

# W.S.G. Isaac Newton Internship Booklet

2020

W.S.G. Isaac Newton  
8th of December

# Introduction

Dear reader,

In your student life there eventually is a point that your study comes to an end. To prepare yourself for what comes next and to already get a taste of what it is like to be a real 'burger', an internship is conducted. In a three to four month period you learn what it's like to be working fulltime and to be a part of really awesome projects. This is a great opportunity to see what you like and to work at really cool companies, all over the world. To make a wise decision, we have already gathered a lot of information specially for you! In this booklet, a great overview of experiences from students from different internship assignments at very diverse companies is presented. Well, what are you waiting for? Go and find your perfect internship!

In case you want to get to know more companies after your internship, the study association has created the Shadowing Days project for this. During this day you can tag along with an alumnus Mechanical Engineer for a day to see what it is like to work in a certain kind of field. Please take a look on the website, or ask the commissioner of educational affairs.

## Contact

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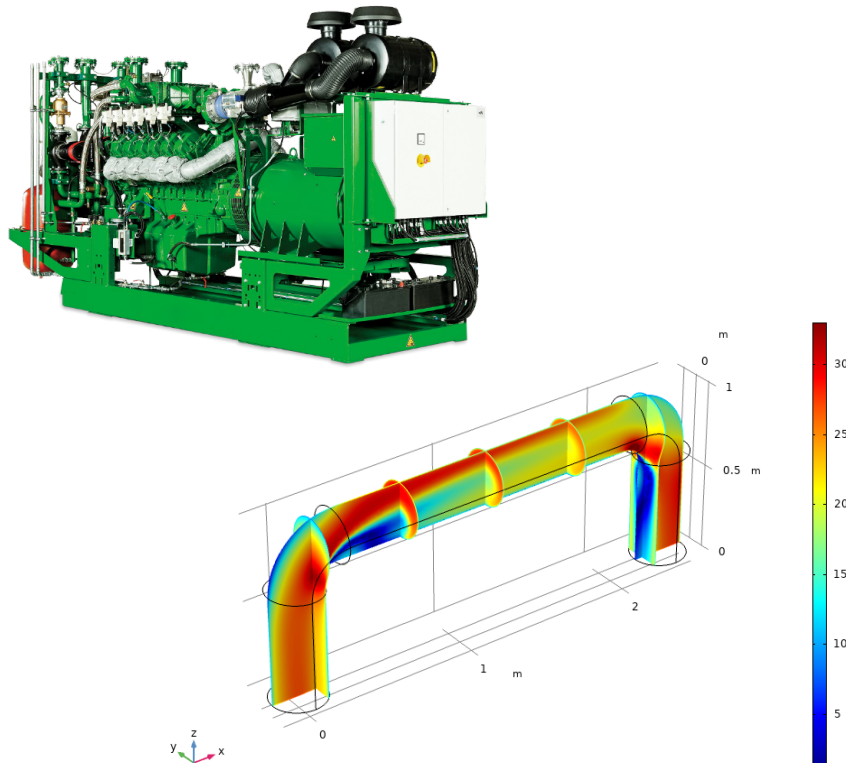
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## 2G Drives

2G Drives (Heek, Germany) specializes in the design and construction of high efficiency (bio-)gas fired internal combustion combined heat and power plants up to 3 MWe. Thermal formation of nitrous oxides is inevitable. Regulations in Germany and the EU are further restricting the emission of this pollutant in the CHP sector.

Selective catalyst reduction is used to reduce the nitrous oxide emissions in exhaust gasses. The design issue at hand was to find the correct design for urea water solution injection and evaporation in CHP plants. After a literature study, the specifications of the combined heat and power plant and its components were used to create a simulation model in computational fluid dynamics software to formulate conclusions for further research and development of the selective catalytic reduction system.



## Actronika SAS

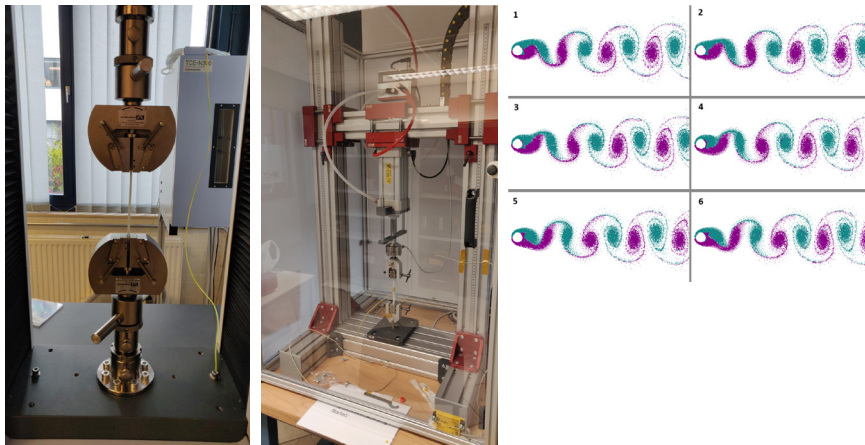
Actronika SAS focuses on designing haptic devices and making haptic effects. They are based in Paris, France and exists since 2015. It is a small company but makes working there great. Everybody in the company is helpful and friendly. During the internship the tasks were to design a device able to generate haptic effects. Haptic feedback is nothing more than the 'sense of touch', it is the feedback to your brain when you touch a surface. The tasks to be fulfilled were designing in a CAD program, print the design using 3D printing and assemble the device for which soldering was required. Next some performance test were done for the device. Overall it has been a good experience.





# Allseas

During the internship at Allseas, the intern worked on multiple aspects of the design of the AllStrake VIV strake, an addition to sub-sea pipeline that prevents damage to said pipeline due to oscillations coming from the flow of the water around the pipeline. These three aspects worked on were fatigue, seawater ageing and impact resistance. For these aspects, the material properties of various earlier selected materials have been determined through testing. Additionally, further recommendations have been made to obtain a test setup to determine the impact resistance properties of the materials, as no setup was available there yet.



# ARCNL

The Internship was executed at Advanced Research Center for Nanolithography (ARCNL), in the Netherlands. ARCNL is a public-private partnership between the Netherlands Organization for Scientific Research (NWO), the University of Amsterdam, VU University Amsterdam and ASML, a manufacturer of machines for the computer chip industry.

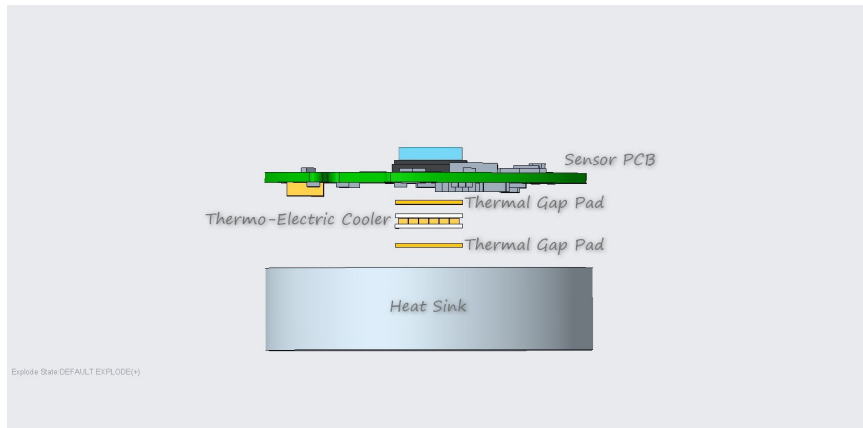
ARCNL conducts highquality fundamental research in the field of nanolithography and thereby it contributes to the production of increasingly smarter and smaller electronics. Much of the research program focuses on the physical and chemical processes critical for nanolithography with extreme ultraviolet (EUV) light. The progress in the development of micro-electro-mechanical-system for the past few years have been exceptional. However, one main factor that limits its widespread development is a high level of friction and wear. The main aim of the internship was to carryout fundamental research in finding ways of addressing the problem by carrying out different experiments using advanced scientific instruments.





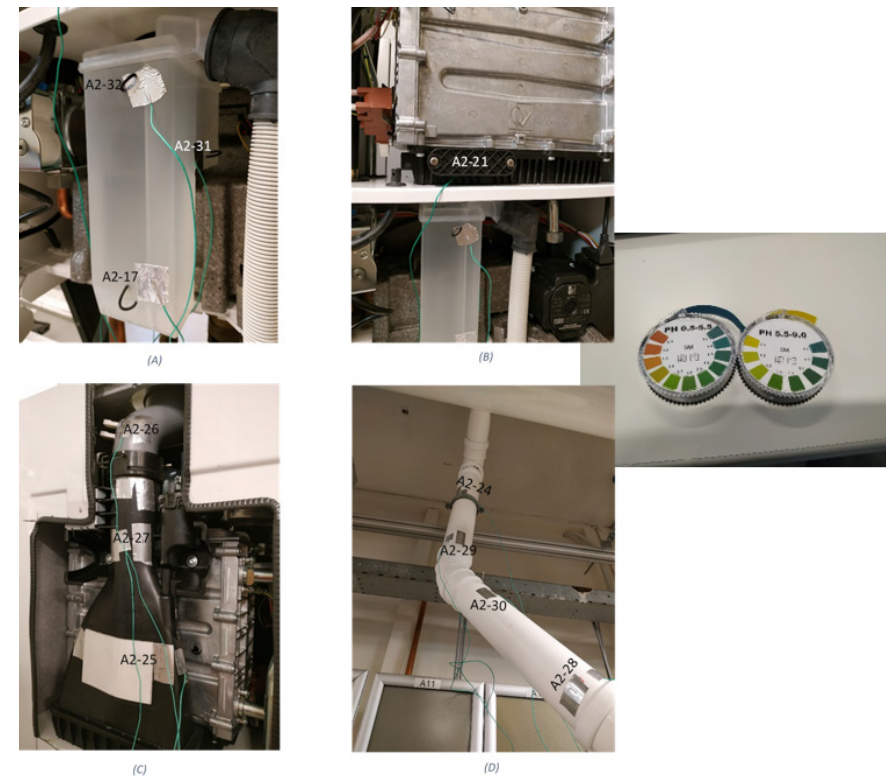
## Bosch Security Systems B.V.

The internship assignment was offered by Bosch Security Systems B.V, situated in Eindhoven, Netherlands. The aim of this assignment was to study the heat dissipation characteristics by Thermoelectric Cooling for sensor cooling applications. During the course of the assignment, weekly meetings and discussions led to a better understanding of the expectations from the design of the cooling setup. A 3D model was then drafted which would be later analysed. In the meantime, Thermoelectric devices were selected for purchase based on Cooling capacity, Coefficient of Performance and Power required for the given cooling applications. Due to the limited time available for the assignment, it was not possible to perform physical experimentation, hence, the results from the 3D model thermal analysis were deemed to be fit.



## Bosch Thermotechnology

The following picture illustrates the adjustments that had to be made on a WB7 condensing boiler for the needs of the experiments. Different wholes had been opened in several parts, so as to get pH measurements of the condensate load with the help of pH paper. Thermocouples had also been used in these specific sampling points so as to find the relation between the pH and temperature. The profiles under which the samples were taken consisted several power modulations (24%, 40%, 60%, 80% and 100%) and supply temperatures (40oC, 50oC, 60oC, 70oC and 80oC).

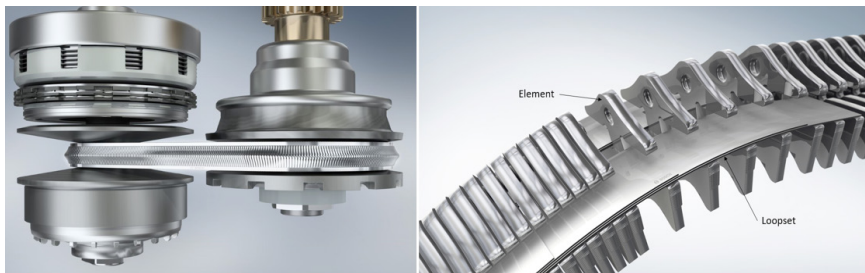


Adjustments made at the condensing boiler WB7. A) Adjustments at the siphon. B) Condensate collector. C) Adjustments at the lower part of the flue gas pipe. D) Adjustments at the higher part of the flue gas pipe.

## Bosch Transmission Technology B.V.

Bosch Transmission Technology B.V. is located in the south of Tilburg, Netherlands. Tilburg is a beautiful student city of Noord Brabant province. Here at Bosch, the work culture is amazing. "You are not treated as an intern but as a regular employee." The perks of working with an experienced team that comprises of all ages of people motivates to work efficiently.

The environment at the University of Twente prepares a student to be ready for the professional challenges and motivates to work independently but in a team. The same qualities were helpful in creating an impact through this internship. The assignment dealt with critical thinking, analytic analysis and knowledge of mechanical engineering. Above all organisation and time management played a key role in executing the given tasks.



## CCS Energie Advies

During the internship the student worked at a small company in Deventer the Netherlands. Here they were developing a new plant that upgrades the low grade biogas which comes from fermented cow manure to high grade methane called green gas. The problem with biogas was that it could only be used at the farm for heat, since it is very difficult to store or transport and sell. Now this green methane gas can then be fed back into the gas network because it has the same quality. This can be compared a little bit like the excess energy from solar panels that can be fed back into the electricity grid. The student helped with the energy balances of this new system and helped design a few components.



## Central University of Technology

The Product Development Technology Station (PDTs) is part of the Central University of Technology in Bloemfontein, they develop products for small entrepreneurs mainly in the medical and agricultural field.

The internship assignment was the design and production of a wind pump rotor for a local farmer. This farmer designed a complete plastic pump ensuring easy manufacturing. This was also required for the wind pump which will be used to power the pump supplying the cattle with water.

The experience was great, besides the different working culture and interesting country it was nice to see the designed product being manufactured (partly by myself). The end result was well received by industry experts for use by farmers and rural communities.



## CERN

This internship was carried out at CERN, the European Organization for Nuclear Research (Switzerland). The work was done at the ATLAS magnet group, part of the Department of Experimental Physics. CERN is a large research institution that houses a diverse portfolio of employees, ranging from theoretical physicists to electrical engineers and computer scientists.

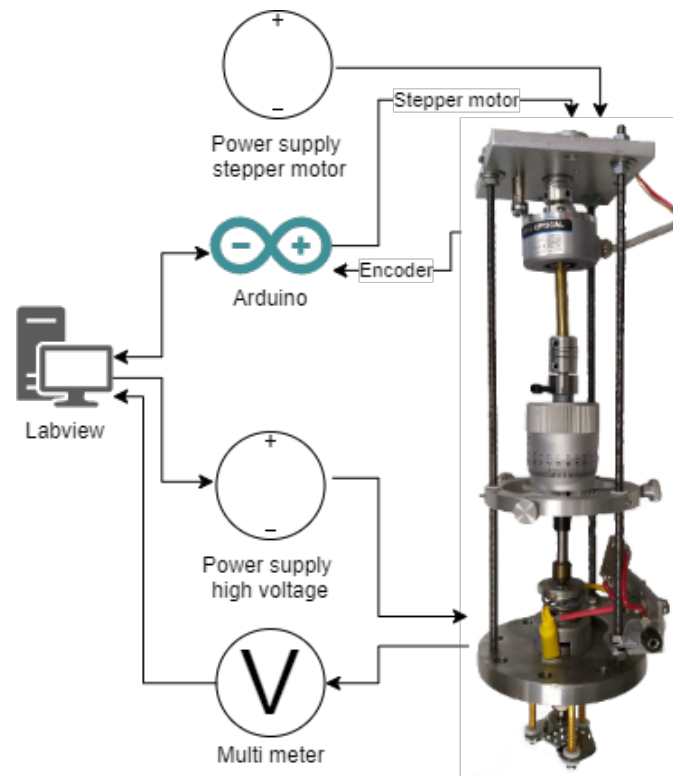
The assignment of this internship focused on the design study of the superconducting magnet system of the AMS-100, a new magnetic spectrometer in space. For this study, the focus was put on the material choice, powering of the magnet system, and quench protection. Furthermore, this research proposed three design configurations for the magnet system and presented a mechanical stability study, where the inherent stability was investigated. For this work, use was made of Finite Element Method simulation tools, such as Comsol Multiphysics.





## CTI Renato Archer

The student did the internship at the CTI Renato Archer in Campinas, Brazil. The CTI is a research institute of the Brazilian ministry of science, technology, innovations and communications. During the internship, a field emission measurement set-up is automated and improved in many ways. The hardware of the set-up is redesigned. The software used for the field emission measurements is improved and implemented. A graphical user interface (GUI) is made to control the measurements and show the measured values. Furthermore, the missing parts for a bake out oven are designed and manufactured. Software is developed to measure the temperature and control the heaters in the oven. At the end, the field emission measurements and bake out oven were fully automated.



*Schematic overview of the field emission measurement set-up*

## DAF Trucks B.V.

The Intern carried out the Internship assignment at DAF Trucks N.V. under Product Development department. DAF is a leading truck manufacturer in Netherlands, which is situated in Eindhoven. The Internship assignment was to analyse the tribological contacts in an engine and determining the design requirements for the improving the design of the tribological contacts in concern with the customer's value for high fuel economy and high reliability. The tribological contact analysed in the work was cam-roller Interface. The design requirements were derived using a design tool "Quality Function Deployment". The basic function of the tool was to translate the customer requirement to design requirement. The Internship provided the Intern to experience the Dutch work culture and enhance his technical skills.

## Damen Shipyards

During an internship of three months in Galati Romania, the intern has tried to create a better understanding of the day to day proceedings in one of the largest yards within the Damen Shipyards Group. During this period, a lot of time was invested in the personal relationship with the workforce. This resulted in a report with an detailed analysis of the building process and a list of recommendations which was more or less a summary of the views of both the workforce and management of the yard. Although a lot has been learned by working in an international environment, you should never underestimate the loneliness and challenges of being away from home in an isolated and less developed location.



## Damen Shipyards

The internship within Damen Shipyards in Gorinchem was an assignment containing both thermodynamics and fluid mechanics. The heat exchangers of tugboats were performing worse in the measurements compared to the original design. Therefore this discrepancy had to be explained. A theoretical model had to be created and CFD simulations were used to verify this model. This caused the three months to contain many different aspects, making it so interesting.

The first month the corona crisis had not reached the Netherlands yet therefore it was still possible to see vessels being constructed on which you were performing calculations. The picture shows one of these tugboats. Besides working on such a practical assignment, it was great to see such a large company operate and experience the daily routine on the R&D department.



## Deutsches Zentrum für Luft- und Raumfahrt (DLR)

In recent years noise radiation has become an increasingly important topic in the aircraft industry. At the Deutsches Zentrum für Luft- und Raumfahrt (DLR) in Braunschweig, Germany, aircraft noise is investigated using theoretical work, simulations and measurements. The institute owns various aircraft and measurement tools, including helicopters, airplanes, (acoustic) wind tunnels and flight simulators, which are used for experimental research. Furthermore, DLR owns several software tools used to compute aerodynamic and acoustic properties of aircraft. One internship assignment concerned investigation of the interaction noise radiated by the Bo105 helicopter depicted in Figure 1. Interaction noise is the sound radiated by the tail rotor due to interference with the main rotor wake. The assignment covered researching theory, performing simulations and processing measured data.



Figure 1: Photograph of DLR's Bo105 Helicopter

## Deutsches Zentrum für Luft- und Raumfahrt (DLR)

The internship took place in Lampoldshausen, Germany. Lampoldshausen is a tiny place in the south. The landscape has a lot of hills and it is close to the forest in which also the site of the German aerospace institute is located. It is very quiet over there, which you must be used to. The internship was about rocket engines and the optimization of its cooling channels. It is one of the cooler subjects you can be in as a mechanical engineer. It is a good professional experience to work there and relatively close to the Netherlands if you want to go abroad but not too far away. Another benefit is that you can keep making the joke: It's not rocket science!





## Dive Solutions GmbH

The internship was executed at Dive Solutions GmbH in Berlin, Germany. The internship was four months from February 2020 on, as most would know the experience was a bit different because of the coronavirus. It was great seeing all the sights in Berlin but I was only able to stay 1,5 month thus I've only experienced very little of what Berlin has to offer so I would really recommend going to Berlin and you will never be bored.

At the company I was doing applying and testing the in-house SPH (smoothed particle hydrodynamics) and DEM (discrete element method) software for different use-cases. I supported to improve the software by researching a new damping model for DEM and studying results and improvement points for a centrifugal pump simulation.



## Dutch Solar Energy B.V.

The intern carried out the internship at Dutch Solar Energy B.V., located in Tilburg, The Netherlands. The company specializes in Solar energy which provides a Solar PV system for domestic and commercial use. Solar panels are installed on one's house roof or commercial buildings based on a lease contract. The intern had to work on the assignment to get the price of the PV system below 50 cents/Wp by an optimal design. PV\*Sol Software was used to carry out the simulations required for the assignment. The results were analyzed and an optimal solution to reduce the cost of the PV system was obtained. The internship helped the intern to not only gain corporate experience but also helped in achieving practical knowledge.

## DWA

The internship is done at the company DWA. DWA gives the building construction advice about sustainability, constructions/installations and is working on the energy transition to make neighbourhoods natural gas free. The goal of the internship was to find out if the city hall of Eindhoven could be made more sustainable. DWA is an interesting company, the employees are kind and friendly. There are no secrets for you and you are welcome to watch every meeting internal and external. So it is recommended to call them if you are looking for an interesting internship in the building construction environment. The company has 4 offices, which are situated in Amsterdam, Gouda, Veenendaal en Rijssen. This internship was done at the office in Rijssen.

**Dwa**

installatie- en energieadvies

## Eindhoven University

The internship was done at Technical University of Eindhoven, in Eindhoven, Netherlands. TU/e is a research university in the field of science and Technology, and is located at the heart of the city of Eindhoven. Eindhoven is a beautiful city and also the technological and design hub of the Netherlands. The internship work was dominantly experimental, which allowed me to develop my own experiments, handle world class equipment and freely implement my own ideas. The supervisor and technicians at the organization were extremely helpful, clearing all my doubts, double checking my ideas and giving a feedback on the work that I did. Overall it was an amazing and unique experience, which helped me in learning a lot about my field of interest.



# Electric Superbike

The final product of a year of hard work by Electric Superbike Twente 2018/2019. The Eclipse gp is the second fully electric racing bike of the team a third bike is already on its way. Electric Superbike Twente promotes electric transportation in an exciting way. The future of racing starts today at Electric Superbike Twente.



# Enerlice

Enerlice is located in La Couronne, France which is about 10 kilometres from Angoulême (a city which is famous for comics internationally). S2EI is the umbrella company of Enerlice. Enerlice majorly contributes to the renewable energy sector with the state-of-the-art facility for benchmarking process. Their unique selling point is sales and services of small and medium scale wind turbines and other related products. The internship task assigned dealt with the development of an off-grid smart hybrid streetlight. During the internship the tasks carried out were to create a pole design on Solidworks and to check its structural safety in accordance with the standards and the regulations set by the local authorities.





## Enexis Netbeheer

At Enexis Netbeheer there are several departments to do an internship. Getting an assignment at the innovation department resulted in an cooperation in a young exciting team. It is allowed to transform the assignment into personal interest with own responsibilities. During COVID-19 the whole internship is done from home, but involved a lot of digital meeting to stay on the right track and stay motivated. This internship was focusing on the digitization of data and the disclosure of data. The work performed is a very interactive internship, which created an overview of all the internal and external aspects involved at the disclosure of data. This is about legal conditions, vision but also the demand for data by municipalities.

## Ergo Design B.V.

Ergo Design is a Dutch engineering consultancy company located at the Kennispark which specializes in industrial engineering. They do this on a variety of scales. From a complete site all the way down to station design. A few examples of their activities are; creating master plans for manufacturing and logistics, designing new factory layouts, manufacturing lines and logistic concepts and perform simulation studies.

The goal of the assignment at Ergo Design was to select and pilot a system which could capture the internal logistic movements at factory sites. After the system selection, the system was tested in a warehouse at a partner of Ergo Design. It was a challenging assignment in which I learned a lot about the business side of engineering. Ergo design has a open door policy and the colleagues are very welcoming and helpful.



UNIVERSITY OF TWENTE.

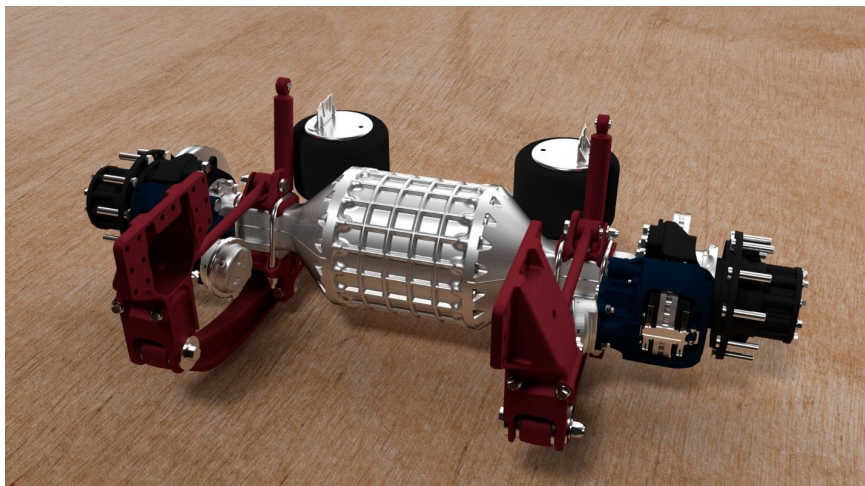
## e-Traction

e-Traction is a company located in Apeldoorn aimed at developing electric powertrain technology. The idea is that the driven axle of a former fossil fuel powered vehicle is replaced by an electric axle.

The current technology uses Permanent Magnet Synchronous Motors (PMSMs). PMSMs have a relatively high torque output so the motors are placed in-wheel as direct drive which means without a reduction gearbox. The drivetrains are able to drive vehicles like buses.

The company also wants to enter the truck market with an electric drivetrain. This yields other requirements to the drivetrain in terms of the torque that needs to be supplied to the wheels as well as the interface to the vehicle. Trucks require a higher torque output at the wheels than the current drivetrain can deliver so the use of a reduction gearbox is inevitable.

Therefore a new drivetrain needs to be designed which is named the e-Axle. In order to choose a final design for the electric drivetrain, different options are compared on efficiency as well as performance. This is done by building a model of the vehicle and drivetrain and simulating multiple drive cycles.



## Demcon

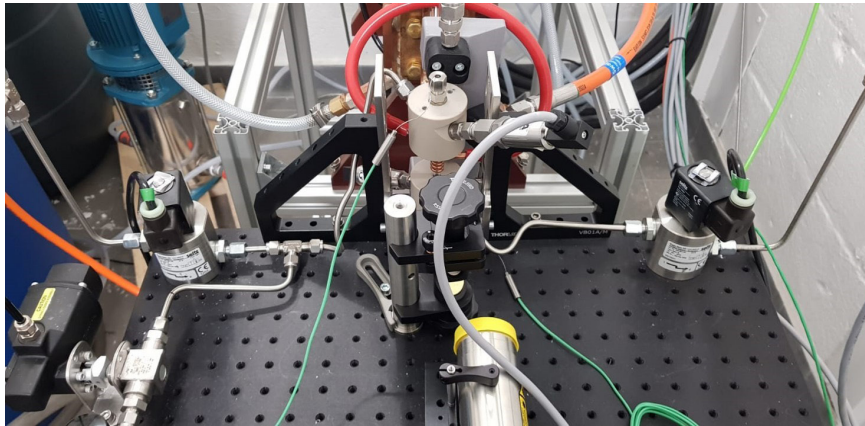
Demcon's goal is to create a minimally viable version of the original Needle Placing System (NPS). This attempt focuses on redesigning parts of the NPS that are deemed too complex and expensive for series production. The aim of the assignment was the design of a manual locking module and a new robot arm that incorporates it. The work was performed at DEMCON in Enschede in the systems engineering department. The interns sit amongst DEMCON engineers and the internship fills more like a regular job than an internship which is really nice. The atmosphere is informal and the students are invited to directly ask anyone for help when they need do. The behavior is very professional and the student was treated like a normal employee which made for a nice experience. In addition, there are weekly progress meetings with systems engineers and other interns. The student chose to derive all the expressions required for the project analytically. There were however other choices as well such as running experiments in the lab or utilizing FEA. The student chose the most interesting route for him.





## Demcon Bunova

In the period from September till December 2019, the intern did her internship at Demcon Bunova, Enschede. Demcon Bunova is a department within Demcon, specialized in mechanical, thermal, flow and electromagnetism simulations. They do calculations and simulations for companies or Demcon projects and give advice about design problems or insights into specific phenomena. The assignment was to perform simulations on a high pressure helium flow and compare the results with experimental data. Eva also helped performing the experiments and in this way had more insight into the actual situation. The ambiance within Demcon and also within Bunova is very easy going and friendly. This made her feel welcome and she will look back at her time within Demcon with great pleasure.



## Fokker Aerostructures

This internship was conducted at GKN Fokker Aerostructures sited in Papendrecht, the Netherlands. The company in this location is part of the Fokker Technologies holding sited through the Netherlands. Fokker Technologies is in turn part of GKN Aerospace. With her 18.000 employees a leader within the manufacturing of aircraft components worldwide. The main activities during this internship where designing a test rig for static and dynamic testing of a new project. The intern was allowed to cooperate within the project and help with the thinking steps of the project. The tasks in this internship varied from CAD work to helping colleagues with more dynamic related stuff and having contact with people from other locations to manufacture test samples for you. After all a very educational experience.





## Graphene Masters

Since its first synthesis in 2004, graphene is at the centre of many researches for its remarkable properties such as electrical conductivity, mechanical strength and thermal conductivity. The Thermal conductivity of graphene is the highest of all known materials with more than 5000 W/mK. In parallel, continuous innovation and miniaturization of electronics have led to an increase in power density per cm<sup>2</sup>, leading to higher temperatures and heating rate of electronics. In order to work in the best condition and to avoid any damages, these electronics needs to be cooled properly. This project aims to explore nano-fluid coolants by creating a simple graphene-based liquid with high thermal conductivity of at least 40% of the water one. The said liquid should be stable in time and its synthesis as simple as possible, mainly based on physical synthesis. Trying to make a more concentrated solution is not always successful: by comparing the 0.1 wt% to the 1 wt% solution, the actual concentration of the 1% solution is not what it is supposed to be. In addition, the non-dispersed particles have been collected and weighted: it is about a certain wt% of the initial amount of graphene put to disperse, proving the inefficiency to disperse graphene in this sample. The same phenomena happen for other samples of lower concentration, despite of using the same protocol. However, the dispersion worked for the sample Flakes wt%, showing an important problem of reproducibility for this method. The thermal conductivity of the synthesized fluid will be characterized by a homemade hot-wire apparatus. Improving this instrument is also part of the project.

*The images cannot be shown due to confidentiality concern.*

## HermanDeGroot

HermanDeGroot is a consultancy firm located in Amersfoort, which is specialized in sustainability and geothermal energy. To reduce the carbon footprint of the Eemland region and to supply geothermal heat to the consumers in a sustainable way, a district heating network will be constructed. The aim of the study was to identify the characteristics of the Eemland district heating network, especially its heat capacity and the required amount of external heat storage. These parameters have been determined by constructing a numerical model.

The external supervisor was very much involved in the process, which is of great importance during these special circumstances (corona pandemic). To increase the interaction with other colleagues, a lunch Zoom meeting was held once a week. During these lunch meetings several topics were discussed.

The logo for HermanDeGroot, featuring the company name in a bold, sans-serif font. The word 'Herman' is in dark blue, 'De' is in orange, and 'Groot' is in grey.

## Howden Netherlands B.V.

The internship focused on improving axial fan efficiency. Fans function by adding energy to air by increasing air velocity and pressure. This causes the air at one side of the blade to have a higher pressure than the other side. Since air wants to flow from high to low pressure areas flow is forced over the tip of the blade, which is called leakage flow. A way of trying to reduce this leakage is to add an end plate to the blade tip. This enhances efficiency by physically blocking a part of the undesirable leakage flow with a piece of material. The research was mostly experimental, in total 13 different end plates were tested at Howdens testing facility.



## Huisman Equipment

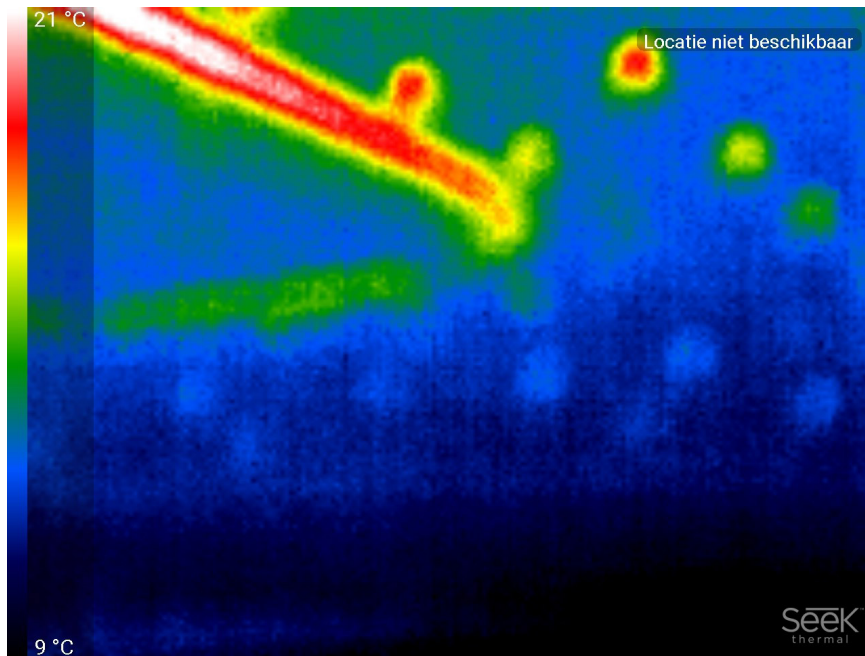
Huisman is a worldwide operating company which designs and manufactures equipment for the offshore industry. Their product range can be subdivided in cranes, pipelay equipment, drilling equipment, winches, vessel designs and special projects. Huisman has production sites in China, Czech Republic and Brazil. The internship was performed at Huisman HQ in Schiedam, The Netherlands (see picture).

The use of high strength steels requires a lot of welding expertise. With the equipment and expertise in-house, Huisman recently adopted Wire-Arc additive manufacturing (WAAM) as a production process. The goal of the internship was to build thermal finite element models that can simulate welding and WAAM, to get insight in the thermal history of the weld material. The models were built in ANSYS and verified with literature data and an experimental test at Huisman.



## Ijsbaan Twente

During an internship at Ijsbaan Twente, a master student Sustainable Energy Technology worked as an energy consultant for the ice skating rink. Situated close to the University of Twente the ice rink was looking for a collaboration with the university and found this in the form of an intern. As a mechanical engineering student she worked out the energy demand of different systems present at the ice rink, like that of the ventilation, heating and ice cooling machinery. With this information she painted a picture of the energy requirement of the ice rink in different scenarios (like summer, winter, competition or recreational use). The research forms the basis for more efficient use of machinery and gives several options for further research and collaboration with the university.



## IM Efficiency

IM Efficiency is a young organization located in Heerlen in the Limburg province of the Netherlands. The city is calm and scenic with a history of being the coal-mining centre of the Netherlands in the 19th century. The company focusses on bringing innovative technologies in the freight transportation sector, especially heavy-duty vehicles. Their first consumer product is the 'SolarOnTop'. It is a low-cost solution to improve efficiency and to reduce emissions in the vehicles. It is a non-invasive solution that can be installed on the truck/trailers and uses solar energy. The two tasks that were handled by me during the internship period were, 1) Finding a replacement for the MC4 connectors and 2) Analysing the effects of vertical installation in terms of energy production.





## Imaging Solutions

From January until April 2020 an internship has been done at Imaging Solutions in Regensdorf, Switzerland. The internship focused on the service part of the company and through different smaller task a good overview was gained, and recommendations have been made on how to improve the service department.

The internship started with a general introduction of the company and working together with people from different departments such a design and purchasing. Also, a training was executed on one of the machines, the fastBlock 05.

Then an analysis was made on the current service department. A database was made based on earlier work-orders and service reports. The findings from this procedure led to an updated service report. For these tasks it was needed to learn to work with Microsoft Dynamics. A visit to a customer was made with a service engineer to perform maintenance on a machine and to learn about the workflow of a photo lab.

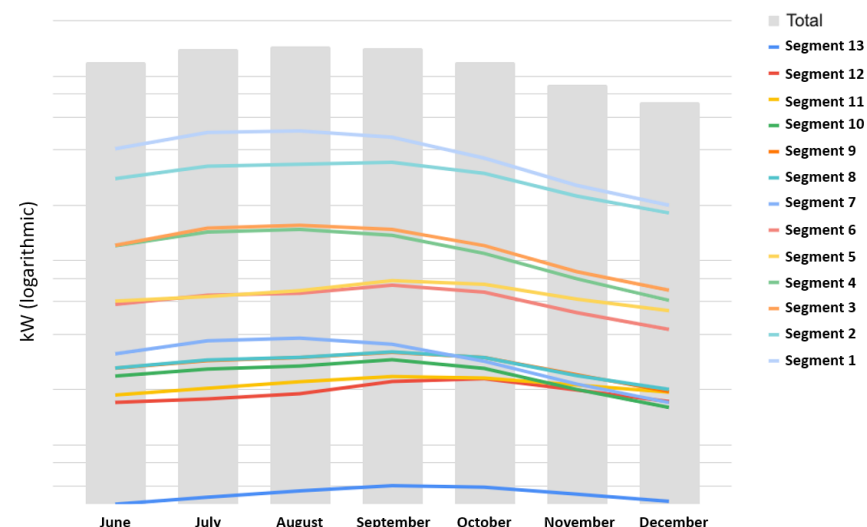
On the fastBlock 05 the RCM logic has been applied. First a FMEA was made and then the RCM logic tree was applied to failure modes with an RPN > 100. A recommendation was made for the implementation of this procedure in the future.

Based on the lubrication of bearings the transition from time-based to usage-based maintenance policies were discussed. Again, a recommendation was made to the implementation of this subject with a link the RCM logic.



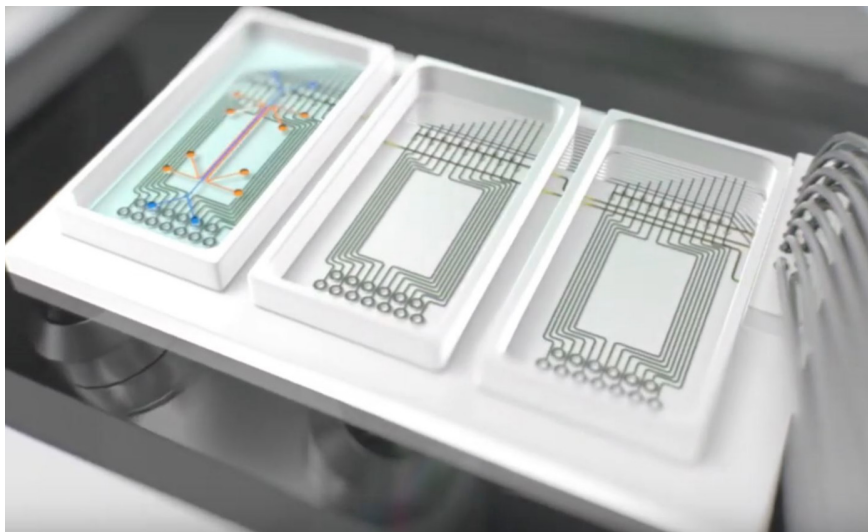
## LEAP Incl.

The research was conducted at Leap Inc., a start-up company located in San Francisco, USA, which manages a portfolio partnerships of companies that control end user electrical devices. The mission of Leap it to allow its partners to make the most out of their energy resources by offering a demand response program, meaning that partners can signal their end users to reduce energy consumption at times of peak demand. Leap provides this access wholesale markets without the administrative burden or complicated integrations that usually apply through a single API. Jules build a quantification model for the amount of curtailable load in a portfolio of smart thermostats controlling residential air conditioning load. This model leverages historic load and weather forecasts data to provide a segmented curtailable load, depicted in figure 1.



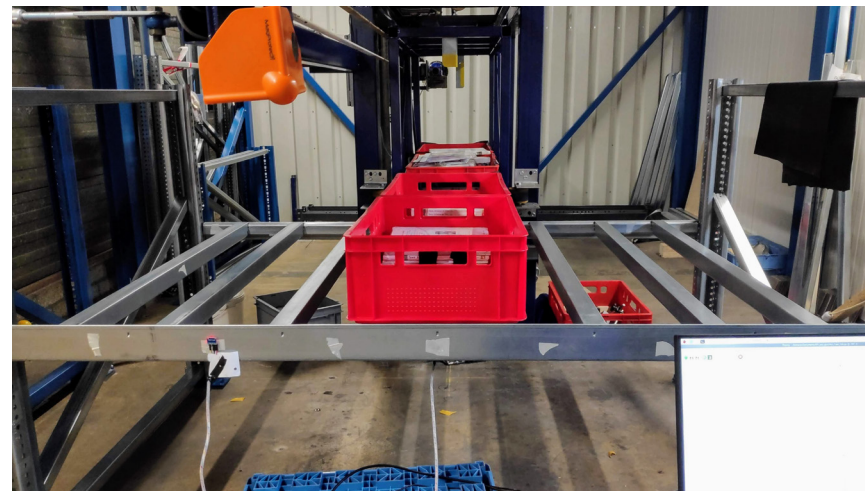
## Micronit Microfluidics

At Micronit Microtechnologies an internship can be great when you do the right things. It is possible to have a regular internship as well of course, but if you show initiative, they are willing to support you in your ideas. The supervisor in this case was quite busy (reorganization, new function, Corona-crisis all at the same time) but when the intern had an idea and thought it through (to visit a conference the next day in Switzerland, to experiment with a new design method, to create user teams all over the country, to 3D print prototypes or make them in Augmented Reality (all actually happened)) they actually help you to achieve the goals. Combined with working on a high quality and cutting-edge Organ-on-Chip solution makes this extremely energizing and motivating.



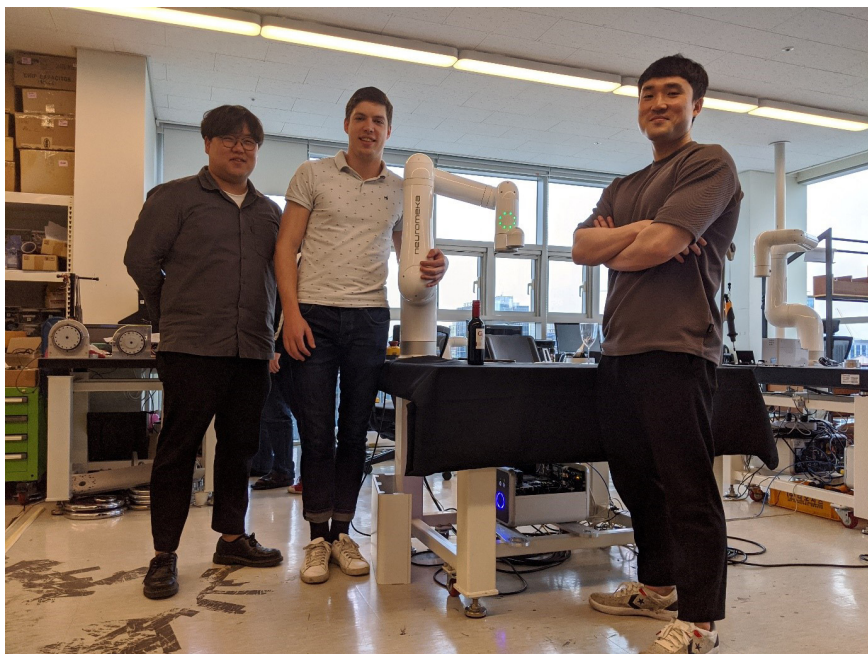
## Nedcon

Nedcon is a manufacturer of storage systems. Some of their systems include fully automatic carts driving through racks and picking and placing crates. Nedcons clients have found that some of the stored crates start to move from their position. This can cause crates to collide and break, which causes downtime. In order to prevent this Nedcon wants an insight into why these crates move. During this internship the chance was given to take a close look into the Friction-Vibration relation between the crates and the rack during picking and placing. It was possible to prove that this relation is an important mechanism behind the moving crates. On top of that a model was set-up that describes the deflection of one partition of the rack during use. This model could be matched to reality with experiments. This model is now used for further investigations.



## Neuromeka

This fourteen week internship was done at a robotics Company called Neuromeka, with its headquarters located in Seoul, South Korea. The robot specializes in making collaborative robots (co-bots). In this internship the robot called Indy7 was used, a cobot with 7 kg payload, as well as there vision system that can be attached to the robot, called IndyEye. During the internship multiple of small tasks were completed. The main categories are video tutorials, written manuals and real-world demo applications. The company aims to use this for either promotional use or as reference for (future) customers. Working in a Korean company was very interesting, the work culture is different from the Netherlands and the language barrier sometimes gave some difficulties, but not to the point where it was impossible to communicate.



## Nevesbu

From mid-February till the end of June the student did his internship at Nevesbu in Alblasterdam, which is, as they call themselves “a naval architecture and marine engineering company involved in the design of ships and structures and installations for offshore, naval and specialist vessels.” He worked on the redesign of a bridge, meant for the connection of two offshore platforms. Instead of using conventional materials such as steel, he looked into the potentials and pitfalls of fibre-reinforced plastics (also known as composites). The result was a significant reduction in weight and maintenance requirement, which indicates it could be a worthy competitor of steel.

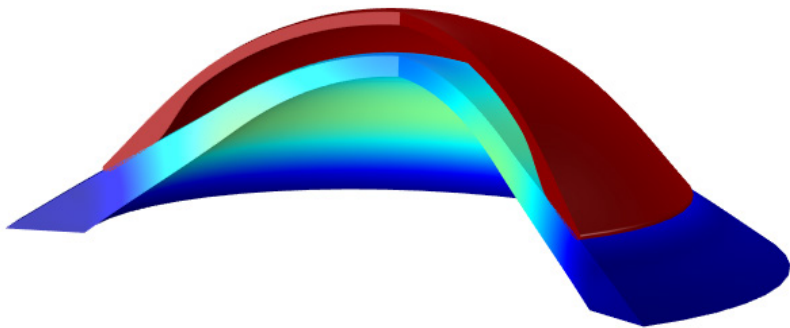
*Unfortunately he does not have a picture of himself at the office.*



## NKL Contactlenzen

This internship took place at the R&D department of Menicon B.V. Emmen. Menicon is a company that designs and produces contact lenses based on the needs of customers. Menicon's goal is to design and produce good contact lenses for everyone. Therefore Menicon located in Emmen is specialized in made to order contact lenses. Mass produced contact lenses such as daily disposable lenses are manufactured and designed by other locations of Menicon.

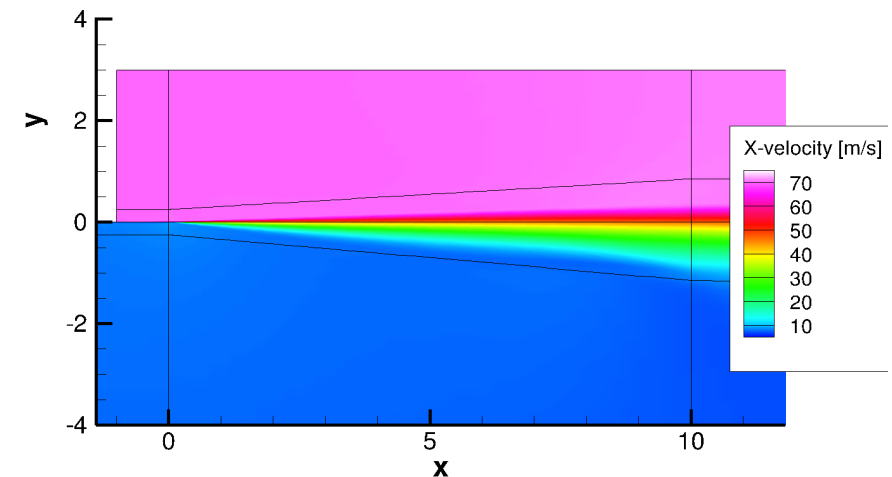
The goal of the internship was to model the interaction between an eye and a sclera lens. This model was requested as a supportive device for both designing new contact lenses as well as a visual aid to show the importance of a good fitting contact lens. The other employees were all very welcoming and the internship overall was a pleasant experience.



## Nederlands Lucht- en Ruimtevaartcentrum (NLR)

The internship assignment was conducted in NLR – Netherlands Aerospace Center in Amsterdam. It was aimed to model a wind tunnel used for acoustic measurements. Simulations were conducted using Reynolds-Averaged Navier-Stokes (RANS) equations in order to analyze the airflow in the edges of the tunnel jet, which is called shear layer and has very turbulent airflow.

Results obtained in the simulations showed a shear layer spread rate that agrees with literature. However, the self-similar velocity profile slightly differs from the profile proposed in literature. The picture below shows a side view of the tunnel's test section in which the shear layer is visible as the transition from the jet stream (pink) to the surrounding environment (blue).



## Nederlands Lucht- en Ruimtevaartcentrum (NLR)

The internship was performed at the Royal Netherlands Aerospace centre (NLR) in Marknesse, Netherlands. Both theoretical and practical work was done on a very specific topic in space research. The topic is connected to a larger project which will have an actual commercial application. The NLR offers interns a hands-on experience during the internship and involves the intern at every step. Interns are encouraged to actively contribute to the project in a team of professionals and bring forward their own ideas and knowledge. All NLR personnel are open to discussing new ideas or approaches regarding every aspect of a project. An internship at NLR offers a great learning experience which is only limited to how much the intern wants to learn.



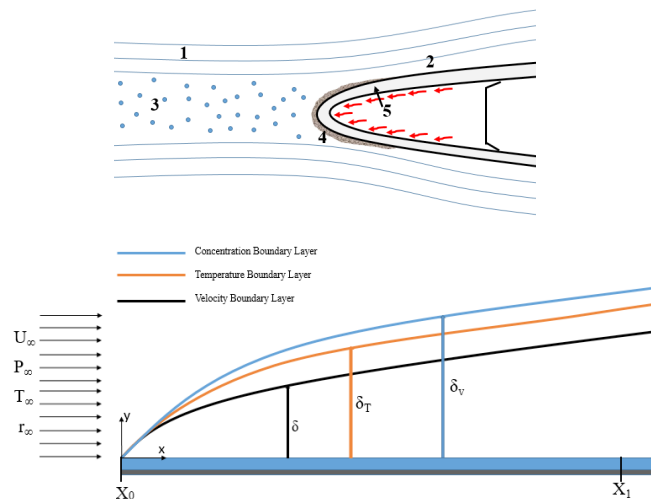
## NTS Norma

NTS Norma makes machined products and mechatronic assemblies for different industries like the semiconductor industry, aviation industry and optical instrument manufacturers, this is done while keeping in mind strict tolerances specified by the customer. During this internship with a duration of three months the goal was to investigate what the possibilities were regarding forecasting of the needed machine capacity for New Product Introductions (NPI). In the end a tool was delivered which gave a machine capacity reservation for an upcoming New Product Introduction based on the price calculation from the quotation for that NPI. Also a throughput time calculation including safety factors was made, the tool was implemented and is currently used by the Planning department.



## ONERA

In the first part of the project a general introduction on the issue of icing in aviation and to the methods used to study it has been performed. It is in this context that lays the focus of the project. It deals with the study of the evaporation mechanisms in the boundary layer developing over the heated liquid film which is formed on wings. This water layer is caused by droplets impacting on the wing and it is heated by the anti-icing system placed inside of it, which provides heat to prevent ice formation. After the introduction to the context, a detailed study of the multi-species boundary layer equations which are needed to solve the problem of the transport of vapor has been performed. This set of equations is solved using the finite volumes method which was already implemented in a software provide by the company. The use of the software required a lot of pre and post processing which has been done using Python. In the following phase the mechanisms of evaporation and how the phenomena is included in the solver to obtain a solution has been investigated. Finally, a comparison of the results for the evaporative mass flux with those obtained using the Chilton-Colburn analogy has been performed allowing to draw conclusion.



## Pentair X-Flow B.V.

This internship was performed at Pentair X-Flow BV. in Enschede. Pentair X-Flow produces filter membranes and modules and develops application concepts for these filters. During the internship the intern was part of the Innovation Centre. The assignment was to design a prototype for a new type of filter concept. 3D CAD models are made together with 2D technical drawings. This prototype will be used in proof-of-concept testing which was postponed until after the internship due to the COVID-19 circumstances.

In addition to this a proposal for mass production was made where the proper production methods and a re-design was made. 3D CAD model and 2D technical drawings of these parts were made as well.





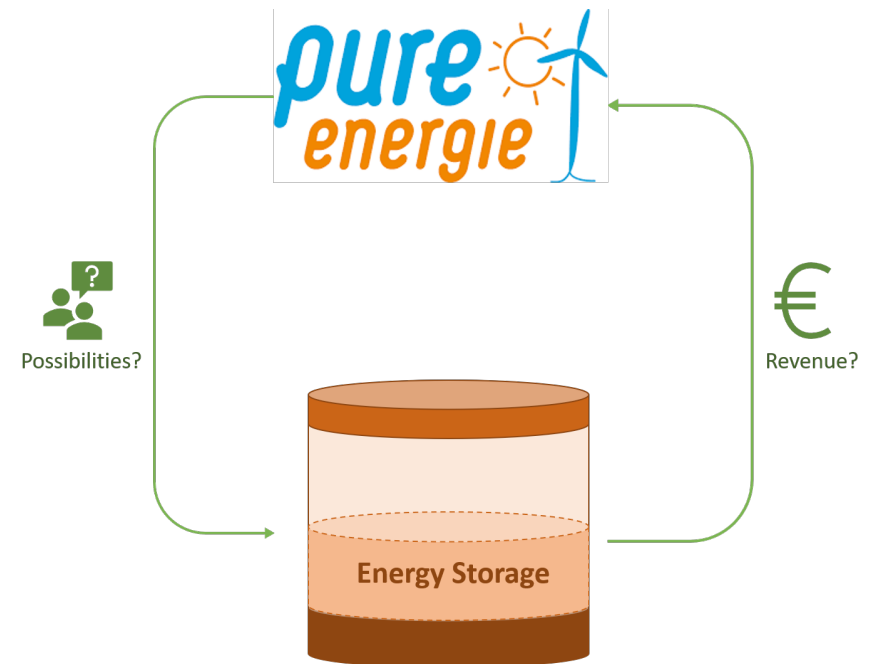
## PT. Apeiron Used Cooking Oil Biodiesel Refinery

Faris had internship in leading bioenergy company, PT Apeiron Used Cooking Oil Biodiesel Refinery, for 3 months in Jakarta, Indonesia. He helped Business Development team to secure the deal with Used Cooking Oil (UCO) producers from commercial and residential sector. The biggest project is from the largest convenient store in the country which generates a significant amount of UCO coming from its in house fried food products. UCO then further will be converted into biodiesel and delivered to customer in Europe. He learnt a lot of stuff from technical and non-technical aspects, particularly regarding business, finance, and supply chain. It was a great experience encountering a lot of people from various background, ranging from executives from big corporations, researcher, suppliers.



## Pure Energie

With Pure Energie you have the possibility to learn more about sustainable energy technologies in the energy market. It is a company in Enschede and a producer, trader and retailer in the Dutch energy market. Moreover, it is a project developer solar and wind farms with a lot of experience and expertise. It is a very nice company if you are interested in the application of sustainable solutions in a real-life environment.



## Reden

During the internship at Reden BV in Hengelo, the capabilities of Elmer were tested by modelling and simulating an electromagnetic problem, like magnetic force simulations. In this case, two magnets were placed at varying distances in the model. The results were compared to results from other software packages, but also to experimental values. To understand and interpret the results, electromagnetic theory and the implementation in Elmer was studied. Also, a wireless power transfer was studied and the possibility in Elmer was mapped. Next to gaining more insight into this problem, the capabilities and restrictions of Elmer to solve other problems were investigated, because it might be a suitable software package for future projects at Reden.

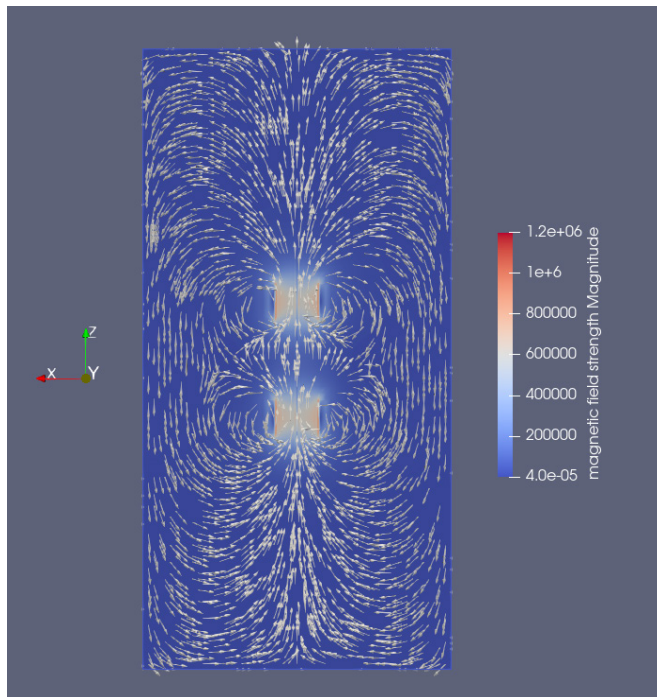


Figure 1: Magnetic field of two magnets, simulated

## Ricardo Rail

The internship was performed with Ricardo Rail Utrecht. The assignment was on obsolescence management. Obsolescence management is a part of asset management where one has to think about what will happen when spare parts are no longer available from the Original Equipment manufacturer. If this is the case one has to be prepared on what to do, since one does not want its assets to stand still unnecessarily. The assignment was to create a model that could help to predict what parts would cause most problems and think of a general way to resolve the possible problems.

*The internship was mainly done from home, so there are no cool pictures*



## Schaeffler

An internship with Schaeffler introduces the intern in the different areas the company excels in. The German company is a world leading manufacturer of drive trains, bearings and clutch systems. With over 90.000 employees, there are many opportunities, in either English or a great way to learn German. The most important subjects during the internship were supply chain management, understanding key figures and how to use that to further improve the company's performance. During the COVID-19 pandemic the resources to work from home were excellent, everything was taken care of. This did not give the full experience of being abroad, but the German work environment was still there. It is a great company to work with, with many growth possibilities.



## Shell Chemicals Europe B.V.

The internship assignment was based in Rotterdam, at Shell Chemicals Europe B.V. which is part of Shell Downstream business. The assignment was commercially oriented, with a focus on the investigation of strategy and sales development of a particular solvent product line in a given time period. It encompassed extensive market research, competitor landscape analysis and active prospecting activities. The objective was to provide a comprehensive proposal for the way forward based on all the collected findings. Shell, as a leading multinational energy company offers a very stimulating environment, particularly because you are surrounded by exceptional people and vast learning opportunities. Here you will be challenged by working on projects with real business impact that resonate with the needs of the future generations.





## Spark Holland B.V.

The company Spark Holland BV was founded in 1982 and is specialized in developing liquid analysis equipment. Products of Spark are used worldwide in laboratories at pharmaceutical and clinical businesses. For example, a typical application is performing doping tests for athletes.

The internship focussed on creating a Functional Model for a new UHPLC (Ultra High-Performance Liquid Chromatography) pump. These pumps can operate up to a pressure of 1300 bar for flow rates up to approximately 2 ml/min. Within the company Spark Holland a Functional Model is used as a breadboard setup to test and develop its new products. This resulted in a very nice practical assignment with some hands-on experience with one of Spark Hollands products. Furthermore, contribution was made to the development of the new pump. Here, the acquired theoretical knowledge obtained at the UT could be applied very well.

The atmosphere within the company was very pleasant. Employees can be asked questions in an approachable manner and they are always willing to enthusiastically tell about technical challenges they have faced. Overall, it was a great experience!



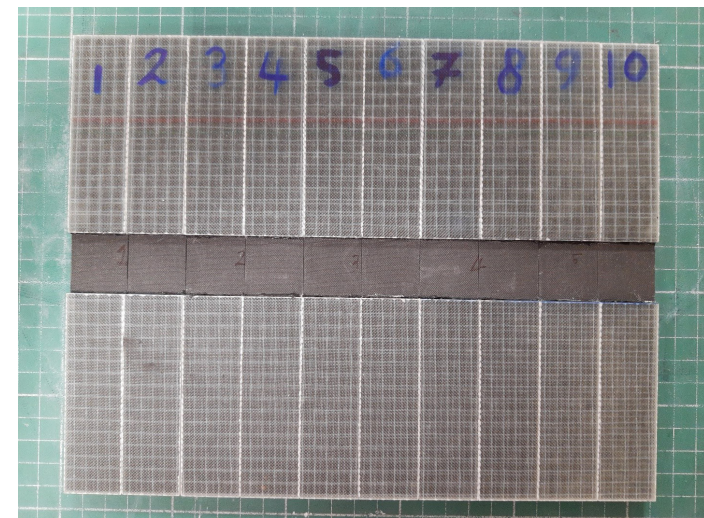
## Suzlon

This internship was done at Suzlon Energy limited in Hengelo. This is the research department of the company, which focusses on the design and the materials of windmill blades.

The internship consisted of producing test samples and finding out the best way of testing on these samples. The intern first had to learn how test samples are produced and what the reasons for this are. Once the intern had the proper amount of understanding the intern was tasked with producing his own samples.

Once the samples where produced, understanding of the material behavior needed to be gained. For this first some simple tensile and compression tests were performed. After the results of these tests were analyzed more complicated tests were performed with the goal of gaining both the tensile and compressive modulus from a single test.

For all the tests multiple measuring devices have been used and several ways of determining the modulus were tested. The final task was to analyze the results of all different options and to find out which ways of testing are the most suitable.



## TG hyLIFT

The intern did his internship at the small department of the company TG hyLIFT that brings forth the product line hyCLEANER. The company is situated in Gronau, Germany and the hyCLEANER roof-, solar- and façade-cleaning robots are actually distributed world-wide.

By using water that is purified by RO the cleaning effectiveness can be enhanced, yielding even better results. The internship concerned the development of a small and mobile RO plant that is tailored to the requirements of the hyCLEANER machines. The project included learning how RO is done, designing the RO system and setting up a test platform, which will serve as a platform for subsequent system and product development.

Being at a small company allowed him to get into direct contact with all the departments and staff members.



## Thales

The internship took place at Thales, Hengelo. Thales offers very well supervision and gives enough room to give your input for the assignment. You can determine what you want to learn and discuss this when establishing the assignment. The assignment included the influence of the design of a perforated plate in a radar system for naval vessels. The sheet must meet requirements regarding electromagnetic compatibility, air flow resistance and mechanical performance. Therefore, an analysis is done to determine the influence of the aperture diameter, plate thickness and number of apertures on the electromagnetic, air flow resistance and mechanical performance.



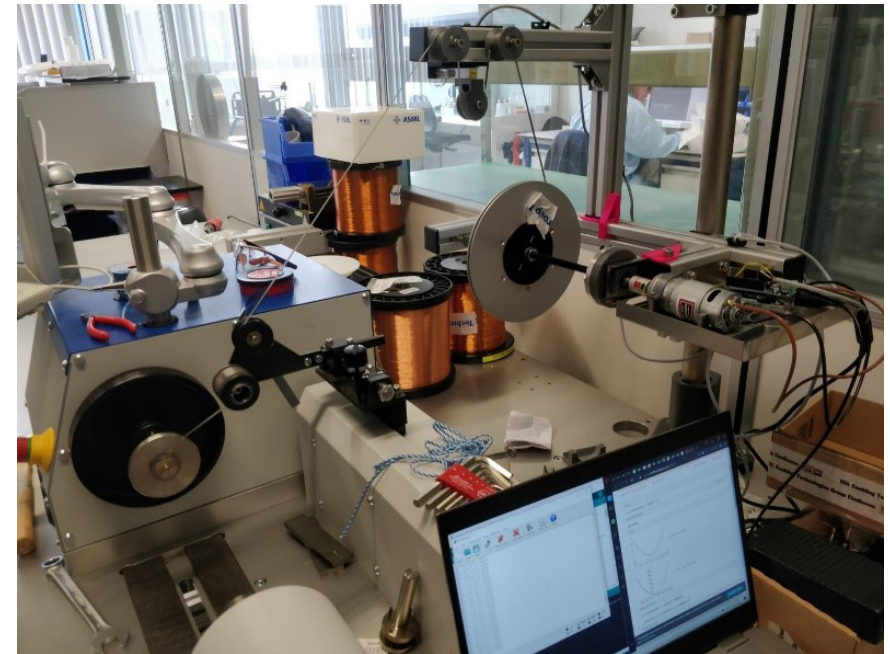
## University Centre of Svalbard

Svalbard (Spitsbergen) is an archipelago located above the polar circle. The town, Longyearbyen, (encircled in the image) is the northernmost settlement in the world with 2.000 citizens. Svalbard experiences extremely cold winters with 24 hours darkness and summers with 24 hours sunlight. Glaciers cover the island, there is a permanent permafrost and there are no trees. However, this island produces one of the highest carbon emissions per capita in the world due to their coal mining culture. The awareness to change to renewable energy is there, albeit slow. The student had her internship at the Arctic Technology Department at the University Centre of Svalbard on different sustainable energy projects, such as a Borehole Thermal Energy Storage project and a project on detecting heat losses from buildings and heat transport systems.



## VDL ETG Almelo

VDL ETG Almelo is located as one might think in Almelo. It is a high Tech company that designs and produces a lot of parts of ASML. The internship was about designing a new setup which would be able to apply a user defined windup tension. And if wanted variable over the windup process. In the shown figure, the new designed and build setup can be seen, everything in the upper right quarter of the figure. The setup created tension by creating a braking torque in a DC motor, which was controlled by an Arduino reading out the tension in the material with a loadcell.



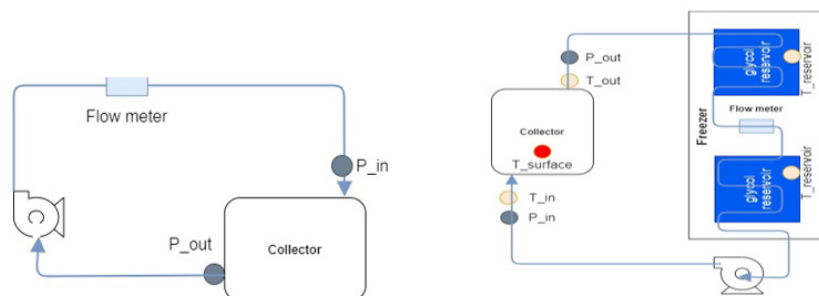


# Viridi Production B.V.

Viridi Production is a company specialized in the PVT collector manufacturing and designing located in the city Hengelo in the Netherlands. This internship assignment provided by the Viridi is to measure the performance of the collector through two experiments.

The task of this internship assignment is to design and build up the setup of experiments by which the company could have quantified information of performance on PVT collectors.

Two main experiment setups are the flow resistance and the thermal performance. These are the two main indicators of the PVT collectors' performance. The experiment results could be used to compare different designs. The thermal power of the PVT panels as source for a heat pump can be determined. Therefore, the experiment is a tool for developing future designs.



Set up for flow experiment (left) and for thermal experiment (right)

# VIRO Engineering B.V.

Internship at VIRO Hengelo could be very versatile due to large number of customers they serve. That is, they can offer almost for many interests an interesting internship assignment. The intern will be integrated completely in the project group to function comparable as an engineer and work on serious projects. The assignment will require mainly engineering as well as meeting and discussing with VIRO and customer's engineers. This makes the internship challenging, since this has not been a large aspect of the study prior to the internship. At VIRO, the teams consist out of many young engineers which are open for discussions and trying to help whenever possible.



## VMI Group

The intern stayed in the Netherlands for her internship, at VMI, a machine building company in Epe. The company was found via Bedrijvendagen. They had a spot available at the quality department, where the intern had to investigate how the engineers could be trained in sustainable engineering and how that training should be continued in order to create sustainable products. Due to the corona virus it was only possible to go to the office once per week, and there only a few people from the department were present. But with weekly casual Skype calls with the whole department it still felt as she was part of the group. VMI is a great company for internships, they were constantly involved in the project and the colleagues were very friendly.



## Zitron Nederland B.V.

Zitron Nederland in Hengelo (Ov.) is a manufacturer of ventilation systems for railroad and traffic tunnels. They provide detailed designs as well as install and maintain axial and centrifugal fans for such ventilation systems. In order to provide a properly distributed airflow throughout the tunnel, deflection vanes are mounted at the outlet of a jet fan. The goal of the internship was to optimize these deflection vanes with respect to noise production, aerodynamic drag and flow deflection in general. This was done based on experimental data, analytical models and CFD simulations. Every co-worker was willing to help and advise at all times, which created a very friendly atmosphere. Most of the recommendations will be applied to future designs, which makes for a very interesting and useful internship.

