Summary of Germany's packaging take-back law
Prepared by Clean Production Action. Sept 2003

Sources: *Extended Producer Responsibility, Phase 2: Case study on the German Packaging Ordinance, OECD, ENV/EPOC/PPC(97)21REV2, May 1998*

Perchards's report on DSD, circa 1998 (untitled) www.perchards.co.uk

In June 1991, the Ordinance on the Avoidance of Packaging Waste (Verpackungsverordnung) under the German Waste Act was introduced, the **first and most extensive piece of legislation** for which a significant body of information on the implementation of EPR exists. At the time, packaging accounted for 30% by weight and 50% by volume of total waste stream and was growing!

Germany was the first country to introduce binding requirements on producers for the recycling and recovery of sales packaging. The Ordinance puts full financial responsibility on manufacturers and distributors to be responsible for the packaging they create. It requires **retailers and producers to take back a fixed and yearly increasing percentage of packaging materials**, and to recycle them in accordance with the principles laid down in the Ordinance.

The Goals of the Ordinance
The overall goals of the Ordinance are to **reduce packaging waste** requiring disposal and to **stimulate new recycling technologies.** Specifically, Article 1 of the Ordinance states:

1. *Packaging is to be produced from materials that are environmentally acceptable and do not hinder recycling*
2. *Waste from packaging is to be avoided, if that packaging:*
   - ⇨ *is reduced to that volume and weight necessary to protect the contents and to market the product;*
   - ⇨ *is so produced as to be refillable, insofar as it is technically possible and feasible; and*
   - ⇨ *is recycled when refill is not possible.*

Who is the producer?
Packaging waste is highly mixed, may be contaminated, and is disposed of in high volumes from many sources, generally within a short time after production. This created the problem of finding responsible parties for take-back programmes. Under the Ordinance, all producers and distributors have equal responsibility, with the retailers, as distributors being required to take back used packaging. The Ordinance requires retailers to provide bins so that customers can leave outer packaging in the stores. Since retailers have significant control over packaging on their shelves, they have been able to influence producers to eliminate or alter packaging. In practice, **the filler of packaging material has assumed final responsibility for compliance**.

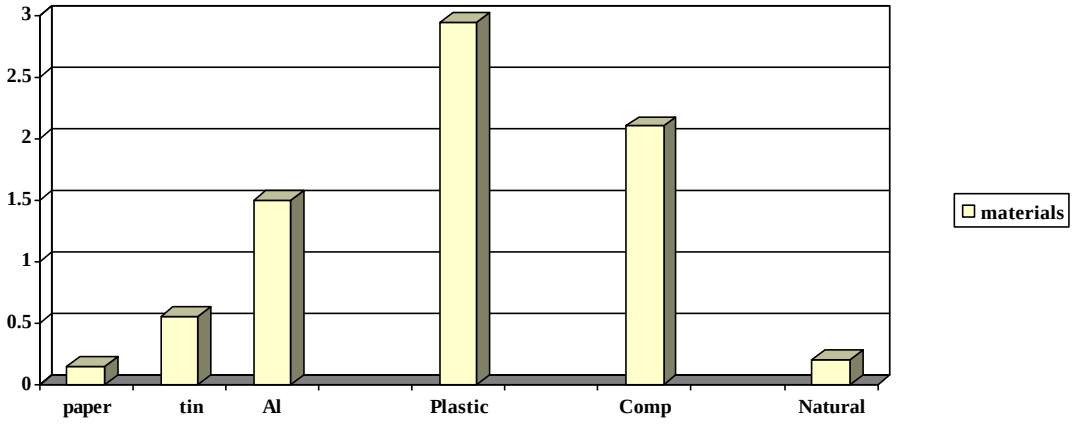
Since it is impractical to identify and return packaging to individual producers, the German Packaging Ordinance provides for the setting up of a non-profit

Producer Responsibility Organisation (PRO) to assume responsibility for collection, sorting and recycling of packaging waste. The PRO created in Germany was the **Duales System Deutschland (DSD),** a consortium initially made up of 600 companies but by 1998 numbering 17,000. The DSD started operating in January 1993.

All products licensed by DSD carry a **Green Dot.** Producers and distributors pay an annual licence fee to DSD based on the amount and type of packaging introduced into the market. (See Table 1) This allows them to use the **'Green Dot'** symbol on the packaging to identify the product for the PRO, which collects all Green Dot packaging. Over 75% of all packaging in German stores carries the green dot. Consumers pay an increased price for the packaging, based on what material it is made from, to cover the cost of recycling. This **provides an incentive to manufacturers/fillers to reduce the price by using more favourable materials** which have a lower disposal fee or reducing the amount of packaging.

Until secondary packaging entered the Green Dot system in 1993, retailers received no reimbursement for costs incurred as a result of take-back requirements. To avoid costs for handling secondary packaging, e.g. blister packs, they exerted pressure on producers to eliminate all unnecessary secondary packaging. In the case of chains that offer low prices, the option for fillers to pass Green Dot costs on to the consumer has been limited by retailers who have held price levels. Retailer pressure continues to motivate the system, since failure of the DSD to meet quotas in any of the German States would result in a nationwide reversal of the decision to lift the take-back requirement for sales packaging and a return to the legally mandated system of return to retailer. **This counterbalance between retailers, industry and the DSD appears to be an effective enforcement tool for the legislation.**

Table 1: Licence fee for Green Dot
Weight-based fee: DM/kg



The Ordinance is implemented by meeting government-mandated collection, sorting, recycling and refilling (for beverage containers) targets and allowing industry to impose fees on packaging materials.

Table 2: Targets for collection, sorting and recycling packaging materials in 1996

Material	Collection quotas	Sorting quotas	Recycling quotas
Glass	85%	100%	85%
Paper, cardboard & cartons	94%	98%	92%
Plastics	80%	88%	68%
Tin plate	82%	99%	81%
Aluminium	95%	88%	81%
Compounded materials	84%	96%	79%

The Ordinance imposes a **minimum 72% quota for refillable bottles**. If the national market share of refillable containers falls below 72%, a mandatory deposit on beverage containers. This obligatory quota for refillables has been challenged by the European Commission as creating a barrier to the free movement of goods within the EU. In 1995, only 13% of drinks imported to Germany were sold in refillable containers, while 75% of drinks filled in Germany used refillables. The EU is now objecting to Germany imposing deposits on one-way drinks containers, and Chancellor Gerhard Schröder has until 1 October 2003 to make the scheme compliant with EU trade law.[1]

The original Ordinance specifically **prohibited incineration as a means of meeting the targets,** but this was changed in 1998 to allow energy recycling under strict conditions such that the waste must only be used as substitute fuel and not to simply get rid of the waste; the caloric value of the waste and incineration efficiency must be high and any additional waste arising during recovery can be disposed of without further treatment. Of the 57 incinerators operating in Germany today, only two or three can fulfil these requirements.

Problems related to implementation

Waste Trade

When the Packaging Ordinance was first introduced, the enthusiastic response from the public resulted in a mountain of waste, and a lack of domestic capacity to recycle it. The majority of this waste was exported and dumped abroad in France, Eastern Europe and Asia.

Domestic recycling capacity was due to come on line by 1998. However, in the interim, surplus material, especially plastics continued to be exported. For example in 1994, of the 461,000 tonnes of plastics collected, 256,000 tonnes (55%) were exported, primarily to China and European Community. After 1997, the export of packaging waste for recycling was banned.

[1] *Germany gains time on drinks pack deposits*, Environment Daily 1488, 24 July 2003

Disruption of markets for secondary materials
When the tough provisions of the Packaging Ordinance first came into effect, they wrought chaos **in international secondary raw materials markets**, particularly for **paper**. Some of the players involved, particularly the waste management industry, saw the Ordinance as a good market opportunity and turned it to their advantage.

Plastics recycling
At the time the Ordinance was passed, recycling technologies and capacities were available for glass, paper/board and metal. The **primary problem has been with plastics recycling**. The DSD system collapsed in 1993, when households placed four times the amount of material required by collection targets in the DSD system. DSD announced it would only separate for recycling the easily recyclable material, such as bottles and send the rest back to the public waste system, which created public image problems for DSD.

This fiasco and the scandals around exports of packaging waste forced the DSD together with waste managers to create a dedicated plastics recycling consortium, known as DEKUR-Kunststoffe Recycling (DKR). The need to deal with waste plastics has led to the development of new technologies, both for sorting and recycling mixed plastics.

New sorting technologies are increasingly automated and use hydrocyclones or centrifuges to separate individual plastics. For example, the Thyssen Henschel process uses hydrocyclones to separate polyolefins, polystyrol and PVC with a throughput of one tonne per hour and achieving 99% purity.

Recycling technologies available at the time the Ordinance was adopted, were based on raw materials processes to convert waste plastics to new plastic products. However, to meet the targets, it was necessary to find other processes for converting waste plastic and to create new markets for secondary materials.

The emphasis in new technologies is on recycling to recover oils, gas and chemicals and the use of plastics as a reducing agent in steel production. New plastics recycling technologies developed in response to the Packaging Ordinance include:

- **BASF Pyrolosis process**: cracking at 300°C under vacuum in the absence of hydrogen to produce naphthalene, hydrocarbons, gases and oils, the latter are converted to methanol;
- **Hydrogenation in the Kohle-Öl-Anlage**: uses hydrogenation to produce synthetic crude oils and gases. Plastics are cracked under a pressure of 300 bar at 480°C in the absence of oxygen to break the hydrocarbon chains into short segments forming a fluid mass which is then hydrogenated;
- **Synthesis Gas Production Technology**: The company Schwarze Pumpe GmbH uses temperatures of over 800°C in an oxygen atmosphere and steam to convert plastics to gases, mainly carbon

monoxide and hydrogen. High temperatures break down chlorine compounds. Residues of heavy metals are converted to glass-like slags to be used in road construction. Rapid cooling of gases prevents formation of dioxins and furans. Synthesis gases are used to produce methanol;

- **Plastics as a reducing agent in steel production**: The company Klockner has developed a process which uses plastics as a reducing agent in steel production. Material is heated in a kiln to 2000°C in the presence of iron oxide. In the reducing atmosphere, polymers form gases which combine with the oxygen from the iron oxide to release elemental iron. Residual gases, like carbon oxides are recovered. Unlike incineration, reduction releases no heat but uses the energy produced within the system. Because of the molecular similarity of plastics to oils, the substitution ration from waste plastic to oils is 1:1.

From 1 January 1999, 60% of plastic packaging must be recovered. Currently **33% of plastic waste, mainly polyethylene (PE) and polypropylene (PP) is mechanically recycled**. **The remaining 58% is sent to chemical depolymerisation plants for 'feedstock' recycling**. Chemical recycling of plastics– which is itself highly energy intensive - extracts the gas and oils in the plastic for use as a substitute for heavy oil in blast furnaces to make pig iron or to liquify the polymer for recycling into other plastics. In 1997 nine percent of plastic waste was shipped to other countries for recycling.

A small amount of PVC (2.5%) is still used in packaging and this has proved a problem since it contaminates other plastics in mechanical recycling and creates additional waste disposal problems in feedstock recycling. For this reason PVC packaging waste is sent to landfill.

In 1989, Germany had a plastic recycling capacity of 10,000 tonnes using raw materials technologies. Projections for 1997 estimated increases in feedstock **capacities of 400,000 tonnes**. The problem now is to find markets for secondary materials, which can be 2-3 times more expensive than virgin materials. Hence the growing appeal of using plastics as a reducing agent in steel production, where no secondary materials are produced.

Free riders

Free riders cost the DSD some 400 million DM annually. Common examples of 'free riding' are when wastes for which Green Dot licences have not been paid enter the DSD system, such as when packaging not carrying the Green Dot or non-packaging wastes are disposed of by households in the yellow DSD bin. Proposed amendments to the Packaging Ordinance will require firms not participating in the DSD system to demonstrate through annual reporting that they are able to reach the same collection, sorting and recycling quotas as the DSD, or face hefty fines.

Following DSD's financial crisis in 1993 caused in part by 'free riders', the DSD was given authority to require verification (by an independent accounting firm) that amounts of packaging certified by licence holders as carrying the Green Dot were not exceeded. Retailers voluntarily helped in identifying

products from manufacturers not included in the list of licence holders, but appearing on their shelves with the Green Dot. The DSD was given authority to levy fines for such activities.

Double payment for waste management services
The same volume of waste is now being shared by the DSD and municipalities without a reduction in municipal waste management costs. Duplication of collection services occurs when the same volume of waste is collected by the DSD and municipalities. Some municipalities are considering pick-up on a bi-weekly instead of weekly basis to reduce costs.

The PRO as a monopoly
The inclusion of PRO schemes in EPR legislation may create waste collection monopolies. Under the German system, the power of the DSD was limited by powers of the States and municipalities. The requirement for co-ordinating with existing waste handling systems weakened the position of the DSD in negotiations with local and municipal waste managers, since the latter set standards and prices for waste contracts.

Critics argue that the DSD has created profitable waste management monopolies for private waste managers and municipalities, at the expense of consumers. The EU filed a cartel complaint against the DSD, for providing sorted material to recyclers at no costs. As a result, recyclers now have to pay for materials with a positive market value and the DSD requires rebates from waste managers for materials sold.

Licence fees paid to DSD are used to subsidise plastics recycling, which in turn ensures that the DSD can meet the recycling targets. Critics argue that most new recycling technologies consume too much energy and secondary materials have no viable markets due to high costs.

Misinterpretation of the Green Dot symbol
The Green Dot was initially incorrectly recognised by consumers as a sign of environmentally improved packaging, providing sales advantages for Green Dot products. Since most products now carry a Green Dot, this is no longer an issue.

Has the take-back system resulted in real reductions in resource use?
Between 1992 and 1993, the volume of packaging material in circulation was reduced by half a million tonnes. **Since the passage of the Ordinance, total packaging has been reduced by 1 million tonnes**, a per capita reduction of 15 kg.[2] The reduction reflects the elimination of some types of unnecessary packaging, such as shrink or blister packaging and the increased use of concentrates and refillable packaging. Significant design changes were made to reduce the amount of material used in packaging.

[2] Daten und Fakten zum Grünen Punkt, Wertstoffrecycling in Zahlen – Techniken und Trends

For comparison, **between 1991 and1995, Green Dot packaging decreased 14% from, while total packaging in Germany decreased 7%; during the same period in USA, packaging increased 13%.**

The proportion of beverages sold in refillable containers has increased. The transport packaging sector, which has seen the greatest drop in packaging, has developed reusable shipping containers. Furthermore, the Ordinance has raised awareness among packaging producers of the need to radically re-think material use in packaging.

Other Impacts of the Packaging Ordinance
Use of composite and plastic packaging fell as other materials were substituted, with use of **composites reduced by 50% and plastics use in packaging falling from 40% (by volume) to 27%.** This drop reflects avoidance and minimisation of plastic packaging, in favour of paper/carton and tinplate. Also seen within the plastic packaging sector were shifts away from PVC to PE and PP.

Amendments to the original Ordinance have mandated the **reduction of concentrations of lead, cadmium, mercury and hexavalent chromium in packaging** from 600 ppm (parts per million) by weight from 30 June 1998 to 100 ppm by weight from 30 June 2001.

Current recycling levels have reduced the weight of packaging waste going to landfill and incineration by some 66%. However, the influence of the DSD collection on reduction of the total amount of waste destined for incineration is estimated to be only some 8%. Despite this, in some regions of Germany waste volumes are no longer available to support existing incineration facilities, leading to the transport of waste from neighbouring States and complaints about waste traffic.

The Ordinance has spurred the development of new sorting and recycling technologies, especially for mixed plastics. For example the company KHD Humbolt Wedag AG uses a three-step centrifuging process to separate mixed plastics, metals and contaminants. However, the **high costs of sorting and processing make prices for secondary materials non-competitive**. For example, secondary materials from processes which convert plastics to oils and chemicals may be 2-3 times that of raw virgin materials. Moreover, **viable markets for secondary materials are not expected in the near future.**

An assessment of the DSD conducted by the Prognos Institute in 2002[3] calculated that:

- The recycling of two million tonnes of lightweight packaging avoids carbon dioxide pollution by the same quantity which arises in the incineration of 28 million tonnes of residual waste
- The costs of the Green Dot are between 520 and 605 euros per tonne, but could drop to 250-370 euros

[3] *Environmental Success Balance 2002 of Duales System Deutschland AG, www.gruener-punkt.de*

- By recycling used sales packaging, a total of 67.5 billion megajoules of primary energy was saved, equivalent to 1.5 million tonnes of climate-damaging greenhouse gases.

The Prognos Institute predicted a further 15% decrease in waste 2000-2005. Moreover, a ban on dumping untreated waste to landfill from 2005 will lead to more reductions through more reuse and recycling. New rules applying to biodegradable plastics requires that after 1999, these plastics must achieve a composting target of 60%.