

AT73.06: Product Design & Development

Progress Presentation

Project 2 : Design & Manufacturing of Automatic Pet Feeder

Product Development Team

Mr. Maharaj Singh

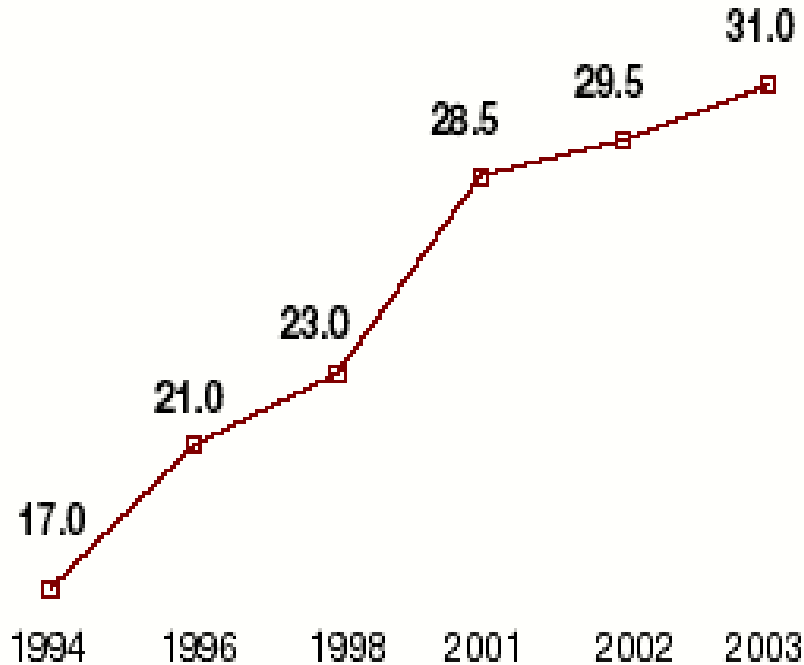
Mr. Shaukat Ali Shah

Mr. Polpat Chuinklin

Mr. Poramade Dhanarun

Market Opportunities

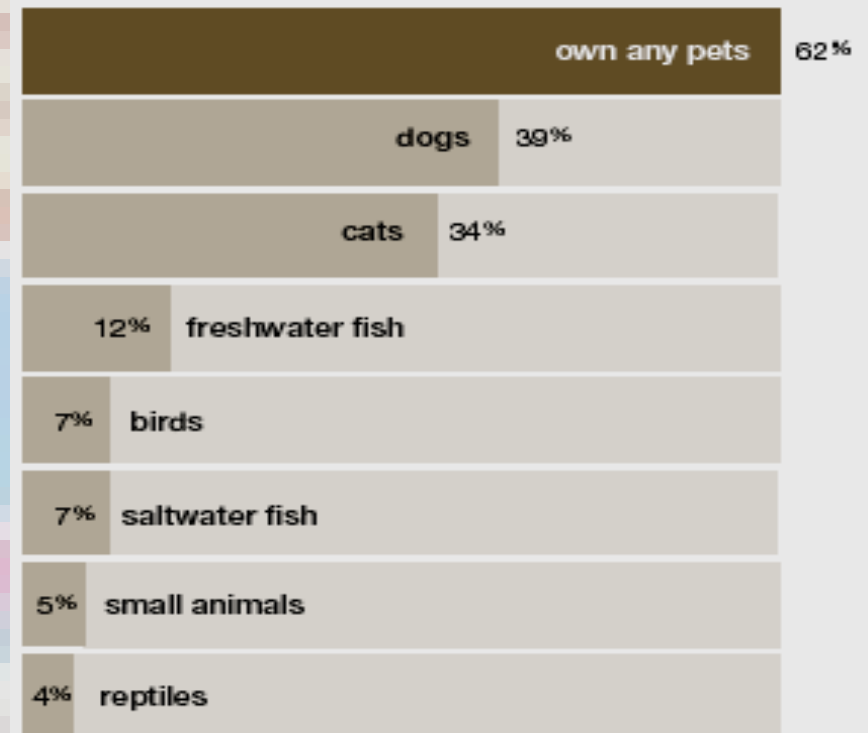
Spending on pets in billions



Source: American Pet Products Manufacturers Assn.

Which pets?

U.S. pet ownership, 2000, % of total U.S. households



Source: 2001/2002 American Pet Products Manufacturers Assn. National Pet Owners Survey

Mission Statement

Mission statement:

“To make a Portable, Trustful and Compact Automatic Pet Feeder.”

Product Description:

The automatic Pet feeder is scheduled, have discrete food delivering capacity, with delivery times and quantities adjustable by owner. The feeder has enough storage capacity, easy to use and configure and safe for animals and children.

Primary Market:

Household Purpose for Upper Middle to higher income who are pet lovers .

Secondary Market:

Suburban or Rural Homeowners.

Stakeholders:

Product Design Team, Small Urban Retailers, Veterinary Offices with large animal practice, and Outlets, such as Rural Feed and Seed Stores.

Motivations For Design

The Automatic Pet Feeder.....

- Feeds the Pet sufficient amount of food on time in absence of the owner.
- Feeder is easy to use and configure.
- Ensures Safety for the animal and small Children



Product Planning

- Functional Decomposition
- Group External Search
- External Individual Search
- Internal Brainstorming
- Assessment of All Findings for the best inputs to project
- Collective Integration of the findings
- Assigning of Group and Individual Tasks

Concept Development

- Identify Customers Requirements.
- Determine Relative Importance of the Needs.
- Set initial specifications.
- Set Target Specifications.
- Construct HOQ.
- Brainstorm and Generate Concepts and Select Final Concept to Pursue.

Customer Survey & Requirements

Customer Profile

- Deals with more of the customer information like age, income.

Product and Service Specification

- Probe customer about the product, key features, likes, dislikes and improvements that they want in the product.

Key Customer Requirements

Customer Profile

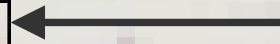
Middle to upper-income, pet lovers, one to three pets in home; urban, suburban or rural homeowner. Looking for quality and control, willing to pay more than existing products cost.

Key Desires of the Customers

- Easy and Safe to Use and Clean.
- Feeds the Pet Sufficiently and on Time.
- Can provide water as well.
- Durable and non toxic.

Customer Requirements & Relative Importance

| NO. | | Needs | Importance |
|-----|----------------|---------------------------------|------------|
| 1 | The Pet Feeder | Ease to clean | 4 |
| 2 | The Pet Feeder | Ease to refill | 2 |
| 3 | The Pet Feeder | Can feed many type of dry food | 5 |
| 4 | The Pet Feeder | Make sure pet come to eat | 5 |
| 5 | The Pet Feeder | Light weight | 1 |
| 6 | The Pet Feeder | Keep the food fresh | 2 |
| 7 | The Pet Feeder | Pets can not over eat | 3 |
| 8 | The Pet Feeder | Feed many times a day | 5 |
| 9 | The Pet Feeder | Can feed for many days | 5 |
| 10 | The Pet Feeder | Can boil the food | 1 |
| 11 | The Pet Feeder | Can mix the foods | 1 |
| 12 | The Pet Feeder | Color to match kitchen | 1 |
| 13 | The Pet Feeder | Can use at out door | 4 |
| 14 | The Pet Feeder | Make sure the pets eat all food | 2 |
| 15 | The Pet Feeder | Save the food cost | 1 |
| 16 | The Pet Feeder | Stable | 2 |
| 17 | The Pet Feeder | Durable | 4 |
| 18 | The Pet Feeder | Safety to animal/children | 5 |
| 19 | The Pet Feeder | Throw away the old food | 1 |
| 20 | The Pet Feeder | Easily Configurable | 4 |
| 21 | The Pet Feeder | Non toxic to Food Products | 5 |
| 22 | The Pet Feeder | Water provided | 4 |



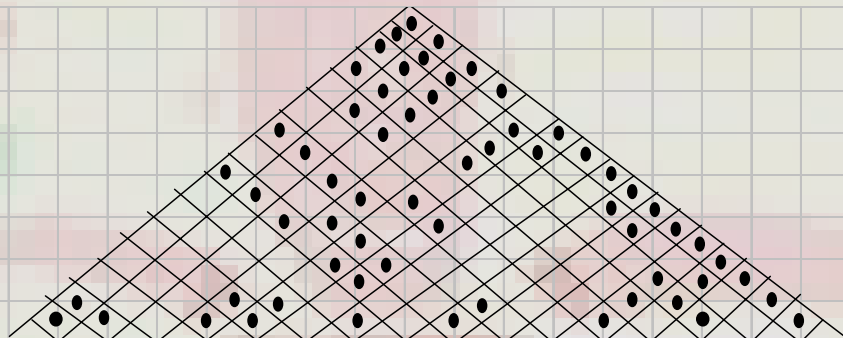
Preliminary Specifications

| S. No. | Need Nos. | Metrics | Marginal values | Units |
|--------|----------------------------|--------------------------|-----------------------------------|-----------|
| 1 | 1, 2, 5,13,16 | Weight | ≤ 8 | kg |
| 2 | 1, 21,18,17,13 | Base Material | ultimate tensile strength >9000 | Mpa |
| 3 | 11 | Agitator | ≤ 100 | rpm |
| 4 | 3,7,8,9,14,15,20 | Timer Setting | ≥ 2 | meals/day |
| 5 | 3,7,8,9,14,20 | Portion setting | ≤ 0.7 | kg |
| 6 | 14 | Voice Recorder System | 10 - 20 | secs |
| 7 | 2,6,8,9 | Food Storage capacity | ≤ 5 | kg |
| 8 | 3,7,8,9 | Food Distribution System | 0.1 | kg/s |
| 9 | 4,14,18 | Pet Video capture System | ≥ 10 | frames/s |
| 10 | 4,8,9,22 | Waterer System | ≤ 5 | kg |
| 11 | 10 | Heater system | ≥ 120 | F |
| 12 | 6 | Cooling System | ≤ 20 | F |
| 13 | 1,2,3,6,11,13,19 | Assembly | < 60 | secs |
| 14 | 1,5,6,10,12, 13,17, 18, 21 | Holding tank material | ultimate tensile strength >9000 | Mpa |
| 15 | 3,6,44 | Water Proof Seal | $< \text{moisture } 5\%$ | % |
| 16 | 12,17,21 | Safety | ISO 9000 | Standards |
| 17 | 3,8,9 | Types of Food | ≥ 2 | Nos. |
| 18 | 14 | Speaker Sound | ≤ 80 | db |

Target Specifications

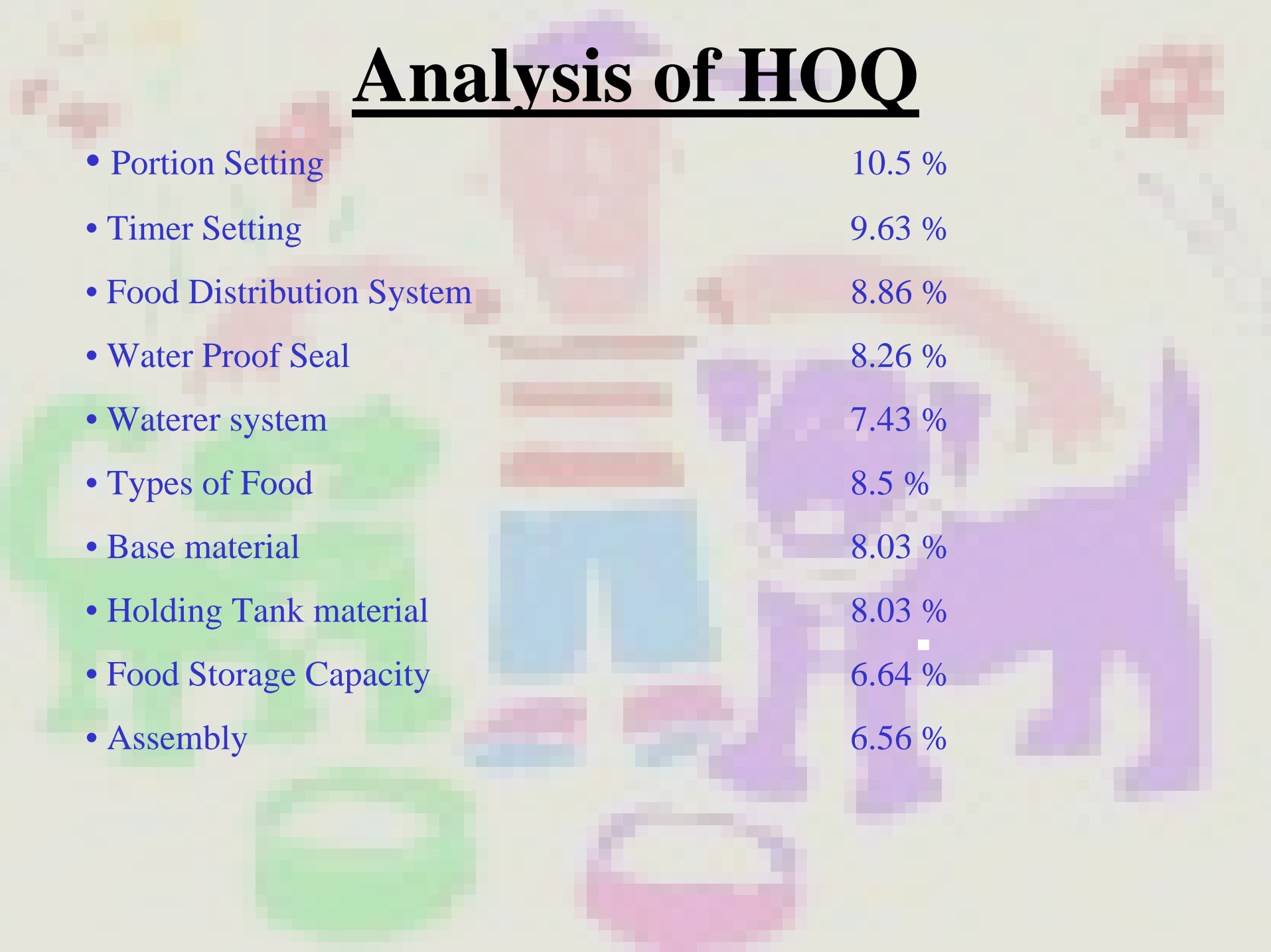
| S. No. | Metrics | Final values | Units |
|--------|--------------------------|--------------|-----------|
| 1 | Weight | 8 | kg |
| 2 | Base Material | 9000 | Mpa |
| 3 | Agitator | 100 | rpm |
| 4 | Timer Setting | 2 | meals/day |
| 5 | Portion setting | 0.6 | kg |
| 6 | Voice Recorder System | 15 | secs |
| 7 | Food Storage capacity | 5 | kg |
| 8 | Food Distribution System | 0.1 | kg/s |
| 9 | Pet Video capture System | 10 | frames/s |
| 10 | Waterer System | 3 | kg |
| 11 | Heater system | 120 | F |
| 12 | Cooling System | 20 | F |
| 13 | Assembly | 60 | secs |
| 14 | Holding tank material | 9000 | Mpa |
| 15 | Water Proof Seal | 5% | % |
| 16 | Safety | ISO 9000 | Standards |
| 17 | Types of Food | 2 | Nos. |
| 18 | Speaker Sound | 80 | db |

Customer Need and Importance Need – Metrics Matrix



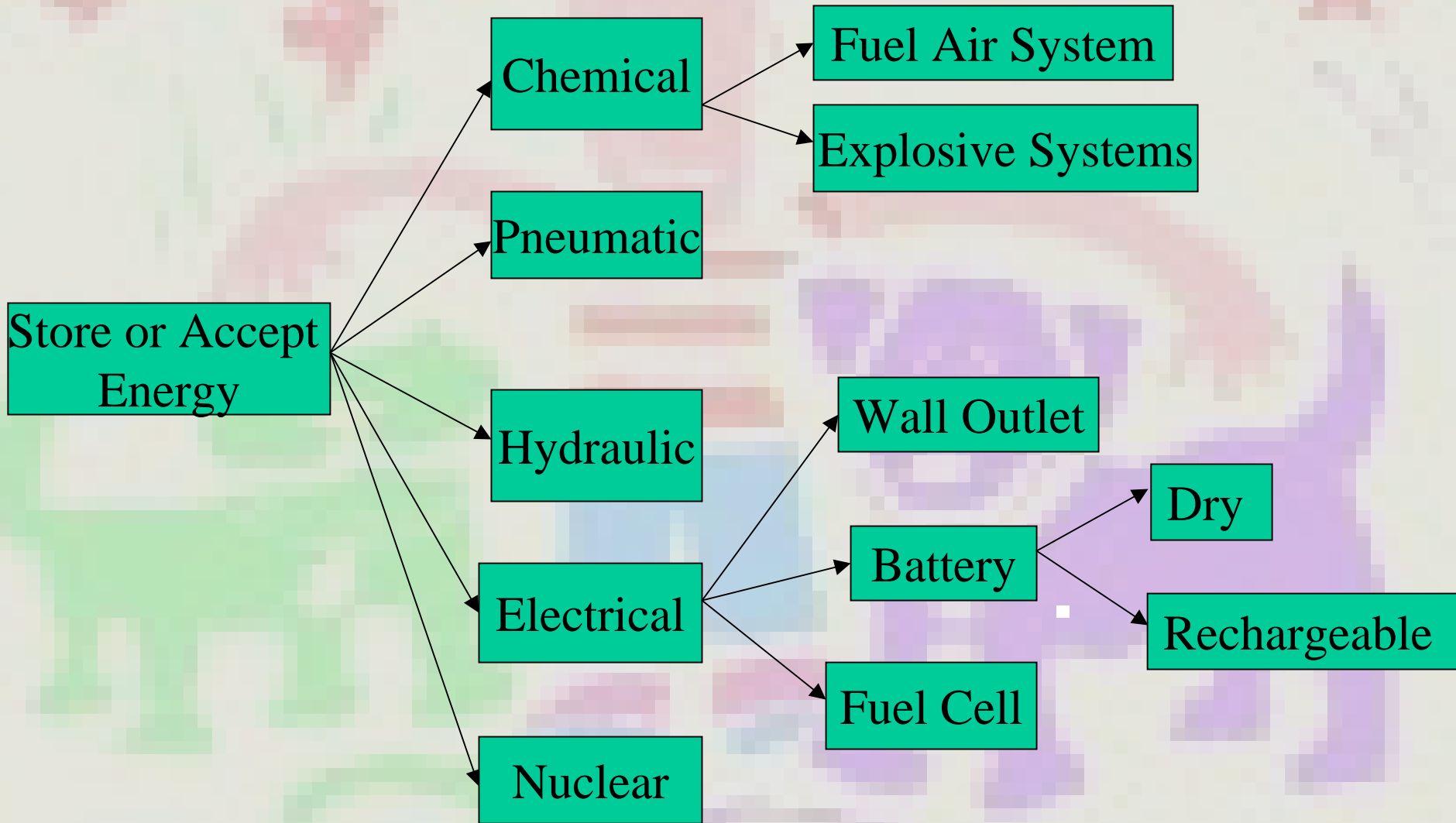
| Pet Food Feeder | Weight | Base Material | Holding Tank Material | Agigator System | Timer Setting | Portion Setting | Voice Recorder | Speaker sound | Food Storage capacity | Food Distribution system | Pet Video Capture System | Waterer System | Water Proof Seal | Heater System | Cooling System | Types of Food | Assembly | Importance Competitor 1 | Competitor2 | current position | Average of the two Competitors | future position | sale point | Improvement Ratio | Raw Score | Percentage Score | |
|----------------------------------|--------|---------------|-----------------------|-----------------|---------------|-----------------|----------------|---------------|-----------------------|--------------------------|--------------------------|----------------|------------------|---------------|----------------|---------------|----------|-------------------------|-------------|------------------|--------------------------------|-----------------|------------|-------------------|-----------|------------------|------|
| Functional Performance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ease to clean | | 3 | 3 | | | | | | 3 | | | 3 | | | | 3 | 9 | 4 | 3 | 3 | 1 | 3 | 4 | 1.2 | 1.33 | 6.4 | 6.03 |
| Ease to refill | 3 | | | | | | | | 9 | 3 | | | | | | 9 | 9 | 2 | 3 | 2 | 1 | 2.5 | 4 | 1 | 1.6 | 3.2 | 3.01 |
| Can feed many type of dry food | | | | | 9 | | | | 9 | 9 | | | | | | 9 | 3 | 4 | 1 | 3 | 1 | 2 | 3 | 1.2 | 1.5 | 7.2 | 6.78 |
| Make sure pet come to eat | | | | | | 3 | 9 | 9 | | | | 3 | 3 | | | 3 | | 3 | 3 | 3 | 1 | 3 | 4 | 1.2 | 1.33 | 4.8 | 4.52 |
| Light weight | 9 | 3 | 3 | | | | | | | 1 | | | | | | | | 1 | 5 | 3 | 1 | 4 | 5 | 1 | 1.25 | 1.25 | 1.18 |
| Keep the food fresh | | 3 | 3 | 1 | | | | | 9 | 3 | | | | | 9 | 1 | 3 | 2 | 5 | 5 | 1 | 5 | 5 | 1 | 1 | 2 | 1.88 |
| Pets can not over eat | | | | | 3 | 9 | 1 | 1 | | 3 | 3 | 3 | | | | 3 | 1 | 5 | 2 | 4 | 1 | 3 | 5 | 1.5 | 1.67 | 12.5 | 11.8 |
| Feed many times a day | | | | 1 | 9 | 9 | | | 9 | 9 | | 3 | 3 | | 3 | 9 | 1 | 5 | 5 | 5 | 1 | 5 | 5 | 1.5 | 1 | 7.5 | 7.07 |
| Can feed for many days | | | | 1 | 9 | 9 | | | 9 | 9 | | 9 | 3 | | 9 | 9 | 1 | 5 | 5 | 5 | 1 | 5 | 5 | 1.5 | 1 | 7.5 | 7.07 |
| Can warm the food | | 3 | 3 | | | | | | | | | | | 9 | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0.94 |
| Can mix the foods | | | | 9 | | | | | 1 | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0.94 |
| Color to match kitchen | | 3 | 3 | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0.94 |
| Can use at out door | | 9 | 9 | | | | | | | | | 3 | 9 | | | 1 | 3 | 5 | 4 | 5 | 1 | 4.5 | 5 | 1.2 | 1.11 | 6.667 | 6.28 |
| Make sure the pets eat all food | | | | | 3 | 3 | 3 | 3 | | | 9 | 3 | | | | | 1 | 2 | 3 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 1.88 |
| Save the food cost | | | | 3 | 3 | 3 | | | | 3 | | | | | | 3 | | 1 | 2 | 3 | 1 | 2.5 | 2 | 1 | 0.8 | 0.8 | 0.75 |
| Stable | 3 | | | | | | | | | | | | | | | | | 2 | 4 | 3 | 1 | 3.5 | 3 | 1 | 0.86 | 1.714 | 1.62 |
| Durable | 1 | 9 | 9 | | | | | | | 3 | | | 9 | | | | 3 | 4 | 3 | 3 | 1 | 3 | 4 | 1.2 | 1.33 | 6.4 | 6.03 |
| Safety to animal/children | 1 | 9 | 9 | | | | | | | 1 | | 3 | 9 | | | | 3 | 5 | 5 | 5 | 1 | 5 | 5 | 1.5 | 1 | 7.5 | 7.07 |
| Throw away the old food | | | | | | 3 | | | | 3 | | | | | | | 3 | 1 | 3 | 1 | 1 | 2 | 4 | 1 | 2 | 2 | 1.88 |
| Easily Configurable | | | | 1 | 9 | 9 | | | | 1 | | | | | | | 3 | 4 | 3 | 4 | 1 | 3.5 | 5 | 1.2 | 1.43 | 6.857 | 6.46 |
| Non toxic to Food Products | | 9 | 9 | 1 | | | | | | 3 | | 3 | 3 | | | 1 | | 5 | 3 | 3 | 1 | 3 | 4 | 1.5 | 1.33 | 10 | 9.42 |
| Water provided | | | | | 9 | 9 | | | | | | 9 | 3 | | | | 3 | 4 | 4 | 3 | 1 | 3.5 | 5 | 1.2 | 1.43 | 6.857 | 6.46 |
| Absolute score | 37.58 | 292.1 | 292.1 | 42.64 | 347.8 | 376.6 | 58.13 | 58.13 | 238.9 | 319.7 | 52.29 | 265.8 | 296.1 | 8.479 | 1017 | 302.2 | 237.7 | | | | | | | | | | |
| Relative percentage Score | 1.13 | 8.78 | 8.78 | 1.28 | 10.4 | 11.3 | 1.75 | 1.75 | 7.18 | 9.61 | 1.57 | 7.99 | 8.9 | 0.25 | 3.06 | 9.08 | 7.14 | | | | | | | | | Sum | 108 |

Analysis of HOQ



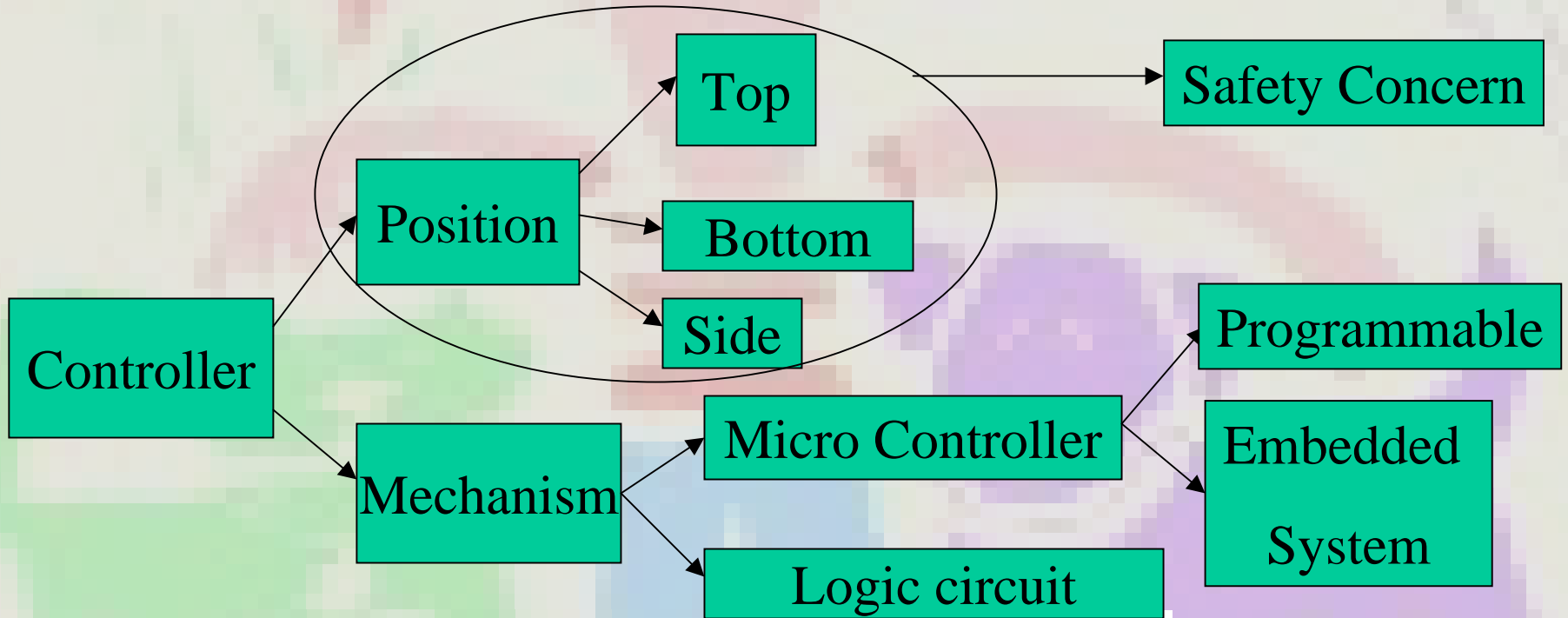
| | |
|----------------------------|--------|
| • Portion Setting | 10.5 % |
| • Timer Setting | 9.63 % |
| • Food Distribution System | 8.86 % |
| • Water Proof Seal | 8.26 % |
| • Waterer system | 7.43 % |
| • Types of Food | 8.5 % |
| • Base material | 8.03 % |
| • Holding Tank material | 8.03 % |
| • Food Storage Capacity | 6.64 % |
| • Assembly | 6.56 % |

Concept Generation



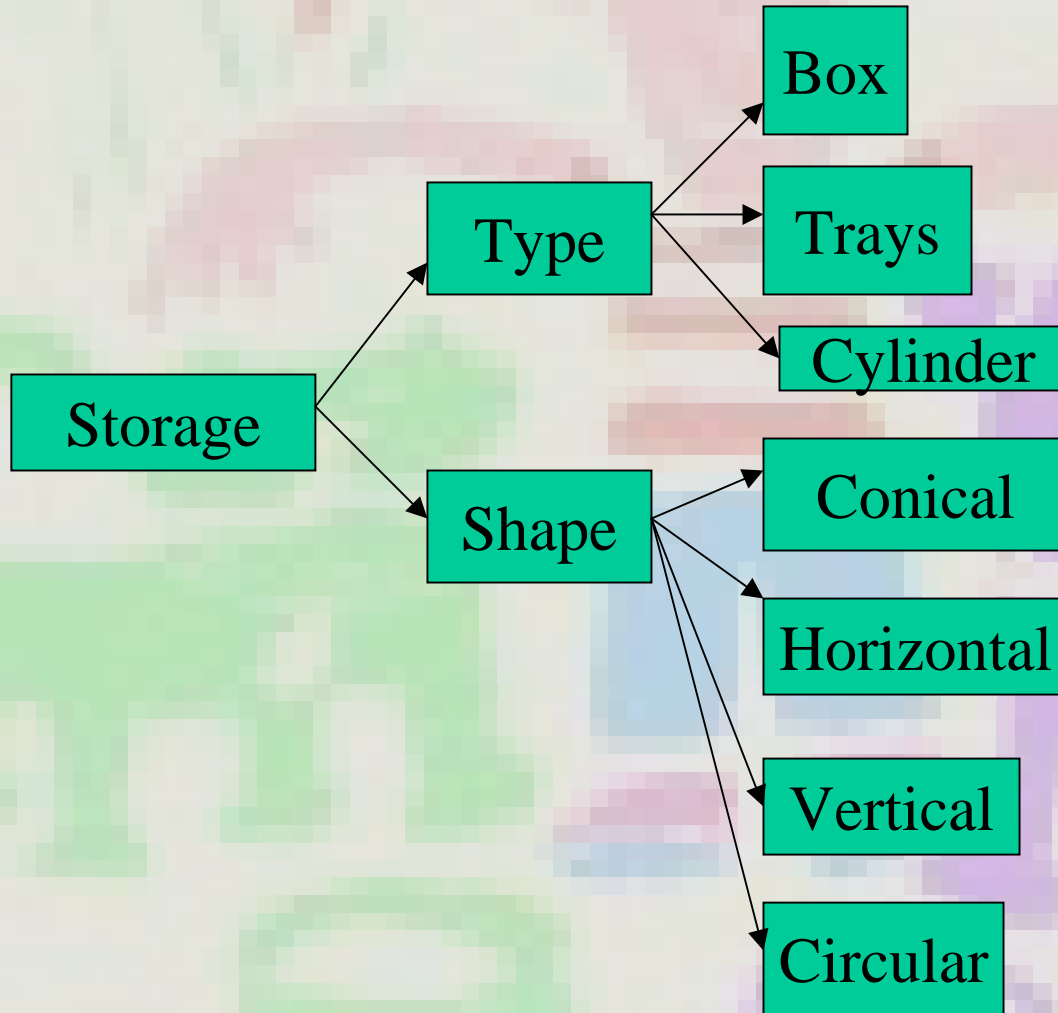
Classification Tree for Energy

Concept Generation



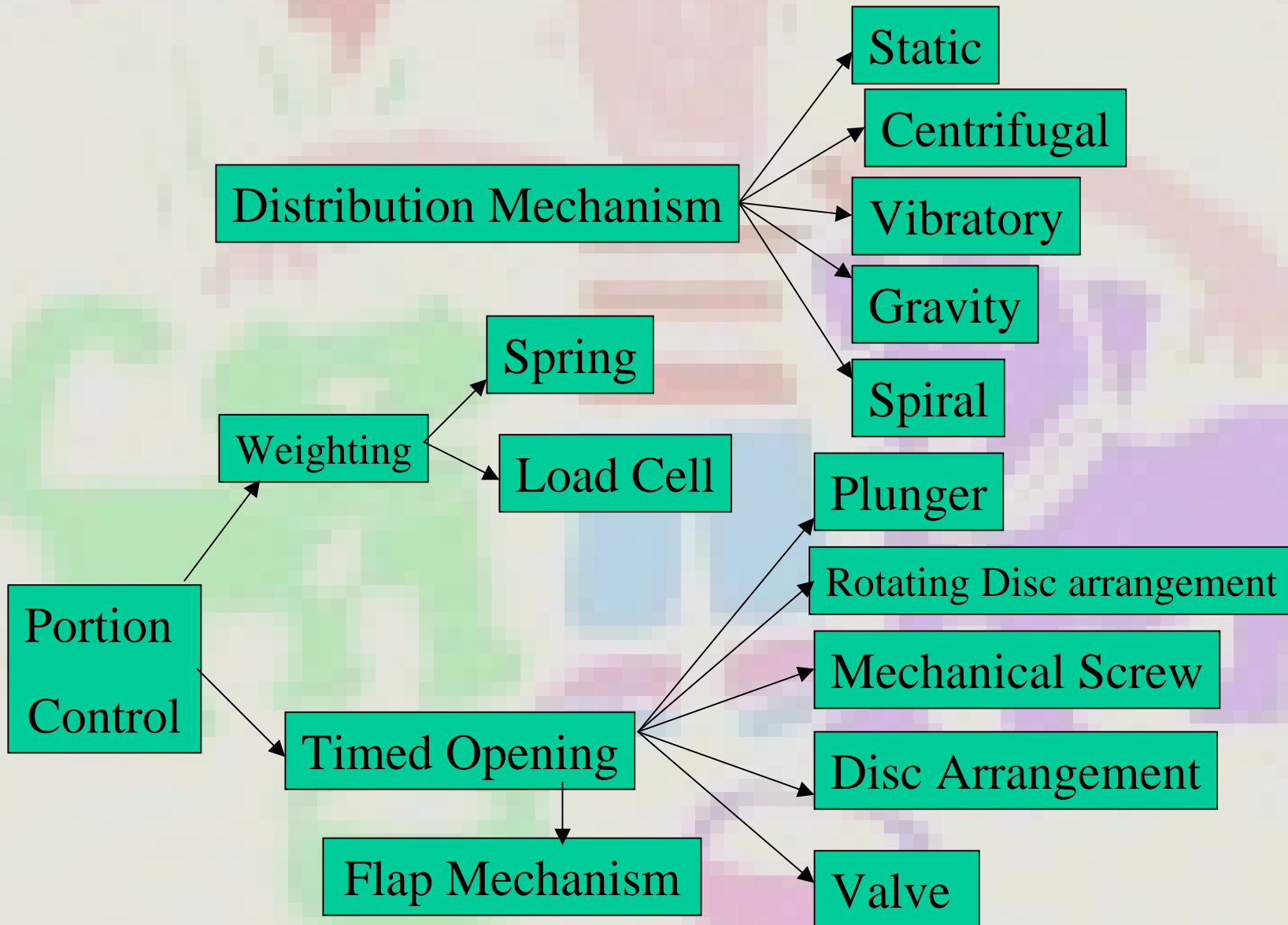
Classification Tree For Controller

Concept Generation



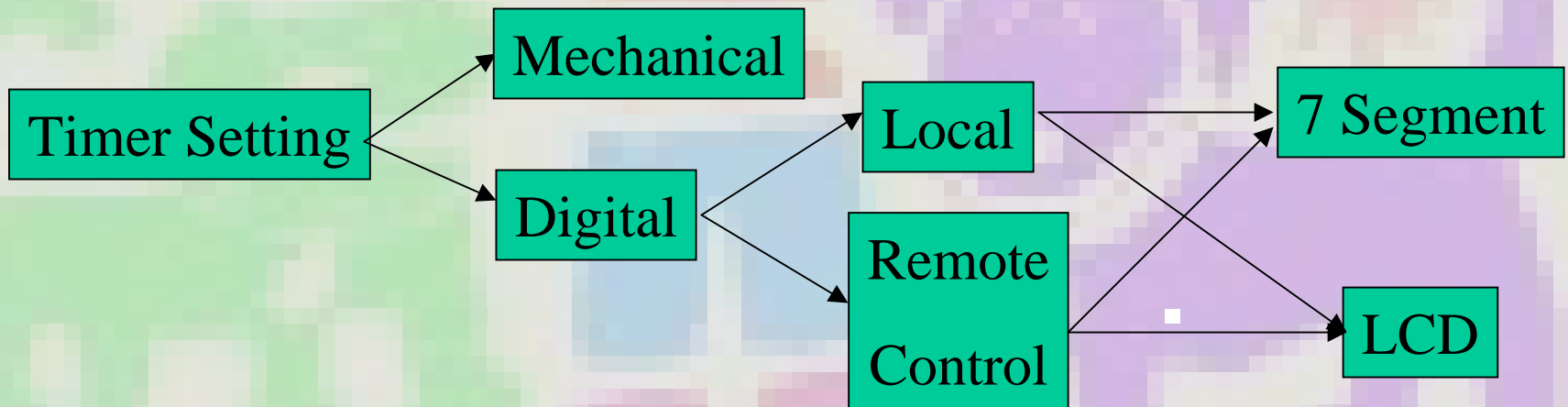
Classification Tree For Storage

Concept Generation



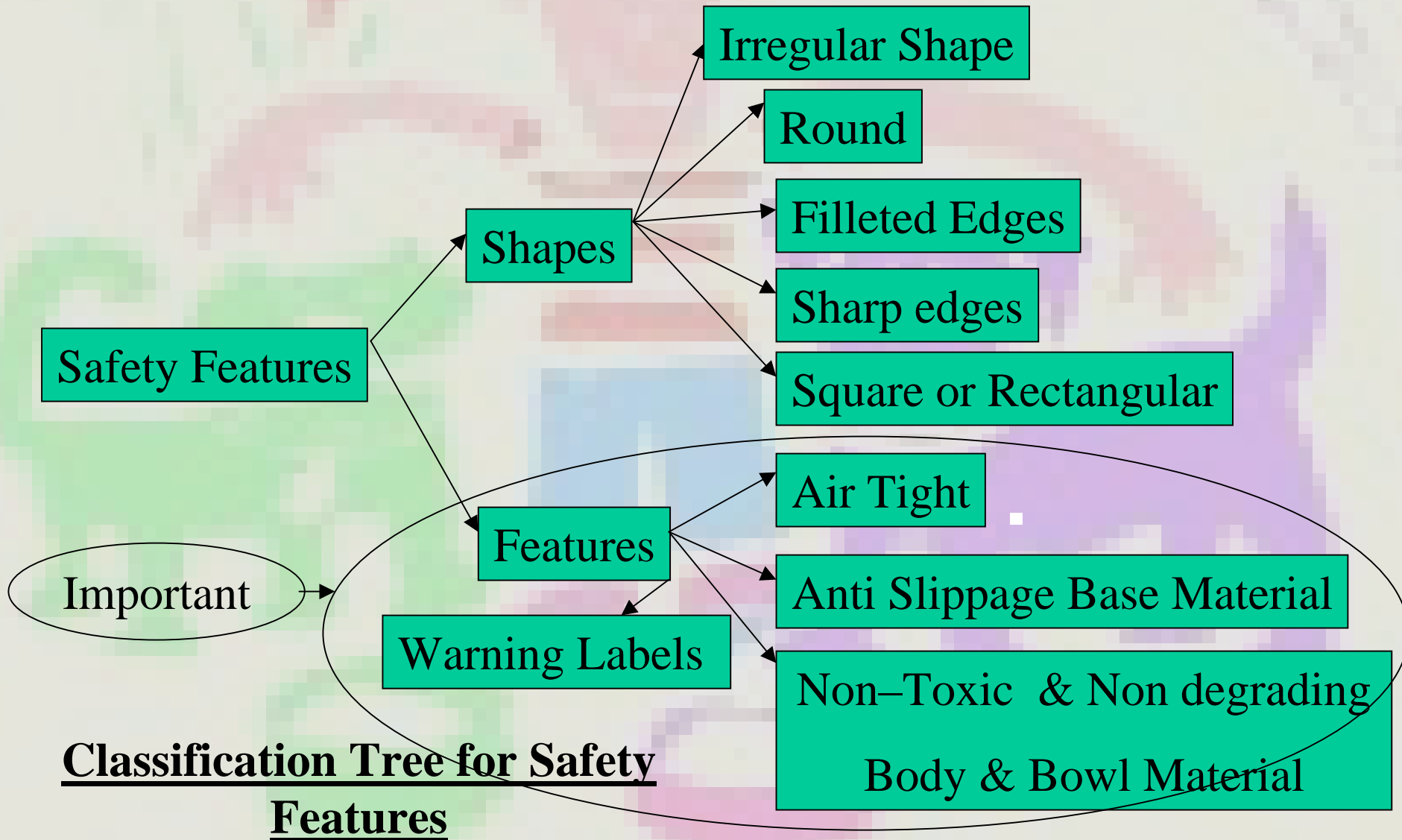
Classification Tree for Distribution Mechanism & Portion setting

Concept Generation



Classification Tree For Controller

Concept Generation



Material Selection

| Selection Criteria | Concept | | | | | | |
|-----------------------|----------|---------------|-----------|---------|-----------|----------|---------|
| | A ABS | B Acrylics | C PTFE | D PA | E LDPE | F PVC | G PP |
| Cost per unit weight | - | 0 | - | - | 0 | 0 | 0 |
| Mechanical properties | + | + | + | + | 0 | + | + |
| Impact resistance | + | - | 0 | - | 0 | - | - |
| Chemical resistance | + | + | - | + | 0 | - | + |
| Thermal resistance | - | 0 | + | + | 0 | - | 0 |
| Designability | + | + | - | - | 0 | + | + |
| Transparency | + | + | - | - | 0 | + | + |
| | 0 | + | 0 | 0 | 0 | 0 | 0 |
| Sum +'s | 4 | 4 | 2 | 3 | 0 | 2 | 3 |
| Sum 0's | 1 | 2 | 2 | 1 | 7 | 2 | 3 |
| Sum -'s | 2 | 1 | 3 | 3 | 0 | 3 | 1 |
| Net Score | 2 | 3 | -1 | 0 | 0 | -1 | 2 |
| Rank | 2 | 1 | 6 | 4 | 4 | 6 | 3 |
| Continue? | Yes | Yes | No | No | Revise | No | Yes |

| Selection Criteria | Concept | | | | | | |
|-----------------------|----------|---------------|-----------|---------|-----------|----------|---------|
| | A ABS | B Acrylics | C PTFE | D PA | E LDPE | F PVC | G PP |
| Cost per unit weight | - | 0 | - | - | 0 | 0 | 0 |
| Mechanical properties | + | + | + | + | 0 | + | + |
| Impact resistance | + | - | 0 | - | 0 | - | - |
| Chemical resistance | + | + | - | + | 0 | - | + |
| Thermal resistance | - | 0 | + | + | 0 | - | 0 |
| Designability | + | + | - | - | 0 | + | + |
| Transparency | + | + | - | - | 0 | + | + |
| | 0 | + | 0 | 0 | 0 | 0 | 0 |
| Sum +'s | 4 | 4 | 2 | 3 | 0 | 2 | 3 |
| Sum 0's | 1 | 2 | 2 | 1 | 7 | 2 | 3 |
| Sum -'s | 2 | 1 | 3 | 3 | 0 | 3 | 1 |
| Net Score | 2 | 3 | -1 | 0 | 0 | -1 | 2 |
| Rank | 2 | 1 | 6 | 4 | 4 | 6 | 3 |
| Continue? | Yes | Yes | No | No | Revise | No | Yes |

Material Selected - ABS

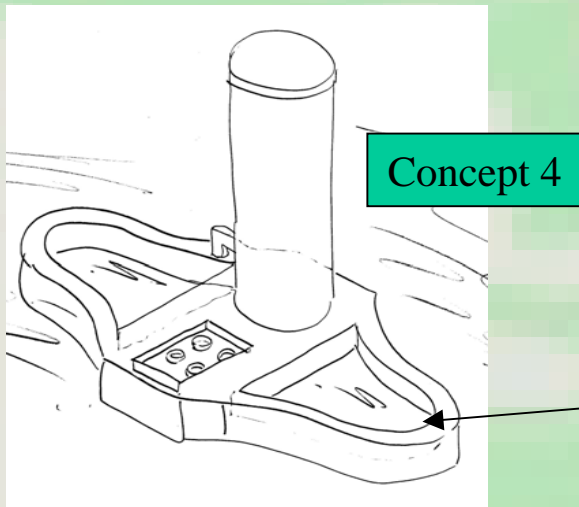
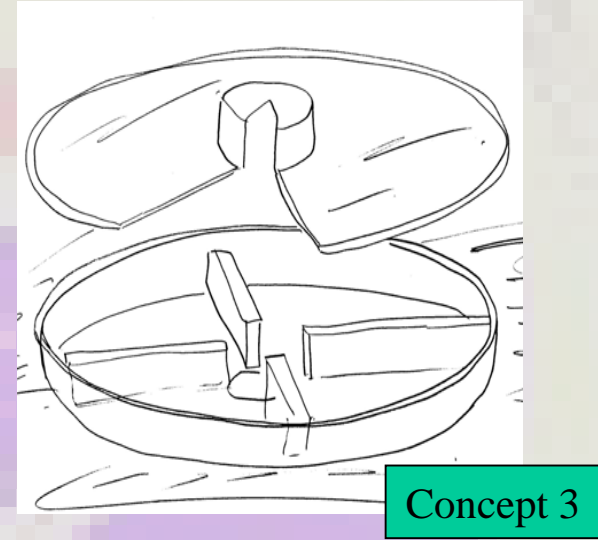
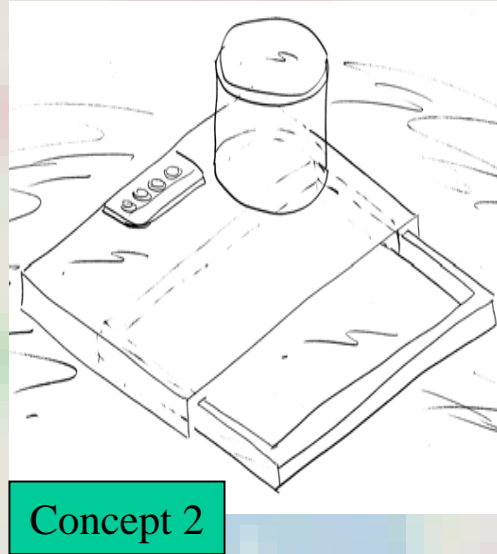
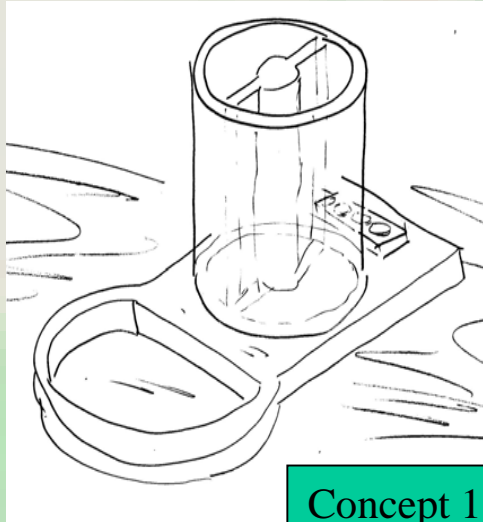
Concept Combination

| Energy | Main Controller | Portion Setting | Distribution Mechanism | Time Setting |
|------------------------|-------------------------------------|------------------|------------------------|------------------------|
| Dry Batteries | Logic circuit | Disc Arrangement | Gravity | Digital with LCD |
| Rechargeable batteries | Micro controllers with programmable | Mechanical screw | Spiral | Digital with 7 segment |
| Batteries | | Valve | Vibratory | |
| Wall outlet | | Timed Opening | centrifugal | |
| | | Plunger | Static | |
| | | Flap system | | |
| | | Rotating Disc | | |

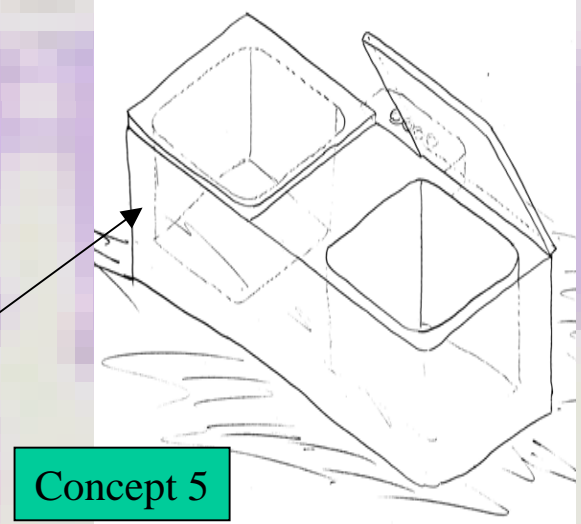
Combined Concepts

| | Energy | Main Controller | Portion Setting | Distribution Mechanism | Time Setting | Storage |
|---|------------------------|-------------------------------|---------------------------|-------------------------------|---------------------|--------------------------------------|
| 1 | Dry Batteries | Logic circuit | Disc Arrangement | Gravity | Digital with LCD | Vertical Cylindrical |
| 2 | Rechargeable batteries | Logic circuit | Spring | Gravity | Mechanical | Vertical cylindrical |
| 3 | Batteries | Programmable Micro Controller | Rotating Disc Arrangement | Static | Digital with LCD | Horizontal Tray |
| 4 | Batteries | Programmable Micro Controller | Mechanical screw | Spiral | Digital with LCD | Vertical Cylinder (water chamber) |
| 5 | Rechargeable batteries | Logic circuit | Flap System | Static | Mechanical | Rectangular Box (separate for water) |

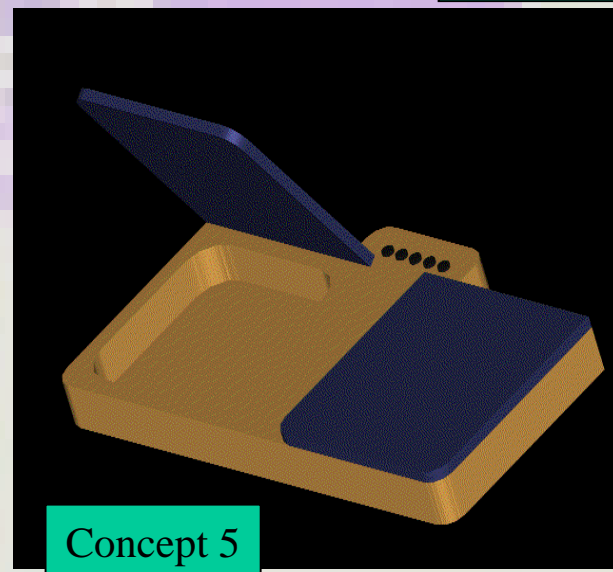
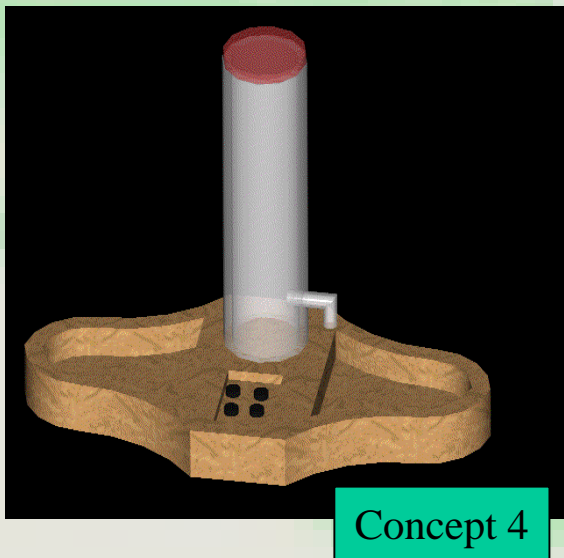
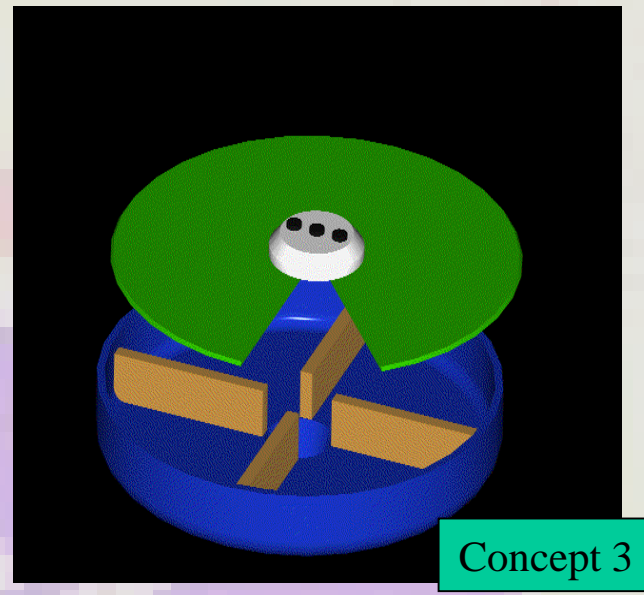
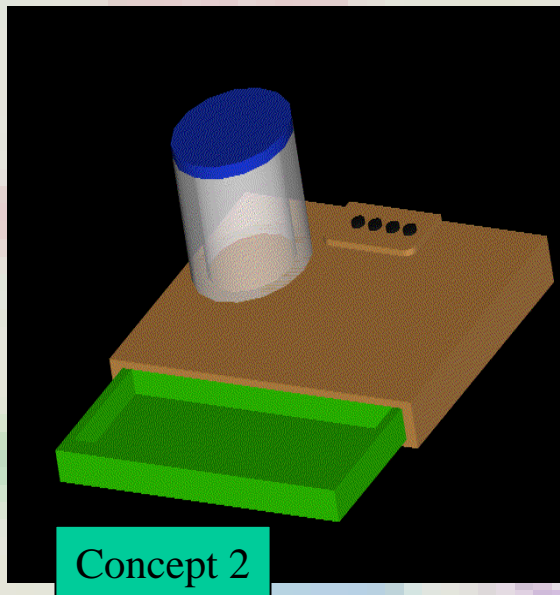
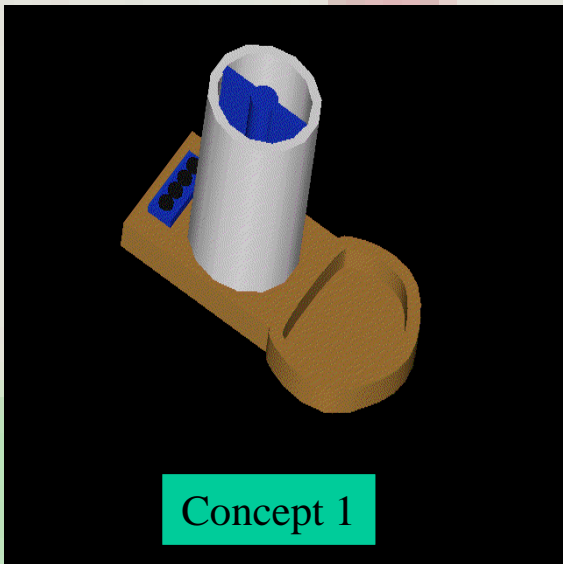
Rough Sketches of Developed Concepts



With water storage



Final Sketches Developed Concepts

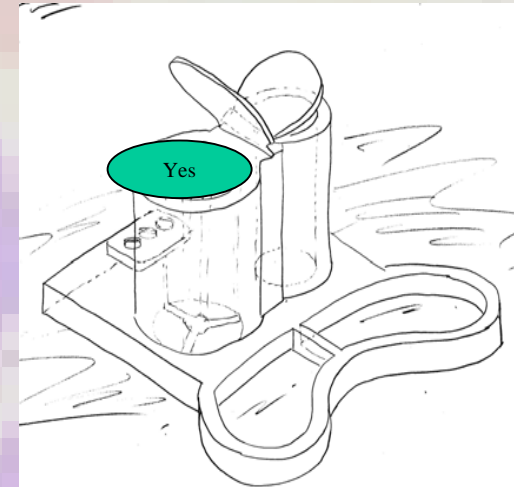


Concept Screening

| Selection Criteria | Concepts | | | | |
|---------------------|----------------|-----------|-----------|-----------|----------------|
| | Concept 1 | Concept 2 | Concept 3 | Concept 5 | Concept 4 |
| Easy to use | + | 0 | 0 | 0 | + |
| Ease of Manufacture | 0 | - | 0 | - | + |
| Time accuracy | 0 | - | 0 | 0 | - |
| Portability | - | - | 0 | - | 0 |
| Food capacity | + | + | 0 | + | 0 |
| Durability | 0 | 0 | 0 | 0 | 0 |
| Portion accuracy | + | + | 0 | + | 0 |
| Safety Features | 0 | 0 | 0 | - | 0 |
| | 3 | 2 | 0 | 2 | 2 |
| Sum 0's | 4 | 3 | 0 | 3 | 5 |
| Sum -'s | 1 | 3 | 0 | 3 | 1 |
| Net Score | 2 | -1 | 0 | -1 | 1 |
| Rank | 1 | 4 | 3 | 4 | 2 |
| Continue ? | Yes | No | No | No | Yes |
| | Combine | | | | Combine |

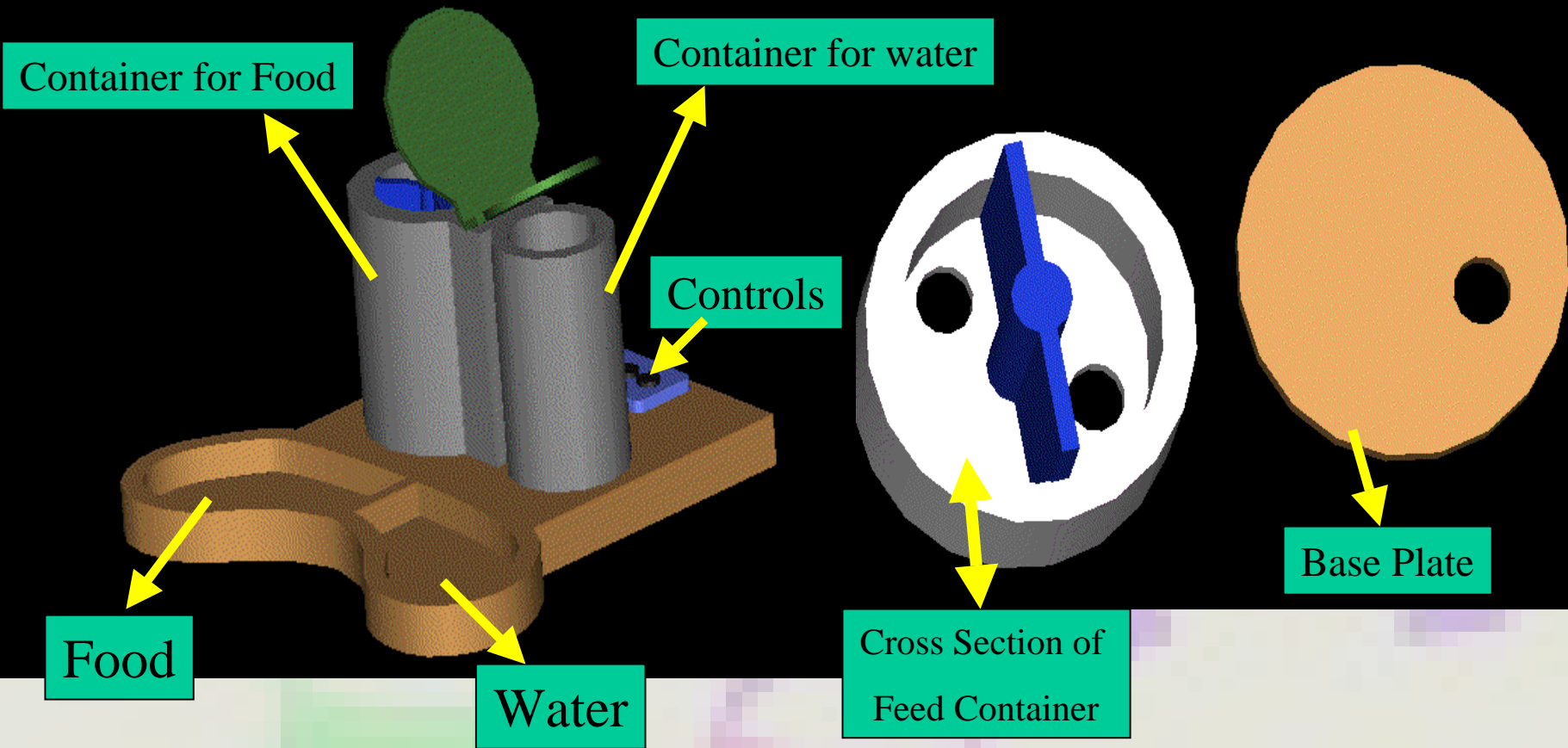
Concept Scoring

| | | Concepts | | | |
|---------------------|--------|------------------|----------|-----------|----------|
| | | Combined Concept | | Concept 1 | |
| Selection Criteria | Weight | | Weighted | | Weighted |
| | | Rating | Score | Rating | Score |
| Easy to use | 10% | 4 | 0.4 | 4 | 0.4 |
| Ease of Manufacture | 10% | 4 | 0.4 | 5 | 0.5 |
| Time accuracy | 20% | 5 | 1 | 3 | 0.6 |
| Portability | 10% | 3 | 0.3 | 5 | 0.5 |
| Food capacity | 5% | 5 | 0.25 | 2 | 0.1 |
| Durability | 5% | 3 | 0.15 | 3 | 0.15 |
| Portion accuracy | 20% | 5 | 1 | 2 | 0.4 |
| Safety Features | 20% | 3 | 0.6 | 5 | 1 |
| Total Score | | 4.1 | | 3.65 | |
| Rank | | 1 | | 2 | |
| Continue | | Yes | | No | |



Combined Concept

Final Selected Concept



Process Driven Design Phase

Manufacturing Design Goals

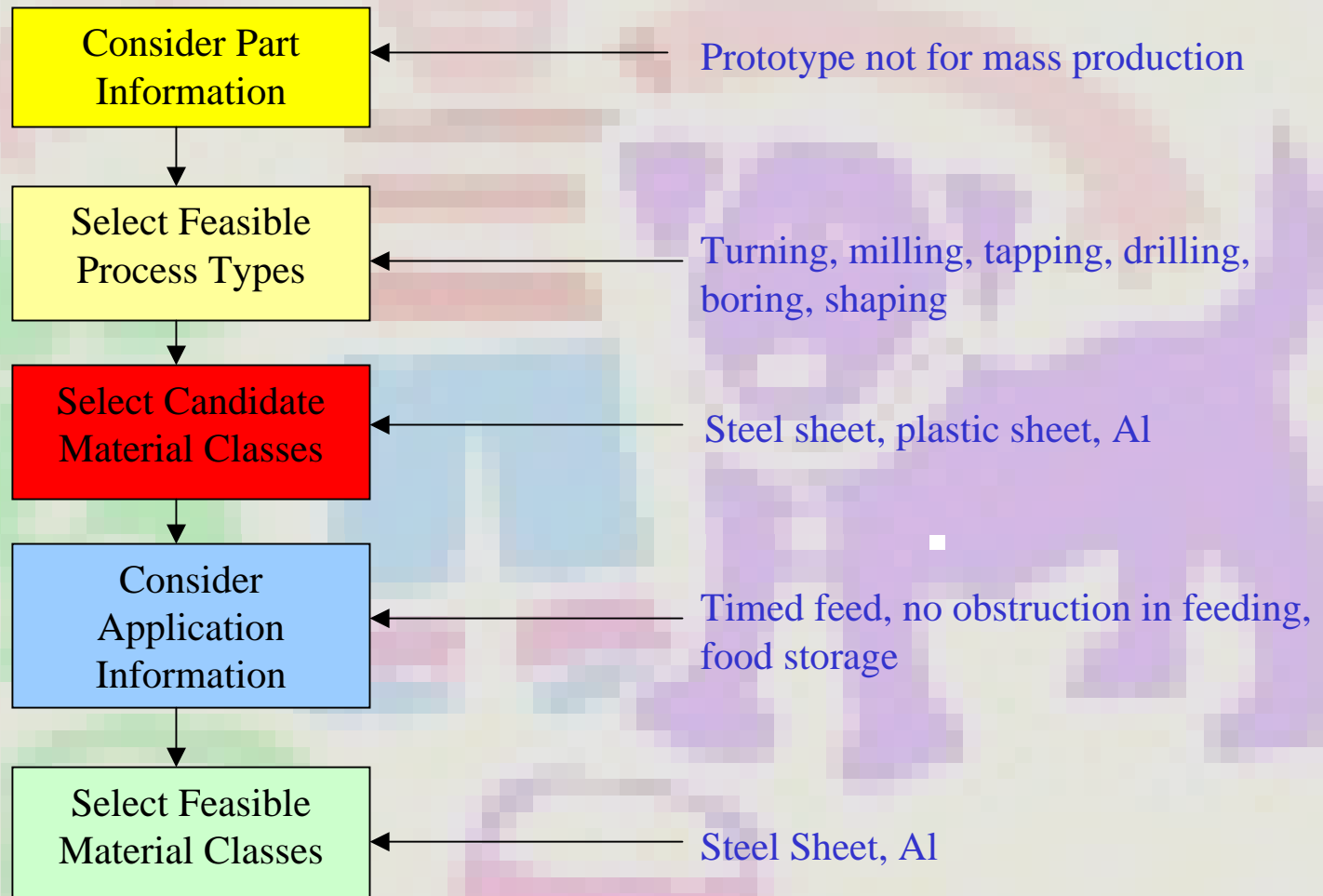
- Product with additional features – Keep the number of parts minimum.
- Manufacturing facilities – A Constraint – Used Facilities available in AIT physical plant
- Non-availability of advanced manufacturing facilities – Prototype developed using mainly steel sheets.

Product & Process Plan

- Standard and Designed Components defined.
- Stacked Construction
- Process and Material Selection for key components

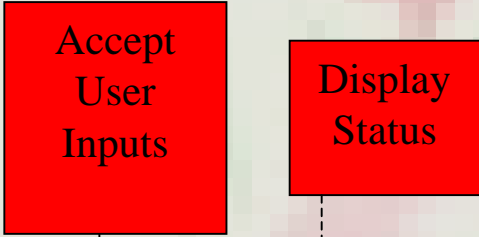
Process Driven Design (contd.)

Process First Approach

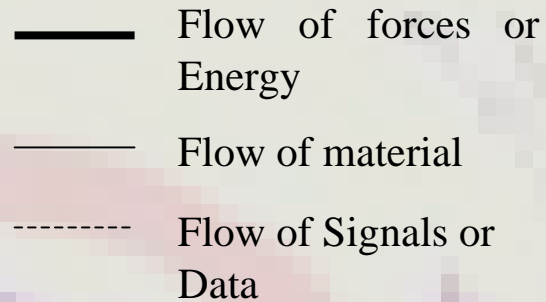
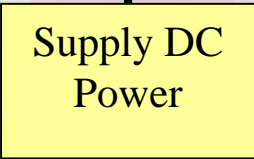


Product Architecture

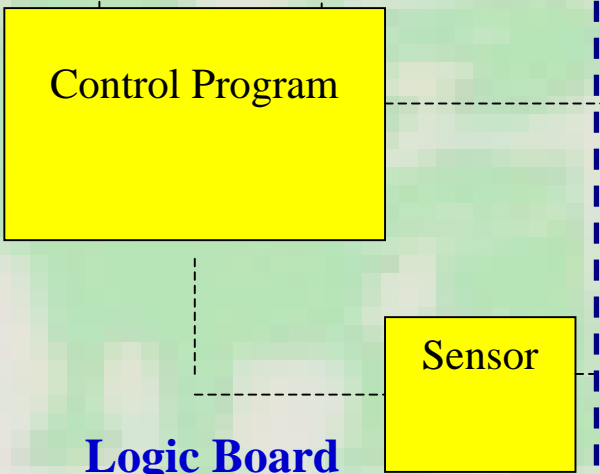
User Interface Board



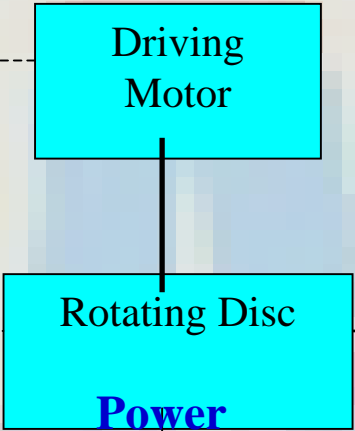
Power Module



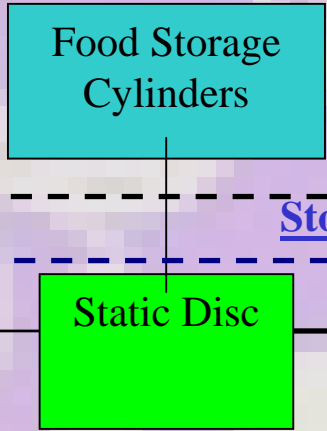
Logic Board Module



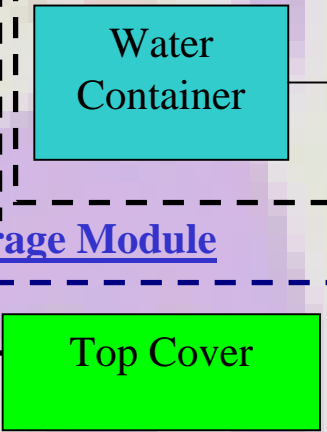
Power Transmission



Storage Module



Structural Support

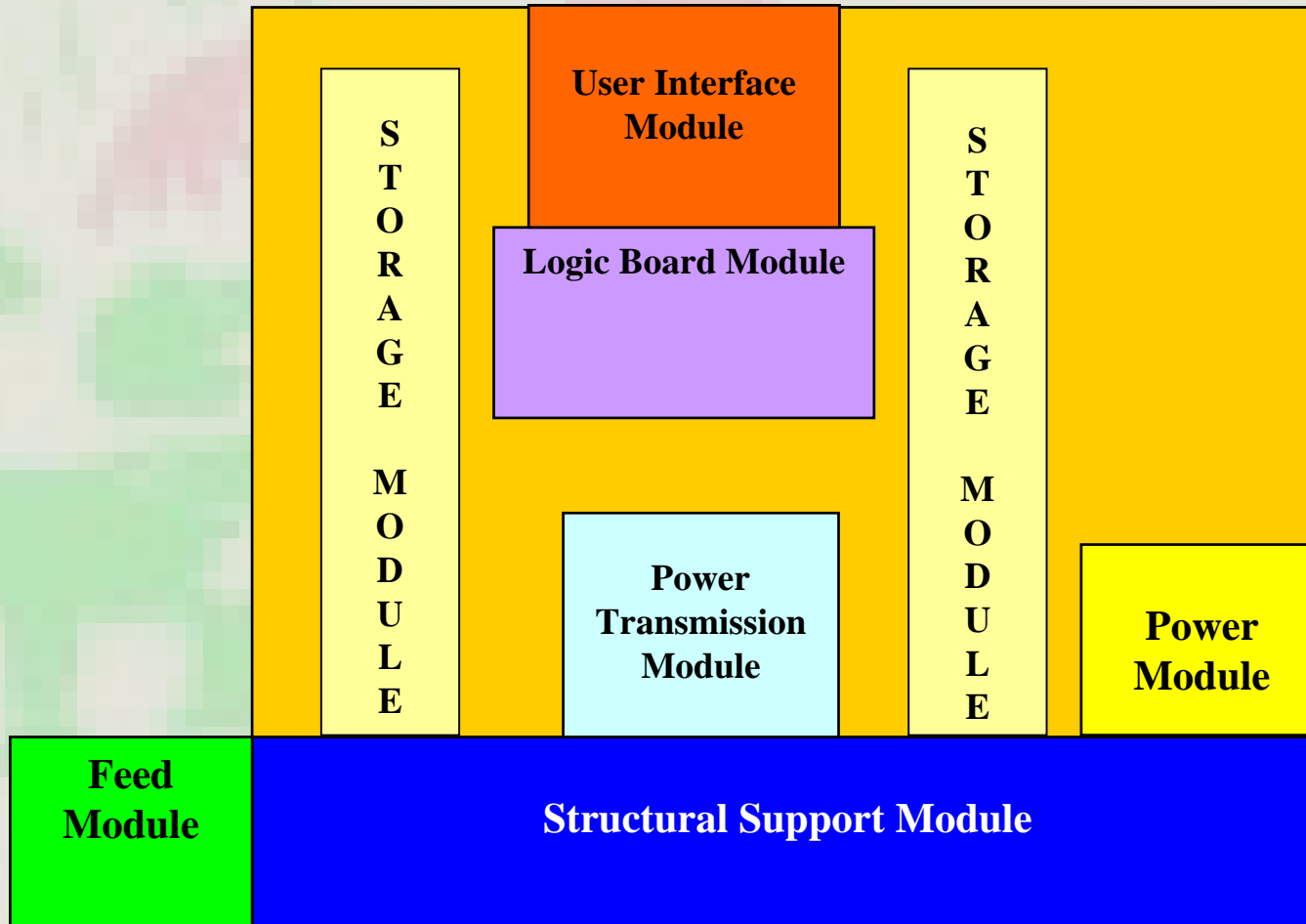


Food Feed Module

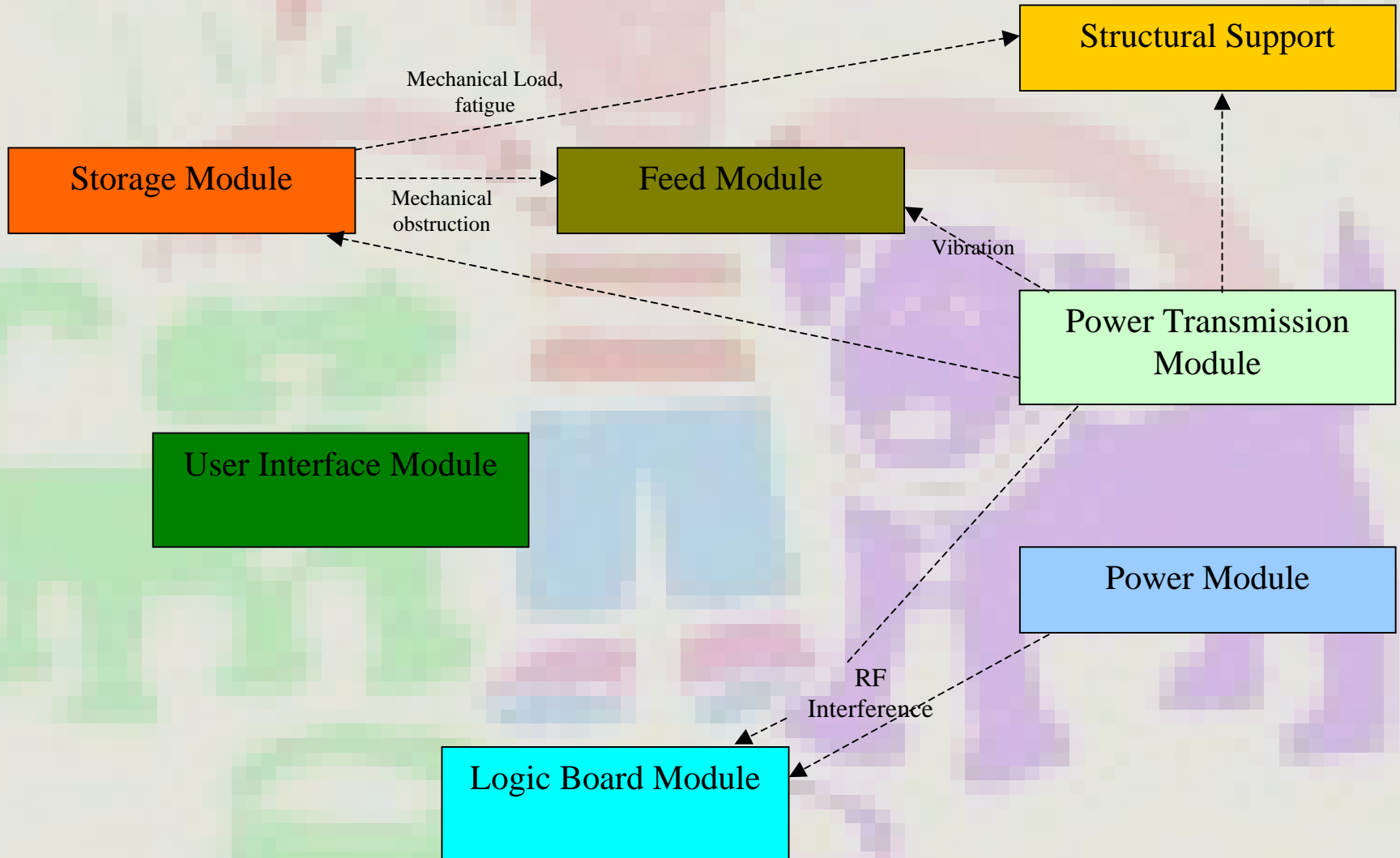


Product Architecture (contd.)

Rough Geometric Layout

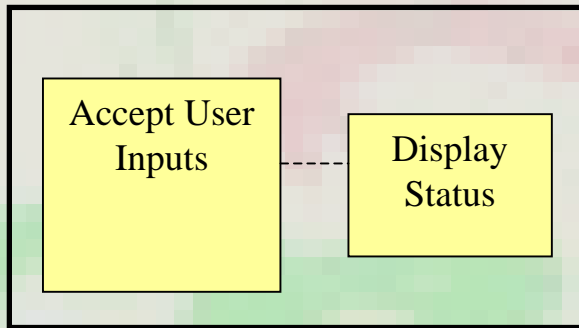


Fundamental & Incidental Interactions

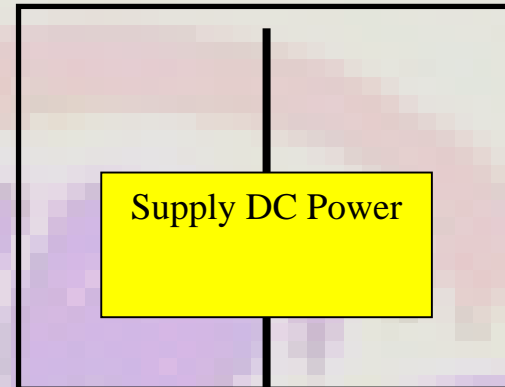


Detail Design Phase

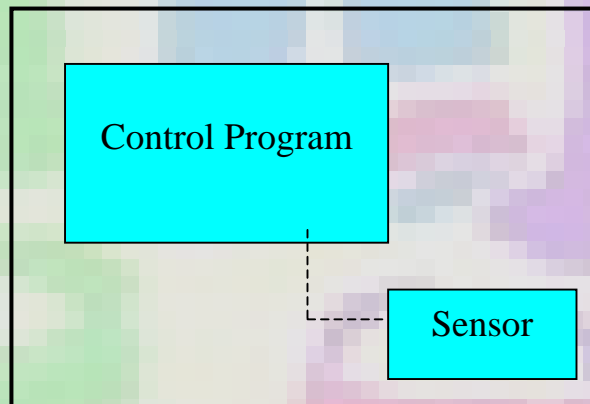
User Interface Module



Power Module

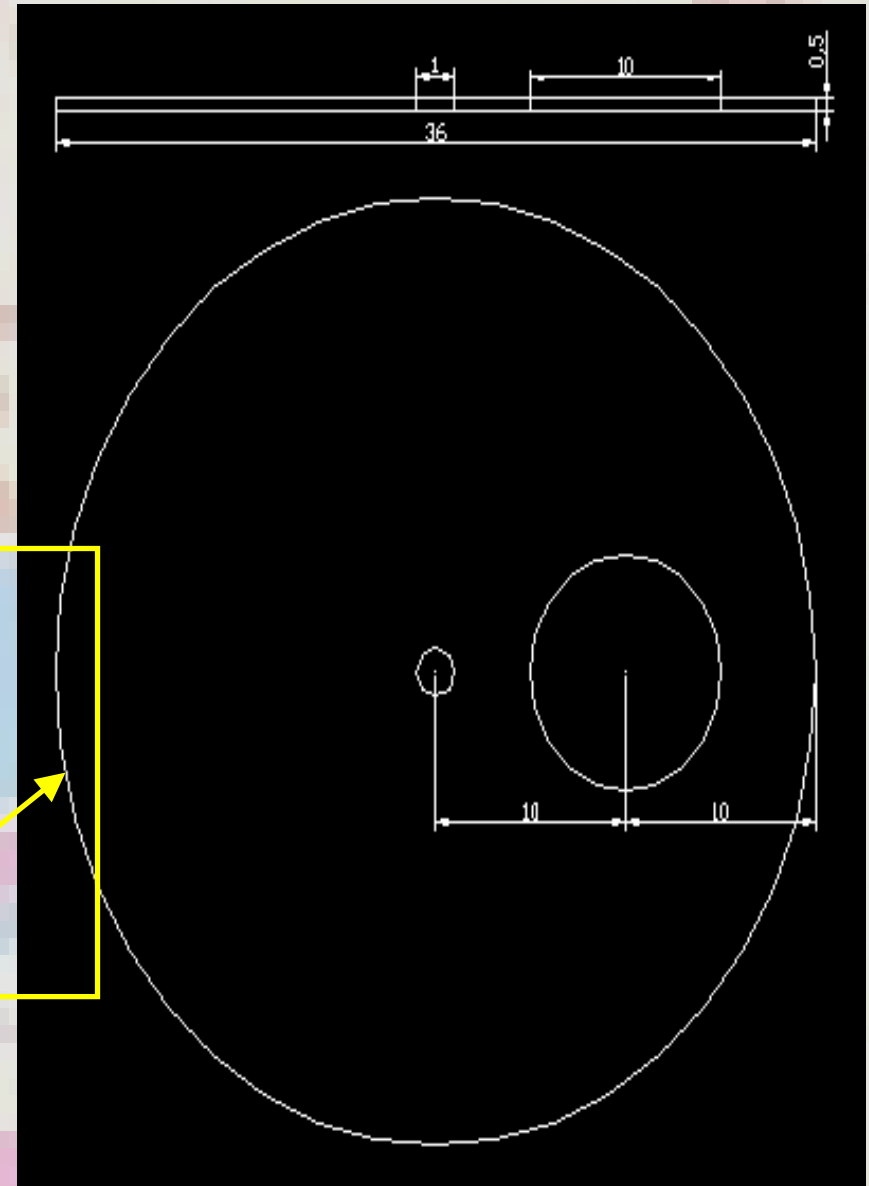
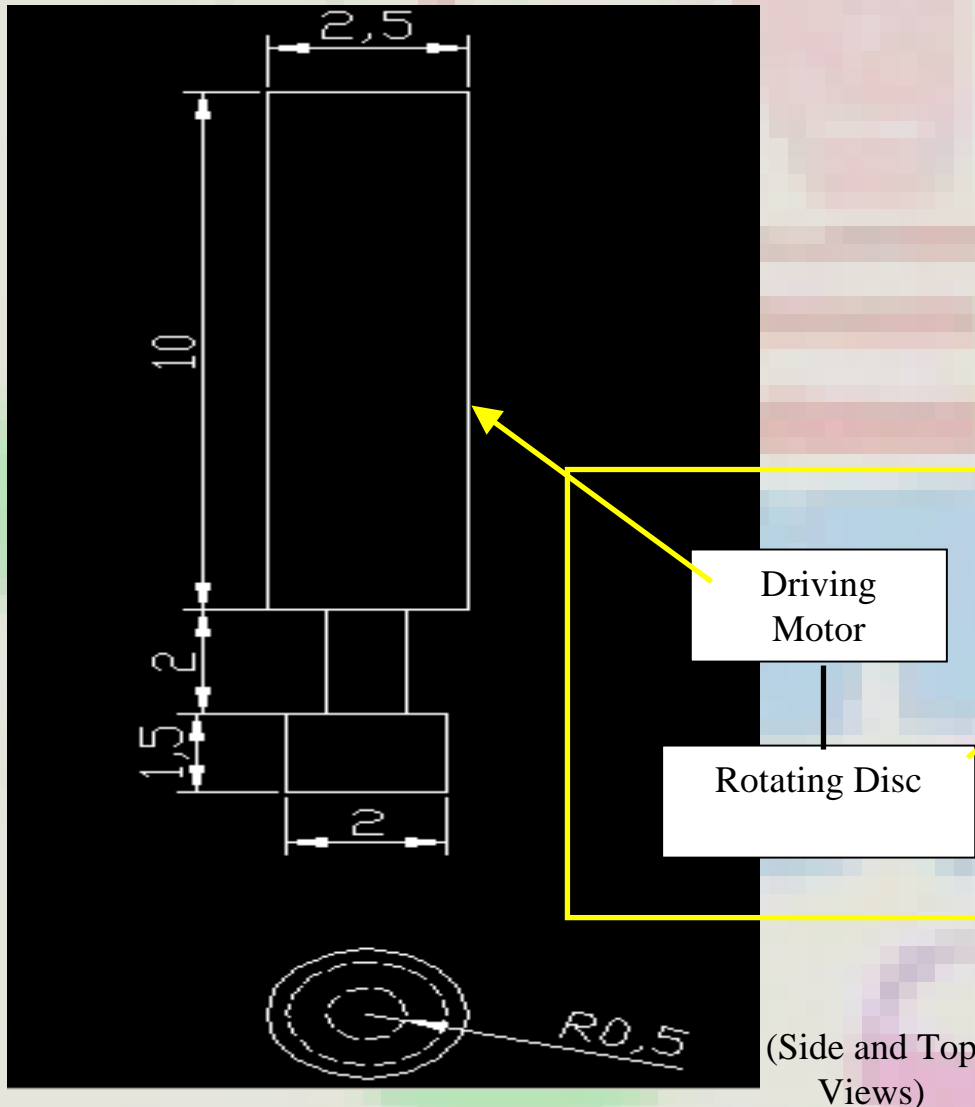


Logic Board Module



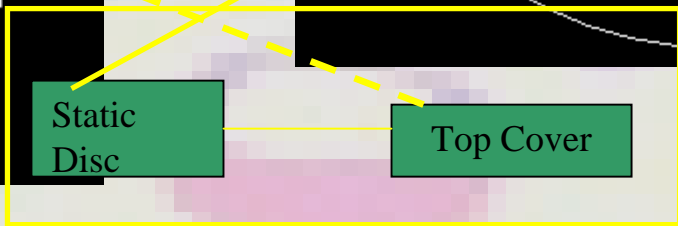
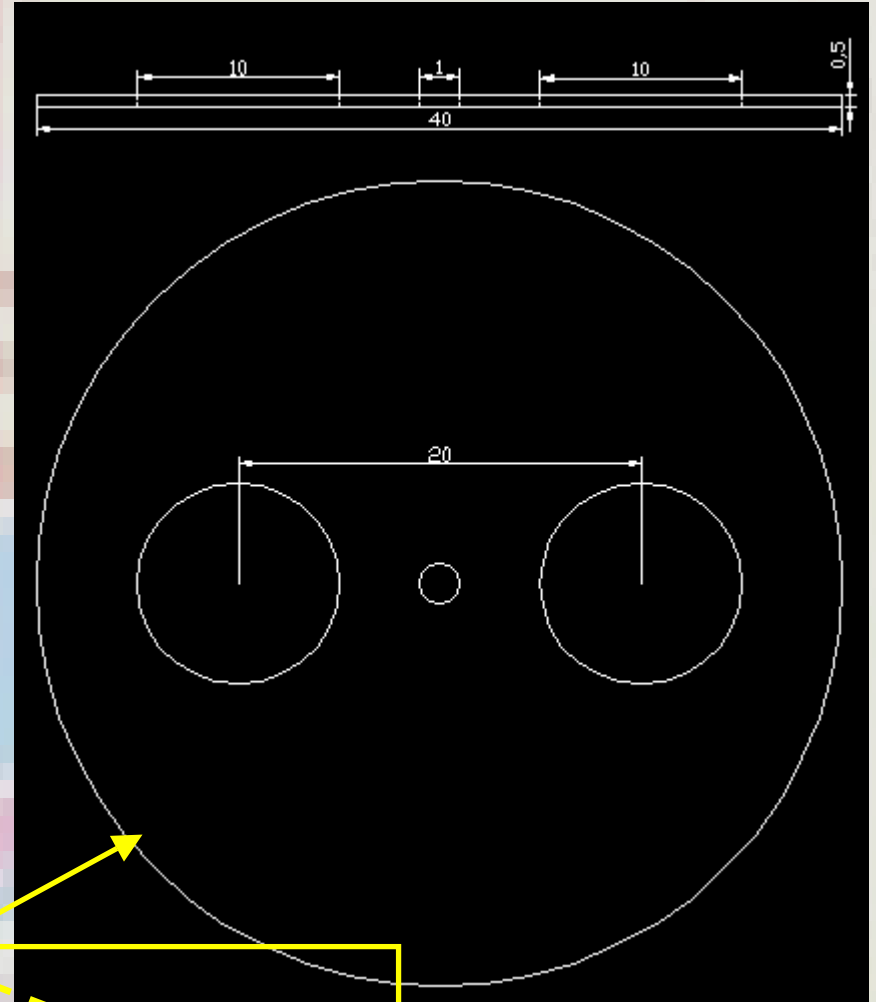
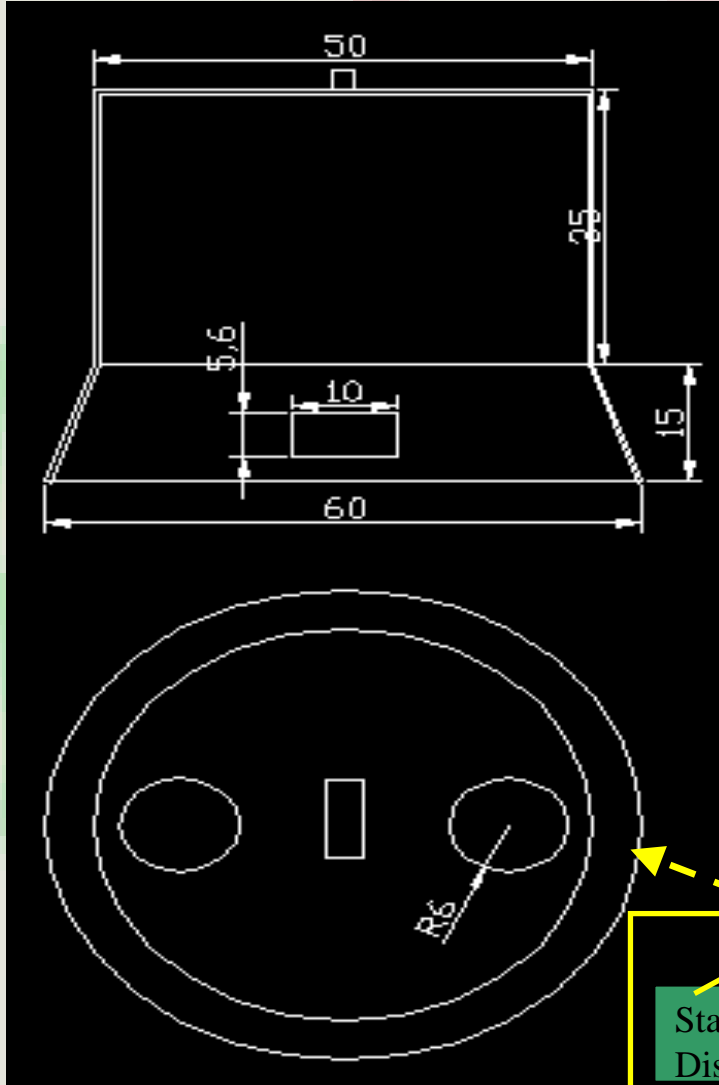
Detail Design Phase (contd.)

Power Transmission Module



Detail Design Phase (contd.)

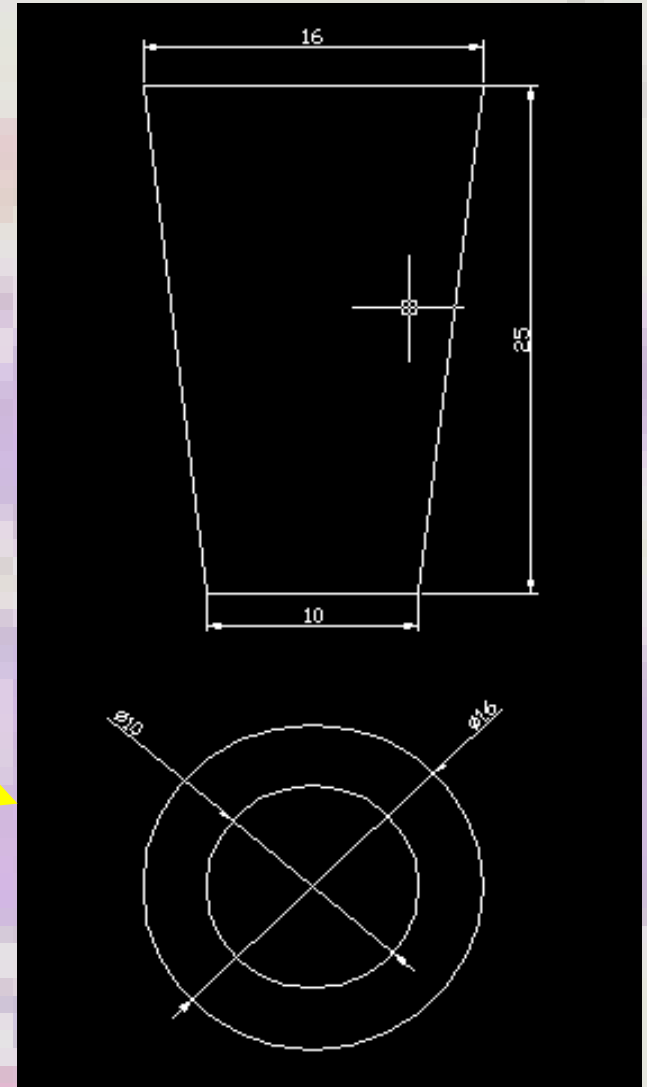
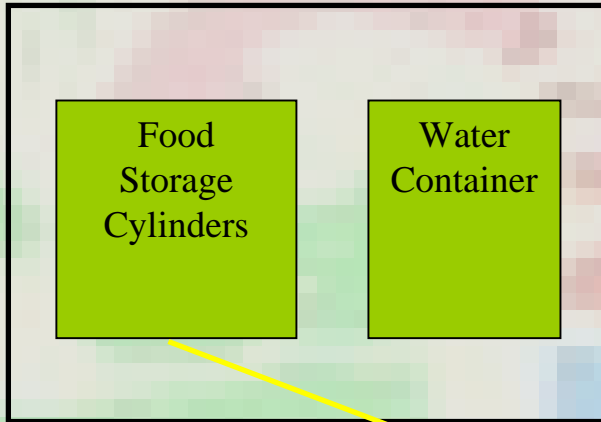
Structural Support Module



(Side and Top Views)

Detail Design Phase (contd.)

Storage Module



Design for Manufacturing

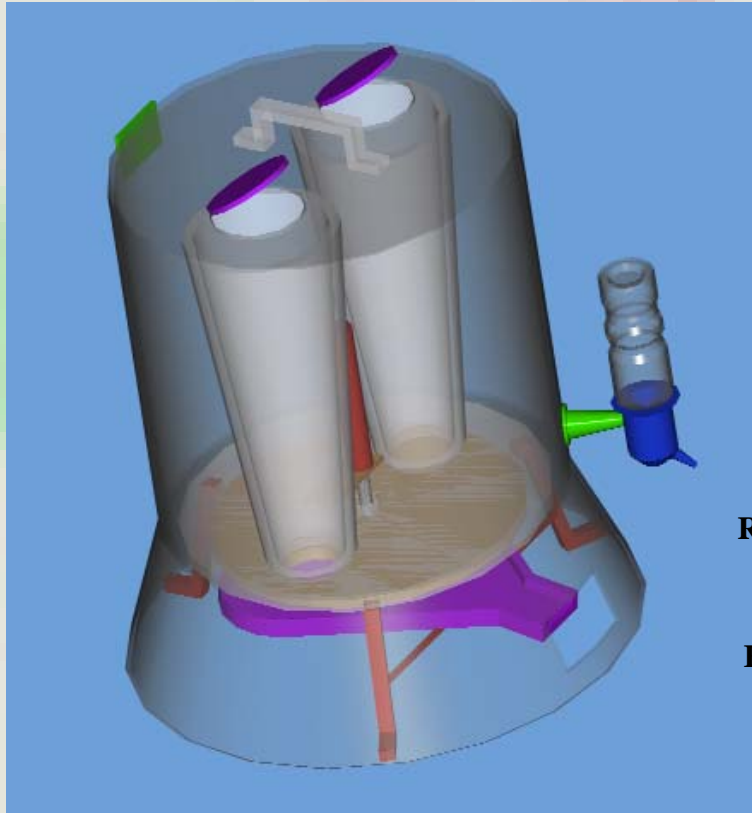
Manufacturability Analysis Worksheet

| | | | Assembly | | | | Part Elimination | | | | Assessment | | | |
|-------------------------------|----------|------|----------|---|---|---|------------------|----------|----------|-----|------------|----|----|-------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | 9 | 10 | 11 | 12 |
| Part name | Quantity | Type | H | I | S | C | Motion | Material | Assembly | CFE | V | M | UI | Notes |
| Stands | 3 | 2 | 0 | 0 | 0 | 0 | N | N | Y | 0 | 2 | 0 | 0 | |
| Feed Bowl | 1 | 2 | 0 | 0 | 0 | 0 | N | N | Y | 0 | 2 | 0 | 0 | |
| Water Bowl | 1 | 2 | 0 | 0 | 0 | 0 | N | N | Y | 0 | 2 | 0 | 0 | |
| Sliding tray | 1 | 2 | - | - | - | - | N | N | Y | 0 | 0 | + | - | |
| Rotating Disc | 1 | 2 | + | 0 | - | 0 | Y | N | Y | 0 | 0 | - | - | |
| Stationary Disc | 1 | 2 | + | 0 | - | 0 | N | N | Y | 0 | 0 | - | - | |
| Food Containers | 2 | 2 | + | 0 | + | 0 | N | N | N | 2 | 0 | - | 0 | |
| Motor Support Plate | 1 | 2 | + | 0 | 0 | 0 | N | N | N | 1 | 0 | + | 0 | |
| Top Cover | 1 | 2 | 0 | 0 | 0 | 0 | N | N | N | 1 | 0 | - | - | |
| Motor | 1 | 2 | | | | | | | | 1 | 2 | | 0 | |
| Water Mechanism | 1 | 2 | | | | | | | | 1 | 2 | | 0 | |
| Bolts (flat head) size (1/4)" | 3 | 1 | | | | | | | | 3 | 2 | | 0 | |
| Flat Head Screws (1/8)" | 42 | 1 | | | | | | | | 42 | 2 | | 0 | |
| Nuts (1/8)" | 44 | 1 | | | | | | | | 44 | 2 | | 0 | |
| Round head screws (1/8)" | 2 | 1 | | | | | | | | 2 | 2 | | 0 | |
| Plain Washers (1/8)" | 2 | 1 | | | | | | | | 2 | 2 | | 0 | |
| Flat Head Screws (1/16)" | 1 | 1 | | | | | | | | 1 | 2 | | 0 | |

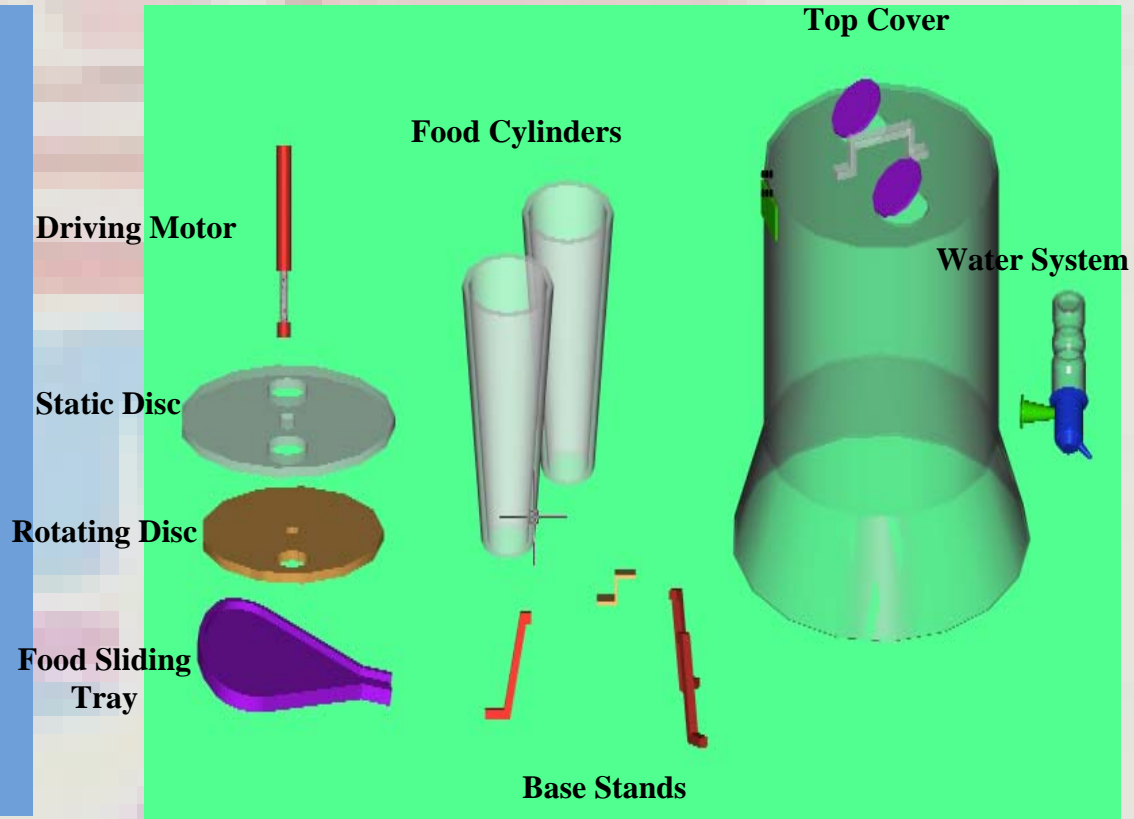
Count ratio = 0.074

Prototype Models

Solid 3D Isometric View

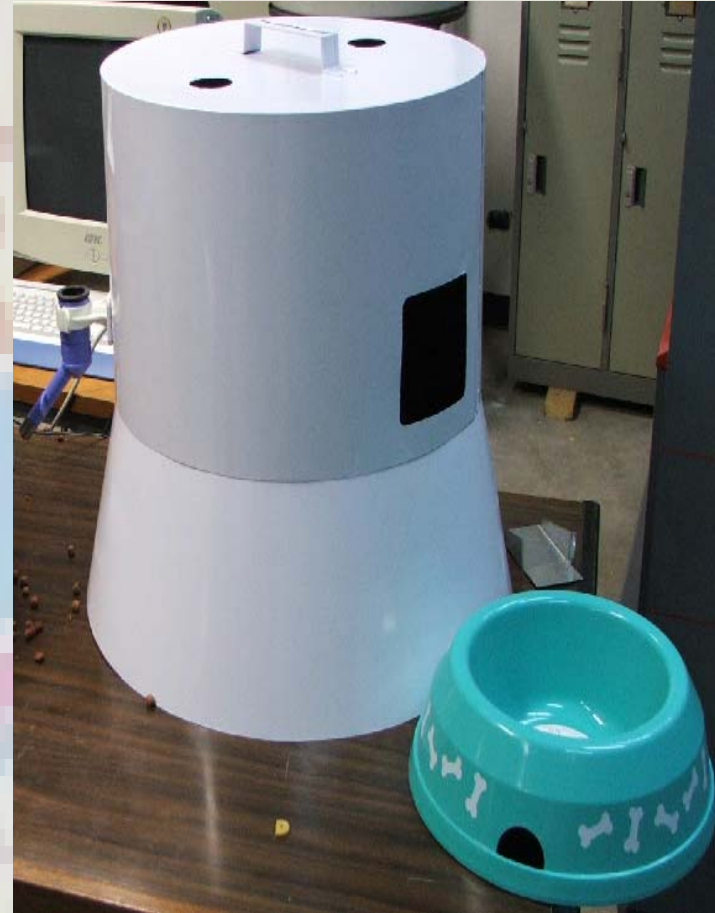


Exploded View of the 3D Model



Prototype Manufacturing

Physical Prototype



Prototype Testing

- Food stuck between the rotating disc and the stationary disc when the rotating disc starts moving again in order to stop the food supply.
- Initially the food containers set on the top of the circular holes of the stationary disc, and while running the prototype all the food started falling at once and the food was difficult to control.
- Stands found to be small - difficult to adjust the angle for the sliding disc for the ease of passage of the food to the food bowl.
- Timer display problems when overcharged battery was used.

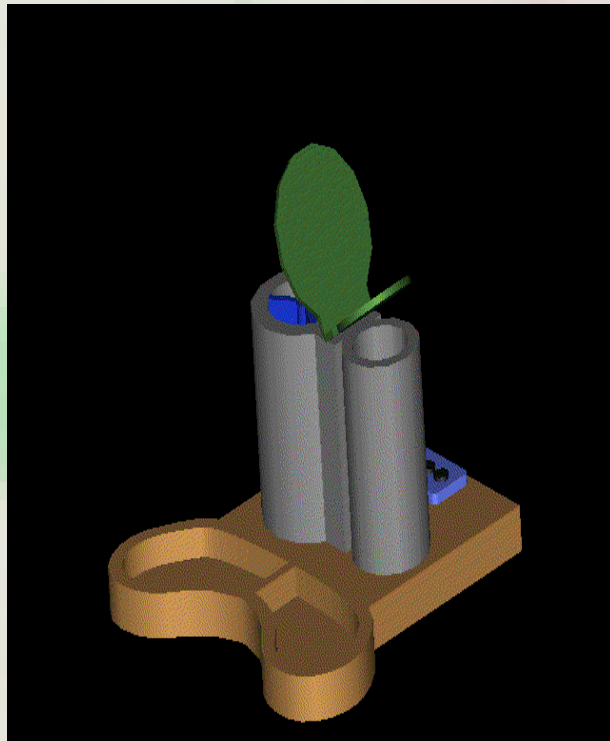
Refinements

- At the periphery of the stationary disc holes pieces of packaging tape were put which were cut into the shape of fingers for the ease of passage of the food.
- To control the passage of food the food containers were put on the stationary plate holes so that the two form an elliptical shape for the passage of food and the food does not move an uncontrolled fashion.
- The height of the stands was increase from initial 10 to 30 so that enough space is there to adjust the angle for the sliding plate.
- The timer display problem was solved by not overcharging the battery.

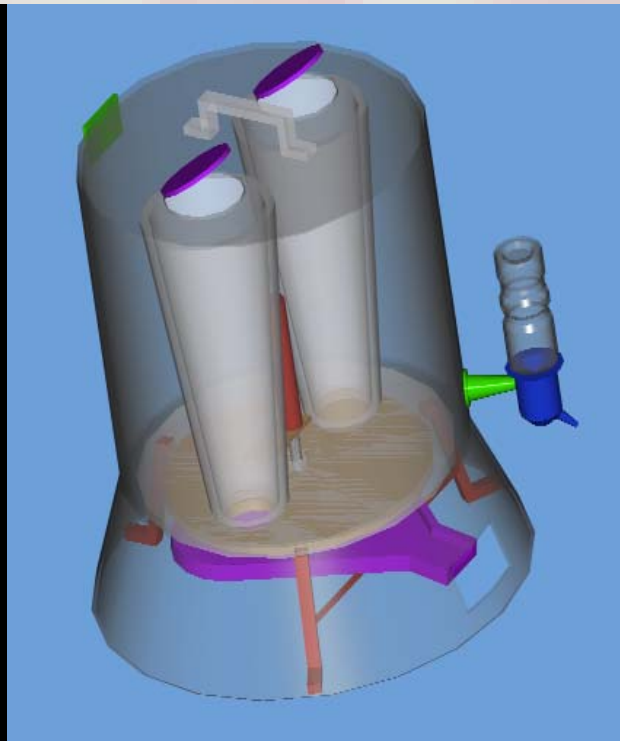
Other Improvements

- Power supply to both the micro-controller and DC motor to be provided using single battery and transformer
- Environment friendly Li ion batteries to be used finally.
- Final production to be done using ABS – the selected material.
- Water system to be made automatic later.

Concept to Final Prototype



Selected Concept



Detail Design Phase



Final Prototype



Queries?



Thank You
&
Enjoy
The Demonstration