Latvia - Excursion 2016

Department Management, Information, Technologie

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JADEHOCHSCHULE
Wilhelmshaven Oldenburg Elsfleth

RTA
RĒZEKNES TEHNOLOĢIJU AKADĒMIJA

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Sunday, December 20th

Alexander Bley

The journey was planned in cooperation with our supervisor Dipl.-Ing. Paul Beckmann and Prof. Dr.-Ing. Josef Timmerberg parallel to the lecture "Automatisierungstechnik". From the 20th to the 27th of November we attended a practical training to programming in "SIMATIC STEP7" within an international environment at the Rezekne Academy of Technologies.

The journey with the duration of one week started on Sunday the 20th of November with the travel to the airport of Bremen. We organized the drive to the airport on our own in little groups. The meeting point was the entrance of the Ryanair building. We left our luggage and passed the safety control without any problems, the airplane took off at 06:40h to the airport of Vilnius in Lithuania. The time shift was plus one hour. After round about two hours of flight we landed at 09:35h in Vilnius.

The next part of the journey we had to take a car. We picked up our luggage and went to the parking area, where a driver with a Mercedes bus waited. The distance between Vilnius and Rezekne was 275 kilometres. It was conspicuous that most of the country was uninhabited. We saw just a few single houses on the countryside.

After three hours on the road we reached Rezekne and entered our hotel "Kolonna". The hotel was located at a crossroads near a river. After one hours in the hotel, we met us in the lobby and decided to get first impressions of Rezekne. The city was characterized by new buildings and partially houses with a modern look. In contrast to them, there were always old houses. From a small hill with an old ruin we had a view over the whole city.

At the end of the day, we visited a restaurant not far away from our hotel to have a dinner. The dinner was very good and cheap compared to our German prices.

Picture 1: Restaurant "Sami S."

Monday, November 21st

Lukas Lamm

After a delicious meal in the evening, our first night at Hotel Kolonna was comfortable. Our first impressions of the Hotel were fine and all in all we had nothing to complain. From now on our Alarm clock was set on 8:30 am. We started with our work at 10 am every day. After our breakfast, which was okay but nothing special, we started walking to the Rezekne Academy.

On our way, we saw the first difference between Germany and Latvia. We all noticed the old and dilapidated buildings between the big, new and modern buildings. But the most buildings were old and not in a good condition.

Picture 2: Route to the Academy

As we reached the Academy, we were amazed by the modern building. Andris, the Latvian professor, welcomed us very heartily. Andris was a very friendly and lively person. Erika, the dean of the Academy, welcomed us too and presented the Rezekne Academy of Technologies. According to that, Paul also presented the Jade University to the Latvian students.

Following that, Andris showed us directly the Academy and each laboratory. We were impressed how modern the whole Academy was. After we gained a quick and impressive overview, we met the Latvian Students. Immediately Andris told us what we should do over the week and split us into groups with the Latvian Students. Our task for the week was programming the Festo Modular Production System via Simatic Step7. Each group had to program one step of the Production System and had to make a little presentation of the result.

At the beginning most of the students were restrained but after a short warm up the ice was broken.

Most of us started directly with the work at the MPS station. Lunchtime was at 1 pm, the meal was good but the service was very slow and we waited 30 minutes for our food. The Latvian Students told us we should do lunch at 12:30 then we must not wait so long. After lunch we worked together till 17 pm.

Picture 3: Rezekne Academy of Technologies

By having dinner in the hotel we resumed the first day. The resume was very positive all local people were very friendly to us and the most things were different than expected but positive.

Tuesday, December 22nd

Bernd Plaggenborg

Around eight o'clock we got up. The Tuesday was a cold and rainy day. In the course of the day the weather didn't get better and it was never really bright. After a common breakfast we went to the university together at 10 a.m. We were working on the subproject in our individual group.
About 2 o'clock we went as a group to the university cafeteria and ate a typical Latvian soup, stuffed potatoes and a pudding. After lunch break everyone worked again on their projects.
We dealt with the mathematic behind the analogue signal and wrote a mathematical model for it. In the early evening we went together to the hotel and we got showered
After getting ready we met in the hotel bar around 8pm and discussed our suggestions for the evening planning.

Picture 4: Bar in Rezekne

We agreed to spend the evening in a Skybar in the immediate vicinity of the hotel.
This Tuesday was a Chamipions Leauge matchday with a german team.
The bar was half a spotsbar and half a kind of casino. Those who weren't interested in soccer went to the game machines and tried their luck to win. Unfortunately none of us was very lucky in the evening. We ended the day with a beautiful cold beer and saw the Dortmunder team play in the champions Leauge.

Wednesday, November 23rd

Fabian Renken

On Wednesday, we went again to the University of Rēzekne where we worked on our projects. Everyone went to his station. Because some programs didn't work, some of us deleted their results of the day before and started to write a new program. The other

students had either finished or completed their programs. In the afternoon, some groups started to prepare their presentation for the following day.

But we didn't only talk about the project. We also talked about the differences of life in Latvia and in Germany. It was quite interesting to listen what they told us. After having finished the presentation the Latvian students told us, that there was party especially for students that evening. It was called Neon Party and we should meet them at 9 pm.

We went back to our hotel and planned how to get to the party. The concierge of the hotel told us which bus we had to take and after having prepared for the evening we went to the bus station. We were surprised that bus tickets in Latvia were really cheap. The ticket only cost 50ct although the trip was quite long. After we had arrived at the party some students came, welcomed us and presented the location. The entrance fee was also very cheap and we only had to pay 2 euros. But we had a problem because we didn't know, that we should bring our own food and drinks. So we decided to go to the petrol station nearby. But the Latvian students told us, that it was impossible to get alcoholic drinks after 10 pm in Latvia. It was strictly forbidden to sell alcohol then. They offered us

Picture 5: Poster of the Party

to share their drinks with us, but we didn't want to. In Germany people told us that lots of alcohol was self-made or even punched. But then someone had an idea. He and two guys of our German group went away to organize some drinks for us. They were lucky and we could celebrate together. After the party some of us took a taxi and went back to the hotel. The taxi was also very cheap. We only had to pay about 5 euros. The other members of our group went to a bar.

Picture 6: The German and Latvian Students at the NEON Party

Thursday, November 24th

Christopher Rauß

On Thursday, after the party night, it was really hard to stand up at 7.30 and some people of our group were a little late for breakfast. So we had to go a little bit faster to the Rezekne Technological Highschool. After the whole group was complete, each small group started finishing its projects and prepared the presentation. Every group made their presentation in Power Point. As preparation for the presentation some groups wrote down everything they wanted to say in a running text, others limited to headwords and some wrote down nothing. At 11.30 the presentations started and the order was like the sequence of the SPS- Machine. Noticeable has been the difference between the methods of presentation. On the one hand the German students, who spoke loudly and to the audience. On the other hand most of the Latvians students, who spoke gentle and straight to the white board. I assume the reasons are that the Latvian students don't present often, as one student told me. Then we showed the working SPS- machine to Mr. Timmerberg, who had some questions about it.

Picture 7: Showing the PLC-Machine to Mr. Timmerberg

After presentations and the demonstration, the whole group drove to an old Latvian royal house at 13.30. There we got a guidance with many facts of the old building which has been restored some years ago. The building with the rich woodcarvings on its façade, gorgeously decorated in eclectic style was built in the last quarter of the 19th century. It belonged to the merchant Vorobjovs, but very soon the building became the property of the city. Whilom it was used as teachers' institute as well as the school, the tuberculosis dispenser and the military registration office. Unfortunately, frequent change of owners almost totally destroyed the splendiferous inner arrangement. In the middle of the 1990s it was acquired by the Rezekne Art College. Due to the efforts of the students and the pedagogues, the Art House got back its initial outlook. In the Art House one can get acquainted with the exposition "Latgalian painting" from the reserves of the Latgale Culture History Museum.

Picture 8: The Latgale Culture History Museum

After a short walk in the park we got a homemade soup near the royal house. The soup contained potatoes, fish, onions and a lot of dill why many German students didn't liked it so much. The woman who made and distributed the soup could also speak some words German, as many people from Rezekne.

Picture 9: Waiting to get something to eat after the walk in the park

All in all it was a nice trip, but for me and some other students the royal house was not so interesting. Next time maybe a trip to the Latgales cultural museum would be more interesting to get to know more about the country. At 16.30 we drove back to the Hotel in Rezekne and the Latvian students drove back to the dorm. Everyone recovered from the last night some went to the Sauna in the Hotel, which is very cheap. At 20.00 we all met in one Hotel Room and we ordered Pizza. The Pizza was different from the one we got in Germany. As conclusion you can say that you have to be open minded for new tastes. Then we all stayed together in one room watched football and played computer games.

Friday, November 25th

André Löschen

At 9:45 The Day started with the opening of the RTA Laser Centrum. The Rezekne Academy Technologies has a partnership with the University in Mittweida/Germany and got a few Machines and Devices for Researching Laser Technologies. There where German Guests and Politicians of Latvia. Some Parts are for researching are in area of Laser colour marking and they expect to get some milestones in the next 7-10 years. After the opening, we heard a lecture from Prof., Dr. Lubomir Lazov about Laser Technology especially about the History and how it grows. Prof., Dr. Lubomir Lazov is speaking German so the lecture was also in German.

At 12.00pm we started to an excursion to a company named VEREMS. They produce plywood Boards. The tree is cut into a long sheet by being clamped and turned. Then the long sheet is going to be cutted in smaller sheets. They were about 3x2m. Then they separate by quality and lay some sheets above each other with glue between them. Now the pile is pressed. When the glue is hard the pile is a plate. And they cut the edges straight. We saw the production Line from the raw material (tree trunks) to the ready Boards.

After the excursion, we drove into the woods to go to a view tower. The Area is called Ančupāni. There is also a World War 2 Memorial. There was also a little Lake. We got a look all around there and took a walk for about 2 hours.

Picture 10: View Tower in Ančupāni

Saturday, November 26th

Jan Hüsing

On Saturday the 26th of November, we woke up at 7 o'clock in the morning, because the bus brought us at 8.30 am to Vilnius. At Vilnius we first checked in at the Ivolita Hotel. The rooms were clean and looked like a mashup from modern and classic. After we get in our rooms, we relax for an hour. Then we were going to explore the city. We found a little market where some of us bought some things. Later we discovered the historic center of the city. There were a lot of restaurants and lovely little stores. There were also a lot of soldiers from different countries. A lot of them were German. We also found a Christmas market, but before we were going there we had to eat something, because we were hungry. So we went to KFC and had a little meal. When we were finished we decided to going up a hill where an old castle stands. The castle was more like ruins, but you had a great overview of the city. After we went down, we decided to now visit the Christmas market. At the Christmas market we had cup of mulled wine and talk a little bit. Some of us found some cool stuff and bought something.

Then we went again through the historic center of the city. There we found a nice restaurant where we wanted to go later. We also went through little alleys and saw there some historical and cultural things. Before we went to the restaurant we found earlier, we decided to going to our hotel to spend some time there. The restaurant was very nice and the food was very delicious. The prices were the same as in Germany. That was a little surprising for us because in Latvia everting was cheaper than in Germany. After the dinner some of our group went again to the Christmas market and after that to some bars. The rest were going to the hotel.

Picture 11: Christmas tree

Picture 12: View over Vilnius

Sunday, November 27th

Julius Bihler

The Sunday began early at eight o'clock local time in the hotel "Ivolita" where all participants of the group met for breakfast. The taxis were ordered for nine people at 8:30 so there was enough time to reach the airport. Only two taxis arrived with room for eight people so a little delay occurred. The receptionist had to come due to communication problems. A third taxi has been called while the first two were already heading towards the airport. After the arrival some discussion evolved due to price differentials for every taxi although it was the same route. The check-in happened at nine o'clock. The check-in, the security controls and the ticket control happened without any problems. Rynair flight 7601 to Bremen could start four minutes earlier as scheduled. It was good flight weather and the plane landed 15 minutes earlier at 10:35 in Bremen. After everyone has had his luggage the excursion to Rezekne ended at 10:50 with some final words of Mr. Beckmann. After that everyone headed home in multiple ways.
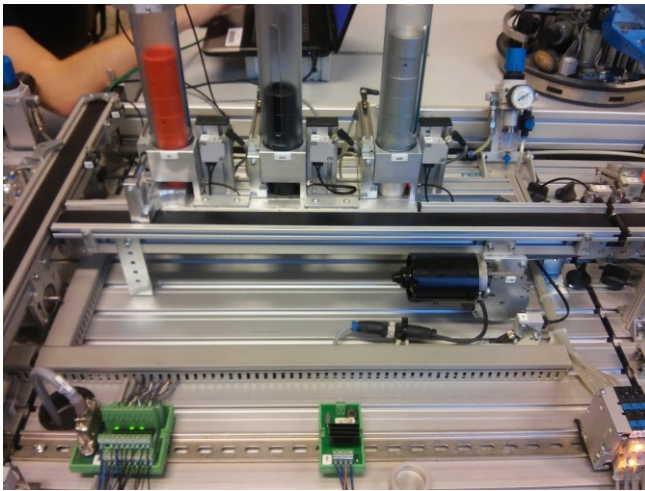

Picture 5: Group photo in front of the hotel

1. Station report

In this section the different stations of the modular production station are described.
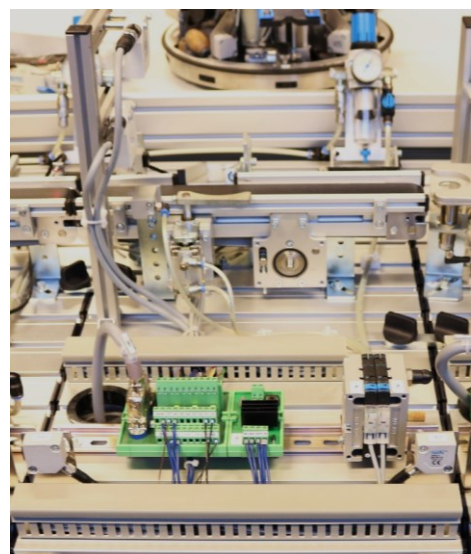
1.1.   Station 1

On the first day, we were divided in eight separate groups to work with students from the Rezekne Academy of Technologies at the SPS-station. My task was to program the first station with two students from Rezekne until Thursday. Our station was responsible for giving out the workpieces in the right order to the right time. When we pressed the start button at the control panel sensors checked if workpieces are in the magazines and the conveyor also started. Than a red workpiece was ejected by a cylinder und a programmed timer started to count. After fifteen seconds, that was the time which the other stations needed to handle the workpieces, the next workpiece with the colour black was ejected. The same procedure we used for the silver workpieces. When one of the magazines were empty the conveyor stopped and we had to refuel that magazine with workpieces.
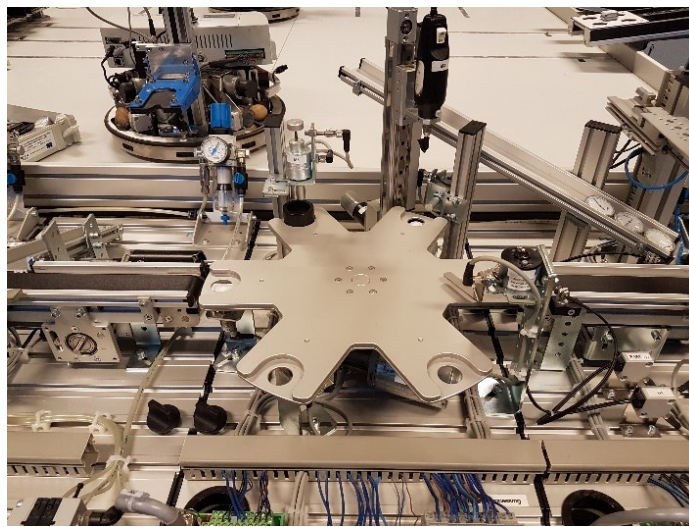
1.2.   Station 2

I programmed a sorting machine. It was for checking the order of the workpieces. And it was also checking if the workpiece lays in the top. The right order was first a red one then a black one and after that a silver one. A problem was that the belt which transported the workpieces was also black, so we had to program an exactly point for the color detection. After the checks the wrong workpieces had to be sort out. They were pushed to a slide. So, next we had to program that the belt stops when the slide was full. After that the program was ready. Maybe this sounds easy but the sorting process was very complicated and it took a lot of time to think about the program.

1.3.   Station 3

The task I had to work on was the third part of the factory street. This platform had six forms where a workpiece of the second part of the street was put in. After having come into the form, the platform turned to the next position. In the first position, the hole of the workpiece was checked. In the second position, the hole was cleaned by a drilling unit. It went down and cleaned the hole with a drilled brush. After that the platform turned into the last position and kicked the piece to the fourth part of the factory street. Many sensors were used to realize this part of the project. Four sensors were under the platform. One gave a signal, when the platform was in the correct position. The other three sensors checked if there was a workpiece in one of the six places.
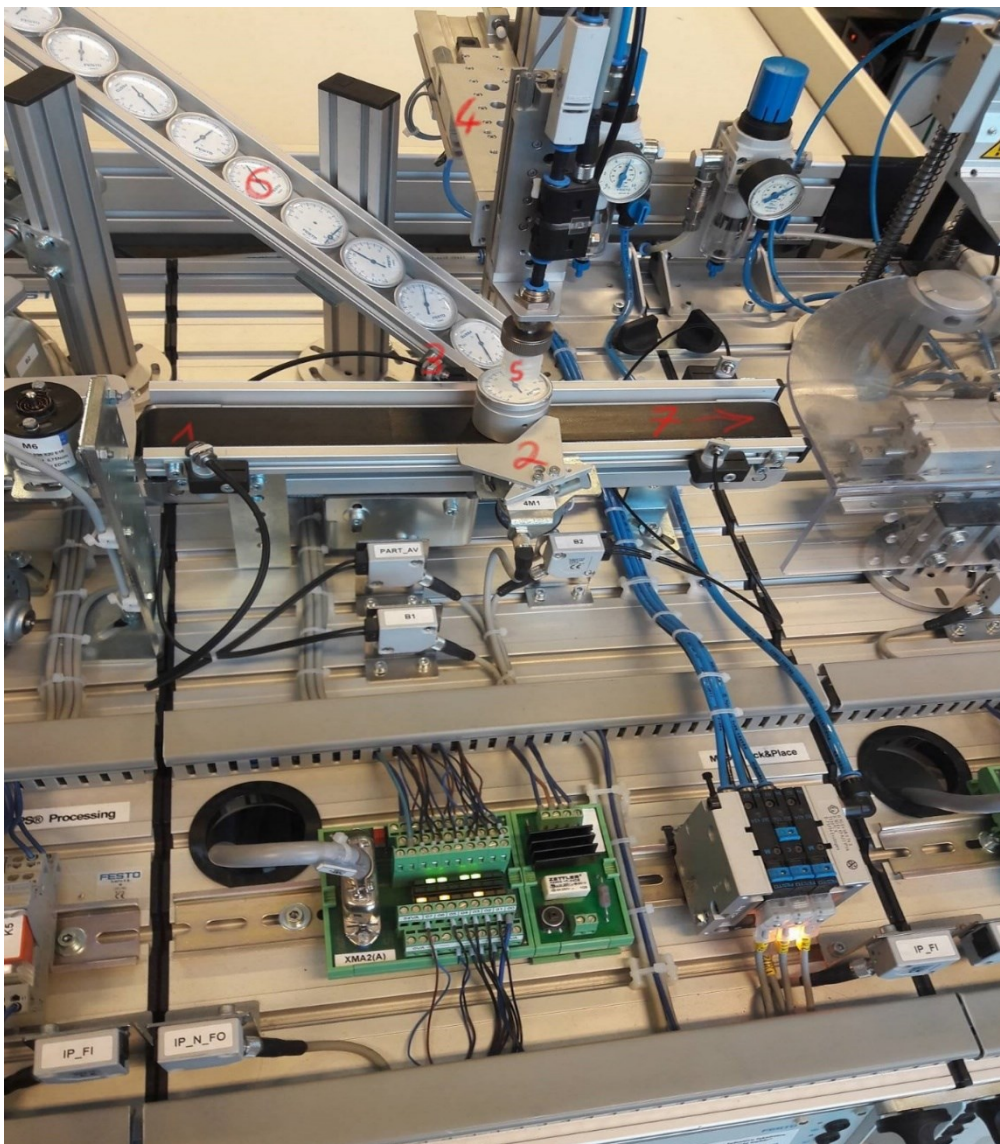

We programmed, that the platform only turned to the next position, after a new workpiece had arrived. Then the second sensor opened the next part of the program, which checked the workpiece. There also was a sensor that gave a signal when the hole wasn't correct. The third sensor under the platform was at the drilling unit. When the workpiece was in the correct position, the sensor gave a signal and it was fixed by a magnetic tool. Then the drilling unit turned on and went down to clean the hole. If the platform got a new workpiece, it turned to the next position. But it wasn't able to turn until the checking part and the drilling unit had been finished and the signal was given. After checking and cleaning, a little arm kicked the workpiece to the last position.

In our program the platform only turned when a new workpiece had arrived. But what about the last ones? We thought about, how the last workpieces could come out without being followed by another one. We solved the problem by switching between automatic and manual mode. When the control key was in manual position, we could press the start button and the platform turned to the next position. Then the last workpieces came out, and the problem was solved.

1.4.   Station 4

When the workpiece is passes the first sensor "part available"1 the conveyor starts and the separator extends   2When it passes the second sensor "Workpiece at processing position"3The Minislide   moves downwards 4 and the vacuum5 turns on. When the Thermometer in the Magazin 6 is picked up the mini slides turns down an extends. It´s turning down again but above the workpiece and sets the thermometer in is. The Minislide removes and the separator retracts so the workpiece moves on the conveyor and is handed over to station 5 7.
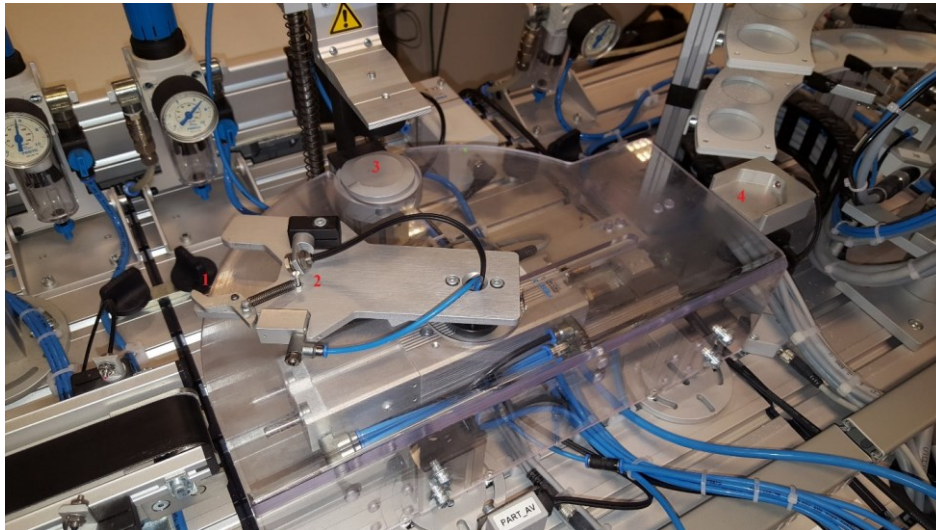
1.5.   Station 5

This Station should press the thermostat in the puck and hand over the puck to the next station. From the conveyor the puck moves into the gripper (1) .There the gripper has to close and then "the Hand" (2) moves to the press (3). When "the Hand" reaches the position under the press, the press moves down. When the sensor "pressure reached" is activated the press moves up. The "the Hand" moves to the fourth position (4). At first with a movement to the right und then straight movement to the fourth station. There the gripper releases the puck and the puck is ready for the next station. For a continuous process "the Hand" has to move back to the upstream conveyor.

At the beginning, we made us familiar with the whole construction and we tried out all sensors and actors. Then we made up a little plan how the program should work. With this paper we started programming. While programming we got some problems, like getting the right length for the timers or improving our program by trying to reduce the amount of memory   Stones.

1.6.   Station 7

1.   Controllable outputs and useable inputs:

At first, there are the basic buttons to start, stop and reset the program, as well as the lock which could be used with a key. There are 3 detectors for detecting the colour. There is one (the blue one) for detecting if it is magnetic or not (silver or not silver). The lower sensor can detect if the workpiece is bright or dark (not black or black). The upper sensor detects if there is any part at the stopper. There is also a shunt to pass a part to the upper station. This one is normally open. There are two belts. The lower belt (Belt Motor 1) which ends in the right station (station 7) and the upper belt (Belt Motor 2) which leads to the upper station which was not programmed. There is the stopper which closes to secure the clear detection of the colour. At last there are detection sensors at every entrance and exit of this station.

2. The Task:

The task was to send the parts to the upper station in a correct order which we had to agree on. Our order is silver, silver, red, black. So, if the right part is detected the shunt needs to send it to the upper belt. Otherwise, if the wrong part is detected the shunt will not close. The order should also be looped. That means, after the last one passed the order must restart.

3. The program code:
   a. Safety   functions
      The start and the stop key are used as safety functions. Therefore, the program only works when the start button was pressed. The stop button stops all process and the reset function will immediately reset all the markers.
   b. Belt   Motor   1
      This Belt will start as soon as there is a workpiece available at the entrance of this station. One ODT secures that if there is no workpiece detected for 10 seconds the belt will stop.
   c. Output   Section
      We created the "Output Section" to keep a clear overview of all outputs and by which marker they are controlled.
   d. Detection   of   colour   network
      If there is a workpiece at the stopper the timers start. Both timers secure that the Workpiece is standing still while being detected. The second one which is an "ODT-Timer" denies measures when the workpiece is moving into the stopper. The first one which is a "Pulse-Timer" denies measures when the workpiece is moving away from the stopper. This secures the right detection of the colour. The colour schema is a simple combination of "Bit Logic" parts (0 or 1). The first step is to detect if there is a workpiece at the stopper. This can be black, red or silver (magnetic). The second step is to detect if the workpiece is bright or not bright. Only the red and silver parts are bright. A black workpiece therefore results in another path. The third step is to detect if it is magnetic or not magnetic. Only a silver one is magnetic. These three steps secure the clear detection of the colour. The results are stored in a separate marker and the markers reset when the stopper opens. The stopper will open one second after a workpiece is detected and stays open for 400ms due to timers.
   e. Sorting   algorithm
      This is realized with a counter and equality comparators. The counter starts at zero and will be reset through another comparator, which opens if the counters number is larger than three. Comparators are open when the counter value has the same number as the value which is saved in the comparators (0, 1, 2 and 3). The right colour detection results in:
      i. Opening of the connection
      ii. Counting the counter up (+1) and therefore the next comparator is open
      iii. Shunt closes (after 2.5s / for 1s) just for this workpiece to push it up to the "Belt Motor 2"
      iv. Belt motor 2 starts for eight seconds

1.7.   Station 8

The Task of Station 8 was to detect the three different materials (red, black, metal) and realize the sorting of the materials in 3 rows.

To detect the material we had to use two optic sensors and one inductive sensor. The first optic sensor we have used for the detection is there material or not. If the optic sensor has detected a work piece the program started the belt. Next step was a little bit difficult. We had to program the material detection for the three different kinds of work pieces with the optic and inductive sensor.

The algorithm we programmed:

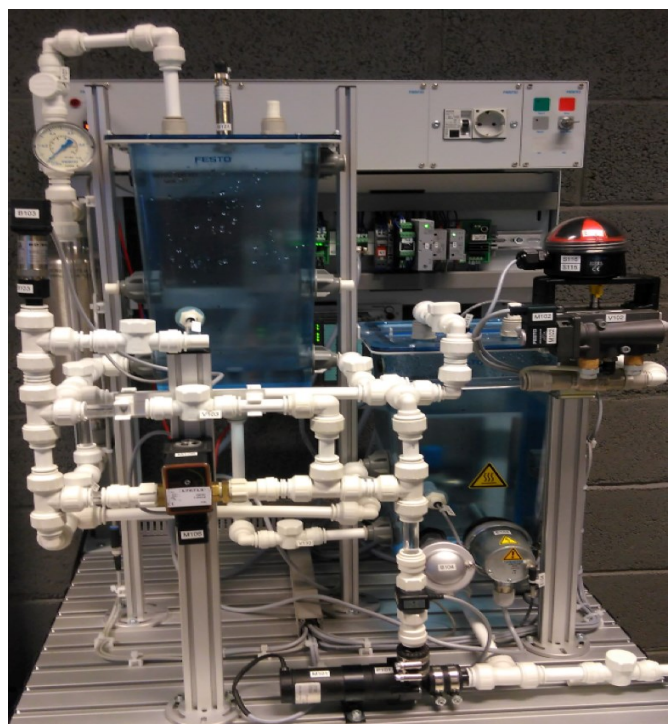Optic on and inductive on -> metallic work piece

Optic on and inductive off -> red work piece

Optic off and inductive off -> black work piece

After the detection, the stopper who holds the work piece in position for the detection retracted. At this point the program known which material are on the belt and which switch must be set to sort the material in the right row.

1.8.   Separated Station: Fill level control

With this station level simulations can be implemented. Various sensors are available to perform different simulations. There are two sensors for the filling level control on the lower tank. These sensors provide digital signals to control the pump and the pneumatic valve. In the upper tank there is the possibility to control the pump and the valve via float. This also supplies digital signals via an ultrasonic sensor. The ultrasonic sensor provides an analogue signal to use an additional mathematical model is required in the programming. This model must convert the analog signals into digital values. For this the parameters for the model have to be determined in previous tests. The pump feeds the water from the lower tank into the upper tank

and is supplied with the signal from the programming whether the pump is to pumping or not. The pump can be controlled via the speed, so different amounts of water can be pumped. The pneumatic valve is used to control and regulate the return flow into the lower tank. The valve is also supplied with signals from the programming there is the possibility to open, close or control the flow rate. A valve is installed in the valve, which can be opened differently depending on how much and how quickly water is to flow back.

Various different simulations and experiments can be derived from the different components and the associated settings. Our task was first to simulate the design of the system with the digital sensors on the lower tank. On the basis of this task, we understood the structure of the model. The operation of the pneumatic valve and the pump was easier to understand. In the second step we were concerned with the ultrasonic sensor since this only supplies analogue signals, so we had to get first reference values. We obtained these values by means of experiments and converted them using mathematical models. After that we wrote the program code with our parameters and set the mode of operation of the ultrasonic sensor with the pump and the pneumatic valve into our code. The last step in our programming was to set the start and stop conditions.