Objective

Engineering Characteristics
- Number or percent of pill dispensing errors
- Wear on pills
- Time to isolate pill
- Pill isolation mechanism
- Number of medications that can be processed by the artifact
- Size of pill

Constraints
- The power drawn <= 20A at 120V
- Footprint = 1.5 ft. on a side
- Weight < 50 lbs.
- 180 Pill Capacity per Prescription
- Number of Prescriptions
- Sizes of Pills
- Error sensing
- Noise Level

Concept Generation

Concept 1
- Conveyor Belt
- Vacuum Pressure to Secure Single Pill
- Pros: Cost, Noise, Isolation Mech. Ineffective

Concept 2
- Foam Rollers
- Separate a Single Pill, Empties into a Chute
- Pros: Iso Mech., Cost, Noise
- Cons: Error, Size of Pill, Cost

Concept 3 - Final
- Motor Activated Disk Rotates Vacuum Tube.
- Rotates and Releases Pill.
- Pros: Iso Mech., Size of Pill, Error
- Cons: Noise Level Cost

Decision Characteristics Weights

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<thead>
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<td>% of Med. Error</td>
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Reasons for Choosing Final Design
1. Medication Error is the most important characteristic
2. Meets the 3rd and 4th characteristics
3. Cost is Secondary to Error
4. Noise negligible

Prototype and Testing

Noise Level / Size of Pill
- 12V vacuum had max output of 84 dB, 3” away
- Pill pickup dependent on pill orientation
- Used 3 types of Pills

Data from Noise Testing

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<th>Location</th>
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<td>Ambient</td>
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</tr>
<tr>
<td>1ft away, suction open</td>
<td>73</td>
</tr>
<tr>
<td>1ft away, suction closed</td>
<td>75</td>
</tr>
<tr>
<td>3” away, suction open</td>
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Test Results and Future Work

Summary of Design Process
- Identified a need for a specific group
- Used HOQ to identify DCs
- Used the Analytic Hierarchy Process to rank DCs and concepts
- Satisfied most CTQ customer requirements

Future Work
- Focus Group
- Improve ability to dispense a variety of pill sizes
- Smaller external dimensions
- Decrease cost of custom parts

Reflections
- Market Analysis determined a definite, currently unmet, need
- Concept Generation identified a design that would satisfy the CTQs and DCs
- 1st Prototype gave areas to improve
- Final Prototype was a proof of concept

The General Need for Pill Buddy

Patients spend too much time and effort sorting pills, and can easily make errors.

Market Information
- Current population of seniors (65+) in Maryland is 724,000
- Average senior citizen uses 7 medications.
- Average annual number of prescriptions filled by senior citizens in Maryland is 22.

Customer Requirements
- Dispense correct dosage
- Indication of time to take dosage
- Does not damage pills during dispensing
- Dispense a variety of pill types and sizes
- Pills do not cause a jam during operation

Key Innovation
- Affordable
- Vacuum pump and rotating disk pill isolation mechanism

Tradeoffs
- Noise
- Simplicity

Satisfaction of Customer Requirements
- Accurately dispenses a variety of pill sizes
- Does not damage pills or jam during operation
- Alerts user when to take dosage

Operation of the Product
- LCD user interface
- Types, time, and number of medication
- Isolates and dispenses medication via suction
- Alerts user to take medication

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