DESIGN FOR our future

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT

Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name	Mane
initials	S
given name	Sanket
student number	4697472
street & no.	Rotterdamseweg 139
zipcode & city	2628 AL Delft
country	The Netherlands
phone	+31647620396
email	s.n.mane@student.tudelft.nl

Your master programme (only select the options that apply to you):

IDE master(s): ★ IPD ( ) DfI ( ) SPD

2nd non-IDE master:

individual programme: - - (give date of approval)

honours programme: ( ) Honours Programme Master

specialisation / annotation: ( ) Medisign

( ) Tech. in Sustainable Design

( ) Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Arjen Jansen — dept. / section: DE-PAD Product Arch.

** mentor: Lennart Teunissen — dept. / section: DE-Emerging Material

2nd mentor: Rein Bokslag

organisation: Inuteq

city: Deventer — country: The Netherlands

comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Arjen Jansen date - - signature

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: _____ EC

Of which, taking the conditional requirements into account, can be part of the exam programme _____ EC

List of electives obtained before the third semester without approval of the BoE

YES all 1st year master courses passed

NO missing 1st year master courses are:

name date - - signature

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: APPROVED NOT APPROVED

Procedure: APPROVED NOT APPROVED

comments

name date - - signature

Initials & Name S Mane Student number 4697472

Title of Project Polyvinyl Alcohol Integrated Shirts for Dutch Olympic cyclist

Polyvinyl Alcohol Integrated Shirts for Dutch Olympic cyclist

project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 11 - 03 - 2019 06 - 08 - 2019 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

The Olympic Games in Tokyo are expected to be the most challenging Olympics yet due to the extreme weather conditions: around 33°C in combination with a very high humidity. Participation in sports in this climate is intense for the body because the body temperature rises faster than normal. This affects the performance of the athletes and may lead to serious health problems. To prepare the elite athletes optimally for this, the Thermo Tokyo project has been set up. The goal of this project is to minimize performance loss and improve the performance of athletes in warm and humid Tokyo.

At TU Delft, the project is conducted by Emerging Materials group of IDE, where researchers will work together with students to design cooling clothing and test for effectiveness.

Other stakeholders involved in the Thermo Tokyo project are Radboud University, VU University Amsterdam, Arnhem and Nijmegen University of Applied Sciences, NOC * NSF and Sports Center Papendal and Inuteq

Inuteq is the manufacturer of cooling products like cooling vests for motorcyclists, a cooling crown pad (which is worn under safety helmet), body cooling towels, cooling wristbands, cooling ties and others. The manufactured products are based on one of the four technologies: Inuteq PAC®, INUTEQ-PVA®, INUTEQ-H2O® and INUTEQ-DRY®. The project will focus on INUTEQ-PVA® technology.

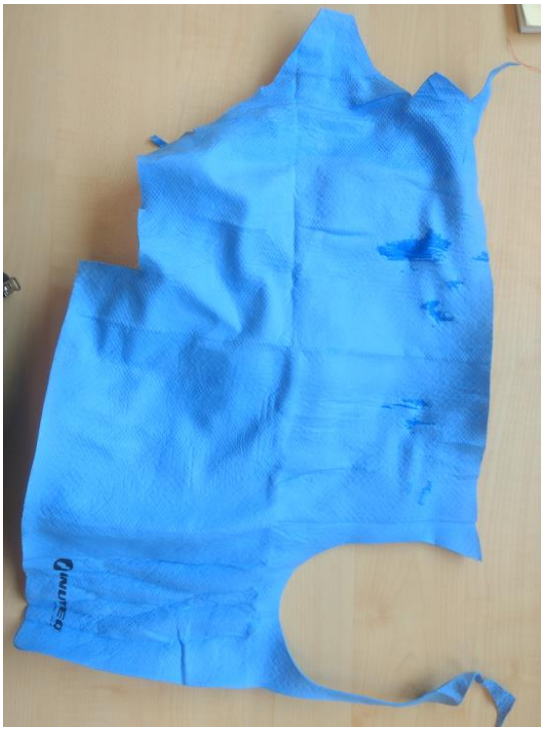
This technology is based on a few principles. It uses Polyvinyl Alcohol (PVA) as its main material. PVA is a material that is super absorbant, when inserted in water it forms hydrogen bond with water molecules because of which it can retain water for a long period of time. The latent heat of evaporation of the water keeps the body cool by absorbing heat from the body and converting water into vapors and thus provide cooling for much longer than standard fabrics. PVA materials are great options for activities where one will be exposed to the heat for an extended period of time. Inuteq has developed a towel with this material previously. If the PVA towel starts to get warm or dry out, one can simply wet it, wring it out, and wave it in the air to re-activate the cooling properties.

If PVA becomes dry, it will become stiff which is uncomfortable to wear. This is one of the limitations that will be addressed over the course of this project.

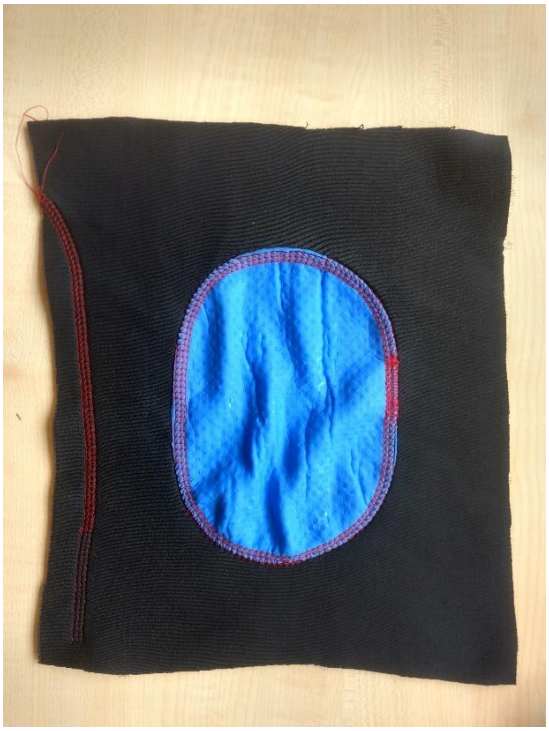
Current cooling shirts (fig 2) available for athletes are made from INUTEQ PVA or H2O technology. The cooling shirts made from PVA materials were tested during the Qatar World Championship 2016 but the cooling effect lasted only for 20 min whereas the race can last for 5-6 hrs. INUTEQ H2O technology is another options athletes can choose from, although the duration of the cooling effect is longer, the cooling effect itself is less than PVA technology and therefore not preferred. Weather also influences the performance of the PVA material. The humid weather in Tokyo will prevent the evaporation of water which will affect the performance of the PVA material and reduce its cooling efficiency.

space available for images / figures on next page

introduction (continued): space for images



Dried PVA (Stiff)



Wet PVA (Flexible)

image / figure 1: PVA (blue material) dried and wet.

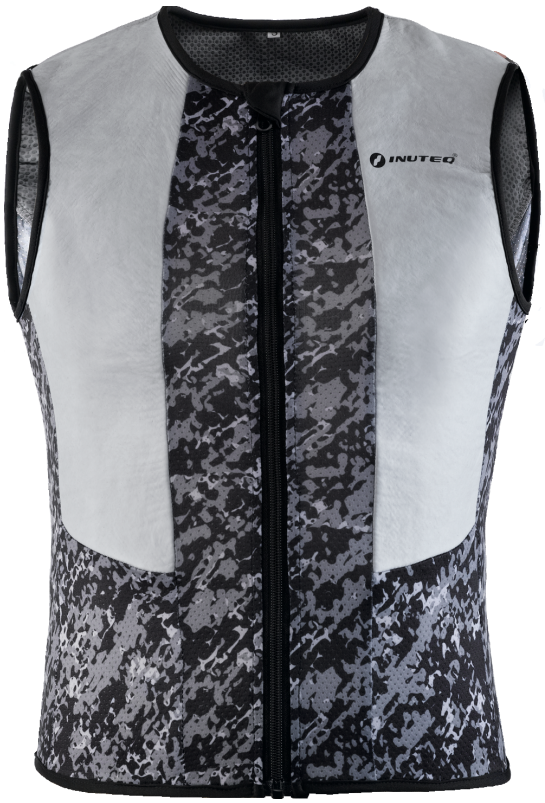


image / figure 2: Current PVA shirt

Initials & Name S Mane Student number 4697472

Title of Project Polyvinyl Alcohol Integrated Shirts for Dutch Olympic cyclist

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

In the graduation project, three main issues need to be addressed:
1. Cooling effect needs to last longer.
The cycling race takes almost 5-6 hrs to complete however the cooling effect from the PVA fabrics lasts only for 20 min. An innovative solution is needed to increase the cooling effect time with the PVA fabrics.

2. Rigidity of dry PVA material
Reactivating the PVA material during the race is possible but is not preferred by the athletes. It takes up time and athletes may lose focus off the race. Hence a solution has to be found which keeps the shirt comfortable to wear by preventing the PVA material from becoming rigid.

3. Non-efficient PVA placement.
The current PVA shirt's composition includes PVA fabric and knitted, breathable Polyester eyelet fabric. The PVA is present from the shoulder to the belly. The current shirt is designed by taking the advice of athletes or by following the design of big companies (like Adidas) which at times blocks the area of skin, where natural evaporation is possible, which reduces body's cooling efficiency. Therefore a new design is needed which efficiently cools the body.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

Design a shirt for Dutch Olympic cyclists with PVA fabric integrated in it which
1. Provides cooling for a longer time than the current solution
2. Is comfortable to wear by reducing the rigidness of the dry PVA material.
3. Employs correctly placed PVA fabric.

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Title of Project Polyvinyl Alcohol Integrated Shirts for Dutch Olympic cyclist

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 11 - 3 - 2019

6 - 8 - 2019 end date

20 weeks						Mid								Green								
Project Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Date	11Mai	18	25	1Apr	8	15	22	29	6May	13	20	27	3Jun	10	17	24	1Jul	8	15	22	29	5Aprl
Days (after that week)	5	10	15	20	25	30	34	39	44	49	54		59	63	68	73	78	83	88	93	98	100
Research																						
Ideation (Isssue 1)																						
MVP																						
Selecting 3 concept																						
Testing & selecting																						
Ideation (Isssue 2)																						
MVP & Testing																						
Developing 1 concept																						
Integration																						
Iterations																						
Backup Week 1																						
Report Writing																						
Final Selection																						
Final Prototyping																						
Report and green light																						
Final Testing																						
Data Analysis																						
Presentation week																						
Final Delverables																						
															8th May		Mid-term					
															5th July		Green light day					

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MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

I have a bachelor's degree in mechanical engineering which means that before joining IDE, TU Delft I was never formally trained as a designer. Therefore most of the projects which I did before coming to Delft had a very free and organic design process and it also varied a lot depending on the type of project. At Delft though, I have worked with fellow colleagues who are very organized and follow a systematic design process and by working with them I have also learned those methods. Even though in the course of Design Theory and Methodology we had to reflect on your own design process and think of who you are ass a designer, for me it was a bit too early. This graduation project provides a fantastic opportunity to see which process would I prefer and what suits best for me. The project can serve as a mean to answer many questions regarding my identity as a designer.

As far as the project is concerned, I think the reason it suits me well is because it requires both analytical and creative mindset which I have managed to develop through design and engineering study background. Also I have good interest in sports because I have being playing badminton, swimming, bouldering, chess since my childhood.

I am pretty excited to start the project.
Thanks.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

No Comments

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Title of Project Polyvinyl Alcohol Integrated Shirts for Dutch Olympic cyclist