2016 JCCU Industrial Tour to Sweden and Denmark Report

This year the Industrial Tour took 15 Materials Science undergraduates, 1 postgraduate and 1 member of staff through West and South Sweden for industrial visits to Volvo Trucks, Höganäs AB, Trelleborg AB and Lund University, finishing in Copenhagen, Denmark.

The Tour began with a bright and early 5am start on Sunday 13th March, for a quick flight to Gothenburg, Sweden. The first day was relaxed, with free time to explore the beautiful city of Gothenburg and recover from the early start so we were ready for the exciting and packed week ahead.

MONDAY 14th March 2016 – Materials Technology, Volvo Trucks: Gothenburg, Sweden

The first visit was to the Materials Technology division of Volvo Trucks in Gothenburg. Our visit consisted of a presentation about the division itself, the metallurgical technology the branch deals with and a guided tour of the materials testing facilities that are onsite. We learnt how Volvo Materials Technology assists companies in the Volvo Group with applied metallic materials technology in product development, supplier quality and failure analysis.

The tour of the research facilities was given so that the route followed a typical examination of a failed part sent to the division for analysis - 57% of these components are involved in power generation and transmission, such as engines or gears. This begins with careful documentation and photography, followed by mechanical testing such as fatigue testing and fractography. There were multiple workshops for sample preparation for the use of various microscopes and hardness testers. The tour was particularly interesting as we saw what the materials scientists were doing first hand. It was great to know that the many hours we spend refining our polishing and grinding skills in undergraduate practicals would not go unused in industry.

We were also treated to a delicious Swedish lunch during the day in their company restaurant. This break gave us an opportunity to talk to staff about working at Materials Technology and other divisions of the Volvo Group, giving an insight into the friendly atmosphere of this large firm. Once we were done at Volvo, it was a 2hr journey on a spacious train, down the Western coast of Sweden to arrive in the university city of Lund.

TUESDAY 15th March 2016 – Lund University, NanoLund, ESS and MAX IV: Lund, Sweden

The Lund University campus was a short walk from our hotel in the centre of town. We first visited the nanotechnology (NanoLund) department, which we subsequently found out was a subset of the P–guild (physics). The importance of guilds was stressed to us later in the day.
The morning started with a short interactive session with a group of students, where we quizzed them on various topics; the course, the department, student life and the city. They explained to us how all the engineering faculty topics started with a 3-year bachelors degree and then a 2-year masters programme followed. For the nanoscience group they could choose their masters from four main groups- electronics, biomedical, physics or materials.

Lund University Campus. Picture courtesy of Shona McNab

The next part of the NanoLund trip involved a tour of the facilities. We visited the Lund Nano Lab clean room. It featured state of the art spectroscopy alongside a large collection of research and characterization equipment.

For the afternoon we travelled to MAX IV and the ESS construction site. MAX IV is a newly finished synchrotron research facility hosted by Lund University. It accelerates protons around a large circular ring (528m circumference), producing X-rays of high intensity and quality. It has branded itself as the brightest X-ray source on earth due to the coherence of the wavelengths of the radiation emitted. During the tour of the site, we were able to see where the different beamline groups were situated and what the main focus of each would be. Scientists at BioMax and HIPPIE explained how their beamlines would be used once the facility was fully functional.

After MAX IV we headed towards ESS; the world's most powerful neutron source, which is a partner facility to MAX IV. Here we viewed the large construction site and listened to a presentation on the visions and overall goals of the ESS. Construction started on the European Spallation Source in 2011 and is forecast for completion in 2019. The mammoth build is predicted to cost around 14 billion SEK, but should attract more than 5000 visits/year with expertise ranging from medical to communications research.

After ESS we headed back into the City Centre where the student president of the Engineering Faculty greeted us. He gave us a tour around the City Centre, pointing out the main attractions, which included the cathedral and the university buildings. He showed us all the different departments (guilds), which the Engineering Faculty encompassed and explained how the guilds were an important part of university life; they had their own songs and competed against other guilds in various extra-curricular competitions.

In the evening the Engineering faculty hosted us for a delicious 3-course meal, which was cooked by the student union sabbatical officers themselves. Here we got to meet some more students from the different guilds and compared university life. We were handed a song book at the beginning of the evening and sang lots of traditional Scandinavian songs, sampled traditional Scandinavian Schnapps and ended the evening with a traditional Scandinavian Sauna on the rooftop of the Union building. All in all, a great day thanks to our Lund University hosts!

Oxford and Lund students from various Guilds at The Student Union, sharing a classic Lund dinner party, prepared by the Sabbatical Officers. Picture courtesy of Björn Sanders

WEDNESDAY 16th March 2016 – Höganäs AB: Höganäs, Sweden

Next stop on the Tour was to the town of Höganäs after a two hour coach journey from Lund. We visited the headquarters of Höganäs AB, the world's largest producer of metal powders who mostly sell to the automotive industry or for welding and coatings. Other products that also utilise Höganäs metal powders include water filters, packaging solutions and food additives/supplements. We heard how the automotive industry makes up 70% of their market and in every car there is likely to be about 10kg of iron powder produced by Höganäs. We learnt how they aim to expand their stake by developing components that have never been made by powder metallurgy before, such as gears.

The most exciting part of the visit was the plant tour where we saw how they mass produced iron powders using the sponge iron reduction method – a method first used by the company 100 years ago. We were able to see every part of the process, including how giant crucibles of fine ground iron ore combined with reducing agents (coke) were heated at 1200C for two days as it passed through a 263m long furnace tunnel, coming out as a coarse iron powder. It was highly impressive how Höganäs automated every stage of their production process – from laser-guided lifting robots for transporting goods to automatically selecting the right volumes and types of metal powder, lubricant and graphite for custom mixes.

Group photo before plant tour at Höganäs. Picture courtesy of Rebecca Wang

For the last part of our day at Höganäs, we visited Power of Powder (research and development centre) and Digital Metal, a recently acquired subsidiary company focusing on commercialising additive manufacturing using metal powders, demonstrating another innovative use of metal powders. Currently they are able to make small, high complexity components from their powder-bed ink jet printing process. However, the entire manufacturing process of printing, cleaning and sintering is very slow compared to traditional methods. It was fascinating to see how this emerging technology was developing in order to increase automation and speed of additive manufacturing.

Overall, our day at Höganäs was fantastic as we not only saw the metal powders being mass produced with the sponge iron reduction plant, but also how R&D is carried out and learnt about the emerging technology of additive technology. We were impressed how all the employees we spoke to were truly passionate about their materials, innovative technologies and products.

THURSDAY 17th March 2016 – Trelleborg AB: Trelleborg, Sweden

Visit to Trelleborg. Picture courtesy of Rebecca Wang

Our final visit was to Trelleborg Group, an advanced polymer manufacturer, which was founded in 1905 as a rubber factory. The site that we visited in Trelleborg, on the Southern coast of Sweden had approximately 400 of the 16,500 total employees worldwide and consists of the head office plus manufacturing facilities. The group is currently split into five different business areas; offshore and construction, coated systems, industrial solutions, wheel systems and sealing solutions. Our visit concentrated on Trelleborg Offshore and Construction and Engineered Fabrics, a unit of Trelleborg Coated Systems.

The day began with a talk on Trelleborg Offshore and Construction which strives to provide polymer products which can seal, damp and protect in highly demanding offshore environments. It was interesting to learn that the offshore and construction business area of Trelleborg has no continual orders or deliveries; all of their work is based on specific projects from companies. We also had a tour of the Engineered Fabrics manufacturing plant where we learnt more about the production of the fabrics, for use in applications such as aircraft evacuation slides, chemical protection suits, flooring and conveyer belts.

Next, it was interesting to learn about Trelleborg Group's strong company values in the last presentation of the day and how they believe that their brand is one of their most valuable assets and allows them to reinvent themselves and enter different product markets. We also learnt about the Trelleborg Group University, an internal training program to ensure that employees are able to make the most of their potential within the company. It was clear to see that the "core values" set out by Trelleborg Group (customer focus, performance, innovation and responsibility) are central to all decisions made by the company.

We all found the visit to Trelleborg rewarding, especially being able to talk to employees from so many different sectors in the business which gave us real insight into how the company is run and what sort of opportunities they have to offer.

FRIDAY 18th March 2016, Tourist Day: Copenhagen, Denmark

After completing all the industrial visits, we bid farewell to Sweden and took the train via the Øresund Bridge to Copenhagen. Our final day of the Industrial Tour consisted of free time to explore the Danish capital, visiting famous sites such as the Little Mermaid statue, walking down the picturesque Nyhavn waterfront and seeing the changing of the guards at Amalienborg Palace. In the evening we came together for the celebratory Tour dinner at the restaurant TIGHT.

Feedback from the students includes:

"I thought that the evening at Lund University was really fun! It was nice to meet the other students and good to have some traditional food. In terms of the visits, I really enjoyed Hoganas as the speakers/tours were enthusiastic. I also enjoyed that the tour involved travelling to so many different places – it was great to have the free day in Copenhagen at the end."

"The whole tour has been a delight. We have visited many industries and been exposed to many different industrial areas."

"It was great to see how what we learn at university relates to the various industries. Despite the fact that I had never heard of Hoganas and Trelleborg before, it is amazing to see the broad range of industries and products the companies provide the raw materials for. The sheer scale of the materials characterization facilities at Lund and the multi-million tonne iron powder producing plant at Hoganas were incredible to see in person. Scandanavia was a great choice for the tour with not only a wide range of industry, but also with fantastic people, culture, traditional food and saunas."

"I really enjoyed the visit overall. I think there was the perfect amount of free time to explore the cities independently. It was great to see how materials stuff in our labs actually relates to industry. Great success! Thanks so much for organising it."

Rebecca Wang & Benjamin Evans

Inside and outside MAX IV. Pictures above and below courtesy of Rebecca Wang

Dinner party with Lund students. Picture courtesy of Björn Sanders

Nyhavn, Copenhagen. Picture courtesy of Rebecca Wang