## Objective

**General Need for Product**
Currently, no countertop doughnut machines are available on the market. Previous attempts at countertop doughnut machines were unsatisfactory.

**Market Estimation**
In 2009 the leading doughnut company in the US grossed $178,970,000. We hope to enter that market and supply these doughnut lovers with the opportunity to make fresh doughnuts at home.

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## Design

### Operation
1. The pre-made doughnut dough is placed in the cage.
2. Cage enters the frying oil, which cooks the doughnuts.
3. User releases cage door and donuts are safely ejected.

### Innovation
Our machine submerges rather than flips the doughnuts.

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### Satisfaction of Customer Requirements
- The cage and pot are dishwasher safe and removable.
- The machine design is slightly larger than a coffee maker.
- The machine cooks 4 full-size, high-quality doughnuts at a time.

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## Prototype and Testing

### Prototype Description
The prototype was constructed to match design functionality using stainless steel, copper pipes, wood, and a hot plate.

### Computer simulations
This simulation approximates the oil's temperature distribution and recirculation due to natural convection.

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### Testing and Analysis Procedure
Surveys were given to potential customers concerning design and doughnut quality. The results were then statistically analyzed.

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### Test Results and Future Work

#### PDP Summary
- Identified important factors for doughnut and machine quality.
- Developed five concepts using both flipping and submerging.
- Selected best concept using Pugh chart and AHP.
- First CAD analysis found fault with original design.
- Redesigned base concept around physical limitations.
- Created new design and tested functionality.

#### Future Recommendations For Commercialization
- Incorporate electromagnetic timer and temperature control.
- Create pot insulation and outer shell to protect customers.
- Possibility for smaller, single-doughnut models to use less oil.

#### Process Reflection
The HOQ put the customers’ preferences in perspective, enabling the team to make unbiased design decisions.