Fire Safe Microwave
Overview

- Background
- Microwave Features
- Technical Components
- Business Model
- Summary
Unsafe Microwaves

Fatal fire sparked by foil in microwave
by The Associated Press
Friday October 10, 2008, 7:09 AM

PHILADELPHIA -- Fire officials said an elderly blind woman killed in a West Philadelphia apartment fire started the blaze by putting aluminum foil in a microwave oven.

Officials said Nicole Swaayze, 88, was found in a unit in the Katie B. Jackson Apartments.

Golden Gate Estates microwave fire leaves $50,000 in damage

By RYAN MILLS (Contact)
6:28 p.m., Tuesday, September 23, 2008

NAPLES — A microwave fire caused about $50,000 in damage this afternoon in Golden Gate Estates.

Holiday jet downed by mid-air microwave fire

28/08/2008

A plane packed with British holidaymakers made an emergency landing after a microwave caught fire.

Prairie school evacuated due to microwave fire

By Jodi Heckel
Thursday, April 17, 2008 11:39 AM CDT

URBANA -- Prairie Elementary School was evacuated for a short time this morning after a microwave caught fire in the teachers' lounge there.
Microwave Features

Detects spark and/or fire

1. Alerts user of danger
2. Shuts down microwave
3. Extinguishes flame with CO$_2$
4. Notifies user when unsafe to open door
5. Indicates when CO$_2$ cartridge needs to be replaced
Product Demonstration
Product Demonstration
Component- Circuitry

Digital control system with photodiode sensing

- Check for Spark
  - Spark Detected
    - Stop Microwave
    - Alert User
- Check for Fire
  - Fire Detected
  - Suppress Fire
  - Alert User
Component - Fire Suppression

- Spring
- Solenoid
- CO₂ Cartridge
- Cartridge Punctured
- CO₂ Released
Component - CO\textsubscript{2} Flow Switch

- CO\textsubscript{2} Flow
- Reset Button
- Electrical Continuity
- CO\textsubscript{2} Breaks Continuity
- CO\textsubscript{2}

Diagram showing the flow of CO\textsubscript{2} and its interaction with the reset button and electrical continuity.
Testing- Schlieren Flow Visualization for CO$_2$ Nozzle
Testing - Schlieren Flow Visualization for CO$_2$ Nozzle
Component- User Interface

- 3 surveys with over 300 responses

- Final design
  - LED Light System
  - Auditory Alarm
Business Model

Market Fire Safe Technology to OEM through product license

<table>
<thead>
<tr>
<th>Version</th>
<th>Survey: Price People Will Pay</th>
<th>Manufacturing Cost to Add Feature</th>
<th>Expected Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>$17</td>
<td>$2.30</td>
<td>$14.70</td>
</tr>
<tr>
<td>Deluxe</td>
<td>$30</td>
<td>$16.20</td>
<td>$13.80</td>
</tr>
</tbody>
</table>
Price and Cost

![Graph showing revenue streams over time with cost and price per unit comparison.](image-url)
Market Penetration in 3 Years

- % of Market Penetration
- Time (Quarterly)
Expected Revenue

Projected Revenues and Costs

Thousands of Dollars

Time (Semi-Annual)
Fire Demonstration
Fire Demonstration
Acknowledgments

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- Papallardo Staff
- 2.009 Instructors, TAs, Mentors, Staff, Maureen Lynch
Questions or Comments?
Back Up Slides
Circuit Diagram
Component - CO₂ Flow Switch

- CO₂

- Reset Button
Materials Costs Breakdown, Standard

- Blue PD: 52%
- IR PD: 26%
- Other Materials: 13%
- Microprocessor: 4%
- Various Electronics: 5%
Materials Costs Breakdown, Deluxe

- Blue Photodiode: 43%
- IR Photodiode: 20%
- Other Materials: 12%
- Microprocessor: 7%
- Various Electronics: Resistors etc: 5%
- Cartridge Holder: 4%
- Cartridge Assembly: 1%
- Tubing: 1%
- Solenoid: 1%
- CO2 Canister: 1%
- CO2 Switch: 1%
- Nozzle: 1%
- Puncture Pin: 1%
- Bracket: 0%