RE: ANU Student Project Collaboration

Andre Olivier

Fri 4/10/2019 1:11 PM

To: Anthony Boarer <anthony@keitheng.com.au>
Cc: Derek Tan <u6391332@anu.edu.au>; Minghui Zhang <u6065938@anu.edu.au>; Jiaying Ying <u6034298@anu.edu.au>; Martin Amidy <martin.amidy@anu.edu.au>

Hey Anthony

Thanks for the feedback, and sorry if there wasn't enough detail, ill try to rectify that in this email. One thing I don't think I covered well (and will consequently be adding) is a proper description of our rendering process.

1. Insects are moved into the Cooker (Component 1) post death, their moisture content at this point being 70-75% water, and 20-25% dry matter.
2. I used the term "batch cooker" and meant it as an adjective of the continuous cooker, rather than a separate component, sorry if I wasn't clear enough. It cooks in "batches", rather than the material moving continuously through. So essentially for the first 2 hours, it is only the continuous cooker working, evaporating the water into the contained chamber. After this the chamber is opened to the rest of the system, the vapour being extracted as the material is then "dried" for 3 hours. This is how the manufacturer in China who we are sourcing the cooker from, explained the process, with the dimensions provided as those in the pdf.
3. Once dry, the material is then moved through the Screw conveyer (Component 2) into the Fat press (Component 3), where the tallow and meal is separated, moving into storage containers outside of the crates themselves. Below is a link to our repository, if you scroll down the page you will see clearer overviews of our process and YouTube links to the 3-D components. In retrospect I should have sent this link before, my apologies.
    a. https://github.com/JessYJY/InsectFarming
4. During the drying process, the vapour travels through the "dust collector" (Component 6), which essentially removes any impurities or residual particles from the vapour, before it moves into the Condenser (Component 7).
5. The Condenser then runs cooler, outside water in pipes through the chamber, to condense the much hotter vapour coming in from the dust collector and continuous cooker.
6. The "waste water" (condensed vapour from cooker) then flows out of the system (probably into an outside tank nearby) to be treated separately, and the cooling water that helped in the condensing process, flows into the Cooling Tower (Component 8) and then into the water Storage tank (Component 9).
7. The Vacuum pump (Component 4), forces the vapour out of the cooker and into the rest of the system.

I hope this clears up most of the points you listed. With regards to your other points:

- **Possible use of Centrifuge**: This was one of our earlier explorations, and were advised that a fat press is sufficient as the grade of oil that wish to extract is not very high. However, we will definitely make note of this in our final report as a possible area to further explore.
- **Pumps and plate heat exchanger**: Hopefully the process above addresses this concern, if not some clarification on what their purpose would be would be much appreciated.
- **Interconnecting equipment**: We as a group were tasked more with the conceptual design and so were given leeway in regards to the specifics of how the equipment pieces would be connected up. We have focused mainly on the main components, and assumed the rest of the interconnecting equipment is detail for a future project, but feasible within our overall design. If you do not think this is a fair assumption then we will definitely make note of that in our final submission as well.

Hopefully this isn't too much detail (or too little) and addresses some of your concerns. Overall thanks again for taking time to give us some really good feedback.

Cheers

Insect farming group

From: Anthony Boarer
Sent: Friday, 4 October 2019 8:48 AM
Subject: RE: ANU Student Project Collaboration

Hello Andre,
I have had a read through your project summary and have the following comments:

- Firstly as suppliers of commercial rendering equipment our smallest continuous plant processes 3.5 ton per hour so as you can imagine the equipment is quite large so the equipment you reference is not familiar to us and the boxes shown on your design schematic don't show us enough detail to properly comment on the layout.
- You mention a continuous cooker and also a batch cooker, which one is it?
- You have a fat press in the component listing, I would think a centrifuge would be more suitable for this process.
- I don't have any figures on the moisture content of the Larvae however lets say that they are 60% moisture, this equates to 600kg of moisture (heat vapour at 100 deg C) to the condenser. What is happening to this 600kg of condensate?
- You are missing pumps and a plate heat exchanger on your waste heat side.
- What is the dust collector doing? There shouldn't be any dust in the vapour going to the condenser.
- How are the larvae being fed into the cooker? How are the finished products being collected?
- There equipment to interconnect the main pieces of equipment apart from a hugely oversized screw conveyor are not shown.

To sum up, with the limited amount of detail that was provided I would have to say that there is a lot of holes in this process and at this stage I wouldn't be comfortable in saying that you will have a lot of success as it stands, although in saying that I am in no means an expert in larvae processing.

If you would like to provide a bit more detail I may be able to comment further.

I hope this helps

Best Regards

KEITH

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Keith Engineering (Australia)

Project Manager

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From: Andre Olivier <u5807603@anu.edu.au>
Sent: Thursday, 3 October 2019 3:00 PM
To: Anthony Boarer <anthony@keitheng.com.au>
Cc: Derek Tan <u6391332@anu.edu.au>; Minghui Zhang <u6065938@anu.edu.au>; Jiaying Ying <u6034298@anu.edu.au>; Martin Amidy <martin.amidy@anu.edu.au>
Subject: RE: ANU Student Project Collaboration

Hello Anthony

Thank you so much for getting back to us and offering your advice. Attached is a pdf summary of the project and preliminary design, up to date with all current information. Any feedback would be much appreciated, and your help will of course be thanked and aknowleged in the final project submission.

Thanks Again

Andre

From: Anthony Boarer <anthony@keitheng.com.au>
Sent: Wednesday, October 2, 2019 5:06:53 PM
To: Andre Olivier <u5807603@anu.edu.au>
Cc: Derek Tan <u6391332@anu.edu.au>; Jiaying Ying <u6034298@anu.edu.au>; Minghui Zhang <u6065938@anu.edu.au>; Ankur Sharma <ankur.sharma@anu.edu.au>; Martin Amidy <martin.amidy@anu.edu.au>; Derek Henderson <derek@keitheng.com.au>; Marty Pope <marty@keitheng.com.au>; David Pinches <dpinches@pinches.com.au>
Subject: RE: ANU Student Project Collaboration

Hello Andre,
Thanks for your email, please send us the information and we will have a look at it for you. Hopefully we will be able to provide some valuable feedback.

Best Regards

KEITH

Anthony Boarer
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Project Manager

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From: Keith Engineering <admin@keitheng.com.au>
Sent: Monday, 30 September 2019 3:37 PM

To: Marty Pope <marty@keitheng.com.au>; Derek Henderson <derek@keitheng.com.au>; Anthony Boarer <anthony@keitheng.com.au>
Subject: FW: ANU Student Project Collaboration

From: Andre Olivier [mailto:u5807603@anu.edu.au]
Sent: Monday, 30 September 2019 3:23 PM
To: Keith Engineering <admin@keitheng.com.au>
Cc: Derek Tan <u6391332@anu.edu.au>; Minghui Zhang <u6065938@anu.edu.au>; Jiaying Ying <u6034298@anu.edu.au>; Ankur Sharma <ankur.sharma@anu.edu.au>; Martin Amidy <martin.amidy@anu.edu.au>
Subject: ANU Student Project Collaboration

Dear Keith Engineering

My name is Andre Olivier and I represent a group of students from the Australian National University. We are all currently involved in a final year Engineering course that seeks to give students real world experience by partnering them with local companies, and allowing them the opportunity to work on and complete projects proposed by the industry partners.

Our group has been partnering with the Canberra based company Goterra (https://www.goterra.com.au/), who seek to perform organic waste management through the use of mobile insect farming modules. The project we have been working on with them, has been looking at the feasibility of developing a modular and mobile rendering plant that would either travel with the farming module, or be near location, but transportable if needed.

Not being familiar with the animal rendering plants in general, the bulk of our time has been understanding the process, contacting manufacturers of the various pieces of equipment, and working towards a design that would be appropriate for our projects' goals (that is the rendering of Black Soldier Fly larvae into meal and tallow).

Currently nearing the final stages of the project, we now have a preliminary design that we would really like to run past experts in the industry to provide comment on the technical feasibility of the design. If you have time available before 4th of Oct, if we were to send you our design, would you be willing to briefly have a look, just providing some feedback as to whether or not it is generally feasible, or if the assumptions we've made with regards to the equipment and the process overall are incorrect. Any feedback would be greatly appreciated.

Look forward to hearing from you.

ANU Insect Farming Group