit systems for beverage containers

• Refillable bottles
• Non-refillable (one-way) beverage packaging
• Results, lessons learned, and future developments
Refillable vs. Non-Refillable Bottles

Whereas one-way bottles are only filled up once before – assuming best case with separate collection – going into recycling

- a glass refillable bottle can be refilled and circulated over **50 times** before it goes into recycling (average for water bottles: 53.4 times)

- a PET refillable bottle is refilled and circulated around **13 times** before going into recycling (average for ice tea: 13.7 times)

- a crate, on average, is circulated **100 times** before going into recycling
Refillable Bottles Reduce the Amount of Packaging Waste

For the same volume of mineral water either 1 refillable 0.75 liter glass bottle or 40 one-way 1.0 liter one-way PET bottles are used as packaging
The Refillable System: Bottle Recirculation and Closed Loop Recycling

- **Wholesalers for beverages**
  - Collection from retailers
  - Recirculation of empties to mineral springs / bottlers

- **Mineral springs and bottlers**
  - Cleaning and bottling

- **Retailers**
  - Take back of bottles / crates
  - Pre-sorting

- **Wholesalers for beverages**
  - Purchase / pick up
  - Storage
  - Consignment sale
  - Distribution

- **Consumers**
  - Buy at point of sale
  - Return of bottles

- **Retailers**
  - Allocation and sale

Based on graph from GDB
The Refillable System: Multiple Fillings

Number of fillings per refillable bottle (2006)

<table>
<thead>
<tr>
<th></th>
<th>Glass refillable bottles</th>
<th>PET refillable bottles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral water</td>
<td>53,4</td>
<td>11,4</td>
</tr>
<tr>
<td>Juice</td>
<td>45,8</td>
<td>12,8</td>
</tr>
<tr>
<td>Soft drinks</td>
<td>30,6</td>
<td>13,1</td>
</tr>
<tr>
<td>Bier</td>
<td>19,2</td>
<td>-</td>
</tr>
<tr>
<td>Milk</td>
<td>16,3</td>
<td>13,0</td>
</tr>
</tbody>
</table>

Source: UBA (2008)
The Refillable System: Standardized Bottles Improve Efficiency

Standardized bottles can be returned by all system participants minimizing transports
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Standardized bottles can be returned by all system participants minimizing transports.
The Refillable System: Environmental Benefits

Source: IFEU (2008)
The Refillable System: Influence on Global Warming

Kg CO₂ / 1.000 Liter

Source: IFEU (2008)
The Refillable System: Non-Environmental Benefits

• **Securing jobs**
  – Soft drinks: 3:1 ratio in employment refillables vs. one-way
  – Mineral water: 5:1 in employment refillables vs. one-way

• **Strengthening regional economies**
  – Local products from local fillers
  – Local distribution (logistics) and retail

• **Enabling “Beverage (product) diversity”**
  – Germany: 1.302 breweries vs. USA 3 brewery groups
Two Different Deposit Systems: Refillable Bottles vs. One-way Beverage Containers

**Refillables deposit**

- 8 Eurocent per beer bottle (0.33, 0.5 liter)
- 15 Eurocent per water, soft drink or juice bottle (0.5, 0.7, 1.0 liter)

The deposit for refillable bottles is voluntary

Deutsche Umwelthilfe
Two Different Deposit Systems: Refillable Bottles vs. One-way Beverage Containers

One-way deposit

- 25 Eurocent for all containers
- 0.1-3.0 liter
- beer, water, soft drinks
- glass, plastic, metal

The deposit for non-refillable beverage containers is mandatory and regulated in the German Packaging Ordinance
Introduction of a One-Way Deposit to Protect the Refillable Systems

- **1991**: Introduction and revision of the German Packaging Ordinance
- **1997**: First time the German refillable quota dropped below 72%
- **2003**: Introduction of mandatory one-way deposit
- **2004**: Simplification of the one-way deposit system
- **2006**: European Court Decision
- **2008**: 2003 2004 2006
German One-Way Deposit: Current Regulation

• Objectives
  – Protect the environmentally beneficial refillables systems
  – Reduce littering from one-way beverage containers
  – Achieve high return quotas enabling better recycling

• Subject of deposit
  – Environmentally non-beneficial beverage containers made of metals, glass and plastics
  – Containers filling 0.1-3.0 liters
  – Mineral water, beer, carbonated and non-carbonated soft drinks and alcoholic mixture drinks
  – No deposit on milk products, fruit and vegetable juices and dietetic products directly designed for babies
German One-Way Deposit: Current Regulation

• Deposit value
  – 0.25 EUR (regardless of material and volume)

• Mandatory labeling
  – Logo
  – Barcode
  – Legibly labeling as “deposit container” on visible spot

• Take-back
  – Automatically (reverse vending machines) or manually
  – Everywhere, where the type of one-way container is sold (metal, glass, plastic)

Exception: Small stores (<200 m²) can limit take-back of one-way containers to the types they are putting on the market
German One-Way Deposit: Deposit and Material Flow

Waste disposal Company / Recycling

Material flow

Deposit flow

Producer / importer

0,25 €

0,25 €

0,25 €

0,25 €

Service providers

Retailer

Wholesaler

Consumer

Service providers
German One-Way Deposit: Funding Mechanisms

- Beverage “fillers” and retailers (first importers) pay for 100% of the system
- Costs are totally internalized, and there are no formalized fees in the system
- As far as the return-deposit system for the beverage containers is concern, industry keeps unredeemed deposits (estimated at 140 million Euros)
- Retailers keep material revenues
German One-Way Deposit: Returning Beverage Packaging at POS

- Automatic take-back (reverse vending machines)
  - Some reverse vending machines accept refillables only, some non-refillables only, and some both refillables and non-refillables
  - In most supermarkets (trend is increasing)
  - Beverage containers are automatically counted and reported to the DPG System

- Manual take-back
  - Mainly in kiosks and smaller stores
  - Beverage containers are subsequently counted and reported to the DPG System
German One-Way Deposit: Manual take-back

Return location controls DPG logo

Filled bags are sealed and labeled with unique origin code.

Cans and PET bottles are registered according to DPG standards.
Counting data are transferred and used for deposit reimbursement from industry.
German One-Way Deposit: Manual take-back

After delivery by truck, the bags are placed on transport trolleys and transferred to the counting line.
German One-Way Deposit: Manual take-back

After counting, the containers are transported using conveyer belts to high performance compactors

Counting centers
German One-Way Deposit: Automatic take-back

Return information are picked up by Retail Service Provider and used for deposit reimbursement from industry.

Cans and PET bottles are baled before send off to recyclers.
DPG was entered into the local commercial register on June 29, 2005 – General managers and advisory board have been designated

Deutsche Pfandsystem GmbH

- DPG established – entry into the local trade register on June 29, 2005
- General management is made up of members of trade and industry in equal numbers
  - Verena Böttcher (HDE)
  - Bernd-Ulrich Sieberger (BVE)
- The eight advisory board members have also been appointed from trade and industry in equal numbers
- Board of trustees with 15-20 members from trade, materials manufacturers and industry

SP= service provider
Source: Roland Berger, AT System GmbH
Deutsche Pfandsystem GmbH provides the organizational and legal framework for the system-relevant areas of action

Core tasks
- Contract management
- Management of marking standards
- Master database provision
- IT interface management
- Processing DPG sticker
- Certification management
- Owner of DPG sign
- Marketing and PR

Basic principles
- Non-profit company
- Operational tasks scaled down to management of marking standards and DPG stickers for small volumes
- Deposit, product, clearing and return flows only between initial suppliers, dealers and SPs
- No knowledge of service providers' deposit funds, sales/return quantities and terms

SP=service provider
Source: Roland Berger, AT System GmbH
Easy integration of DPG sign into existing graphics

Signet forms of the DPG sign

**Mass market**

![Wrap-around label](image1)

**DPG sticker**

![Can](image2)

Source: Roland Berger, AT Signet form
DPG requires that the EAN be integrated into the vertically-placed barcode and (if possible) the DPG sign should be centered above.

DPG sign – Main requirements

- The EAN Code is to be attached to the container as a vertical bar code. This simplifies machine read-out when rotating and feeding in.

- The EAN code can vary in size from at least 0.8 to no more than 2.0 of the GS1 target size. A size factor of 0.8 on the target width of 21.29mm produces a minimum width of 17.03mm.

- Blank areas are to be taken into account when attaching the EAN codes. The blank areas of the DPG sign and EAN area may blend into each other.

- The EAN code must comply with GS1 specifications (numbering and graphics).
Read-out units can be built using standard components by following operating descriptions – Retro fitting in existing machines

Retrofitting read-out technology

Read-out unit

- Blank recognition unit
- Camera optics
- Lighting

Reverse vending machine

- Possible to replicate using operating descriptions
- Use of easily available standard components

Source: Roland Berger, AT read-out technology
German One-Way Deposit: Results So Far

Very high return rates of one-way containers

- 95-98% (compared to 40% in the household separate collection)
- High quality sorted material suited for bottle-to-bottle recycling through point of sale (POS) separate collection
- High market value

“Zero” littering of one-way beverage containers with deposit

- Comparison 2002: 1-2 billion one-way containers littered (at the time 20-25% of the total littering)*

*Source: Witzenhausen-Institute
Berlin...
10 Tage vor Einführung des Dosenpfandes
Berlin...
5 Tage nach Einführung des Dosenpfandes
German One-Way Deposit: Results So Far

Differentiated results regarding protection of the refillables systems for the different types of beverage

- Beer: Refillable rate 2008 about 85%, stable
- Mineral water and carbonated soft drinks: Refillable rate 2008 about 35 %, going down

But without deposit:
- Juices and wine: less than 10%
German Beverage Packaging Regulation: Possible Next Steps

• Public awareness campaign for refillables by NGOs and small and mid-sized companies

• German Government admits to the protection of refillables and announced further regulatory steps at national and EU level

• In 2009 consumer informations about the type of system on the bottle

• Parliamentarian initiatives to combine the existing deposit with a ‘climate protection fee’ of 20 Cent for single-use PET-bottles and cans
Thank you for your attention!

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