

Exploring Efficient Ways To Capture Air in a Container: A Localized Study

Noshin Tahsin

bsse0914@iir.ku.ac.bd

Institute of Independent Research, University of Kishoreganj
Kishoreganj, Bangladesh

Md. Rakibul Islam

bsse0903@iir.tu.ac.bd

Institute of Independent Research, University of Thakurgaon
Thakurgaon, Bangladesh

ABSTRACT

In Dhaka, a city with the worst air quality, residents are craving for fresh air. Those who still got the opportunity to leave, are leaving. Those who cannot leave, are craving and crying for fresh air. They have also been asking their friends to bring fresh air capturing in jars. This study explores the existing ways of capturing fresh air, possible exciting ways to make it cost efficient and attractive and presents the solutions in a structured way.

KEYWORDS

Air, Capturing Techniques, Sustainability, Aesthetics

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1 INTRODUCTION

Dhaka, the densely populated capital of Bangladesh has once again topped the list of world cities with the worst air quality [1]. Dhaka's air quality index (AQI) was recorded at 316 at 10.46am on Friday, January 21, 2022 which is undoubtedly considered 'hazardous'. AQI, an index for reporting daily air quality, is used by government agencies to inform people how clean or polluted the air of a certain city is, and what associated health effects might be a concern for them [2]. In Bangladesh, the AQI is based on five criteria pollutants: Particulate Matter (PM₁₀ and PM_{2.5}), NO₂, CO, SO₂ and Ozone [3]. An AQI above 300 is considered 'hazardous' for everyone and doctors advise people to avoid all outdoor activities, as air pollution consistently ranks among the top risk factors for death and disability worldwide [2] [3].

Breathing polluted air has long been recognised as increasing a person's chances of developing heart disease, chronic respiratory diseases, lung infections and cancer, according to several studies. As per the World Health Organization (WHO), air pollution kills an estimated seven million people worldwide every year, largely as a result of increased mortality from stroke, heart disease, chronic obstructive pulmonary disease, lung cancer and acute respiratory infections. It affects our immune system to a great extent [4]. In these circumstances, it is necessary to leave cities with polluted air, Dhaka in this case, as soon as possible. If there are friends, who can not leave the city instantly due to obvious reasons, we may present them with pure air, which can be the most precious gift considering the circumstances, as studies say, presenting someone with something they lack makes them happy [5] [6] [7] and experiential gifts makes us happier [8].

The main contribution of this study is proposing 5 different approaches to ensure efficient fresh air capturing, namely, the Minimalist Glass Jar approach, the Traditional Balloon approach, Compressed Air Cans, The Scented Nicotine-Free Cigarettes approach and the Hypothetical Jar approach. To find these approaches, firstly, we identified the following research questions aligning with our goal.

RQ1: What kind of container should be used to capture air that would make the process cost-efficient?

RQ2: How to make the container aesthetic so that it looks like a present?

In this study, we first explored the existing ways to capture fresh air. As our goal was to find out efficient ways to make sustainable and aesthetic air jars, we designed an interview questionnaire and conducted interviews on 6 professionals to answer the research questions. After conducting the interviews, we analyzed the collected data. The methodology and result analysis is presented in the following sections of this paper.

Structure of the paper. The following section of this paper describe background study (Section 2), methodology of this study (Section 3), result analysis and discussion (Section 4). This paper ends with a conclusion (Section 5), acknowledgement and important notes (Section 6) as well as references.

2 BACKGROUND STUDY

Air cans are being sold throughout the world, as resources show. It started as a joke, but now people spend a fortune on bottled fresh air and global pollution is fuelling this fad. From an article from The Guardian, we can see, air is being sold in aluminium canister connected to a plastic mouthpiece through which customers could inhale air siphoned from remote locations in Banff, Alberta, by the company Vitality Air [9]. They target the inhabitants of the world's most polluted cities, some of whom were unable to walk 200m without inhaling damaging levels of pollutants. Start-ups in Switzerland and Australia launched similar products: canisters filled with compressed air collected from areas of outstanding natural beauty. Normally the sites were rural and marketable, locations already associated with purity, or adventure holidays: Banff, Lake Louise, Lucerne, Sydney's Blue Mountains [9]. There is now luxury air, cold-pressed air, 100% mountain air. There is air canned for the benefit of mothers. There is air for work. Air for kids. Air for grandparents.

However, most items are expensive – an 8-litre Vitality Air canister costs 32 dollars (£19); on average, we each breathe 6 litres a minute – but some are more expensive than others. Leo De Watts, an Englishman who coined the term “air farming” – a strategic coup at the dawn of a new industry – began to fill clip-top jars

with air from hillsides in Dorset, roping his family into an outlandish collection process that involved very tall nets. In reference to Greek mythology, he named his company Aethaer. A 580ml jar sets customers back £80.

Prior to 2014, there is very little on record to suggest that anyone had made a large-scale attempt to transport vast quantities of clean air from one location to another. But the idea had been explored in film. In the 1987 sci-fi spoof *Spaceballs* [10], Mel Brooks tells the story of an evil race scheming to steal the fresh air of a neighbouring planet, having squandered its own supply. In one scene, an entire atmosphere is hoovered up by a colossal spaceship that resembles in form a maid using a vacuum cleaner. In another, a character inhales fresh air from a can. The product is branded Perri-Air.

Brook's premise is hilarious for its absurdity. But he made *Spaceballs* 30 years ago, when air pollution posed less of a threat. Today it is "the world's largest single environmental health risk", according to the World Health Organisation – a modifiable burden that costs 6.5 million premature deaths a year, one in nine of the global total. For the most part that trend is increasing, particularly in emerging economies – India, for example – where rapid industrial growth has come at the expense of the environment. The causes of air pollution are simple and, with legislative support, correctable: inefficient transport, coal-burning power plants, industrial incineration, industrial production and household energy use. In many parts of the world, the air people inhale is quietly killing them, and often there is no escape. "The problem is that when you're a citizen, you can't choose the air you're breathing," said Dr Maria Neira, a director at the WHO's department of public health. "You breathe whatever is available." [11]

In countless urban centres, particularly those in Asia, whatever is available regularly exceeds the WHO limit, sometimes tenfold. But it can become worse still. In November, a recording in New Delhi monitored the air pollution level at almost 40 times the recommended maximum, prompting locals to refer to the city as "a gas chamber". For days, commuters wore scarves over masks. Schools closed, and a dense smog veiled the city in gloomy darkness. Not for the first time, locals had to consider very seriously the necessity of going outside, which is all, in a terrifying kind of way, extremely good news for the success of Vitality Air. Their target markets include China, India, Vietnam, Russia, Turkey, Iraq and Kuwait. Often, customers are buying a product they hope will offer much-needed respite, if not a cure.

Swissbreeze sells 8-litre canisters of Swiss air at €19.90 (£17.60) a pop. They include Pure Swiss Air and Swiss Alpine Air [9]. "There are reports about the benefit of clean air over highly polluted air," But "the reality is there are no current medical science reports about the benefits of small amounts of clean air." Nobody has actually sat down and performed rigorous tests to answer the question: does canned air actually work?

Dr Sarah Elkin, a respiratory consultant at Imperial College London, for her opinion on whether canned air offered health advantages to those in regions affected by high levels of air pollution. Her response was succinct: "To my knowledge there is no evidence of benefit." (Later in the same email she suggested I search for existing studies. Perhaps the remark was pointed.) Other specialists share Elkin's stance – Shawn Aaron, the director of the Canadian Respiratory Research Network, once told a reporter that: "We don't

know that these bottles of pollution-free air have any health effects, beyond placebo effects." But, for the lack of data, few can confirm the position as indisputable.

Dr Neir, the WHO director of public health, dismissed bottles of canned air as "sophisticated ad-hoc products," before complaining that they encourage users to ignore the larger issue. It is "like accepting what should be unacceptable", she said. "When you are in a city where the air is totally polluted, and you try to solve it by breathing with your own device, it's like you are accepting that breathing polluted air is something normal. And it shouldn't be." Neir's colleague, Dr Flavia Bustreo, assistant director general at the WHO, has said: "For people to be healthy, they must breathe clean air from their first breath to their last," which would appear to discount all temporary measures as ineffectual.

But now there are scented air cans, which people find refreshing. 7-Eleven Japan is selling cans of O2 Supli in two scents: strong mint and grapefruit [12]. The company does not claim that there are any medical benefits of using oxygen-to-go products, but many believe that high levels of oxygen reduce stress and alleviate fatigue. 7-Eleven says the grapefruit and mint scents are also therapeutic. The can, which contains 95 percent concentrated oxygen, hasn't convinced everyone. A can costs about 5 dollars or 600 yen. An O2 can contains an aroma sheet inside the cap, which doubles as a mask. Once you've chosen a scent, you place the aroma sheet inside the mask and press a lever that lets you inhale. The cans can last for about 10 days, that's about 18 cents per inhale. Japanese consumers seem to have taken a liking to O2 pick-me-up products. About 3,000 cans of O2 Supli were sold in a single business day, according to 7-Eleven Japan. They are finding it refreshing as they have to work in such environments where people are cramped in tiny spaces.

Some are still not used to the idea of buying oxygen, though. For a long time, the Japanese thought they would never have to pay for three items: water, air and safety. When mineral water came into the retail market in the early '80s, a lot of Japanese consumers didn't buy it. However, we can see, things have changed. In 2005, mineral water sales in Japan reached 1.2 billion dollar with more than 500 different types of mineral water stocking aisles in most department stores. In Japan, 7-Eleven hopes oxygen-to-go will enjoy the same success [12].

3 METHODOLOGY

After studying the nature of the topic being explored and existing approaches, we designed an interview questionnaire and conducted online interviews on 6 professionals. Then we analyzed data collected from the interviews. The steps are described below.

3.1 Questionnaire Construction.

Aligning with the aim of our study, we specified the questions that we will ask to the participants. We kept questions related to the way of capturing air, the type of containers to keep the captured air, and ways to make the container low-cost and attractive. Considering the explanatory nature of the study, the questions were kept open-ended.

3.2 Interview Conduction.

We selected 6 participants based on personal contact who we thought can provide valuable insights regarding the issue [13] [14] [15]. We conducted the interview online, via messenger chats. The average interview time per person was 5 minutes.

3.3 Data Analysis.

As the data was collected in Banglish (Bangla typed in English alphabets) [16] [17] [18], we translated them into English and performed qualitative analysis [19] [20]. We categorized the different ways of capturing air, identified cost-efficient approaches and different ways to decorate the container.

4 RESULT AND ANALYSIS

The identified approaches are stated in the following subsections.

4.1 Minimalist Glass Jar Approach.

33% of the respondents proposed a minimalist glass jar approach, in which air can be captured in a regular use glass jar, the same jars used to store pickles in the households of Bangladesh. According to them, the jar should be kept in our targeted area, from where we want to capture fresh air. Then the lid of the jar should be put on tightly and then, it should be sealed to preserve that captured air as long as the users want. They said, the jars can be decorated with fairy lights outside the jar, or glass paintings e.g. daisies, sunflowers, sun or both, depending on the size of the jar. It can also be decorated with woolen strings or mandalas [21]. Besides, philosophical, motivational and funny quotes can be added in colorful papers and pasted on the outer surface of the jar, based on the taste of the person to whom the jar will be presented as a gift.

4.2 Traditional Balloon Approach.

33% of the respondents said that, air can be captured in a balloon. 50% of them proposed the balloon to be transparent as well as to be kept inside a transparent glass jar.

4.3 Compressed Air Cans.

33% of the respondents referred to the compressed air cans recently being sold in several countries in the world, as discussed in the previous sections. One of the respondent proposed to integrate Virtual Reality (VR) Technologies [22] [23], while using the air cans, to make the experience more realistic.

4.4 Scented Nicotine-Free Cigarettes.

16% of the respondents proposed that, Nicotine-Free cigarettes, stuffed with scented elements, e.g. lavender, mint, green tea, based on the users choice, can be used to generate fresh scented airy smoke, which can be captured in jars. However, they were not much interested about beautifications of the jar. They wanted to keep things simple.

4.5 The Hypothetical Jar.

16% of our respondents, were busy with their never ending jobs and academic pressure. So, instead of talking or exploring much, they proposed a hypothetical way to achieve our research goal. It is as

follows. However, the respondents provided no insight regarding the aesthetics of this hypothetical jar.

Jar.load(air); (1)

Jar.seal(); (2)

AirJar = Serialize(Jar); (3)

5 CONCLUSION

We proposed 5 different approaches to ensure efficient fresh air capturing: the Minimalist Glass Jar approach, the Traditional Balloon approach, Compressed Air Cans, The Scented Nicotine-Free Cigarettes approach and the Hypothetical Jar approach. Considering practicality, cost efficiency and aesthetics, we eliminate the idea of Compressed Air Cans and finally keep the remaining four approaches in the proposed design guideline: Minimalist Glass Jar Approach, Traditional Balloon Approach, Scented Nicotine-Free Cigarettes and The Hypothetical Jar. We eliminate the Compressed Air Can approach, as it is costly and not affordable at this moment, given the financial ability of the authors and their current state of funding. But we can consider this in the future, if we receive enough funding. We keep the Hypothetical Jar Approach, in spite of being intangible, as intangible presents can also make people happy, if they are not 100% materialistic [24]. The study has several limitations. Due to time and resource constraints, we were only able to collect little amount of data. In future, we will conduct this study on more people to collect more responses and get more valuable insights regarding this topic.

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And about the writing process of this paper, the introduction and background study section may contain plagiarised content (I am pretty sure about it, as I did not have much time to write the whole paper on my own and I, myself had copied and pasted a bunch of texts here. I am not gonna submit this paper anywhere anyways. So does it matter?). Sections starting from the methodology is written by the first author, and reviewed by the second author. The ACM Reference Format on the first page is not correct. However, I kept this as I didn't have enough time and energy left to remove it. The paper used the ACM SIGS proceedings format to be used for the GE@ICSE'22 Workshop, that is going to be held on Februray 2022, Pittsburgh, KS, USA. Could not remove the text "GE@ICSE'22, Februray 2022, Pittsburgh, KS, USA" from top of the pages of the paper as well, didn't have the time and energy to to explore this either, so kept it as it is. Don't take anything stated in this paper seriously. Thanks.

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