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## **Excursion: Regensburg – Budapest – Prague**

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**University:** Jade UAS  
**Date:** 6<sup>th</sup> of May – 12<sup>th</sup> of May 2018  
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The excursion group and two employees of MR (on the right)

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Excursion Industrial Engineering (course Electrical Engineering IE)

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## 06.05.2018

On Sunday we left Wilhelmshaven at 8 o'clock. We had an uneventful and smooth journey and arrived in Regensburg in the late afternoon.



The excursion group at "Walhalla" Regensburg

After visiting the "Walhalla" we drove into the town, had dinner together and sat together to talk a bit afterwards.

Everybody went to bed rather early, so that we would be well rested the next day.

## 07.05.2018

### Visiting the Maschinenfabrik Reinhausen in Regensburg

We arrived at the factory Maschinenfabrik Reinhausen in Haslbach at 9 o'clock in the morning and got friendly received by Mrs. Riedl and Mrs. Stoiber. At first, everyone got their own identity card in the lobby, before we went to the conference room in the upper floor. After we took place in the conference room, we met two other employees of Maschinenfabrik Reinhausen. They showed us a small presentation about their company and explained how their main product, the "On Load Tap Changer" (OLTC), is working. Dr. -Ing. Bernhard Janssen was the person who invented the OLTC.

Some facts about the company: The Maschinenfabrik Reinhausen (MR) was founded in 1868 and was just a small sawmill until 1901 when they decided to build machines. Nowadays MR has over 3400 employees, from which 75% are actually working in Germany. 90% of their production is taking place in Germany. MR is world leader in switching transformers, nearly 50% of the world's power consumption is running over their products, and they have got 38 subsidiaries and six investment companies. Their annual sale is 750 million euro. The company is constantly working to improve itself and to be a safe, competent, reliable, advanced and networked company.

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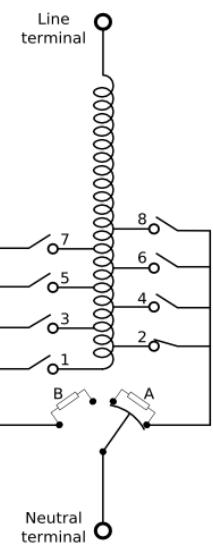
Another big thing about MR is that they were awarded "best place to work", because they were the second best employer in Germany in 2017. They told us that the employees are their priority, so they offer flexible working time, sport activities, trips, nutritional advices and respect each other as equals, as if they are a big family. They also want to focus on a longtime development strategy and even more attractive working conditions.

Besides that, they introduced us to their OLTC, which is a pretty important part in the transformer. It is regulating the power demand in the power networks. For example if there is more power needed, because many people coming home from work in the evening and turn on their TVs or something like that, a voltage loss in the network will appear because of the higher use of current. To prevent that less power is reaching the houses and factories, the OLTC will equalize that as it raises the level in the transformer. MR is offering two different types of the OLTC with different technologies. One is with oil tap and the other one with vacuum tap, where the lighting is going through, if the level will be raised or reduced. Therefore the OLTC is necessary for a transformer and should have a lifetime of at least 60-70 years, which requires high quality. To ensure that, they check every piece which is produced.

In the future, they will also face another problem because of the increasing renewable energy forms like solar power or wind power, that are really inconstant. Therefore, it is going to be a challenge to balance the power feed and the power demand in the network, because at the moment there are not so efficient ways to save the power.

Afterwards, we went through the assembly and production halls, where we saw a bigger variety of products that were produced by MR. Our first impression was that the production halls are really structured. We could go to the milling- and lathe machine, the tool construction and were allowed to have a closer look at the winding process of a fiberglass resin tubes, which are used as the outside case to protect the OLTC from wetness. In some parts they already used robots to take on some work, like polishing metal components for example. Furthermore, we went to their "museum", where we could see all the old OLTCs that they produced in the past.

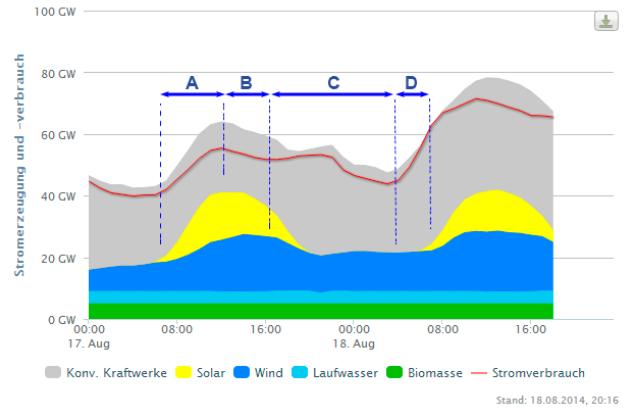
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Working principle OLTC



OLTC



Power consumption course in Germany, 2014

Unfortunately, we didn't manage to look into the main production hall, because the time was already over. In the end, they mentioned that they want to put their production halls closer to each other in 2022 to shorten paths and make it easier for the supplier trucks, due to just-in-time-production.

We finished the visit at 12:15pm and took a picture before we left. In conclusion, it was a great experience for us.

08.05.2018

### Visiting Festo

On Tuesday, the 8<sup>th</sup> of May, a visit to Festo was planned.

It started at 7 o'clock in the morning, after a 20-minute drive we arrived at the company premises. Our group was warmly welcomed, after a short coffee break we were greeted by the company manager. This was followed by a talk about the company.

Festo was founded in Esslingen in 1925 by Gottlieb Stoll and is a worldwide group with its own companies and 250 branches in 61 different countries. Festo AG & Co. KG is a group of companies in the field of control and automation technology headquartered in Esslingen am

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Neckar. The place of business in Hungary was founded in 1992 and has been growing ever since, with a new building planned every 4-5 years.

Festo also supports the "Master Factory" project, which shows small companies how to find solutions to specific problems. The goal is to build a fully automated line in 2020 with a cycle time of 5 seconds.

After the presentation about the different tasks of the company, we were guided through the different areas. This area in Festo is characterized by a high degree of automation, but also a lot of manual workstations are available. During the guided tour, it is constantly shown that every single worker is connected with the other workers in order to ensure short information channels. We were also introduced to the preparation for Industry 4.0. The company is very interested in taking advantage of the benefits of the Industrial Revolution, which will come in the coming years.

After this tour, open questions could be clarified in the meeting room. The questions were mainly about completing an internship in the company. In addition, Festo Hungary is trying to adopt the dual training system from Germany, which has remained very positive in their memory since every worker is appreciated and gets a great support. In conclusion, it was a very exciting visit. Particularly for our specialization Industrial Engineering and the associated Industry 4.0 it was great to gain initial insights into such a corporate structure.



The excursion group at FESTO AM Budapest

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### Visiting the Obuda university

In the afternoon, we visited our partner university in Budapest. The first impression of

the university was embossed by the museum flair. A scrapped locomotive was located in front of the entrance, on which students of the Faculty of Engineering and Electrical Engineering have planned various projects.



High Voltage Laboratory



Locomotive in front of the entrance

Within the university, there were various display models and evolutionary equipment. Past galvanometer and voltmeter of 1955, past sensors and a programmable logic controller made by Siemens in 1975 extended over two square meters, of which nowadays there has been only a fraction left.

The excursion group has learned a lot about different sensors as well as the way inductive and capacitive sensors work. Moreover, theoretical content was further explained on a test station.

Consistent with our lecture of electrical engineering, we got to know the way an operational amplifier works through an experiment in a labor.

Nevertheless, the highlight was located two streets further. There was a labor for regulating automatic and high voltage technology. We were able to watch students work on their projects. We were also able to watch an experiment at the high voltage labor, in which two electrodes created electric tension about 300.000 volt over only a short distance. The loud bang/acoustic shock and the thereby arising spark made every student wince, so that even the most tired student was awake and ready to learn more.

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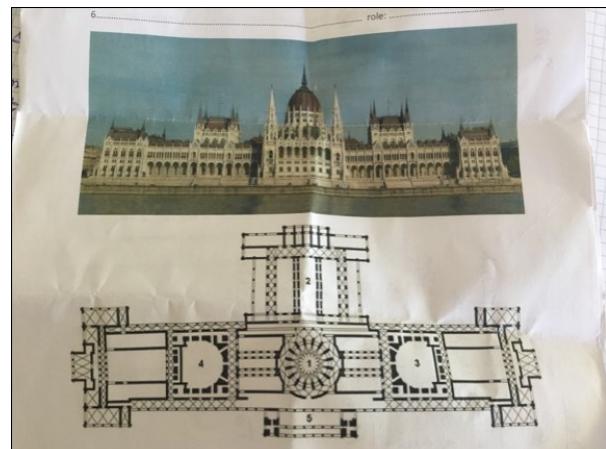
### Visiting the Citadella

Tuesday evening we visited the Citadella, which is located on top of Gellert Hill. While taking a few pictures and surveying the whole place, Mr. Beckmann told us interesting information about its history. The Citadella used to be of strategic and military but also symbolic importance. Nowadays, it belongs to the UNESCO World Heritages. Furthermore, there was the Liberty Statue (also called Freedom Statue) to be seen, which is a monument for „those all who sacrificed their lives for the independence, freedom and prosperity of Hungary“. It shows a woman holding a palm leaf.

09.05.2018

### Visiting another department of the Obuda University

On the third day of the field trip we visited the Obuda University in Budapest. The visited parcel of the university was 15 minutes away from our hotel and quite central located. The leader of the location received us heartily and after a small introduction we started with a task, which was prepared for our visit. The goal was to learn some aspects about project management and personal management. The actual task was to build the Hungarian government building with sugar cubes.



Hungarian Parliament Building

The students were separated into three groups, which included one leader and two builders who weren't allowed to talk. The leader had to tell the builders where to place the sugar cubes. Afterwards, we had a little discussion round, which reflected the process and everybody had to evaluate his own group and the working. The main aspect was to assess the own working.

After the task was finished we had a little walk across the campus and saw a lot of possibilities to be active, like basketball or ping pong. In the end, all of the students and professors were invited to lunch.

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### Sightseeing Budapest

#### Heroes Square

(*Hősök tere*)

On Wednesday afternoon we drove to Heroes' Square by car. The Heroes's Square, which construction ended in 1929, is a very important square in Budapest. The significant elements are the Millennium Monument and the colonnades which frame the monument from both sides. The idea of building the square and the monument was made in 1896 to commemorate the thousandth anniversary of the foundation of the Hungarian State and to do the heroes of Hungarian history the honor of building up the nation. These heroes, which are pictured on the statue, symbolize the Seven Chieftains of the Magyars around prince Árpád during the conquest of the present Hungarian state territory in 796. The seven horsemen standing in front of a 36-meter-high pillar with a statue of Archangel Gabriel on top of it. The statues in the colonnades portray the rulers and important people of the Hungarian history until the end of 19<sup>th</sup> century.

Right next to the Heroes Square is the main entrance to the City Park (Városliget), in which the excursion group get a time-out and some light refreshments. Characteristically is the gate of the Vajdahunyad Castle, which was also build as a part of the Millennial Exhibition in 1896. Between the Castle and the Heroes Square is a little lake where you can rent paddleboats or a canoe.



Millennium Monument at Heroes' Square

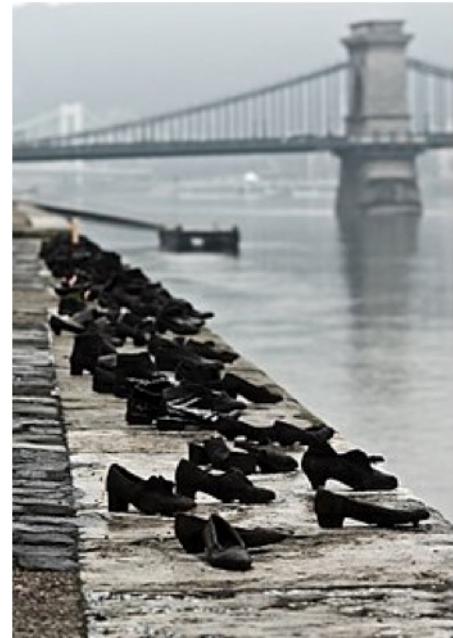


Gate of the Vajdahunyad Castle

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### Chain Bridge, Shoes on the Danube Bank

Afterwards, visited the Chain Bridge, whereupon the main focus of attention was on the Shoes on the Danube Bank, which are located between the Chain Bridge and the parliament. The shoes are a memorial for the Holocaust of the Hungarian Jews, which were shot at the Danube bank during the Second World War. This in 2005 newly build memorial has a very special aura, because it isn't very dominant and doesn't interrupt the perspective. But if you take a closer look on the shoes, which are looking close to reality and seem to be positioned as it happens, you can look through them in the dark history of this really idyllic appearing Danube Bank.



Shoes at the Danube Bank with a view on the Chain Bridge

### St. Stephen's Basilica

*(Szent István-bazilika)*

Not far from the Shoes at the Danube Bank is the St. Stephen's Basilica located. It is the third largest church building in Hungary and was named in honor to the first Christian King Saint Stephen. Completed in 1905 after 54 years of construction, the basilica is along with the Hungarian Parliament the tallest building



Inside St. Stephen's Basilica

in Budapest. Worth mentioning is that in 1868 the dome collapsed and there was a need of rebuilding from the ground up. Inside the Church is dominated by gilding and marble.

### Communal meal

In the evening, the whole group went out for dinner not far away from Óbuda University. The restaurant had a big seating area in the backyard, where the excursion group had the possibility to have a chat and allow the group to enjoy the end of the stay in Budapest.

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Besides the personal conversations, we summarized the stay in Budapest so far and the company visits. Following the dinner some students used the remaining hours to climb up the Gellért Hill and sneak a peek on Budapest by night from the citadel. Long after midnight the last students returned to the hotel.

10.05.2018

### Factory visit at Tyco Electronics Hungary in Esztergom

We entered the factory through the main Entrance, where we had to put on safety glasses and overcoat safety shoes. Afterwards, we walked directly across an assembly hall to the presentation room to get more specific information about the company.

Tyco Electronics is represented worldwide in the industries Automotive, Power industry, Health-care, Communications and data transfer, Commercial transport, Military and aviation and many more. The biggest industry in Hungary is Automotive and the biggest customer is the Volkswagen Company. They employ over 7500 engineers worldwide and granted over 18000 patents. They have two factories in Hungary, one in Esztergom and one in Békéscsaba.

The factory is divided into different areas of production. The molding has a size of 2600m<sup>2</sup> with 110 automatic machines and about 930 tools. Their overmolding is the smallest area with 27 machines and 46 tools. After the creation of product parts in the molding, it is necessary to put them together for finishing the product. This happens in the assembly which is split into automatic assembly with 4220m<sup>2</sup> and 43 machines and manual assembly with 800m<sup>2</sup> and 400 employees.



Safety shoe protector



Welcome gift

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Another product group of Tyco Electronics is the construction and production of ambient lighting for the interior of cars. The area has a size of 250m<sup>2</sup> and uses automatic soldering, laser cutting, light pipe bending and manual assembly. Furthermore, TE is capable to produce their own tools in the Tool shop. The area is 970m<sup>2</sup> large and exists of 22 machines.

The newest machine is a 3D-printer for metal. It uses the selective laser melting which melts metallic powder into a physically 3D object. This progress depends on the size of the produced tool, but it takes roundabout 70 hours or more to produce a tool for the molding machines.



Display in the entrance hall



The excursion group and two employees of TE Connective

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11.05.2018

### Sightseeing Prague

First of all, we drove from our hotel to the subway station “Muzeum”. After that, we walked to the Old Town Square where we met our tour guide. The tour started at 12 o'clock at the Old Town Square. In the beginning, he told us the following facts about the Clock Tower: The



Our tour guide in Prague

City Hall Clock Tower of Prague was quite taller before the Second World War and in October 2018 there is going to be the 100<sup>th</sup> anniversary party in it.

Our next view was the Church “San Nicolas”. It is an example of French gothic architecture.



Picture of the City Gate Tower

Afterwards, we moved to the Estate Theater where Wolfgang Amadeus Mozart performed “Figaro” for his first time.

A building architected by Picasso was shown to us by the guide shortly after that. The outside and inside appearance of this building is only made out of angular objects. There are no round-shaped things in it. Even the parasols are like squares.

Next to it was the Charles University of Prague. The Charles University is one of the oldest schools in Europe and Albert

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Einstein educated students at it. From this point we walked over the Royal Way which is decorated by 700 gas lamps. Our group went through a City Gate Tower, one of twelve which circle the old town, into the newer part of the city.

Then we arrived at the Wenceslas Square, which is named after a king who was murdered by his jealous brother. The square used to be a market, mostly where you could buy horses. Nowadays it's a traditional setting for demonstrations, celebrations and other public activities.

After a short break, we went to the oldest synagogue in Europe, the "old-new synagogue" which was built in the 13<sup>th</sup> century. The style of the synagogue is gothic.



Old-New-Synagogue

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Our last place was the place where we could see the Castle of Prague at its best. The Castle of Prague is the biggest castle in the world and the church in it needed 1000 years to be built up. The tour ended at 3 pm and after a small arrangement the group was split into smaller ones with which we strolled through Prague on our own.



... also Prague...

## Final evening

We used our final evening as an opportunity to reflect on and talk about the past week. The feedback was very positive, all students enjoyed the journey and would definitely like to make this trip again.



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12.05.2018

The last day was a nice and uneventful ride back to Wilhelmshaven. After breakfast at the hotel, we departed quite early. In the evening, everybody arrived safe and sound.



Morning sun over Prague



... a short break ...