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FROM CIRCULAR TO LINEAR SYSTEMS: HOW THE REFILLABLE GLASS BOTTLE BECAME SINGLE-USE PACKAGING

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The purpose of this note is to analyse why the refillable glass bottles were once introduced, how single use beverage packaging was phased in and why the refillable bottles were finally phased out. This note thus describes a reversed transition; from the circular to the linear. Materials have been collected from Swedish governmental reports, brewery magazines and newspaper articles.

Introducing the refillable glass bottle (1886-1954)

The first deposit-refund system was introduced in Sweden 1886 through an agreement between the Swedish brewers (Bring, 1935; 322). Previously, to buy beverages, customers typically brought their own jars to the breweries. But with the new and popular lager beer, the barrels needed to be emptied quickly, without interruption. Furthermore, the glass bottles were blown by hand, which made them expensive. Reversed logistics became the solution, where consumers merely borrowed the bottles. A deposit fee was paid at the purchase of the bottles, which was refunded when the bottles were returned. The breweries then inspected, washed and refilled the returned bottles for resale.

Establishing a deposit-refund system for glass bottles coincided with two other historical events in Sweden. The national deposit-refund system required cooperation rather than competition in the brewing industry. Thus, the deposit-refund system contributed to establishing Sweden's first business association; the Swedish Brewers' Association (Bring, 1935:217). To facilitate handling, sorting and refilling in the reversed system, all breweries were required to use the same bottles. The Brewers' Association adopted therefore in 1886 the world's first standardized glass bottle, the Stockholm bottle, a 33 centilitres bottle (Bring, 1935:322).

The refillable standardized system was so successful that it was gradually introduced for virtually all forms of beverages during the 20th century in Sweden. For example, Vin & Sprit, the Swedish company with monopoly on the production and import of strong alcoholic beverages, built a centre in 1956 for bottling wine in Stockholm. The wine was transported by boats in large containers from abroad to be bottled in Sweden in standardized refillable glass bottles.

Most popular, however, was the 33 cl Stockholm bottle that was used for beer, soft drink and carbonized water. The bottles were typically bought in trays, which were also subject to a deposit fee. The design of the standardized 33 cl bottle has not changed much since 1886 (Figure 1). Machine blowing of the bottles was introduced in the 1910s and a cap replaced the cork in 1932 (Bring, 1935: 321). All bottles were initially coloured brown to reduce the effect from the sun on the content and were to at least be recirculated 100 times.

However, the Stockholm bottle was controversial. During the 1940s, the bottle, rather than the negative social impact of alcohol, was accused of causing the bad reputation of beer (Henriksson 2019:15). The chairman of the breweries' standardization committee stated that "the brown colour and the clumsy shape [of the bottle] contributes to, consciously or unconsciously, [the beer's] declassification" (Bryggeritidskrift, 1949).

Phasing in single-use packaging (1955-1997)

To improve the beer's reputation, new types of packaging were launched. In 1955, the beer can was released on the Swedish market (Ministry of Social Affairs, 1969: 29). From viewing the refillable bottle as a problem in the brewing industry, the steel can brought the packaging to the



FIGURE 1: The development of the standardized 33 cl Stockholm bottle over 130 year. The two left bottles were blown by hand (1880s, 1901) and the three bottles on the left (1880s, 1901, 1930) were sealed by a cork. The others were blown by a machine and capped (1937, 1959, 1968, 2013). Image used with permission from Henriksson (2019).

forefront of the breweries' marketing. For example, when one of Sweden's largest breweries, Pripps, advertised their new beer, Pripps Blå, in 1961, the brilliance of the packaging was emphasized rather than the content, as the can required "no deposit and no empty bottles to bring home" (Figure 2). The advertisement ends with "an extra tip" to emphasize the simplicity of disposable packaging for the sailing trip; "Make a hole in the bottom of the empty can and it will sink faster." (Göteborgs Kungliga Segelsällskap, 1961).

The convenience of single-use packaging was thus market as a perfect match with the emerging leisure life. To meet the increased competition from the can manufacturers, the glassworks launched the single-use glass bottle a few years later, in 1959 (Ministry of Social Affairs 1969: 29).

The share of beer sold in refillable glass bottles started thus to decrease, from 94% in 1963 to 87% in 1967 (Bryggeritidskrift, 1968). But with the increased use of disposable materials, the problem of littering in Sweden grew during the 1960s. Single use packaging became a problem that required action. However, the Social Democratic government was negative to ban disposable packaging (Ministry of So-



FIGURE 2: A Swedish beer advertisement from 1961 that emphasizes the simplicity of the single-use can and how easily it can sink through "a hole in the bottom". The text is partly translated in the body text above. Used with permission from Göteborgs Kungliga Segelsällskap (1961).

cial Affairs, 1969: 143). So to meet the protests, the measures focused on the effects of the use of the single-use packaging, rather than the source of the problem, i.e. the disposable packaging.

Hence, a ban and fines on minor littering in both nature and urban areas were introduced. The bans were combined with massive anti-littering campaigns to change people's behaviour. In 1970, the Swedish Government launched the nationwide campaign "Keep Sweden Tidy" against littering. The municipality was assigned responsibility for sanitation and began to place infrastructure in the form of large bins all over. To cover the costs, a packaging fee was introduced.

But these measures against littering had only a marginal impact. For example, the police rarely prioritized littering offenses, while littering of single-use packages, especially cans, continued to increase during the 1970s (Table 1).

When the production of cans shifted material from steel to aluminium in 1981, the centre-right government demanded breweries to introduce a deposit-refund system for cans in Sweden (Swedish Government, 1981). But unlike the glass bottles, the cans and especially its sealing, the pop tab were originally designed for single use. Refilling was thus not discussed, instead the cans were to be recycled after collection, which was promoted by the high scrap value of aluminium (Swedish Government, 1981: 9).

The first plastic bottle made of PVC, Rigello, was introduced to the Swedish market 1970. But it was not until the introduction of the PET bottle in 1983 that the plastic bottle was popularized. The possibilities of resealing made it possible to sell larger volumes per unit. In 1990, 30% of all soft drinks in Sweden were sold in PET bottles, corresponding to 100 million bottles (Swedish Government, 1990:5).

Like previously successful introductions of single-use packaging, the PET bottle was also debated, and action was required. But unlike the previous governmental assessments of disposables, the consumers were no longer in focus. Instead, the manufacturing of the PET-bottle was primarily problematized:

"The manufacture of single-use packaging of PET for beverages does not correspond to the requirements on packaging of the future or their significance for conserving energy and resources" (Swedish Government, 1990: 6).

The Social Democratic government therefore banned single use plastic for beverages in 1991 (Swedish Government, 1990). Just like the refillable glass system, PET

TABLE 1: Measurements of littering along Swedish roads between 1972 and 1975, divided into different beverage packaging (Ministry of Agriculture, 1974: 81).

		1972	1973	1974	1975
Glass	Refillables	11 %	7 %	6 %	6 %
	Single use	29 %	26 %	22 %	20 %
Cans		42 %	45 %	55 %	57 %
PVC Plastic bottles		18 %	22 %	17 %	17 %
The share of beverage in relation to all packaging litter		10,2 %	10,7 %	11,6 %	12,6 %

bottles were instead to be refilled through a deposit-refund system, managed by the breweries. The sealing of the bottles with a screw cap opened up possibilities for refilling. But in order to be reusable, a standardized, thicker PET bottle was introduced (Figure 3).

The system with refillable plastic bottles were nonetheless discontinued after a few years. This since the brewers' association claimed that small breweries lacked finances to establish dishwashing facilities. In addition, PET-bottles proved less suitable for industrial reuse, compared to glass bottles. The repeated cleaning resulted in discoloring and scratching the PET-bottles. Therefore, the ban on single-use PET bottles was reformulated by the centre-right government the year after its implementation, in 1992 so that the deposit-refund systems for plastic bottles would be based on single-use and recycling, just as for the can (Swedish Government, 1992).

Phasing out the refillable glass bottles (1998-)

Although the refill system for plastic bottles failed, the political decision to introduce such a system needs to be understood against the background that the refillable glass system was still running smoothly 100 years after its introduction. In 1987, about 50% of all beverages were still sold in refillable glass bottles (Bryggeritidningen, 1988). In 1986, 250 million refillable glass bottles circulated on the Swedish market. This is to be compared with 53 million in 1937 (Henriksson, 2019: 23), when refillable glass bottles were the sole packaging for beverages. The refillable glass system was thus resilient and single-use packaging did not primarily replaced the glasses, but rather expanded the market.

However, in the end of the 1990s, the refillable glass system started to be phased out. This process was not primarily driven by consumers' purchasing priorities. Nor was it because single-use packaging was cheaper for the breweries. In fact, single-use packaging was about 20% more expensive (Friedel, 2014: 510). Instead, it was an active decision taken by the breweries, since the switch to single-use packaging opened up possibilities to increase profits and markets.

Vin & Sprit, which had a monopoly on the import and production of alcohol in Sweden, abandoned the refill sys-



FIGURE 3: The refillable PET-bottle (Vänernuseet, 2015). Licensed under creative commons.

tem in 1998 because "single use bottles are much more profitable for us" (Svensson, 1997) according to their CEO. The trays with the standardized 33 cl. bottles are here a prime example. They had become a catchpenny for the grocery stores in the 1970s and 80s: buy food for 30 euros, and buy a tray with 20 bottles for 3 euros!

Hence, customers were not willing to spend money on beverages sold in refillable bottles. The refillable bottles had simply become a symbol of cheap beverages and the margins in all stages were limited. A representative of Sweden's breweries association justified the phase out of the refillable glass system by saying that "no one makes any money from them. The price for the consumer is simply too low" (Gustafsson, 2013). However, restaurants could charge higher prices for the bottles, where it is thus still possible to buy the refillable Stockholm bottle.

By filling the beverage in new packaging, for example 50 cl. bottles of plastic that were placed in refrigerators, stores were able to charge higher price per product and litre, which increased the margins. A study showed that the prices of soda increased by 100% per litre after the switch from refillable glass bottles to single-use PET-bottles (Edman, 2013).

Furthermore, the dishing process at each brewery required space. A space that was justifiable when packaging materials were expensive, but less rational when the price of glass, plastic and aluminium was marginalized compared to other production costs. The trays with the standardized bottles were also a problem for some of the grocery stores since they were heavy, bulky and exposed the products poorly. By removing the trays, more units could be placed in the same space, with improved visibility.

In addition to these practical reasons, the globalization and liberalization of the Swedish beverage market contributed also to the phase out of the refillable glass system. Or as Vin & Sprit's CEO argues, the refillable bottles "worked well during the monopoly era, but not in today's free market" (Svensson, 1997). When Sweden became a member of the European single market in 1995, Vin & Sprit lost their monopoly on import. Single-use bottles began to flow into the Swedish market from all around the world.

With increased competition, a growing supply of different beverages and as the consumers' purchasing decisions moved to the stores, the Swedish breweries' interest in using the packaging to expose their products increased. Profiling the beverages only through the labelling, which were the case for standardized bottles, were no longer sufficient.

When the Swedish Minister of the Environment, Birgitta Dahl, banned single-use plastic bottles in 1991 and tried to introduce standardized refillable PET bottles, the American soda producer, Coca Cola, refused to adapt its curvy bottles. In a letter to the Swedish Prime Minister, the head office in Atlanta described how the distinctive shape of the bottles was a central part of the company's profile. Therefore, the soda giant could not accept a standardized bottle, which could according the company affect the possibilities of supplying Sweden with the specific beverage (Broberg, 1992). The specific bottle was thus exempted from the standardization.

Conclusions

This study demonstrates that the concerns over single-use packaging have gone in circles. How the problem of disposables is understood will influence the choice of measures. For example, if littering is defined as the problem, the focus of the measures may fall on the effects of consumption. Littering can thereby be tackled through bans, fines, infrastructure, bins, campaigns and deposit-refund systems. But such measures generates also acceptance for increased production of single-use packaging. Furthermore, if only one type of single-use material is problematized, the production of disposables typically continue, but only of a different material, with new problems as a result.

In order to establish large-scale reuse systems, product standardizations seem to be central. This since standards create the necessary predictability for those who shall receive the used products to adapt the circulation processes accordingly. However, it remains to be seen how standards for circulation can be introduced when free product development, packaging design and exposure have become cornerstones of the market economy.

Finally, transitions in consumption and production systems are the result of at least two different but related processes. How the linear systems are phased in or out, and how the circular systems are phased in or out. For many decades, the refillable systems and disposable systems were running side by side in Sweden, before an active decision was made to phase out the refillable bottles.

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