Proposal: SMART garbage containers in residential areas

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May 8th, 2023

SUMMARY

The proposed program aims to introduce solar-powered, smart garbage bins in New York City residential areas, equipped with advanced features such as: motion-sensing lights, an odor filtration system, smart panels, and a dedicated software application for authorized residents and sanitation workers. With extensive experience in developing sustainable waste management solutions, JAD Inc.'s team is uniquely qualified to undertake this project. The budget for the construction, implementation, and operation of this smart garbage bin system is estimated at $200,000 for upfront costs and $695,000 for ongoing yearly costs, which totals $895,000 for the first year. Our comprehensive plan details the physical layout, location, and innovative features of the smart garbage containers, along with a detailed budget and timeline for implementation. By adopting this Smart Garbage Bin System, New York City can significantly enhance its waste management processes, resulting in cleaner streets, reduced environmental impact, and improved quality of life for its residents.

PRESS RELEASE

JAD Inc. develops new SMART garbage containers for residential areas in NYC.
New SMART garbage containers hope to eliminate garbage pollution in NYC.

JAD Inc. recently developed new SMART garbage containers with unique features that will drastically reduce rat sightings, smell, and garbage on the streets of New York City. The new SMART garbage containers will be installed in residential areas in New York City to eliminate the rat and garbage problem many residents face across New York City. The new SMART garbage containers will have easy accessibility only for residents and sanitation workers to prevent overflow of garbage.

We also hope these new installations can inspire and help other countries and places worldwide with rat problems and garbage pollution. JAD Inc. CEO Adrian Yu said, "The newly developed SMART garbage containers will help the residential areas in New York City on a micro-scale but we hope in the future, these installations will help other places around the world on a macro-scale."

The SMART garbage containers include unique features such as:
- Odor Filter System
- Solar Panels
- Smart Panel
- Lights with motion sensors.
- Exclusive App for residents and sanitation workers

JAD Inc.

Outline of Contents

1. Smart Garbage Bins: A Solution for Residential Waste Management in NYC

New York City is recognized as one of the most populous and diverse cities globally, however, it faces significant challenges in handling the vast amounts of residential waste generated daily. One such challenge is the inefficient waste management system, which often results in garbage being left outside residential areas for extended periods before being picked up by sanitation workers. This situation not only creates unpleasant smells and sights, but also poses potential health risks and environmental hazards. Rat infestation is a problem, on the streets, across the five boroughs. The New York City Department of Sanitation handles around "3.8 million tons of trash annually, or an average of about 10,000 tons daily" (CBCNY, 2014). The background of this problem lies in the growing population and urbanization in NYC, leading to increasing amounts of waste generation. The current waste management system struggles to keep up with the city's demands, often resulting in delays and inefficiencies in waste collection (New York City Department of Sanitation, 2020). Our idea is to create a garbage dumpster of sorts to mitigate the trash pollution problem. However, there is a twist, we will implement smart features in and around said dumpster to make sure the rat infestation stays at a minimum. The smart features we would implement into the dumpster bin include: an odor filter system, motion-sensing lights, a smart panel, and an application allowing sanitation workers and residents (based on the street and their building number) to open the smart garbage container. By adopting this smart garbage bin system in NYC residential areas, the city can significantly improve its waste management process, leading to cleaner streets, reduced environmental impact, and a better quality of life for its residents.

1A. Modern Bin Design Shortcomings

Although the modern bins out on NYC streets are convenient, the bins do have its own shortcomings. There is not enough space to fit multiple bags of garbage, resulting in bags being left out on the streets for the sanitation workers to pick up. Additionally, in buildings with multiple apartments, the garbage bins get filled up very quickly.

2. PROPOSED PROGRAM

This proposal aims to introduce innovative, smart garbage bins in NYC residential areas to improve the efficiency and effectiveness of waste removal. These smart garbage bins will be equipped with features such as lights with motion sensors to detect when full and report to the sanitation department, an air filtration system to remove unpleasant smells, a smart panel (screen) to prevent touching and facilitate mobile use, and software (App) for sanitation workers and specific residents to unlock the bins. In order to make the Smart bin viable, it will be powered by solar energy. The implementation of these smart garbage bins is expected to contribute to cleaner and healthier residential environments in NYC.

2A. Physical Layout

The smart garbage containers will include many features that will cover several problems people face. For example, nobody wants to touch and open a garbage can with their hands because it may seem unsanitary and disgusting for one to do that. To solve this problem, we created a smart panel and a software app which would allow you to open the garbage container without using your hands. The smart panel will be similar to the OMNY reader you see at MTA subway stations. The software app will only be available to residents and sanitation workers to prevent overflow of garbage from non-residents. Our smart garbage containers also will include

motion sensor lights, odor filter system, and solar panels. Our smart garbage containers will include lights outside for night time use and also inside. Furthermore, our smart garbage containers will have a built-in odor filter system so the smell won't bother residents or bystanders. Our solar panels will be placed on top of our smart garbage containers.
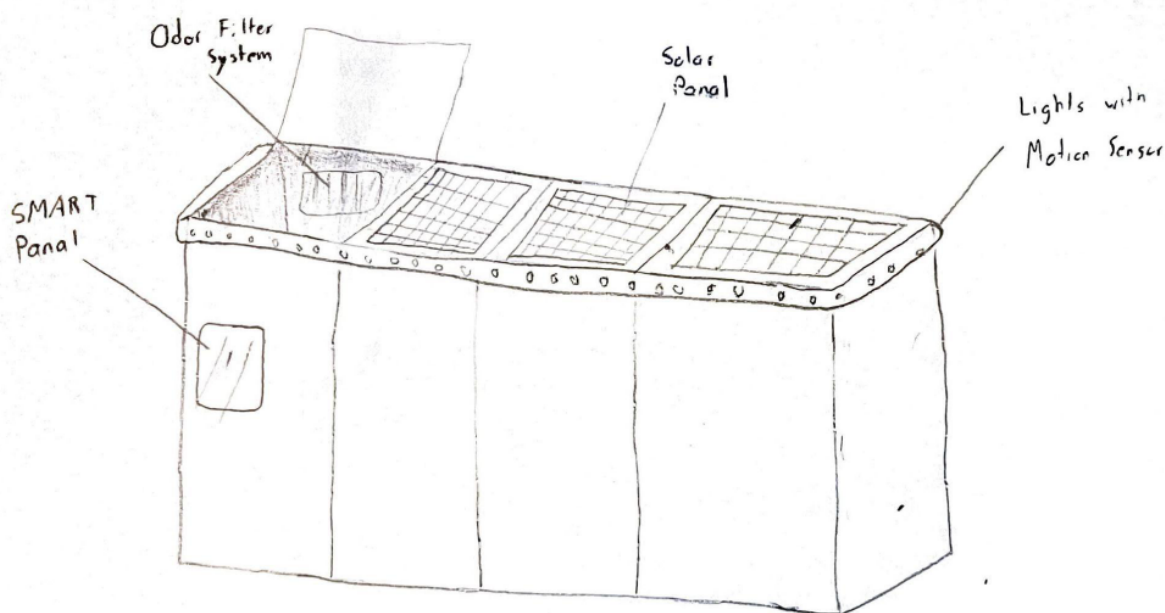
Perez, J. (2023, May 6) Smart Garbage Container

2B. Location

Our smart garbage containers will be installed in residential areas all over the five boroughs in New York City especially in areas with severe garbage pollution. According to a New York Post article, "the Bronx and Manhattan rank the lowest on a mayoral scorecard for the cleanliness of city streets, as garbage has piled up in the boroughs following $100 million in cuts to the Sanitation Department" (Marsh and Hoga, 2020). Our mission is to install these smart

garbage containers in areas such as the Bronx and Manhattan where most of the trash is left on the streets.

(Sadowski, 2020)

https://nypost.com/2020/10/01/the-bronx-and-manhattan-have-nycs-dirtiest-streets/

2C. Motion Sensor Lights

Residents will need lighting to use our smart garbage containers at night so we implemented built-in motion sensor lights in our smart garbage container. We will use LED lights which will be similar to built-in LED lights in kitchen waste bins as shown below.

(Ebay, 2023) https://www.ebay.com/itm/373697546489

2D. Odor Filter System

The smart garbage containers will incorporate an activated carbon filter system to tackle unpleasant odors effectively. As explained by an industry expert:

"Adding an activated carbon filter to the HVAC system and/or dust collector is a good first line of defense for many odor-producing processes. If the odor is not highly noxious or hazardous, this may be enough to bring odors down to acceptable levels both within the facility and in outdoor emissions." (RoboVent)

By integrating the activated carbon filter within the garbage container, the surrounding environment will remain free from foul smells, leading to a more pleasant residential atmosphere. This approach is both practical and efficient in addressing the odor issue commonly associated with waste disposal systems.

2E. Smart Panel

The smart panel installed on the smart garbage containers will serve as a touch-free interface for users. Utilizing near-field communication (NFC) technology, the panel will allow authorized residents and sanitation workers to unlock the container by simply holding their smartphones near the panel. This approach ensures a more sanitary and convenient user experience, minimizing physical contact with the container and enhancing the overall waste disposal process.

2F. Software App

The software application is a vital element of the smart garbage bin system. It is designed to facilitate ease of use and enhance the user experience for both residents and sanitation workers. The application will enable users to open the smart garbage containers remotely through their smartphones, eliminating the need for physical contact with the bins. This not only ensures a more sanitary experience, but also contributes to the overall efficiency of waste disposal. The app will be accessible exclusively to authorized residents and sanitation workers, based on their street and building number, to prevent misuse and overflow of the smart garbage bins from non-residents. To ensure user-friendly navigation, the app will have an intuitive interface, complete with features such as real-time bin capacity updates and notifications for waste collection schedules. By integrating advanced technology with the waste management process, the software application will significantly enhance the functionality and effectiveness of the smart garbage bin system.

2G. Solar Power

Integrating solar power into intelligent waste receptacles is a crucial and beneficial strategy to guarantee cost-effective and eco-friendly electricity for their operations. Harnessing solar energy for powering these advanced garbage bins reduces dependence on traditional power sources, which typically involve burning fossil fuels (EIA, 2021). Consequently, this diminishes greenhouse gas emissions and contributes to the overarching objective of minimizing the city's carbon emissions. Moreover, solar energy, as a renewable and abundant resource, offers long-term financial savings. With the declining costs of solar panels, employing solar energy to

power smart waste receptacles becomes increasingly viable (Lund, 2009). Furthermore, by adopting solar power, these bins can operate independently of the electrical grid, ensuring continuous service even during power outages. Ultimately, employing solar power in these advanced garbage bins not only supports environmental sustainability, but also guarantees dependable and cost-efficient energy for their functioning.

3. INNOVATION PROCESS

Costs for the development of this smart garbage bin system are divided into two phases: upfront, mainly covering the construction and installation of solar-powered garbage bins, and ongoing, which covers the labor and materials needed to maintain and operate the system year-round (Pardini et al., 2020; EnergySage, 2021).

3A. Upfront costs

Based on the construction and installation of similar smart waste management solutions, we expect the system to be fully operational within a year of approval of this proposal (Pardini et al., 2020). As detailed in Table 1 below, the costs to bring the smart garbage bin system online include purchasing and installing the solar-powered garbage bins, implementing the necessary software and hardware infrastructure, and educating the residents about the use and benefits of the system.

The solar-driven waste receptacles, with an approximate value of $1,500 per unit, demand this price due to the various components and features involved in their creation and operation, including material expenses. Primarily, these waste containers employ top-tier solar panels, which transform sunlight into electrical energy to power the compression mechanism and

communication infrastructure within the container. The solar panels, crafted from high-grade materials such as monocrystalline silicon, contribute to the overall expense.

In addition, the receptacles possess an automatic waste compression system, which enhances the receptacle's capacity and minimizes collection frequency. The technology incorporated in this system elevates the unit's cost, as it necessitates accurate engineering and sturdy materials like steel or aluminum for the components of the compression system, ensuring consistent and effective performance.

Moreover, these innovative waste containers feature a built-in communication network, allowing for real-time tracking of fill levels and alerting waste management personnel for prompt collection. The creation and integration of software and hardware for this system also play a role in the cost, as they require electronic components such as sensors, microcontrollers, and wireless communication modules.

Lastly, the design and construction of the receptacles mandate the use of robust materials capable of withstanding various weather conditions, usage wear and tear, and potential vandalism. High-quality materials like stainless steel or reinforced plastic compose the container's body, augmenting the overall manufacturing expenses. In addition, the receptacles may have protective coatings or finishes to improve their durability and appearance further, which also adds to the material costs. Collectively, these factors lead to the estimated $1,500 per-unit price.

Table 1: Startup Costs

Description	Unit	Total Cost
Solar-powered garbage bins (50 units)	**$1,500 per unit**	**$75,000**
Software and hardware infrastructure	N/A	**$75,000**
Community Training/Engagement Program	N/A	**$50,000**
Total Upfront Cost		**$200,000**

3B. Ongoing labor costs

The ongoing labor costs include technicians for the maintenance of the solar-powered garbage bins, IT personnel to manage the software and hardware infrastructure, and community engagement personnel to ensure the proper use of the system (Pardini et al., 2020).

Table 2: Smart Garbage Bin System Labor Costs

Description	Cost/Salary	Total Cost
Technicians (5)	$5,000 per month	$300,000
IT personnel (2)	$8,000 per month	$192,000
Community engagement (3)	$4,000 per month	$144,000
Yearly total		**$636,000**

3C. Ongoing maintenance costs

Regular maintenance of the solar-powered garbage bins, software updates, and hardware replacements will ensure the long-term operation of the smart waste management system (EnergySage, 2021).

Table 3: Ongoing Maintenance Costs

Description	Cost	Total Cost
Solar Power maintenance	**$150 per panel**	**$30,000**
Software updates	**$2,000 per month**	**$24,000**
Hardware replacements	**$5,000 per year**	**$5,000**
Yearly total		**$59,000**

From the proposal date, we estimate an 18-month timeline to establish and operate the smart garbage bin system. The environmental and community impact study will take six months to complete. Upon approval, construction is expected to begin by December 2023. The community education and engagement courses can commence around October 2024. Finally, the smart garbage bin system will be operational in December 2024, with ongoing adjustments and improvements as needed.

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5A. Appendix: Evaluation Techniques

1. Did the introduction of the smart garbage bin system enhance the cleanliness of

   residential streets in New York City?

      a. The New York City Department of Sanitation will carry out yearly cleanliness assessments, comparing the findings before and after the smart garbage bin system's implementation.

2. Was there a reduction in rat infestations in the areas where the smart garbage bins were installed?

      a. The New York City Department of Health and Mental Hygiene will examine the number of rat-related complaints and compare the data from before and after the system was introduced.

3. Did the smart garbage bin system contribute to a more efficient and punctual waste collection process?

      a. The New York City Department of Sanitation will examine waste collection data, such as average collection time, frequency, and delays, both before and after the system was implemented.

4. How successful has the odor filter system been in minimizing unpleasant odors in areas with smart garbage bins?

      a. An independent environmental agency will be enlisted to observe and evaluate air quality surrounding the smart garbage bins, including assessing odor levels pre- and post-installation of the system.

5. Has the solar power system effectively powered the smart garbage bins, resulting in energy savings?

    a.   The performance of the solar-powered smart garbage bins will be evaluated by regularly monitoring solar panel efficiency and energy consumption. A comparison of energy expenses before and after the solar-powered system's implementation will also be performed.

6. Are residents and sanitation workers content with the smart garbage bin system, and have they adopted its use efficiently?

    a.   Formal surveys and interviews with residents and sanitation workers will be conducted to gauge satisfaction levels and gather input for potential improvements. Usage data from the smart panel and software application will be analyzed to determine the rate of adoption and user engagement.

5B. Appendix: Task Schedule

- Press Release: Jeremy
- Summary: Adrian, Derek
- Introduction: Adrian, Derek
- Proposed Program: Jeremy, Derek
- Innovation Process: Derek
- References (APA Citation): Derek, Jeremy, Adrian
- Appendices: Derek