

Recovery Design for Portable Electronics Exposed to Moisture

Introduction

Many personal electronic devices are ruined each year by coming into contact with water: for example, through spillage, precipitation, or submersion in liquid. This design brief provides a guideline to design a device that eliminates water and moisture from electronics. This device will elongate the lifespan of sensitive electronic devices by eliminating the forced disposal of devices that are rendered unusable due to spillage and unfavourable environmental conditions. In addition, it must follow certain constraints (listed below) and be a unique and innovative design.

The usage of portable electronic devices such as iPods, mp3 players, and smartphones are on an undeniable upward incline over the past decade due to the exponential compaction of electronic devices(7). With the rapid increase in the storage ability of smaller and smaller memory spaces, these devices are slowly becoming the popular form of data storage. Water damage can not only cause a temporary inconvenience by taking away an essential communication device from the user, but the user is also at risk of losing valuable data. In addition, most phone warranties do not cover water damage. This product will, therefore, be of great significance as technology advances to new heights. Human dependency on portable media devices will be the primary selling factor.

While there are pre-existing solutions to drying portable media devices, they are not reliable and have many drawbacks. For example, some phones, such as the iPhone, do not allow users to remove the battery or the SIM card. Considering the number of iPhones in use by the global population, there should be solutions to drying devices taking in account the danger of an enclosed power-cell. The device to be designed will take these issues into consideration and offer the greatest versatility.

Overview of Previous Solutions

There are currently available commercial products that perform the same tasks as required in this device. For example, Save-A-Phone [2] and iRecovery Cell Phone Drying Kit [3] are examples that provide simple, and intuitive instructions, as well as an indicator to prevent premature booting of wet devices. However, these products use desiccants such as silica and chalk as adsorbents of moisture, which both pose health hazards if ingested, a possibility with children. [4]. In addition, a cheap, do-it-yourself method employed by most consumers is to place the compromised device, usually a cell-phone, into a bowl of rice, also a good absorbent. However, dust from the rice can damage electronic components inside the device[2], and this method works only for liquids such as fresh water.

If the device is subjected to salt water exposure, previous solutions fail as salt crystals remain even after the moisture has left the device. Overall, the major problem with the current solutions is that most require the battery or SIM card to be taken out before the drying process can occur. This can be an issue with electronics whose batteries are difficult to remove, such as the iPhone[5] - an electronic device that occupies 16.9% of the mobile phone market.



Stakeholders

The primary stakeholders for this design are:

- Consumers of personal electronic devices
 - Instructions easy for consumers to follow
- Electronic manufacturers
 - It may concern electronic manufacturers as the longevity of the device may impact sales for replacements.
 - Electronic manufacturers will be concerned because provision of water devices may be a major selling point in a very competitive market
- Environment
 - Cellphone disposal causes harm to ecosystems by releasing heavy metals (6)

Problem Definition

The primary goal of this design is to eliminate moisture and liquid from personal electronic devices in a shorter time period than current solutions, and prevent any further damage to the devices.

Objectives:

- Create a better solution to remedy the accidental exposure of sensitive electronics to water

Criteria used to assess the design:

- The design must complete the drying process in a timely manner; specifically, in less than 24 hours
- The design must be portable enough that it poses no noticeable discomfort for the user to carry around
- The design must be versatile: it must not be constrained to one particular electronic device such as a blackberry cell phone
- The drying process must be able to dry most forms of liquid: for example, fresh water, salt water, juice, soda, etc...

Constraints the design must meet:

- Must not require or lead to an increase in the temperature of the device over the recommended operating temperature listed on the device - this can damage the interior electronic components of the devices
- Must not require the user to monitor the drying process
- Should use only biodegradable and non-hazardous chemicals
- Must not produce static charges in the sensitive electronic device

REFERENCES

1. (2011, October 25). *PBS NewsHour* [Television broadcast]. Arlington, VA : PBS Newshour.
2. How to Dry a Wet Personal Electronic Device with the Save a Phone Rescue Kit (without Rice). (2011, October 26). *wikiHow - How to do anything*. Retrieved November 3, 2012, from [http://www.wikihow.com/Dry-a-Wet-Personal-Electronic-Device-with-the-Save-a-Phone-Rescue-Kit-\(without-Rice\)](http://www.wikihow.com/Dry-a-Wet-Personal-Electronic-Device-with-the-Save-a-Phone-Rescue-Kit-(without-Rice))
3. iRecovery Cell Phone Drying Kit - SilicaGelPackets.com. (n.d.). *Silica Gel Desiccant Dehumidifiers - Free Shipping!* - *SilicaGelPackets.com*. Retrieved November 3, 2012, from <http://www.silicagelpackets.com/irecovery-cell-phone-electronic-drying-kit.html>
4. Pestell (2011, January 1). *Limestone* [Material Safety Data Sheet]. Retrieved from <http://pestell.com/msds/Limestone.pdf>
5. Micah, J. (n.d.). How to Take a Battery out of an iPhone | Tech Tips - Salon.com. *Tech Tips - Salon.com*. Retrieved November 3, 2012, from <http://techtips.salon.com/battery-out-iphone-4897.html>
6. E-Scrap: Harmful Materials - Earth911.com. (n.d.). *Earth911.com - Find Where and How to Recycle*. Retrieved November 3, 2012, from <http://earth911.com/recycling/electronics/e-waste-harmful-materials/>
7. Moore's Law Inspires Intel Innovation. (n.d.). *Ultrabook, SmartPhone, Laptop, Desktop, Server, & Embedded Intel*. Retrieved November 3, 2012, from <http://www.intel.com/content/www/us/en/silicon-innovations/moores-law-technology.html>