Prototyping Planners

smartWINERY

PROTOTYPING PLANNER

PROTOTYPE OF: Airtightness **PROTOTYPE BY:** dosLHAMAS **DATE:** X/6/21 **VERSION:** P1.0

THINK

IDEA

What are you developing and which part of your product do you want to prototype?

To test the air tightness of the connection in the router coupling.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability ⊗ Technical / feasibility ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

How can we attach the whisk to the motor in an airtight manner without making room for bacteria growth in the lid?

EXPECTED OUTCOME

What is your main objective?

⊗ Exploration ○ Evaluation ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

The prototyping will gives us information on how this part of the lid should be constructed

BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—④—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

The prototype must show a way to construct an airtight coupling.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

3D printing of parts(attachment parts, with a o-ring to seal it.

TEST

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

The prototype will be tested internally within the group. It will be tested with air/pressure and a balloon to see if it's airtight.
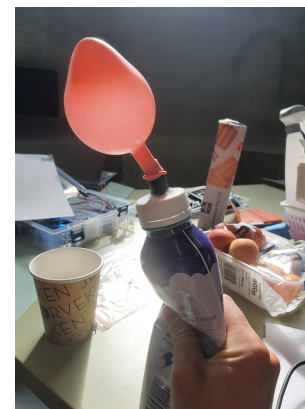
RESULTS

What data will you collect from the test? How? When is the test successful?

The test will be pass/no pass, if the cuping is airtight or not.

PROTOTYPE

Build and test the prototype. Show it here.

ACT
(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

It wasn't possible to get a airtight coupling

ACTIONS

Which conclusions and decisions can you make from these insights?

The test of the coupling wasn't passed and there must be worked further on a solution for the problem.

EVALUATE TEST

Prototyping effort:

①—②—⊗—④—⑤
Low   High

Success:

①—⊗—③—④—⑤
Low   High

Is further testing needed?
What changes will you make for the next test?

Yes,In the next test we will try to seil it around the motor instead.

🔍 THINK　　🛠 BUILD　　⚖ TEST　　⚖ ACT (after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to test if the production of ethanol in our alpha prototype continues and works as expected over time.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability　　⊗ Technical / feasibility　　○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

If the octocoupler will continue counting bubbles, and how often it is necessary to stir the juice.

EXPECTED OUTCOME

What is your main objective?

○ Exploration　　⊗ Evaluation　　○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We want to obtain knowledge about if the mechanism is trustworthy and get a measure on how often to stir

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

What __must__ the prototype be able to do or show?

Count bubbles continuously

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

We have created juice from bought apple juice, sugar and wine yeast + nutrition, which have been added to the carboy.

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

We have placed the carboy with including wine at one of the team members house

RESULTS

What data will you collect from the test? How? When is the test successful?

The team member keeps an eye on the carboy and notices if the process follows our expected schedule. Notes will be taken.

PROTOTYPE

Build and test the prototype. Show it here.

INSIGHTS

Which insights and ideas did the prototyping give you?

After around 24 hours without stirring the mixture, we found that the bubbling stopped.

ACTIONS

Which conclusions and decisions can you make from these insights?

Based on the test, we find that the stirring needs to find place once a day.

EVALUATE TEST

Prototyping effort:
①—②—③—⊗—⑤
Low　　　　High

Success:
①—②—③—⊗—⑤
Low　　　　High

Is further testing needed? What changes will you make for the next test?

We need to test the process further, since it takes time test all the aspects of the brewing

PROTOTYPING PLANNER

PROTOTYPE OF: The "case"   PROTOTYPE BY: dosLHAMAS   DATE: 08/06/21   VERSION: P3.0

🔍 THINK   ⚙️ BUILD   ⚖️ TEST   🔨 ACT (after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to do a prototype of the case containing the smartWINERY's electrical and mechanical parts.

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability   ⊗ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

Which size of the cabinet would look nice, while approximately leaving room enough for the future mechanism

EXPECTED OUTCOME

What is your main objective?

⊗ Exploration   ◯ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

Get an idea about the shape of the container to further detail on, when we are more set on the components to be contained.

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—⊗—③—④—⑤ High (precise but slow)

What __must__ the prototype be able to do or show?

Carry the weight of the carboy, and have 1:1 measures

BUILD PLAN
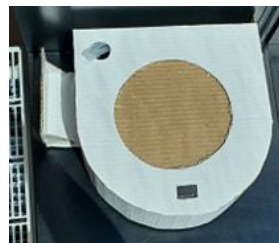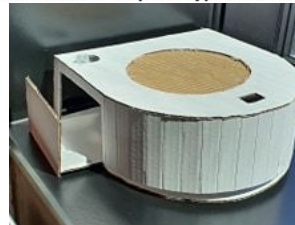
How will you make the prototype?
Which resources do you need? Which limitations exist?

The prototype needs to be low fidelity, but stil with a strong construction capable of carrying the necessary weight

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

The team itself. The prototype is tested by a visual evaluation.

RESULTS

What data will you collect from the test? How?
When is the test successful?

Measurements on sizes, shapes and materials for both a functional and good-looking prototype.

PROTOTYPE

Build and test the prototype. Show it here.

INSIGHTS

Which insights and ideas did the prototyping give you?

We found that a circle shaped box would take up unnecessary space, while a square looks clumsy. The chosen shape allows the product to be placed up against a wall, while not having edges to get torn on.

ACTIONS

Which conclusions and decisions can you make from these insights?

If it turns out later in the process, that the inner components fit the case, this shape would fit well on a kitchen table. THe idea about having a drawer for the filter needs to be refined.

EVALUATE TEST

Prototyping effort:
①—②—⊗—④—⑤
Low   High

Success:
①—②—③—⊗—⑤
Low   High

Is further testing needed?
What changes will you make for the next test?

include inner components, specify measurements, detail the drawer and add wire to motor/lid

PROTOTYPING PLANNER

PROTOTYPE OF: The "case"   PROTOTYPE BY: dosLHAMAS   DATE: 14/06/21   VERSION: P3.1

🔍 THINK   ## ✏️ BUILD   ## ⚖️ TEST   ## 🔨 ACT
(after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to do a prototype of the case containing the smartWINERY's electrical and mechanical parts.

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability   ⊗ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We want to test different ways the components can be placed according to each other and evaluate how big the case actually needs to be.

EXPECTED OUTCOME

What is your main objective?

⊗ Exploration   ◯ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

Some measurements for when we begin building a more high fidelity prototype

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

What must the prototype be able to do or show?

Carry the weight of the carboy, leave space enough for testing various placements of components.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

Laser cut a wooden box with room for the indentation prototype and holes for racking tubes and electricity.

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

We need to place the components and electricity inside the box and do an assessment on how a final prototype construction would look like

RESULTS

What data will you collect from the test? How? When is the test successful?

Pictures. It is successful if the components fit inside the case and if the result causes a possibility to create a smaller case for next iteration.

INSIGHTS

Which insights and ideas did the prototyping give you?

We found that the box is way larger than what it actually must be. It can both be smaller in height, width and length,

ACTIONS

Which conclusions and decisions can you make from these insights?

We need to do a new assessment on how the design of the case must look.

EVALUATE TEST

Prototyping effort:
①—②—⊗—④—⑤
Low   High

Success:
①—②—③—⊗—⑤
Low   High

Is further testing needed?
What changes will you make for the next test?

A new size of the case must be created.

PROTOTYPE

Build and test the prototype

PROTOTYPING PLANNER

PROTOTYPE OF: The "case" PROTOTYPE BY: dosLHAMAS DATE: 15/06/21 VERSION: **P3.2**

THINK

BUILD

TEST

ACT
(after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to do a prototype of the case containing the smartWINERY's electrical and mechanical parts.

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability   ⊗ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We want to test different ways the components can be placed according to each other and evaluate how big the case actually needs to be.

EXPECTED OUTCOME

What is your main objective?

⊗ Exploration   ◯ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

Some measurements for when we begin building a more high fidelity prototype

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

What __must__ the prototype be able to do or show?

Include the components 1:1.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

Do a drawing of the placement of the components and make measurements from this.

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

We want to do a rough estimate on how much room the different components need.

RESULTS

What data will you collect from the test? How? When is the test successful?

We got insight into how the components need to be placed next to each other.

INSIGHTS

Which insights and ideas did the prototyping give you?

If the case is a complete square, it can contain the components if it has the measurements 230x240.

ACTIONS

Which conclusions and decisions can you make from these insights?

The case can be way smaller than we thought.
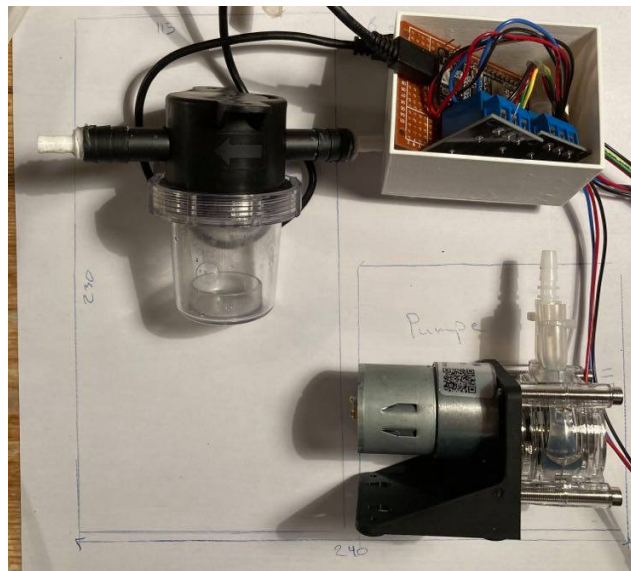
EVALUATE TEST

Prototyping effort:
①—⊗—③—④—⑤
Low   High

Success:
①—②—③—⊗—⑤
Low   High

Is further testing needed?
What changes will you make for the next test?

A new more final version of the case.

PROTOTYPING PLANNER

PROTOTYPE OF: The "case"　　PROTOTYPE BY: dosLHAMAS　　DATE: 17/06/21　　VERSION: **P3.3**

🔍 THINK　　✏️ BUILD　　⚖️ TEST　　🔨 ACT
(after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to do a full prototype of the case containing the smartWINERY's electrical and mechanical parts, in cardboard to see if they fit.

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability　　⊗ Technical / feasibility　　◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We would like to test how the tubes end up running inside the box, and if there is room enough.

EXPECTED OUTCOME

What is your main objective?

◯ Exploration　　⊗ Evaluation　　◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We would like to do a final testing before we start drawing the case in CAD for further high fidelity testing.

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

Include the components 1:1, and leave space for the tubes running between them.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

Cut the bottom of the case box, place the component how we want them and draw tubes and wires between them.

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

We will insert the pump, filter and the box for mechanical mechanisms and then place the tubes and wires.

RESULTS

What data will you collect from the test? How? When is the test successful?

We will take notes on the measurements when the placement of components is perfect.

PROTOTYPE

~~Build and test~~ the prototype. Show it here.

INSIGHTS

Which insights and ideas did the prototyping give you?

The bottom of the case is based on an rectangle (15x25) and a half circle (d=25).

ACTIONS

Which conclusions and decisions can you make from these insights?

We need to be precise when placing everything, since there isn't much extra room inside the case, but we have decided that we want the smallest possible case, and continues with these measurements.

EVALUATE TEST

Prototyping effort:
①—②—⊗—④—⑤
Low　　　　High

Success:
①—②—③—⊗—⑤
Low　　　　High

Is further testing needed?
What changes will you make for the next test?

The same system in wood/plastic.

PROTOTYPING PLANNER

PROTOTYPE OF: The "case"   PROTOTYPE BY: dosLHAMAS   DATE: 21/06/21   VERSION: P3.5

🔍 THINK   ✏️ BUILD   ⚖️ TEST   🔨 ACT
(after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to do a prototype of the case containing the smartWINERY's electrical and mechanical parts, which could be our final beta.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ⊗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We want to test if our CAD drawing would actually work in real life, and test how it can be maufactured.

EXPECTED OUTCOME

What is your main objective?

○ Exploration   ⊗ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

If the different parts fits, and if they are stable enough to hold the weight of the carboy.

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—④—⊗ High (precise but slow)

What must the prototype be able to do or show?

Tell if the different parts fit together

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

Laser cut and 3D print.

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

We will put the different parts together, to test if the measurements from the wood and 3D print are correct.

RESULTS

What data will you collect from the test? How? When is the test successful?

A qualitative test about if the components fit together and if the components fit inside the case.

PROTOTYPE

INSIGHTS

Which insights and ideas did the prototyping give you?

We found that the Laser Cutting got a bit too large, but that it would cause more trouble to try to fix it.

ACTIONS

Which conclusions and decisions can you make from these insights?

We need to find some veneer to cover up the laser cut wood, to make the prototype look less like a prototype.

EVALUATE TEST

Prototyping effort:
①—②—③—④—⊗
Low   High

Success:
①—②—③—⊗—⑤
Low   High

Is further testing needed?
What changes will you make for the next test?

We need to fixate the components together with glue and add the top part of the spine. Further we need to implement veneer and spray paint

PROTOTYPING PLANNER

PROTOTYPE OF: Temperature sensor

PROTOTYPE BY: dosLHAMAS

DATE: 8/6/21

VERSION: P4.0

🔍 THINK

IDEA

What are you developing and which part of your product do you want to prototype?

Test which of two temperature sensors (TMP36 and NHT11) to use

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability　　☒ Technical / feasibility　　◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

Find out how precise and consistent the two sensors are

EXPECTED OUTCOME

What is your main objective?

◯ Exploration　　☒ Evaluation　　◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

Choose between the two

⚙️🖊 BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—☒—③—④—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

Print temperature readings from each sensor and compare with a reference temperature

BUILD PLAN

How will you make the prototype? Which resources do you need? Which limitations exist?

The two sensors and basic Arduino stuff

⚖️ TEST

TEST PLAN

Who will see or use the prototype? How will you test the prototype?

Look at the readings on the serial monitor

RESULTS

What data will you collect from the test? How? When is the test successful?

Evaluate temperature and choose the most correct one

PROTOTYPE

Build and test the prototype. Show it here.

🔨 ACT

(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

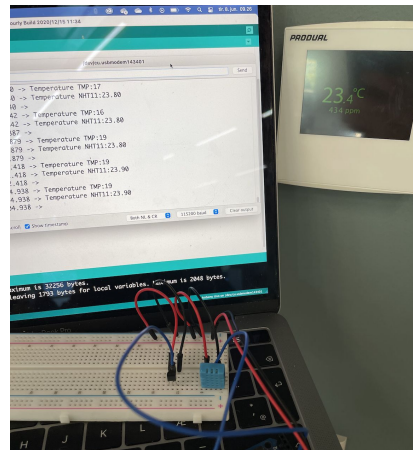The NHT11 is more precise and consistent and also offer humidity sensing

ACTIONS

Which conclusions and decisions can you make from these insights?

We choose the NHT11. The humidity sensor can be used to evaluating if the lid is airtight.

EVALUATE TEST

Prototyping effort: ①—☒—③—④—⑤ Low ... High

Success: ①—②—③—④—☒ Low ... High

Is further testing needed? What changes will you make for the next test?

Nope

PROTOTYPING PLANNER

PROTOTYPE OF: Whisks   **PROTOTYPE BY:** dosLHAMAS   **DATE:** 08/06/21   **VERSION:** P5.0

🔍 THINK   ## ✏️ BUILD   ## ⚖️ TEST   ## 🔨 ACT
(after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to test different designs on the whisk stirring the mixture in our product.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ⊗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We want to do test which whisk design is the most effective.

EXPECTED OUTCOME

What is your main objective?

○ Exploration   ⊗ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We want to choose between 4 designs that we have already developed.

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

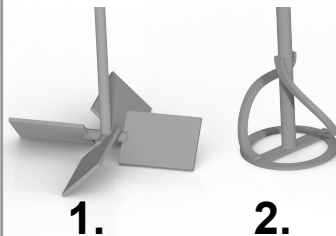*What **must** the prototype be able to do or show?*

It must show that it can mix what is equal to sugar and juice well together.

BUILD PLAN

How will you make the prototype? Which resources do you need? Which limitations exist?

We have sketched 4 different types of whisks in Creo and afterwards 3D printed them. Then add them to a stick (pencil), and stir water and coffee grounds

TEST PLAN

*Who will see or use the prototype? How will you test the prototype?*

The team itself. We want to test the effectiveness of the stirring in a bowl of water and coffee grounds.

RESULTS

What data will you collect from the test? How? When is the test successful?

We will both take pictures, measure the time it takes before the mixture is well mixed, and measure how high the coffee grounds get inside the carboy.
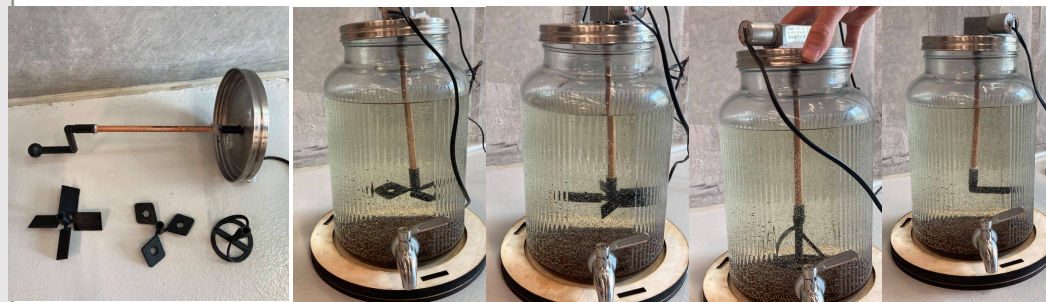
PROTOTYPE

Build and test the prototype. Show it here.

1.   2.   3.   4.

INSIGHTS

Which insights and ideas did the prototyping give you?

We found that the motor wasn't fast enough to swirl up the coffee grounds on the bottom of the carboy. Further it was important to stir close to the bottom. The "1" whisk was the most effective.

ACTIONS

Which conclusions and decisions can you make from these insights?

We need a bigger whisk or a longer stick to get the fluid swirling.

EVALUATE TEST

Prototyping effort:
①—②—③—⊗—⑤
Low   High

Success:
①—⊗—③—④—⑤
Low   High

Is further testing needed? What changes will you make for the next test?

Yes. We need to test with a more alike fluid.

PROTOTYPING PLANNER

PROTOTYPE OF: **Whisks**

PROTOTYPE BY: **dosLHAMAS**

DATE: 09/06/21

VERSION: **P5.1**

🔍 THINK ⚙️ BUILD ⚖️ TEST ⚖️ ACT *(after prototyping)*

IDEA

What are you developing and which part of your product do you want to prototype?

We want to test the design of the whisk

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability ⊗ Technical / feasibility ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

The length of the whisk

EXPECTED OUTCOME

What is your main objective?

◯ Exploration ⊗ Evaluation ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We need to figure out if making the pencil/stick longer helps making the swirling more effective.

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ⊗—②—③—④—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

A longer stick made very low fidelity.

BUILD PLAN

How will you make the prototype? Which resources do you need? Which limitations exist?

We found a wood stick and added it to the pencil to get a longer whisk.

TEST PLAN

Who will see or use the prototype? How will you test the prototype?

The team itself. We want to test the effectiveness of the stirring in a bowl of water and coffee grounds.

RESULTS

What data will you collect from the test? How? When is the test successful?

We will both take pictures and a 1 min video to do a qualitative assesment on.

PROTOTYPE

Build and test the prototype. Show it here.

INSIGHTS

Which insights and ideas did the prototyping give you?

After adding some extra length to the stick, we found that it helped to get the mixture mixed. The carboy has a groove collecting coffee grounds, but it is possible that the real mixture won't get stuck since it is lighter.

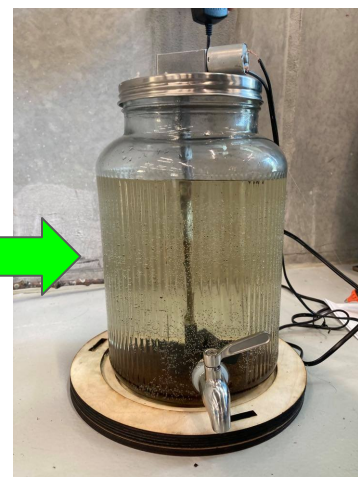### ACTIONS

Which conclusions and decisions can you make from these insights?

We need to test if the coffee grounds is too heavy

EVALUATE TEST

Prototyping effort:
⊗—②—③—④—⑤
Low ——— High

Success:
①—②—⊗—④—⑤
Low ——— High

Is further testing needed? What changes will you make for the next test?

We need to test with a fluid/mixture more like what applewine.

PROTOTYPING PLANNER

PROTOTYPE OF: Whisks **PROTOTYPE BY:** dosLHAMAS **DATE:** 10/06/21 **VERSION:** P5.2

🔍 THINK

IDEA
What are you developing and which part of your product do you want to prototype?

We want to test the design of the whisk

PURPOSE
Which aspect of your idea are you testing?:

◯ Human / desirability   ⊗ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

The design of the whisk in a correct mixture of yeast, sugar and water

EXPECTED OUTCOME
What is your main objective?

◯ Exploration   ⊗ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We want to test if the whisk works better than the last iteration, if we change the coffee grounds with yeast

⚙️ BUILD

WHAT TO BUILD
Level of detail and realism needed:

Low (quick and dirty) ⊗—2—3—4—5 High (precise but slow)

*What **must** the prototype be able to do or show?*

If the mixture gets stirred now that the fluid and the sediment fits with an actual brewing mixture

BUILD PLAN
How will you make the prototype? Which resources do you need? Which limitations exist?

Add sugar, yeast and water to te carboy.

⚖️ TEST

TEST PLAN
Who will see or use the prototype? How will you test the prototype?

We add the most effective whisk from earlier iterations and asses if the carboy content gets better mixed.

RESULTS
What data will you collect from the test? How? When is the test successful?

Pictures and videos.
If the yeast is evenly distributed in the water.

PROTOTYPE
Build and test the prototype. Show it here.

🔨 ACT
(after prototyping)

INSIGHTS
Which insights and ideas did the prototyping give you?

We found that the whisk worked better now that the mixture was more like an actual brewing fluid, but that the bottom of the carboy is shaped in a way allowing the sugar to get stuck in a groove.

ACTIONS
Which conclusions and decisions can you make from these insights?

The whisk is almost good enough, but doesn't mix the top of the fluid as well as around the whisk "head". Further a groove in the carboy collects sugar and other sediments.

EVALUATE TEST
Prototyping effort:

⊗—2—3—4—5
Low   High

Success:

1—2—⊗—4—5
Low   High

Is further testing needed? What changes will you make for the next test?

We need to adjust the whisk to mix the layers in the fluid and stir sediments away from the groove.

PROTOTYPING PLANNER

PROTOTYPE OF: Whisks   **PROTOTYPE BY:** dosLHAMAS   **DATE:** 10/06/21   **VERSION:** P5.3-8

🔍 THINK   ## ✏️ BUILD   ## ⚖️ TEST   ## ⚖️ ACT (after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We want to test the design of the whisk

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability   ⊗ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

How to get the sediment in the carboy groove moving/stirred

EXPECTED OUTCOME

What is your main objective?

⊗ Exploration   ◯ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

To find the most effective design and some rough measurements on how the optimal whisk would look.

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—⊗—③—④—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

It must indicate if the whisk fits the inner diameter of the carboy and if it reaches down and moves the sediment in the groove.

BUILD PLAN

How will you make the prototype? Which resources do you need? Which limitations exist?

Cardboard and sticks taped together and on an already existing whisk, plus adjustment i laser cutted wood.
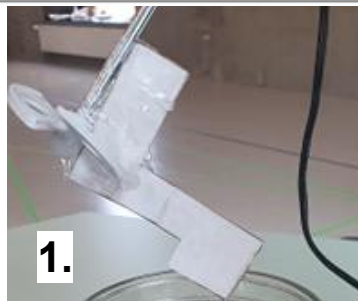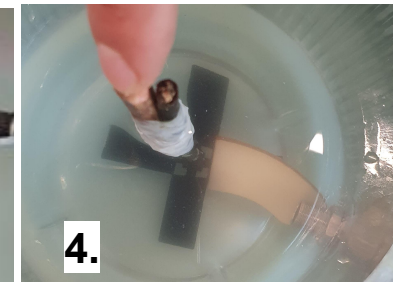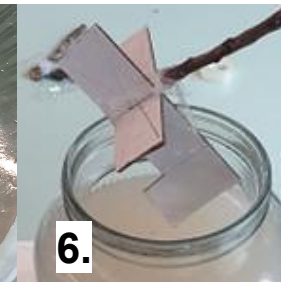
TEST PLAN

Who will see or use the prototype? How will you test the prototype?

Put the different whisks into the carboy and observe if it reaches and stirs the sugar placed in the groove.

RESULTS

What data will you collect from the test? How? When is the test successful?

Pictures and videos.

1.

3.

5.

2.

4.

6.

INSIGHTS

Which insights and ideas did the prototyping give you?

We found that ver. 1 and 2. didn't work very well. The spout gets in the way and they weren't robust enough to indicate if it would actually work. The angeling of the stick on ver 3. worked very well, but could be refined, which we tried in ver. 4.and 5,

ACTIONS

Which conclusions and decisions can you make from these insights?

We need to make a more stable and robust version of whisk nr. 5, but can conclude that it overall works as we predicted and can pass through the carboy opening.

EVALUATE TEST

Prototyping effort:

⊗—②—③—④—⑤
Low   High

Success:

①—②—⊗—④—⑤
Low   High

Is further testing needed? What changes will you make for the next test?

A more refined design of ver 5. needs to be tested, since it still hit the sprout when turning.

PROTOTYPING PLANNER

PROTOTYPE OF: Carboy fixation   **PROTOTYPE BY:** dosLHAMAS   **DATE:** 09/04/21   **VERSION:** P6.0

🔍 THINK

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to test the way the carboy is fixated to the structure containing the mechanisms.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ✗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

How much support is needed for the carboy to be properly secured to the structure?

EXPECTED OUTCOME

What is your main objective?

✗ Exploration   ○ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

After the prototyping more iterations can be done and the result will help design the structure.

⚙️ BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—✗—④—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

The prototype must indicate if the placement of the carboy is stable and let us how complex placing and removing the carboy will become
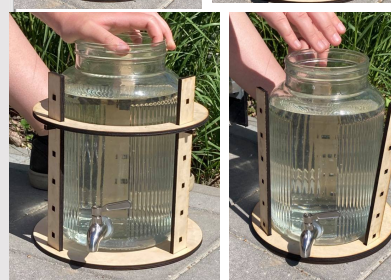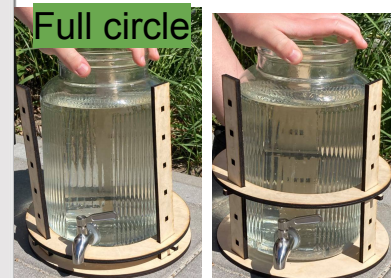
BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

Laser cutting of different support forms in wood. These will be attached to a round plate with large/long dowels. The shape of a circle, a half circle and and a circle shaped cutout on the bottom plate will be tested

⚖️ TEST

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

The prototype is tested internally in the group among the team members.
Shaking and pushing the carboy will help test the support level.

RESULTS

What data will you collect from the test? How?
When is the test successful?

We will do a qualitative assessment on the different versions of the fixation.

PROTOTYPE

...d and test the prototype. Show it here.

Full circle

Half circle

Indentation

⚖️ ACT

(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

We found that the carboy gets plenty of support, even with a supporting indentation on the bottom at the carboy, since the heavy weight when filled with 5L wine. The higher the circle/half circle was placed, the more support the carboy get, but it also complicates the insertion of the carboy.

ACTIONS

Which conclusions and decisions can you make from these insights?

We want to move forward with the indentation. We found that the carboy is heavy enough to not move and eventually tip, if only little support is present.

EVALUATE TEST

Prototyping effort:

Low ①—②—✗—④—⑤ High

Success:

Low ①—②—③—✗—⑤ High

Is further testing needed? What changes will you make for the next test?

The size of the indentation did not fit the bottom diameter but the widest measure. This needs to be corrected.

PROTOTYPING PLANNER

PROTOTYPE OF: Carboy fixation (indentation)
PROTOTYPE BY: dosLHAMAS
DATE: 9/6/21
VERSION: P6.1

🔍 THINK

⚙️ BUILD

⚖️ TEST

🔨 ACT
(after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

Iterating on the the carboy fixation (the indentation version)

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability ⊗ Technical / feasibility ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

How can we best shape the indentation

EXPECTED OUTCOME

What is your main objective?

○ Exploration ⊗ Evaluation ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

The prototype will allow for knowing how to best fixate and support the carboy

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—④—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

The prototype must show if the carboy is properly and safely supported

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

Laser cutting of parts to build indentation. Hot glue/sanding will help shape the slope of the indentation

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

The prototype is tested internally in the group among the team members. Shaking and pushing the carboy will help test the support level.

RESULTS

What data will you collect from the test? How?
When is the test successful?

We will do a qualitative assessment

PROTOTYPE

Build and test the prototype. Show it here.

INSIGHTS

Which insights and ideas did the prototyping give you?

We found that we need to do roundings on the edges, and probably også edit some measurements to make the carboy fit properly

ACTIONS

Which conclusions and decisions can you make from these insights?

We need to increase the diameter of the bottom level to 16 and not 15,5 to make it easier for the carboy to find its place.

EVALUATE TEST

Prototyping effort:
①—②—⊗—④—⑤
Low   High

Success:
①—⊗—③—④—⑤
Low   High

Is further testing needed?
What changes will you make for the next test?

More iterations on which measurements makes the best fitting and another test with a smoother transistion between the layers.

PROTOTYPING PLANNER

PROTOTYPE OF: CREO indentation   PROTOTYPE BY: dosLHAMAS   DATE: 09/06/21   VERSION: P6.2

THINK

BUILD

TEST

ACT
(after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

Prototyping on the indentation for fixating the carboy.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ☒ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

The exact measurements

EXPECTED OUTCOME

What is your main objective?

○ Exploration   ☒ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We want to create a CAD model to get some exact and correct measures to use further when developing the final protoype

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—☒—⑤ High (precise but slow)

What __must__ the prototype be able to do or show?

The model needs to communicate the measurements for further use.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

We draw it inside CREO

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

The prototype will be tested when we do a final prototype. Eventually in a 3D print made by the team itself.

RESULTS

What data will you collect from the test? How? When is the test successful?

Measurements and a visual assessment.

PROTOTYPE

Build and test the prototype. Show it here.

SCALE 0,500

R10 R35   156,8   30   20

SECTION XSEC0001-XSEC0001   215   231,6

Ø250

INSIGHTS

Which insights and ideas did the prototyping give you?

We want to make the height of the rounding on the indentation to fit under the spout and where the pattern on the carboy begins.

ACTIONS

Which conclusions and decisions can you make from these insights?

We need to create a smooth rounding and test which slope makes a tight but soft fitting keeping the carboy in place.

EVALUATE TEST

Prototyping effort:
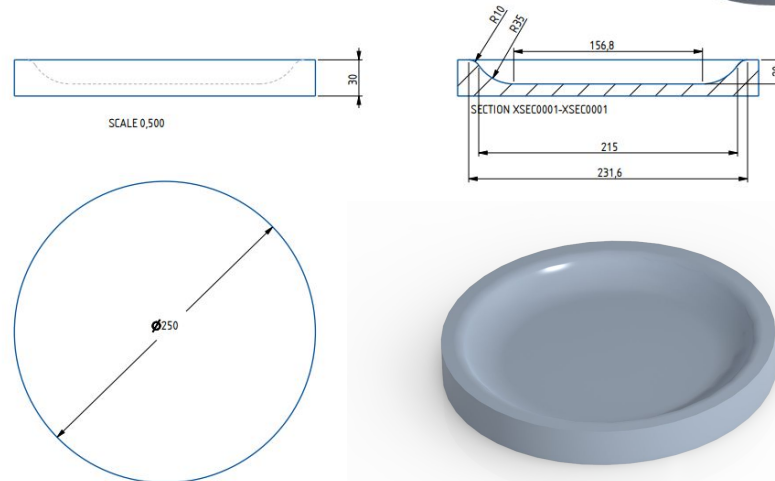Low ①—☒—③—④—⑤ High

Success:
Low ①—②—③—☒—⑤ High

Is further testing needed? What changes will you make for the next test?

We need to make it physical next time, to validate the design.

PROTOTYPING PLANNER

PROTOTYPE OF: CREO indentation   **PROTOTYPE BY:** dosLHAMAS   **DATE:** 11/06/21   **VERSION:** P6.3

🔍 THINK

⚙️✏️ BUILD

⚖️ TEST

🔨 ACT
(after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

Prototyping on the indentation for fixating the carboy.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ⊗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

The exact measurements resulting in a secure fit.

EXPECTED OUTCOME

What is your main objective?

○ Exploration   ⊗ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We want to test if the cad model drawn in the latest iteration fits the actual carboy.

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

What __must__ the prototype be able to do or show?

Fit the carboy enough to support it, but still leaving space for an easy placement.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

3D print of the CAD model.

PROTOTYPE

Build and test the prototype. Show it here.

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

Placing the carboy on the 3D print and assessing if the measurements fit.

RESULTS

What data will you collect from the test? How? When is the test successful?

The test is successful, if it is easy to place the carboy in the print and if the carboy is difficult to tip/shake out of place.

INSIGHTS

Which insights and ideas did the prototyping give you?

It fits! The prototype leaves a little space for the carboy to find its place, but that seems reasonable

ACTIONS

Which conclusions and decisions can you make from these insights?

No more detailing needed on the indentation itself.

EVALUATE TEST

Prototyping effort:
①—②—③—⊗—⑤
Low   High

Success:
①—②—③—④—⊗
Low   High

Is further testing needed? What changes will you make for the next test?

Next step is to make the indentation fit into the case.

PROTOTYPING PLANNER

PROTOTYPE OF: CREO indentation   PROTOTYPE BY: dosLHAMAS   DATE: 14/06/21   VERSION: **P6.4**

🔍 THINK   ✏️ BUILD   ⚖️ TEST   ⚖️ ACT
(after prototyping)

IDEA
What are you developing and which part of your product do you want to prototype?

Prototyping on the indentation for fixating the carboy together with the top of the case.

PURPOSE
Which aspect of your idea are you testing?:

○ Human / desirability   ⊗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

To get a visual assessment of the final prototype and how to fixate the indentation.

EXPECTED OUTCOME
What is your main objective?

○ Exploration   ⊗ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We hope to make a piece of wood keeping the indentation in place.

WHAT TO BUILD
Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

letting us try to place the carboy on the top of the case.

BUILD PLAN
How will you make the prototype?
Which resources do you need? Which limitations exist?

Two pieces of laser cutted wood. One with a hole with a smaller diameter than the top of the indentation and one with an exact fit. .

PROTOTYPE
Build and test the prototype. Show it here.

TEST PLAN
Who will see or use the prototype?
How will you test the prototype?

Placing the 3D printed indentation down into the two pieces of wood.

RESULTS
What data will you collect from the test? How?
When is the test successful?

The test is successful, if it is easy to place the indentation in the wood construction

INSIGHTS
Which insights and ideas did the prototyping give you?

It fits! The transition from wood to 3D print is almost not visible.

ACTIONS
Which conclusions and decisions can you make from these insights?

We still need to glue the 3D print to get a secured fit.

EVALUATE TEST
Prototyping effort:
①—②—③—⊗—⑤
Low   High

Success:
①—②—③—④—⊗
Low   High

Is further testing needed?
What changes will you make for the next test?

No. Just some glue

PROTOTYPING PLANNER

PROTOTYPE OF: Pump   **PROTOTYPE BY:** dosLHAMAS   **DATE:** 10/6/21   **VERSION:** P7.0

🔍 THINK

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to test if we are capable of pump water in and out from our brewing mixture.

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability   ⊗ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We want to test the functionallity off the peristaltic pump we bought at:

(https://www.amazon.de/gp/product/B0863PDLLJ/ref=pox_yo_dt_b_asin_title_o00_s01?ie=UTF8&psc=1&fbclid=IwAR1oYePArCW4ojoIMefTvvV9oW2QREWmMDNE74MbQPO57MmnARfd6WSzBvw)

EXPECTED OUTCOME

What is your main objective?

⊗ Exploration   ◯ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

Test if we can move fluid in and out of the carboy to provide a future racking.

⚙️ BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—⊗—④—⑤ High (precise but slow)

What __must__ the prototype be able to do or show?

Move water in and out of the carbot.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

We add some tubes to both ends of the peristaltic pump, fill a bottle with water and place the carboy nearby.

⚖️ TEST

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

The team itself tests the prototype by letting one of the tubes into the water in the bottle, activating the pump and transfer the mixture down into the carboy.

RESULTS

What data will you collect from the test? How?
When is the test successful?

Photos and videos. The prototype is successful if the water passes through the pump.

PROTOTYPE

Build and test the prototype. Show it here.

🔨 ACT (after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

The peristaltic pump works great and allows for a hygienic and effective way of transferring water/fluid.

ACTIONS

Which conclusions and decisions can you make from these insights?

It works!

EVALUATE TEST

Prototyping effort: *Success:*

①—⊗—③—④—⑤   ①—②—③—⊗—⑤
Low   High   Low   High

Is further testing needed?
What changes will you make for the next test?

We need to test the pump together with the filter.

PROTOTYPING PLANNER

PROTOTYPE OF: Pump PROTOTYPE BY: dosLHAMAS DATE: 23/6/21 VERSION: **P7.1**

🔍 THINK   ## ✏️ BUILD   ## ⚖️ TEST   ## 🔨 ACT
(after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to test how much water the pump pumps, to make sure that the fluid gets filtered each time a racking happens.

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability   ✖ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We want to test how effective the peristaltic pump is in combination with the hoses.

EXPECTED OUTCOME

What is your main objective?

◯ Exploration   ✖ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

Hopefully there the racking can happen, without the water getting stuck in a bend hose.

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—✖—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

Move water in and out of the carbot.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

We are testing on our final beta prototype.

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

We pump water from the carboy into a 0,5L bottle, while takeing time for 1 minute.

RESULTS

What data will you collect from the test? How?
When is the test successful?

An approximately measure on how much water the system have strained after 1 min.

PROTOTYPE

Build and test the prototype. Show it here.

INSIGHTS

Which insights and ideas did the prototyping give you?

It works well, and doesn't matter if the tubes are a bit bend - we tried two different versions of bend hose.

ACTIONS

Which conclusions and decisions can you make from these insights?

It works in a sufficient way.

EVALUATE TEST

Prototyping effort:
①—②—③—✖—⑤
Low   High

Success:
①—②—③—④—✖
Low   High

Is further testing needed?
What changes will you make for the next test?

No.

PROTOTYPING PLANNER

PROTOTYPE OF: Bubble counter   PROTOTYPE BY: dosLHAMAS   DATE: 6/6/21   VERSION: P8.1

🔍 THINK

IDEA
What are you developing and which part of your product do you want to prototype?

The bubble counter which will count the amount of bubbles passing throught the airlock.

PURPOSE
Which aspect of your idea are you testing?:

◯ Human / desirability   ☒ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

How do we count bubbles most precisely?

EXPECTED OUTCOME
What is your main objective?

☒ Exploration   ◯ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

Count all bubbles going through the air lock

⚙️ BUILD

WHAT TO BUILD
Level of detail and realism needed:

Low (quick and dirty) ①—②—③—☒—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

Read bubbles going through the airlock and print it in the serial monitor on a pc

BUILD PLAN
How will you make the prototype?
Which resources do you need? Which limitations exist?

Arduino setup with and IR optocoupler connected to an airlock with a tube to blow air through

⚖️ TEST

TEST PLAN
Who will see or use the prototype?
How will you test the prototype?

One person blowing bubbles through the airlock

RESULTS
What data will you collect from the test? How? When is the test successful?

When we count 1 bubble each time 1 set of bubbles passes

PROTOTYPE
Build and test the prototype. Show it here.

⚖️ ACT
(after prototyping)

INSIGHTS
Which insights and ideas did the prototyping give you?

We found that the bubble counter works well, but that it often counts bubbles twice if smaller bubbles appear after each other.

ACTIONS
Which conclusions and decisions can you make from these insights?

We need to insert a delay to avoid counting too many bubbles.

EVALUATE TEST
Prototyping effort:
① ② ☒ ④ ⑤
Low   High
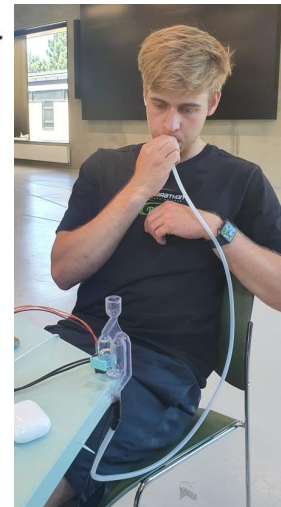
Success:
① ② ☒ ④ ⑤
Low   High

Is further testing needed? What changes will you make for the next test?

A test where we include a delay when connected to the arduino and move it to an ESP

PROTOTYPING PLANNER

PROTOTYPE OF: Bubble counter   **PROTOTYPE BY:** dosLHAMAS   **DATE:** 11/6/21   **VERSION:** P8.1

THINK

IDEA

What are you developing and which part of your product do you want to prototype?

We want to develop a solution for using our ir-sensor that depends on interrupts for detecting when the bubble passes by, feasible on arduino but not yet on a ESP-board

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ⊗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

Being able to run the code on the ESP-8266 board.

EXPECTED OUTCOME

What is your main objective?

○ Exploration   ⊗ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

To be able to use the interrupt function on the esp-8266 board, so we can detect bubbles

BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

What __must__ the prototype be able to do or show?

It must be able to count the bubbles with the ir-sensor

BUILD PLAN

How will you make the prototype? Which resources do you need? Which limitations exist?

ESP-8266, wires, computer, breadbord, ir-sensor - no limitations.

PROTOTYPE

Build and test the prototype. Show it here.

TEST

TEST PLAN

Who will see or use the prototype? How will you test the prototype?

It works if we can detect bubbles

RESULTS

What data will you collect from the test? How? When is the test successful?

The test is successful when we can detect bubbles with the ESP-8266

ACT

(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

The ESP-8266 seems to have some firmware problems that limits it from using interrupt functions which we need for detecting bubbles with the IR-sensor

ACTIONS

Which conclusions and decisions can you make from these insights?

We will need to try another board, that doesn't have the limitations met from the esp-8266.

EVALUATE TEST

Prototyping effort:

①—②—③—④—⊗
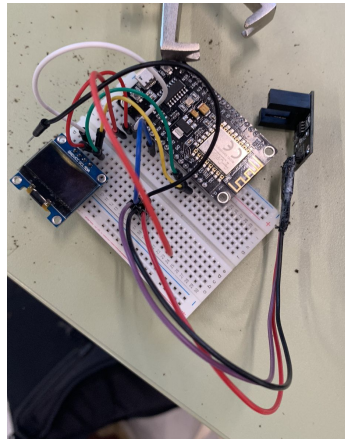Low   High

Success:

⊗—②—③—④—⑤
Low   High

Is further testing needed? What changes will you make for the next test?

Yes, we will try another board - perhaps the esp-32 works.

PROTOTYPING PLANNER

PROTOTYPE OF: Bubble counter   **PROTOTYPE BY:** dosLHAMAS   **DATE:** 11/6/21   **VERSION:** P8.2

🔍 THINK

IDEA

What are you developing and which part of your product do you want to prototype?

We want to develop a solution for using our ir-sensor that depends on interrupts for detecting when the bubble passes by, feaseble on arduino but not yet on a ESP-board

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ⊗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

Run the interrupt function on an ardunio and communicate it to esp board

EXPECTED OUTCOME

What is your main objective?

○ Exploration   ⊗ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

To be able to use the interrupt function on the arduino uno and communicate it to esp-8266

⚙️ BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

What must the prototype be able to do or show?

It must be able to count the bubbles with the ir-sensor

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

ESP-32, wires, computer, breadboard, ir-sensor - no limitations.

⚖️ TEST

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

Team members will view it.

RESULTS

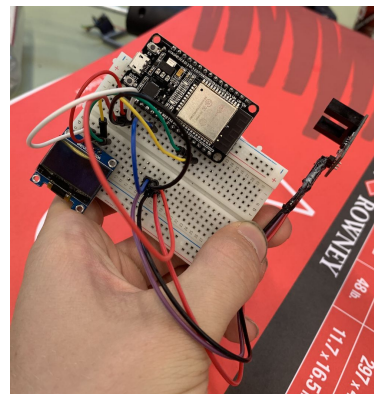*What data will you collect from the test? How?*
When is the test successful?

The test is successful when we can detect bubbles with the ESP-32

PROTOTYPE

Build and test the prototype. Show it here.

⚖️ ACT
(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

Using the ESP-32 for detecting bubbles seems to be just as doomed as using the ESP-8266, same firmware limitations when it comes to interupts

ACTIONS

Which conclusions and decisions can you make from these insights?

We will need to try another board, perhaps more luck with detecting serial communications between arduino and esp boards.

EVALUATE TEST

Prototyping effort:
①—②—③—④—⊗
Low   High

Success:
⊗—②—③—④—⑤
Low   High

Is further testing needed?
What changes will you make for the next test?

Yes, with arduino board and esp

PROTOTYPING PLANNER

PROTOTYPE OF: Bubble counter   **PROTOTYPE BY:** dosLHAMAS   **DATE:** 10/6/21   **VERSION:** P8.3

🔍 THINK

IDEA

What are you developing and which part of your product do you want to prototype?

We want to develop a solution for using our ir-sensor that depends on interrupts for detecting when the bubble passes by, feasible on arduino but not yet on ESP-8266

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ⊗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

Run the interrupt function on an arduino and communicate it to esp board

EXPECTED OUTCOME

What is your main objective?

○ Exploration   ⊗ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

To be able to use the interrupt function on the arduino uno and communicate it to esp-8266

✏️ BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

What __must__ the prototype be able to do or show?

It must be able to count the bubbles with the ir-sensor and communicate it

BUILD PLAN

How will you make the prototype? Which resources do you need? Which limitations exist?

ESP-8266, wires, computer, breadbord, ir-sensor, arduni uno - no limitations.

PROTOTYPE

Build and test the prototype. Show it here.

⚖️ TEST

TEST PLAN

Who will see or use the prototype? How will you test the prototype?

Team members will view it to see if it works.

RESULTS

What data will you collect from the test? How? When is the test successful?

The test is successful when i can detect bubbles with the ESP-8266 combined with the arduino uno

🔨 ACT
(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

Using the arduino to send the bubbles doesn't seem like a feasible option, because it cant send live updates to the esp, without the esp needing interrupts. Also there is problems with sending longer data strings, if we want the esp to do other things than just recive data from arduino
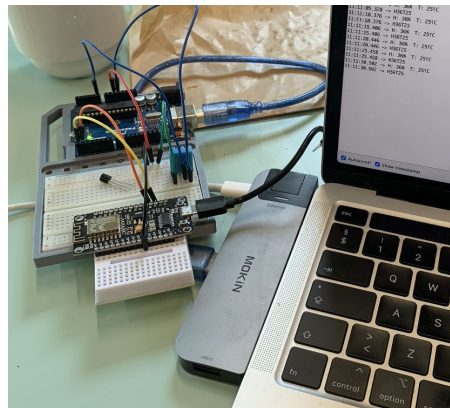
ACTIONS

Which conclusions and decisions can you make from these insights?

We will need to try another thing than using both an arduino and esp.

EVALUATE TEST

Prototyping effort:
①—②—③—④—⊗
Low   High

Success:
⊗—②—③—④—⑤
Low   High

Is further testing needed? What changes will you make for the next test?

Go back and research more on the esp-8266 board.

PROTOTYPING PLANNER

PROTOTYPE OF: Bubble counter **PROTOTYPE BY:** dosLHAMAS **DATE:** 11/6/21 **VERSION:** P8.3

🔍 THINK

IDEA

What are you developing and which part of your product do you want to prototype?

We want to develop a solution for using our ir-sensor that depends on interrupts for detecting when the bubble passes by, feasible on arduino but not yet on a ESP-board

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability   ⊗ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

Going back and researching more on the esp-8266, to run the firmware on that

EXPECTED OUTCOME

What is your main objective?

◯ Exploration   ⊗ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

To be able to use the interrupt function directly on the esp-8266

⚙️✏️ BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—⊗—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

It must be able to count the bubbles with the ir-sensor

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

ESP-8266, wires, computer, breadbord, ir-sensor - no limitations.

PROTOTYPE

Build and test the prototype. Show it here.

⚖️ TEST

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

Team members will see if it works and determine what to do next.

RESULTS

What data will you collect from the test? How? When is the test successful?

The test is successful when we can detect bubbles with the ESP-8266

🔨 ACT

(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

Using the ESP-8266 for detecting bubbles seems to work, if implementing more code telling the esp-8266 how to behave when using interrupt functions

ACTIONS

Which conclusions and decisions can you make from these insights?

No further actions, the code works now, and we can implement the esp-8266 as our only board

EVALUATE TEST

Prototyping effort:
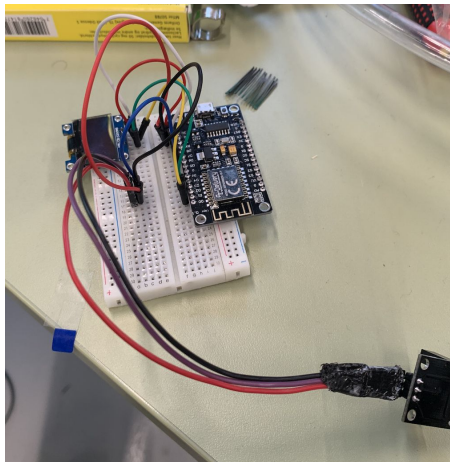
①—②—③—④—⊗ (Low → High)

Success:

⊗—②—③—④—⑤ (Low → High)

Is further testing needed? What changes will you make for the next test?

No, we can implement the rest of the components now.

PROTOTYPING PLANNER

PROTOTYPE OF: Filter   PROTOTYPE BY: dosLHAMAS   DATE: 10/6/21   VERSION: **P9.0**

🔍 THINK

IDEA

What are you developing and which part of your product do you want to prototype?

We would like to test the filtering mechanism allowing us to rack the mixture without using more than one carboy.

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability   ☒ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We want to test the functionallity off the rade strainer we bought at:
https://www.waveinn.com/maritim-fiskeri/nuova-rade-strainer-in-line-with-large-mesh-filter-for-12-mm-hose/137796589/p?fbclid=IwAR0gvI8rVWtLFWS5otRXIGTH3A2QE29Z671iieE4GGxBQ24oRitkeVP5Hgg

EXPECTED OUTCOME

What is your main objective?

☒ Exploration   ◯ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

Test if the fluid easily passes through the strainer and possibly collects some sediment.

⚙️ BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—☒—③—④—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

Let the fluid pass through the strainer.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

Add the strainer to the peristaltic pump connected with some tubes.

⚖️ TEST

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

The team itself places the ends of the tubes down into the carboy and look if fluid is transfered.

RESULTS

What data will you collect from the test? How?
When is the test successful?

We will take photos, videos, and observe what happens.

PROTOTYPE

Build and test the prototype. Show it here.

⚖️ ACT
(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

The strainer easily lets the fluid pass, but we might take into consideration how to make sure that fluid isn't stuck inside the strainer when the racking isn't happening to avoid stagnated yeast cells. Further the filter didn't catch any sediment.

ACTIONS

Which conclusions and decisions can you make from these insights?

We need to figure out a way to empty the strainer and a better filter, but all in all the prototype was a success.

EVALUATE TEST

Prototyping effort:
①—☒—③—④—⑤
Low   High

Success:
①—②—③—☒—⑤
Low   High

Is further testing needed?
What changes will you make for the next test?

We need to add some small-meshed cloth or cheesecloth to actually filter the fluid.

PROTOTYPING PLANNER

PROTOTYPE OF: Filter **PROTOTYPE BY:** dosLHAMAS **DATE:** 14/6/21 **VERSION:** P9.1

🔍 THINK

IDEA

What are you developing and which part of your product do you want to prototype?

We are testing the filter in an actual racking situation.

PURPOSE

Which aspect of your idea are you testing?:

( ) Human / desirability (X) Technical / feasibility ( ) Business / viability

Why are you prototyping? State the question that your prototype should answer.

We would like to test if the cloth works and filters the mixture in an acceptable level.

EXPECTED OUTCOME

What is your main objective?

( ) Exploration (X) Evaluation ( ) Communication

What do you hope to achieve? What will you be able to do after prototyping?

A measure of if the strain filters the juice enough to remove the dead yeast cells and measure how long it takes to rack.

✏️ BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) (1)—(2)—(3)—(X)—(5) High (precise but slow)

*What **must** the prototype be able to do or show?*

It must indicate if the filter actually removes sediment.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

We have combined the filter, the pump and the stirring stick and uses our batch of juice to test the prototype. We have further used some bedding as cloth.

PROTOTYPE

Build and test the prototype. Show it here.

⚖️ TEST

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

We test the prototype by looking at how much juice runs through the tubes and measures how long time it takes before all of the juice has been filtered

RESULTS

What data will you collect from the test? How? When is the test successful?

Qualitative measurements on if the filter works and if the cloth is to small meshed. Time estimate on how long time a racking would take.

⚖️ ACT
(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

We found that the filter is way to small. After 5 minutes the filter was blocked.Otherwise the filtering of the juice worked great. We will take this as a proof of concept. It took a little more than 20 min. to filter it, and 3 times emptying.
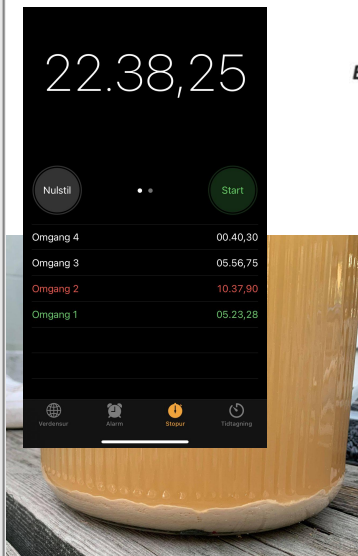
ACTIONS

Which conclusions and decisions can you make from these insights?

We need to create a larger filter and make sure that the tubes are held in place not bending and holding the fluid back.

EVALUATE TEST

Prototyping effort:
(1)—(2)—(3)—(X)—(5)
Low   High

Success:
(1)—(2)—(3)—(X)—(5)
Low   High

Is further testing needed?
What changes will you make for the next test?

A larger 3D printed filter. The filtering time is acceptable, we are however a bit unsure how well it has been filtered and would therefore need to see how it turns out in the end.

PROTOTYPING PLANNER

PROTOTYPE OF: Motor
PROTOTYPE BY: dosLHAMAS
DATE: 11/6/2
VERSION: P10.0

🔍 THINK | ⚙️ BUILD | ⚖️ TEST | ⚖️ ACT (after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We are developing on the electric system for the motors.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability ☒ Technical / feasibility ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

In this prototype/test we want to we see how many amps the motors for the stirring mechanism and the pump is drawing.

EXPECTED OUTCOME

What is your main objective?

○ Exploration ☒ Evaluation ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

To se how many amps the system draws when there is load on.

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—☒—③—④—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

Indicate how many amperes the system draws

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

Setting the two motors in parallel with a multimeter in serial.

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

The team will observe the multimeter

RESULTS

What data will you collect from the test? How?
When is the test successful?

The test is more to collect data, than a pass/no pass test.

PROTOTYPE

Build and test the prototype. Show it here.

INSIGHTS

Which insights and ideas did the prototyping give you?

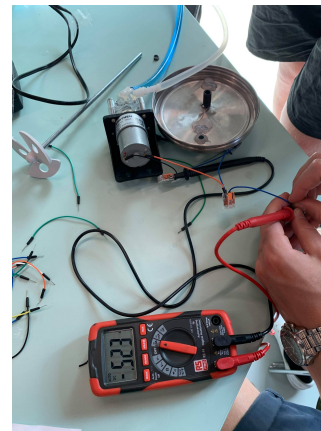The multimeter did show around 0,5 A without load and 0.7 A with load.

ACTIONS

Which conclusions and decisions can you make from these insights?

We can conclude that we have successfully collected the data.

EVALUATE TEST

Prototyping effort:
☒—②—③—④—⑤
Low — High

Success:
①—②—③—☒—⑤
Low — High

Is further testing needed?
What changes will you make for the next test?

No further testing is needed for now.

PROTOTYPING PLANNER

PROTOTYPE OF: Second brewing   PROTOTYPE BY: dosLHAMAS   DATE: 14/6/21   VERSION: **P11.0**

🔍 THINK

IDEA

What are you developing and which part of your product do you want to prototype?

We are brewing the second batch with a different recipe and (less sugar) and "professional" yeast, which was sponsored to us by Chr. Hansen A/S. We want to see if we can track a successful fermentation process.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ⊗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We are testing if the batch will make a fermentation process that we will be able to count bubbles on. We will also know more about brewing wine in the end.

EXPECTED OUTCOME

What is your main objective?

⊗ Exploration   ○ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We are hoping that this recipe will produce a more steady fermentation process that lasts longer.

⚙️ BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—③—④—⊗ High (precise but slow)

What __must__ the prototype be able to do or show?

This batch will produce a steady fermentation process lasting longer than a week until first racking.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

We will use an alternative recipe with 4.5 L apple juice + 1g/5L Chr. Hansen A/S "JAZZ" yeast + 1/10 parts of sugar for a "weaker" wine.

⚖️ TEST

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

The prototype will be made on our business trip and be places at one of the group members house at the end.

RESULTS

What data will you collect from the test? How? When is the test successful?

The team will monitor the juice in the carboy to see if the fermentation process will be successful. After two weeks taste testings will be done every other week.

PROTOTYPE

Build and test the prototype. Show it here.

Compared to batch 1 (left)   After one day

⚖️ ACT

(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

We found out that we probably need to mix the sugar with a bit of water at first to dissolve the sugar more easily. The batch was however bubbling and fermenting after 12 hours, which we will keep monitoring.

ACTIONS

Which conclusions and decisions can you make from these insights?

Based on the test, we found that the fermentation was more steady for a longer time when this amount of sugar was added.

EVALUATE TEST

Prototyping effort: *Success:*

①—②—③—⊗—⑤   ①—②—③—④—⊗
Low   High   Low   High

Is further testing needed? What changes will you make for the next test?

We will make a third batch to hold data up against this batch to compare the fermentation processes.

PROTOTYPING PLANNER

PROTOTYPE OF: Tray
PROTOTYPE BY: dosLHAMAS
DATE: 16/6/21
VERSION: P12.0

🔍 THINK   ✏️ BUILD   ⚖️ TEST   ⚖️ ACT (after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

We want to develop a tray that allows the user to pull out the filter and clean if after a racking.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ⊗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We want to test how large the tray needs to be and how large it allows for the filter itself to be, since we found that was to little.

EXPECTED OUTCOME

What is your main objective?

⊗ Exploration   ○ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We want to achieve some of the measurements to implement into our final beta prototype.

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—⊗—④—⑤ High (precise but slow)

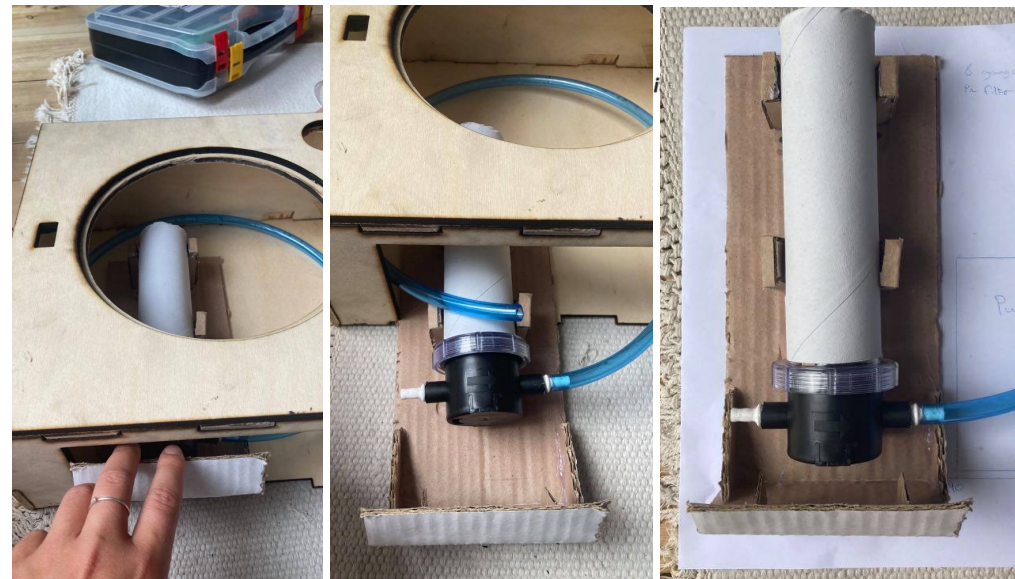*What **must** the prototype be able to do or show?*

How to place the filter and if it is possible to empty/clean it in an effective manner.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

We will build our first prototype in cardboard to get a quick low fidelity prototype, since the most important feature is the measurements.

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

We will take pictures and measure the dimensions.

RESULTS

What data will you collect from the test? How?
When is the test successful?

Measurements. It should be as small as possible, while still allowing a larger filter. It should further be easy to remove the filter when it has to be emptied.

INSIGHTS

Which insights and ideas did the prototyping give you?

We need to make some other fittings for the tubes, angeling them down along the filter.

ACTIONS

Which conclusions and decisions can you make from these insights?

It was difficult to pull out the tray, since the tubes are difficult to bend and therefore blocked the tray.

EVALUATE TEST

Prototyping effort:
①—②—⊗—④—⑤
Low   High

Success:
①—②—③—⊗—⑤
Low   High

Is further testing needed?
What changes will you make for the next test?

Fittings bending the tubes.

PROTOTYPING PLANNER

PROTOTYPE OF: Tray

PROTOTYPE BY: dosLHAMAS

DATE: 17/6/21

VERSION: P12.2

THINK

IDEA

What are you developing and which part of your product do you want to prototype?

We want to develop a tray that allows the user to pull out the filter and clean if after a reracking. The tray holds 2 tubes. The tubes needs to be flexible or have extra length for when opening the tray.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ⊗ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

We want to find a way to store the extra length of the tubes, without them bending resulting in less flow of water inside of them.

EXPECTED OUTCOME

What is your main objective?

⊗ Exploration   ○ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

A nice way of storing the tubes both functional and visual

BUILD

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—⊗—④—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

Indicate if the functionality would work in an later prototype. If the tubes get stuck and blocks the tray.

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

Find the right thickness/bendability of the tubes. Lock them in position with 3D prints and build a tray in cardboard.

PROTOTYPE

Build and test the prototype. Show it here.

TEST

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

Try to pull out the cardboard tray and test if the tubes follows and if it is possible to push it back in place.

RESULTS

What data will you collect from the test? How? When is the test successful?

If the tubes allows the tray to be pulled out around 8 cm.

ACT
(after prototyping)

INSIGHTS

Which insights and ideas did the prototyping give you?

If we place the tubes on each side of the tray, the direction of the end tube pointing directly to the filter fittings allows for an easier movement.

ACTIONS

Which conclusions and decisions can you make from these insights?

We need to place the tubes strategically to make sure that we end up bending the tubes as little as possible.

EVALUATE TEST

Prototyping effort:

①—②—⊗—④—⑤
Low   High

Success:

①—②—③—⊗—⑤
Low   High

Is further testing needed?
What changes will you make for the next test?

A test of the whole bottom of the case, with the different necessary tubes and their placement.

PROTOTYPING PLANNER

PROTOTYPE OF: Stirring stick mount   PROTOTYPE BY: dosLHAMAS   DATE: 15/6/21   VERSION: **P13.0**

🔍 THINK | ⚙️ BUILD | ⚖️ TEST | 🔨 ACT (after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

An attachment mechanism of the stirring stick to the motor shaft.

PURPOSE

Which aspect of your idea are you testing?:

○ Human / desirability   ☒ Technical / feasibility   ○ Business / viability

Why are you prototyping? State the question that your prototype should answer.

How to mount the stirring stick, so it is detachable while being rigid and well secured

EXPECTED OUTCOME

What is your main objective?

☒ Exploration   ○ Evaluation   ○ Communication

What do you hope to achieve? What will you be able to do after prototyping?

Make a simple yet effective mounting mechanism

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—☒—④—⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

A part that connects two rods so a rotating movement can be transferred from one to the other

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

3D print

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

dosLHAMAS.

RESULTS

What data will you collect from the test? How? When is the test successful?

Successful when the expected outcome is achieved

PROTOTYPE

Build and test the prototype. Show it here.

v0   v1   v2

INSIGHTS

Which insights and ideas did the prototyping give you?

A bayonet lock is simple and allows for both a secure fit, while allowing for detachment, if cleaning is needed etc.

ACTIONS

Which conclusions and decisions can you make from these insights?

We made iterations until we found the most secure fit, since the tolerances of the bayonet lock decides the stability of the whisk.

EVALUATE TEST

Prototyping effort:
①—☒—③—④—⑤
Low   High

Success:
①—②—③—☒—⑤
Low   High

Is further testing needed? What changes will you make for the next test?
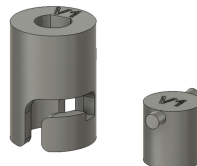
The second iteration of the bayonet lock works well

PROTOTYPING PLANNER

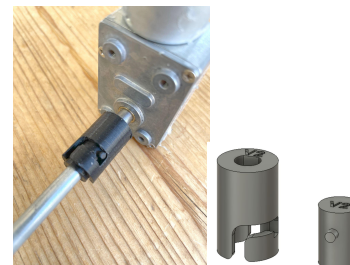**PROTOTYPE OF:** Motor control   **PROTOTYPE BY:** dosLHAMAS   **DATE:** X/6/21   **VERSION:** P14

🔍 THINK

IDEA
What are you developing and which part of your product do you want to prototype?

We want the esp-board to activate two relays in order to control our two motors.

PURPOSE
Which aspect of your idea are you testing?:

◯ Human / desirability   ⊗ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

How to power and activate to relays from an esp-8266 board

EXPECTED OUTCOME
What is your main objective?

◯ Exploration   ⊗ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

We hope that we are able to control two relays from the ESP-8266 board.

⚙️ BUILD

WHAT TO BUILD
Level of detail and realism needed:

Low (quick and dirty) ①─②─③─⊗─⑤ High (precise but slow)

*What **must** the prototype be able to do or show?*

Control two relays.

BUILD PLAN
How will you make the prototype?
Which resources do you need? Which limitations exist?

ESP-8266, wires, computer, breadbord, ir-sensor, relays - no limitations.

PROTOTYPE
Build and test the prototype. Show it here.

⚖️ TEST

TEST PLAN
Who will see or use the prototype?
How will you test the prototype?

The team will view the test and determine what to do after testing, if it doesn't suceed.

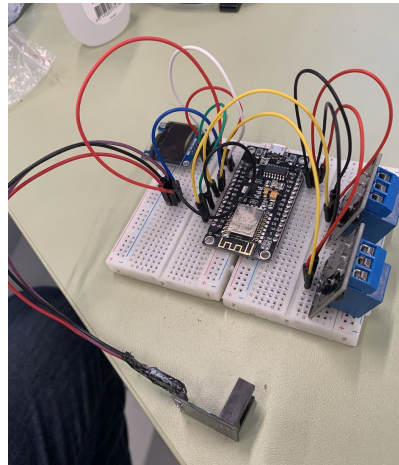### RESULTS
What data will you collect from the test? How?
When is the test successful?

When we can control two relays, the test will be succesful.

⚖️ ACT
(after prototyping)

INSIGHTS
Which insights and ideas did the prototyping give you?

The esp-boards we are using are having too low a signal current, making it impossible to trigger the relays, also the activators in the relays need 5v

ACTIONS
Which conclusions and decisions can you make from these insights?

We will need to buy esp's of higher quality, and find a way to send 5v to the relays.

EVALUATE TEST
Prototyping effort:
Low ①─②─③─④─⊗ High

Success:
Low ①─②─③─④─⊗ High

Is further testing needed?
What changes will you make for the next test?

No further testing is needed.

PROTOTYPING PLANNER

PROTOTYPE OF: Electronics box **PROTOTYPE BY:** dosLHAMAS **DATE:** 14/6/21 **VERSION:** P15

🔍 THINK

⚙️ BUILD

⚖️ TEST

⚖️ ACT
(after prototyping)

IDEA

What are you developing and which part of your product do you want to prototype?

Make a box for the Electronics

PURPOSE

Which aspect of your idea are you testing?:

◯ Human / desirability   ⊗ Technical / feasibility   ◯ Business / viability

Why are you prototyping? State the question that your prototype should answer.

The whole box with room for PCB, esp8266, two relays and wires including a removable lid

EXPECTED OUTCOME

What is your main objective?

⊗ Exploration   ◯ Evaluation   ◯ Communication

What do you hope to achieve? What will you be able to do after prototyping?

It should be small and easy to open/close as Well as having some cutouts for wires/USB port

WHAT TO BUILD

Level of detail and realism needed:

Low (quick and dirty) ①—②—⊗—④—⑤ High (precise but slow)

What __must__ the prototype be able to do or show?

Must be able to contain the things mentioned

BUILD PLAN

How will you make the prototype?
Which resources do you need? Which limitations exist?

3D printed parts (lid screwed on)

TEST PLAN

Who will see or use the prototype?
How will you test the prototype?

The team members.

RESULTS

What data will you collect from the test? How? When is the test successful?

Successful when everything fits nicely Inside and we Can plug a usb to the esp and see if it's powered without opening the box

PROTOTYPE

Build and test the prototype. Show it here.

V15.1   V15.2   V15.3
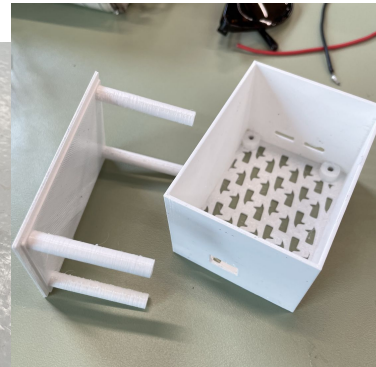
INSIGHTS

Which insights and ideas did the prototyping give you?

After a few iterations everything turned out as expected.

ACTIONS

Which conclusions and decisions can you make from these insights?

We will use the latest iteration in our beta prototype

EVALUATE TEST

Prototyping effort:
①—②—⊗—④—⑤
Low   High

Success:
①—②—③—④—⊗
Low   High

Is further testing needed?
What changes will you make for the next test?

No further test needed unless we find out that the box doesnt fit Inside the prototype alting with the other components