Meeting 6

Date	Tuesday, 16 February 2021
Attendees	Dr Ali Yetisen (AY), Marie Jones (MJ), Mathusan Kandiah (MK), Yuxin Liu (YL), Helen Ogbobi (HO), Wei Ooi (WO), Andreas Richardson (AR), Stephen Tan (SN), Sathurthini Thurairatnam (ST), Mingchuan Zheng (MZ), Antonia Feilden (AF), Abdullah Ahmed (AA)
Apologies	Zong Lee (ZL), Mustafa Naser (MN)
Chair	Stephen Tan (SN)
Secretary	Sathurthini Thurairatnam (ST)

Minutes

Item	Discussion
Effective Working	**Working Between Teams** SN: Actions involving multiple teams were recorded clearly. Team uses the dependencies excel sheet well. There has been improvement in teamwork. MJ: Organised an event to have a games night. SN: Anonymous menti metre poll is tried out to give feedbacks as a team. AF: Get a detailed mark scheme for the final report as guidance **Feedback for Improvement (anonymous from menti poll)** Safety and business team only have one person working on it Last minute major changes Everyone needs to keep on the same page Record daily meetings Daily meetings are too long and go over given allocated time More social events needed Big picture of the project is not understood, different teams not aware what another team are doing Information transfer between teams need improvements SN: Discuss these feedbacks in next daily meeting MJ: People have different understanding of the same situation. Any tips to avoid this problem. AY: Good idea to write down the decisions and send to everyone straight way. Write down actions and who is going to do it. Stick with the timeline, it is important to keep daily meetings at a strict time. AF: Using PowerPoint as whiteboard to share ideas can be helpful. Visualise the idea and decision you are trying to make present to team to get feedback from the team.
Team Updates	**Synthesis** YL: Modularity can come up in 3 different ways: first we are able to switch in 3 products, based on customer demand we can produce different amount of the 3 products or we could look into producing different purities based on the customer's demand. MJ: Confirmed with Klaus, since we are using zeolite catalyst instead of liquid catalyst it is unlikely NOx will be produced. We are going to

consider a worst-case scenario from environmental and safety point of view and not synthesis point of view.
MJ: Sensitivity analysis done on AHP/TOPSIS
MJ: Need to write up report and do heat integration
MJ: Any comments on this Antonia, Abdullah?
AF: Have you looked at how long catalyst last and waste, looking at catalyst suppliers etc.
MJ: Brief look at catalyst was done but need more depth look into it.
AF: Are you going to do pinch point or use GAMS for heat integration?
MJ: Look at aspen as a preliminary and then model with heat exchanger
AF: Has anyone been assigned to check aspen, quality control
SN: We will assign someone

Reactor
AR: Did feasibility calculation on nitration packed bed reactor but pressure drop is significant, so we are going to try a coated wall reactor with a more sensible pressure drop.
AR: Next step is to double check we can achieve desired reactor performance in a coated wall reactor. Update the PFD with any new equipment before the meeting on Thursday for Safety team.
AR: Future doing detailed modelling and mechanical design and coating could be structured as flow plate for example.
MJ: Has heat transfer been considered and how you would cool it?
AR: Current challenge is finalising what the reactor is going to be before Thursday.
AA: Try reaching out to vendors. Corning website has useful materials available, will send email address of corning.
AY: Why is it 200 tubes and 200 channels?
AR: Jason said 100 is about the maximum we can practically fabricate.
AY: Have a basic analysis of why you have chosen this.
AN: Make sure efficient mixing since nitration can become biphasic. In a paper flow plates were scaled out instead of up, more plates were put in series which is not good practice in industry. If one plate goes then the whole unit does not work.
AR: Having many plates in parallel will be ideal but there is challenge of distributing flow across the plates.
AN: Pressure drop for coated flow one because it is porous
AR: Coated wall has negligible pressure drop assumption was made
AN: One way to estimate if system can withhold the heat is if we know the conversion, we can say worst case scenario assuming 100 % conversion and times by enthalpy, if we know the volume of the channel and material we can do estimate to see if it withstands the heat.

Separation
MK: Selected the unit we want to design, SSHE crystalliser and design the wash column. We have someone working on the volume for heat exchanger, someone working on heat transfer calculation and some people working on wash column design.
MK: We will be doing the mechanical design, COMSOL and report writing.

MZ: We also consulted Professor Jerry Heng for some information and emailed Professor Constantino about gPROMS for the crystalliser.
AY: How do you feel about contacting professors are they helpful?
MK: Depends on what question we ask, need to be specific with what we ask.

EHS

HO: Written on law and regulations, plant wide risk assessment is being done currently which will be done by next week. Meeting with Chris and Antonia this Thursday about PFD and HAZOP activity is on Friday. We need to start this by the first week of March.
HO: Research into material selection for the mechanical integrity and try and start looking at waste management. Once whole design is finalised, I can go over waste discharge with Chris properly and get rest of report writing done by week 9.
SN: Have we overlooked anything on safety environment side?
AY: Did Chris give a list of what we need to do?
AY: In terms of some kind of checklist that we will need to address
HO: last week in meeting went over mechanical integrity. Everything Chris wants included in the report has been included in his slide. Chris wants us to get the core things done before we add any extras.
AY: Have the additional product, side products from the process been considered? Has any type of recycling process been incorporated, any thoughts into that?
HO: Planning on selling nitric acid, for interim report we will look at best available technique for waste products which most are VOCs. The NOx needs to be considered, the emission, there is a well-established technique on how to deal with it.
AY: Recycling and waste management can be very costly process so need to incorporate this into the budget as well.
AN: As part of the risk assessment might be worth considering external risk, things beyond our control. In America the hurricane impacted their plant so a quick discussion on whether it is prone to environmental disasters.
AY: How many ISO certification are we planning to acquire?
AR: Business might look into the ISO certifications.
AY: If standard is not met, we cannot sell our product in the market.
AY: Need to get certification for 2 things, certification required for entire company, organisational structure, each process and quality control. Without certificate it cannot be sold to anyone. ISO 9001 is the main one, but we might need to have a specific one that applies to each division. Quality control system is essential for any organisation. Waste management, process design and control systems are included in the ISO standard.
SN: We will take a look at the standard for that, this could be related to the control team as well.

Control

SN: We are still waiting on PFD to be finalised, not much has been done on control so far. We will be designing specific control loops for subsection in the plant. We will be making standard operating procedure for start-up and shut down of the plant. We will do a brief

	overview or survey of the plant to look at what parameters are important for us to control. Last week is to write up the report. **Business** MJ: MN is mostly working on the qualitative content and is preparing the financial template.
Overall Project Timeline	**Team Allocations** SN: Show how we have distributed our manpower for the two weeks, planning to review team after we come to the end of Week 6. MJ: People will be reallocated as we progress **Major Deadlines** SN: Clear timeline for the project was made. Most team aim to finish off detailed calculation by Week 8. Week 9 will mostly be report writing. AY: Start writing the report now, write as much as you can. Designate someone who can work on the report now. AR: Some sections are being written as we go MJ: Designing should be finalised by Week 8, and we can fully focus on the report writing in Week 9. AY: Someone needs to be there to inform the team on how much work needs to be done on specific section AR: Each team looked through past report and came up with a guideline on how much time we need to allocate and what needs to be done. AY: Avoid doing things last minute, do everything in advance. **Daily Mentimeter** SN: We have done a daily poll on how people are feeling. It is a good way to track our general mood in the group. Hoping to keep this going. Over the past few days, you can see the data. AY: Social events provide clue about how people communicate, establish an understanding of how to approach people and communicate effectively. Ask your group mate how they would like to be communicated with and how often they would like to receive the information. Use social events to understand teammates to communicate more effectively. Important to exchange information in an informal environment. SN: Try to make use of our first social night tonight
Any Feedback	AY: Management skills are essential and conflict resolution, try to soften the environment sometimes to not have too much tension in the group.
Next Meeting	12 pm on 23 Feb

Actions

Description	Assignee	Due
General		
- Check detailed mark scheme of the final report for guidance	All	23 Feb
- Start writing the report for each section as we progress	All	Ongoing
- Assign someone for quality checking Aspen	All	17 Feb

Synthesis		
- Write up the report	MJ	23 Feb
- Finish Sensitivity analysis	MJ	16 Feb
- Finish Aspen	YL	17 Feb
- Finish PFD	YL, AR	18 Feb
- Do heat integration	MJ, YL	05 Mar
Reactor		
- Complete first-approximation CWR modelling	ZL, WO, AR	17 Feb
- Detailed CWR modelling	ZL, WO, AR	Wk 8/9
- CWR mechanical design	ZL, WO, AR	Wk 9/10
- Review manufacturers suggested by AF	ZL, WO, AR	23 Feb
- Write up reactors not being modelled in detail	ZL, WO, AR	21 Feb
Separation		
- Determine SSHE crystalliser volume	MZ	23 Feb
- Do heat transfer calculations for SSHE	MK	23 Feb
- Finish wash column design	ST, SN	23 Feb
Control		
- Select 3 potential subsections to control with Safety team	SN, MJ, HO	17 Feb
- Decide 1 subsection to do control analysis	SN, MJ, HO	18 Feb
- Start plant-wide control survey	SN, MJ	22 Feb
Safety		
- Finished plant wide risk assessment	HO	22 Feb
- Look into waste management and environmental lSO Standards	HO	22 Feb
- Consider locational/climate related risks that could impact plant	HO	28 Feb
Business		
- Coordinate production/sales strategy with synthesis and safety teams	MN, HO, MJ	19 Feb
- Complete qualitative work	MN	24 Feb
- Look into valorising waste streams	MN	24 Feb
- Create financial templates	MN	28 Feb

Approval

Ali Kemal Yetisen	Stephen Tan (Feb 17, 2021 11:00 GMT)	Sathu Thurai (Feb 17, 2021 11:01 GMT)
Dr Ali Yetisen *Facilitator*	Stephan Tan *Chair*	Sathurthini Thurairatnam *Secretary*

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