THE RECUP SYSTEM AS A CONTRIBUTION TO A MORE SUSTAINABLE AIR TRAVEL

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1. Introduction

It is now well known that air travel emits an enormously high proportion of CO2. Only in 2017, 29 million tons were emitted by flights departing from Germany. The majority of vacation and business travelers are also aware of this nowadays. It is now possible to compensate the greenhouse gases caused by a flight with certificates such as those from atmosfair.

However, the enormous amount of plastic waste generated by most flights is often ignored. The drinking cups, of which each guest receives at least two, are made of plastic, as well as the cutlery and the bowls for the food. A single passenger leaves around 1.43 kg of plastic per flight. With more than four billion airline passengers each year, that is almost 6 billion kilograms, with a rising tendency. But why aren't alternative ideas being used here?

As part of the AIEST "Contest of fresh Ideas" competition, we would like to look at a more sustainable alternative for disposable plastic cups, proceeding according to the Design Thinking method. First, we analyze the issue area, which is about understanding its actual problem, observing it, and defining a point of view. In the solution part, ideas are to be found, which leads to the development of a prototype, with a test run of it afterwards. The conclusion follows at the end.

2. RECUP in Airplanes

2.1 Design Thinking Method

2.1.1 Understanding

To understand the problem with plastic in airplanes, the problem about plastic in general must be looked at more closely.

Plastic is a material which consists of synthetic polymers. Polymers are long, repeating strands of molecular groups. About 100 years ago, the first fully kind of synthetic plastic, Bakelite, was invented. Generally, plastic is created by breaking down petroleum into its component parts and is therefore relatively easy to mass produce.

An advantage of man-made polymers is also that they are tough, lightweight, and can take on almost any shape. Furthermore, plastic is the best way to keep food fresh, thus ensuring less food waste.

Nowadays, 40% of plastics are used for packaging. Across the EU, there was 167.3 kilograms of packaging waste per capita in 2015.

But plastic bags, to-go cups and other disposable products take 500-1000 years to completely degrade. Conversely, this means that every kind of plastic that has been produced up to now and not recycled or incinerated must still be in circulation on earth. By 2017, 8.3 billion tons of plastic had been produced worldwide, of which 6.9 billion tons count as plastic waste that is no longer being reused and has not been incinerated or recycled. About 8 million tons of this per year end up in the ocean.

A general plastic ban seems the most urgent and logical solution. However, this is more complicated because a lot of plastic alternatives, such as cloth bags, have an even more environmentally harmful production method than the production of plastic bags.

In order to efficiently address and eliminate the plastic problem, it is also important to act globally and not just locally.

2.1.2 Observing

Products made of plastic are especially used in aviation. These simplify the whole process on board during a flight. Shrink-wrapping the food, blankets and headphones guarantee a quick and hygienic distribution to the passengers.

Plastic also makes the work easier for the flight crew, as they only must distribute the meals, collect the leftover packaging, and dispose of it in a bag. The already packaged dishes do not have to be prepared on plates during the flight. There is an additional cost in terms of labor and transportation for dishes that can be used multiple times because they need to be cleaned after use.

The airlines also save on weight when they resort to the environmentally unfriendly option. In this case, less fuel is consumed on a route, which also saves costs and emits less carbon dioxide in return.

Figure 1: The amount of collected trash on a ten hours flight. Source: FAZ

Nevertheless, the reduced CO2 emissions are not an argument in favor of plastic on board as a tolerable alternative. Lufthansa announced that 80 kg of disposable plastic items are used on a flight from Frankfurt to Los Angeles. Approximately 91% of the waste produced is not separated or recycled for hygienic reasons but incinerated or disposed of in landfills. Airlines would like to change this issue, but they are limited due to strict hygiene regulations. The high use of plastic is also generally not well received by passengers.

Some airlines are taking small steps toward more sustainable options by for example, using lightweight stainless-steel cutlery. Etihad eliminated disposable products on their Abu Dhabi - Brisbane route. Adjustments are still needed here; passengers did not find the tableware comfortable to eat in. Nevertheless, sustainable awareness in the aviation sector is developing more and more.

2.1.3 Defining the position

The goal is to reduce the use of plastic to avoid the production and disposal of plastic, which is harmful to the environment. The use of normal metal cutlery or porcelain plates is not considerable because these types of tableware weigh too much or are fragile. Therefore, other alternatives are sought that can be easily implemented in air travel.

2.1.4 Finding ideas

RECUP already addressed the issue of plastic waste in 2016. Their concept: a deposit system for reusable cups. Every year, 2.8 billion disposable cups are thrown away in Germany. The RECUP team wants to counteract this high amount, but still allows customers to take their coffee with them. Thus, the idea of reusable cups came up as a convenient alternative. The customers can get the RECUP with their coffee purchase at a cooperation partner of RECUP with an extra charge of 1€. The cup is available for rental, it can be returned to a cooperation partner and the customer gets back the deposit amount previously given. The website or the RECUP app provides an overview of the distribution points that participate in the network throughout Germany. Partners are coffee-dispensing companies such as cafés, e.g. Coffee Fellows, Shell gas stations or supermarkets like Alnatura. Businesses such as companies, hospitals or universities can also cooperate internally with RECUP in their canteen.

The cups come in three sizes - 0.2l; 0.3l and 0.4l and are made from recyclable plastic, polypropylene. This type of plastic is the most eco-friendly way to go for now, according to RECUP, as it is particularly durable and can withstand at least 500 dishwasher cycles.

Figure 2: RECUP cups. Source: RECUP

As a partner, there is only a 1€ deposit per cup, plus shipping and a system fee depending on the contract period. The prerequisite is that the partners clean the cups themselves, since RECUP does not yet operate any external cleaning logistics.

In summary, the biggest advantage of the RECUP system is the avoidance of single-use plastic and the conservation of resources during production. According to RECUP, the production and consumption of 11,000 tons of CO2, 40,000 tons of waste and 43,000 liters of water are avoided annually.

2.1.5 Developing prototypes

To reduce plastic waste on flights, we would like to implement the RECUP deposit cup system on flights. It is particularly suitable because the cups are very light, easily stackable and thus space-saving and, above all, can be reused several times. The cups can withstand at least 500 wash cycles, and with a certain dishwasher even up to 1000, so they have no disadvantage compared to disposable cups. As the 0.3l RECUP cups contain the usual amount of a cup of coffee or a glass of water, they are going to be used for the flight.

Process

To test the process, we chose the flight route Munich - Hamburg and Hamburg - Munich. The airline we chose is the Lufthansa CityLine. Munich is supposed to be the headquarters for the RECUP cups, where they are cleaned and put back into circulation.

This route is flown by an Airbus A319. The maximum seating capacity is 138, so 276 for a round trip. On most days, the plane flies twice a day from Munich to Hamburg and back, so for simplicity this is assumed for all days.

We chose Munich as the base for the RECUP system. This is where the cups are to be cleaned. Since the effort for an own industrial dishwasher would be too high for the cups only, a cooperation with surrounding restaurants or hotels which already have a dishwasher, is aimed. The Hilton Munich Airport Hotel, which is located between the two terminals at Munich Airport, appears to be the most practical option here. Flights on the Hamburg - Munich route operated by Lufthansa CityLine arrive in Area G of Terminal 2 and depart from there. An example route for transporting the cups would be from Gate G4 to the Hilton Hotel, which is 750m long.

Figure 3: Area G of terminal 2 and the Hilton Munich Airport Hotel. Source: Google Maps.

This can certainly be made possible for a cleaning fee and the transport of the cups from the aircraft to the hotel. In addition, RECUP itself is working on offering a dishwashing service for companies in the future. This can also be used in this case.

As mentioned, a maximum of 276 passengers fly on each round-trip flight. For a flight of this duration, namely 1h 20min, we calculate one drink per guest. Thus, rounded up, 300 cups are required per outbound and return flight. This means that approx. 600 cups are used per day on two roundtrips and they need to be cleaned.

Costs

The costs for a partnership with RECUP are explained in the following.

Lufthansa CityLine would be defined as an in-house partner with RECUP since the cups are mainly used for internal catering of the visitors. In this case, a system fee is incurred, which decreases with a longer contract term. The monthly system fee is 36€ and we decided on a term

of two years which means a total system fee of 864€. There is also a one-time site fee of 599€. In addition, a payment of 1€ per cup is due as a deposit which is returned when the cups are taken back. A maximum of 600 cups will be used and washed per day for the return flight Munich - Hamburg. It also needs to be considered that customers i.e. will take their cups back themselves after a flight to return them to one of the return points, so with an order quantity of 800 cups we are on the safe side. Accordingly, the following costs are incurred: 800 cups*1€ deposit fee + 599€ site fee + 864€ system fee =2,263€ for two years, excluding shipping of the cups.

Costs RECUP in-house partnership for two years duration	amount
System fee (monthly 36€)	864€
Site fee	599€
Deposit amount of the cups (1€/cup)	800€
	2.263€

As the company returns the cups at the end of the contract period to RECUP and get the deposit amount back, the effective costs are €1,463. RECUP also provides the company with the free return of up to 800 cups per 24 months. In addition, from 100 cups, they are collected at no additional cost. Since Lufthansa CityLine will not accept additional cups from passengers, the company does not get over a return of 800, so no additional costs need to be charged for taking back the cups.

The cleaning aspect brings additional costs which must be considered as well. First, staff is needed to transport the approximately 600-800 cups to the Hilton Hotel. The cups are stackable and weigh little, it takes an average of 10 minutes to walk from the gate using a rolling container or similar type of cart. A member of the loader team, who is responsible for unloading the luggage, should also take on this task. In addition, at the Hilton Hotel, the cleaning staff in the kitchen has to put the cups in the dishwasher and dry them. An industrial dishwasher takes only three minutes for one wash cycle. Since a hotel like the Hilton Hotel has several large

dishwashers, we assume that several dishwashers can be used simultaneously for cleaning the RECUP cups. Lufthansa CityLine will therefore also enter a cooperation with the Hilton Hotel to be allowed to share the use of the dishwashers. The conditions for this have to be negotiated.

In comparison, an eco-rinse cycle with a standard household dishwasher, which is relatively new, costs around 30 cents.

Comparison with common disposable cups

The wholesaler METRO sells 500 disposable cups to business customers at a price of €45.99 (including VAT). Assuming a daily traffic on the route between Munich and Hamburg, 600 cups per day would therefore result in 20,143.62€ per year (price per cup: 45.99€/500=0.09198. 0.09198* (365 days*600 cups per day) = 20,143.62€ per year).

The changeover to the cooperation with RECUP and the Hilton Hotel will at first mean additional expenses since the personnel and the logistics have to be organized. Nevertheless, the use of the more sustainable alternative will result in a reduction of costs compared to the use of disposable cups.

2.1.6 Testing

After the effect of the RECUP system has been successfully tested on the Munich-Hamburg route by the airline Lufthansa CityLine for some time, there is the possibility of using the RECUPs on other routes and in other airlines. Thus, more and more disposable plastic could gradually be saved by dispensing with the disposable cups. Costs would also decrease, as the use of reusable RECUPs would be much cheaper in the long run than the constant purchase of new disposable plastic cups.

If the RECUP partnership were to be extended to other flights, consideration could also be given to whether it would be worthwhile for Munich Airport to purchase its own industrial dishwasher. RECUP would also like to offer an external dishwashing facility in the future. The airlines could also use this service if the purchase of their own industrial dishwasher would be too expensive.

In addition, there is the possibility of ordering further sizes of cups and matching lids via RECUP.

Furthermore, the RECUP system could also be extended to train services.

3. Conclusion

It is not only the airlines that are being urged to act in a more sustainable way and produce less waste. As an airline passenger, you can also act sustainably and reduce the waste that accumulates during a flight. Starting with the airline ticket, which you can download to your smartphone instead of printing it out. As an alternative in general for disposable airline cups, it is better if the passenger takes his own reusable empty drinking bottle, which can be refilled after the security check at the airport or by the flight attendants during the flight. To dispense with pre-packed items such as headphones or blankets on long-haul flights, passengers can use their own headphones or take a jacket or scarf with them in their carry-on luggage.

A major weakness of airlines when it comes to waste disposal is that there is hardly any separation and recycling by type. Since everything must be done quickly when cleaning the aircraft, all waste is disposed of collectively and burned. The passenger should take his own garbage after landing and throw it away at the airport, because there are often trash cans separated by species.

There is still a long way to go before the airline industry is perceived as sustainable, but airlines and passengers can still contribute their part.