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Executive Summary

The cell phone has become an intricate part of society. Everywhere you look, cell phones are being used, whether it is to conduct business, make plans, or to simply chat with one of your colleagues. With the advancements in cell phones, we are now able to check and send email, get stock market updates, and even browse the internet. With these innovations to the cell phone, the power of the cell phone and its battery are pushed to their limit. Countless people deal with dead batteries everyday and currently there are no efficient solutions to this major problem.

Surveying randomly 50 people, 43 stated that they owned or used a cell phone. Of those 43 people with cell phones, 34 people were involved in battery related problems. Repeated occurrences of dead cell phone batteries are becoming wide spread. As the cell phone options increase, the dependence on the battery does as well. To solve this problem, we at A.R.S.Inno Inc. designed the EZ Rescue, a device that allows manual charging of cell phone batteries. An additional survey of 50 random people found that 39 are willing to buy the EZ Rescue. Therefore, it is our belief that the EZ Rescue will yield benefits for the users as well as the investors.

The EZ Rescue is a product like no other. Not only is the EZ Rescue reliable, but in comparison with current models, it's first in its class. As of today, current models are too bulky, expensive, fragile, hazardous, over exaggerated, and too impractical. Our Engineers at A.R.S.Inno Inc. have taken into account all the possible flaws that are present in today’s products. The EZ Rescue does not require any additional accessories nor does it require an extensive electronic component background. Thus the EZ Rescue is easy to use, safe, effective, practical, and an all in one deal.

The EZ Rescue is simply a battery with a built in personal generator. Our product will encompass the same dimensions as the current cell phone battery for different particular models. An easy access hidden key will allow the user to turn the generator that produces electricity, thus enabling the battery to be recharged. The EZ Rescue incorporates the following three commercialized devices to produce electricity: a Lithium battery, a worm gear, and an electrical generator. Designed to be strictly a secondary source of energy (emergency use), our product will allow the user to talk for about 15 minutes.

Our implementation plan for producing the EZ Rescue is both cost effective and time efficient. Our production will begin once we have interested investors to fund our idea. Once in production, A.R.S.Inno Inc. will purchase the needed materials from wholesale companies in bulk and produce and test the first prototype. After assuring all aspects are successful, manufacturing of the EZ Rescue will begin. Marketing will include strategies
such as agreements with retailers and placement of ads for the EZ Rescue in consumer oriented areas. A.R.S.Inno Inc. is more than qualified with expertise in the field of Chemical, Electrical, and Mechanical Engineering that will ensure the quality and effectiveness of the EZ Rescue. The EZ Rescue will provide people with more time on their cell phones and increase time efficiency. Thus overall the EZ Rescue is simple to use, cost-effective, and the demand will increase rapidly.
Introduction

The cell phone has become an intricate part of society. Everywhere you look, cell phones are being used, whether it is to conduct business, make plans, or to simply chat with one of your colleagues. With the advancements in cell phones, we are now able to check and send email, get stock market updates, and even browse the internet. These cell phone advancements have improved society’s efficiency by giving people more time.

With these innovations to the cell phone, the power of the cell phone and its battery are pushed to the limit. Countless people deal with dead batteries everyday, and it always seems their batteries die in the middle of an important conversation. According to a survey we took, 80 percent of people with cell phones have had this very problem. The people surveyed explained how they were not able to finish their conversations because their phones died.

To solve this problem, we at A.R.S.Inno Inc. have designed the EZ Rescue, a device that allows manual charging of cell phone batteries. This product is a simple solution to a common problem. The EZ Rescue allows cell phones user to charge their cell phone manually, and with no extra pieces to hold or carry around. This little device is simple, efficient, and cost-effective. It will be stored in the battery in the cell phone, and can be called upon whenever needed.

If our product is accepted, it will provide people with more time on their cell phones and increase time efficiency. We strongly believe that our product will yield benefits for the users as well as the investors. The user will benefit from the design and simplicity, as well as those extra minutes received from it. The investors will benefit because the EZ Rescue is cost-effective, simple to use, and the demand will increase rapidly.
Background/Need

There are problems with cell phone batteries today. They always seem to die when you need your phone the most. The life of the battery can range from one day to a week. Figure 1 shows the battery life of common cell phones.

![Figure 1](#) Average battery life in common cell phones. [Nokia.com, Motorola.com, Samsung.com, Ericsson.com]

To get more information on this subject, we took a survey of 50 random people. From our survey, we asked specific questions about battery life, such as: did you have a problem with your battery dying, did your battery die during an important conversation, and how often does your battery die. We graphed the results, which are shown in Figure 2.
According to our survey, 43 out of the 50 people surveyed owned cell phones. Of those 43 people with cell phones, 34 of them had problems with their batteries dying during phone calls. Of those 34 people whose battery died, 27 were during an important conversation. Figure 3, shows the length of battery life of the people surveyed.

To solve this problem, we at A.R.S.Inno Inc. designed the EZ Rescue. The EZ Rescue can be called on anytime, allowing the cell phone user to gain extra battery life when needed. To see if this product would sell, we took another survey of 50 more people with cell phones. We received the following results shown in Figure 4.
From the second survey we conducted, 39 out of the 50 people with cell phones would purchase our product. We then knew that our product was needed, and we started researching and designing our product to make a simple prototype.
Current Market Offerings

Currently there are four products in the market that deal with the cell phone battery:

- Handheld Charger Units
- Solar Panels
- Key Chain Chargers
- Multi-Power pacs

Listed in detail below are the four products and why the EZ Rescue exceeds the quality of the leading competitors:

1. **Handheld Charger Units** (as in Figure 5 below)
   - Large dimensions make it not space efficient
   - During a conversation, mechanism requires the use of a separate hand
   - Additional expenditures on Alkaline batteries that power the mechanism

![Figure 5. Handheld charger unit. [China depot, n.d.]](image)

2. **Solar Panels** (as in Figure 6 below)
   - Extremely expensive price tag due to the materials used
   - Very fragile and could possibly encounter cracking
   - User is left stranded if sun light is not present
3. **Key Chain Charger** (as in Figure 7 below)
   - Requires the user to carry a 9-Volt battery at all times, which may create undesired risks.
   - Additional expenditures on Alkaline batteries that power the mechanism
   - During a conversation, mechanism requires the use of a separate hand

4. **Multi-Power Pac** (as in Figure 8 below).
   - Extremely high $249 price tag
   - Incompatible dimensions, 7” tall and 3.5” wide.
   - Weighs about 2 pounds
   - The kit includes 10 different chips (for different voltage units), which if improperly used may cause shock or possible damage to cell phone.
Our Engineers at A.R.S.Inno Inc. have taken into account all the possible flaws that are present in today’s products, and in return we give you the EZ Rescue. The EZ Rescue does not require any additional accessories nor does it require an extensive electronic component background. Thus the EZ Rescue is easy to use, safe, effective, practical, and an all in one deal!
Product Design

The EZ Rescue is a battery with a built in personal generator that provides an extra 10 to 15 minutes of battery time on demand. It does not require any additional accessories nor does it require an extensive electronic component background. Thus the EZ Rescue is easy to use, safe, effective, practical, and an all in one deal!

To use the EZ Rescue, just turn the shaft to produce electricity and recharge your battery for an additional ten to fifteen minutes. An illustration of the EZ Rescue mechanism on a cell phone battery is shown in Figure 9.

![Figure 9. Back side of cell phone with EZ Rescue mechanism shown](image)

**EZ Rescue Mechanism**

Figure 10 illustrates the overall view of the EZ Rescue in a blown out portion of a Lithium Ion Battery.
As Figure 10 indicates, the EZ Rescue incorporates the following four commercialized devices to produce electricity:

- A lithium ion battery
- A worm gear
- An electrical generator, which includes magnets, copper wire (Armature), positive wire, and the negative wire;
- A shaft that rotates the coil around the generator.

When you turn the key it rotates the shaft, which in turn rotates the electric generator. The rotation of the electric generator produces alternating current, which is then stored in the battery. As a result, additional battery power is gained.
Lithium Ion Battery

The primary source of electricity for the EZ Rescue is the lithium ion battery. Figure 11 identifies the four components for this device.

In this situation each component contributes to creating electric current from chemical reactions between the lithium ion solution and lead iodide solid. Consistent reactions between the lithium ion solution and lithium iodide solid creates electrons or ions, which are transferred to the lithium iodide solid through the copper wire. Summarily, the EZ Rescue receives most of its electricity from chemical interactions.
Worm Gear

Secondary energy from the electric generator is possible with the worm gear device. Figure 12 illustrates the interface between the worm gear device and shaft of the electric generator.

![Figure 12. Worm gear [Nice, Karim]](image)

As Figure 12 shows, two shafts are necessary for the operation of the EZ Rescue and production of a secondary source of energy. When you rotate the shaft positioned outside the cellular battery compartment, it rotates the worm gear. As a result of the interface between the worm gear and generator shaft, the generator shaft rotates at the same time. Consequently, the electric generator creates alternating current.
**Electrical Generator**

The device that creates secondary energy, which complements the electricity from a lithium ion battery, is an electric generator. Figure 13 demonstrates the shaft motion from the worm gear device along with the basic operating principle for an electric generator.

As the shaft—interfacing with the worm gear—begins to rotate, it affects rotation to the copper wire (armature). Since the copper wire rotates, it reacts to magnetic fields from the bottom and top magnets of the electric generator. During this continuous process, the electronic configuration within the copper wire changes its rotational pattern. Whereas the top magnet affects a certain direction for rotational movement, the bottom magnet affects the opposite direction for rotational movement. Hence the interaction between electrons in the copper wire and polarized magnets creates consistent alternating current. Figure 14 illustrates this alternating current, which closely resembles the sine function of calculus.

![Figure 13. Four components of a generator (Generator, n.d.)](image)

![Figure 14. Sine curve for alternating current. (Alternating Current, n.d.)](image)
**Theory of Operation**

Figure 15 shows the theory of operation for producing alternating current, which is applicable to the EZ Rescue’s mechanism.

![Flowchart of EZ Rescue operating principle.](image)

Lithium ion batteries are conventional batteries used in modern-day cell phones. As well, worm gears are customarily found in windshield wipers. Furthermore, electrical generators have proven to be successful in macro-applications, particularly windmill systems and waterwheel systems.

In conclusion, turning the key rotates the shaft, which in turn rotates the electric generator. The rotation of the electric generator produces alternating current, which is then stored in the battery. As a result, additional battery power is gained.
Implementation Plan

To get investors, we will provide a proposal about our product. At that time, we will also give them our design proposal so they will get an idea of our product and our company. We will first show our idea to local companies and retailers in small areas to get an idea of the demand for our product, and also to get our company known. Based on the demand for our product, we will be able to project the demand on a nationwide basis. From there, we will introduce our product to nationally known cell phone companies and retailers. Then we will be able to expand our company to a nationwide market from the funding that we will receive from the investors.

Once we receive a substantial amount of investments, we will purchase the materials needed for our product. We will buy all the materials from wholesale retailers in bulk, thus lowering our production costs. The cost to make each individual battery will be approximately $15. This includes the battery, wires, magnets, shaft, and gears. Another expense we have taken into account is labor, and we will explain the cost of labor later in this plan.

The job will begin right away, with the founders of A.R.S.Inno Inc. taking out a loan. From this loan, we will be able to fund our company’s needs and expenditures. After we have realized the demand for our product, we will then sell our idea to nationally known cell phone companies and retailers. Once we sell our patented product and pay off all of our debts, the project will be completed, and the next project for A.R.S.Inno Inc. can start.

A.R.S.Inno Inc. is more than qualified with expertise in the field of Chemical, Electrical, and Mechanical Engineering that will ensure the quality and effectiveness of the EZ Rescue. The founders of A.R.S.Inno Inc. all have degrees in these specified fields. Our Chief Executive Officer, Robert Benson, has a degree in Electrical Engineering. He specializes in the circuits of this prototype to produce the electric current that powers the cell phone. The Chief Financial Officer, Shahid Shaikh, has a degree in Chemical Engineering. He specializes in the materials of the prototype and the materials in the battery to give the battery a long, lasting life. Finally, our Head Engineer, Adel Al-ouran, has a degree in Mechanical Engineering. He helped design the organization of components so our product would work. (See resumes in Appendix A).

Initially, we will take out about $100,000 to begin our company and our product, the EZ Rescue. This will be our first year budget. Based on the population of the area we will be targeting, we will manufacture enough batteries to supply 50% of that local population. This alone will cost about $30,000, allowing us to make about 2,000 EZ Rescues. The
making of each EZ Rescue will be done by the executives and a minimal amount of laborers initially. As we expand, we will then employ additional laborers and make machinery to manage the increased demand of the EZ Rescue. From $70,000 left, we will take our product national, and introduce our company to large chain retailers. We will begin advertising in magazines, on television, radio, and billboards. This will cost about $23,000. That leaves about $47,000. We will leave $5,000 in lose ends that we are guaranteed to encounter, thus leaving the company with $42,000. This money will go to the founders of A.R.S.Inno Inc., split three ways. However, they will be encouraged to invest this money back into the company during its first year of existence.
Conclusion

The EZ Rescue is definitely a product that will have high demand. This product eliminates the problem of having dead cell phones when they are in need the most. It is a secondary battery source. The customer will be rewarded with those extra minutes received. At the same time the EZ Rescue still uses the conventional lithium battery found in most cell phones. The investors will be rewarded by the high demand of the EZ Rescue, thus the EZ Rescue will sell, producing great revenue for the investors and company A.R.S.Inno Inc. Thus the EZ Rescue is beneficial for the customer, and more so, the investor.
References


Appendix A: Resumes

This appendix includes the resumes of our top executives: Robert Benson, Shahid Shaikh, and Adel Al-ouran