

**Research stay at Leibniz Universität Hannover (LUH),
Institut für Werkstoffkunde (IW)
Winter semester 15/16**

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Introduction

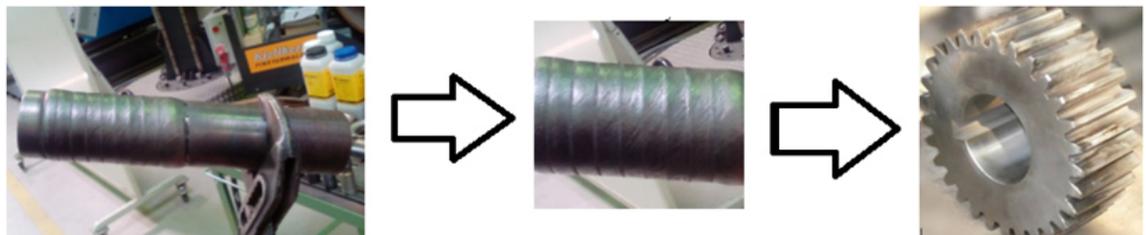
I arrived in Hannover at 05.10.2015 for the winter semester. Fortunately I have a friend who works at the LUH, so he met me at the airport and provided a bed. In addition, I want to thank the international office, in particular Nataliya Butych, Andrea Arnecke, my professor Thomas Hassel, my supervisor, Maximilian Mildebrath, and my friends for the great support during my stay.

This report is about my scientific work and living in Hannover during 5 months.

Research work

The purpose of my visit was to make a research work for my future master thesis, which has the following title: “Experimental investigation on the coating quality of PTA-welding in relation to the material- and process parameters”.

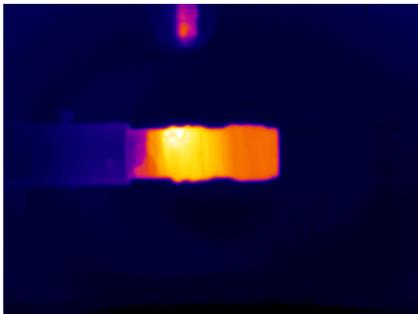
The purpose of this work - to reduce the cost of manufacturing process of parts in mechanical engineering (gears and gear shafts), while maintaining operability. The essence of technology: cylindrical low-cost metal workpieces are covered with anti-friction/corrosion resistant powder material and then the uncovered parts of the workpieces are removed and the surface is milled. Further, workpieces are putted into a press/molding machine and, as a result, we get the details of the necessary configuration (as shown below).



We have developed welding technology 5 different materials (Delcrome 253, 16MnCr5, 41Cr4, 50CrV4, 100Cr6) for steel C22 and analyzed the impact of parameters on the process productivity. 122 samples were welded by PTA-welding in accordance with the program, that we did, and then we cut it with a saw and



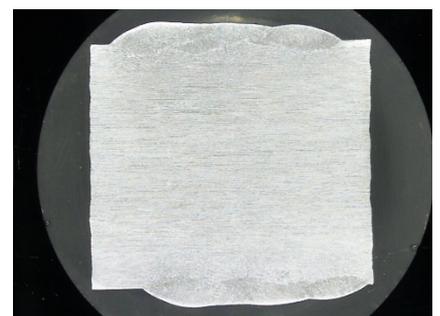
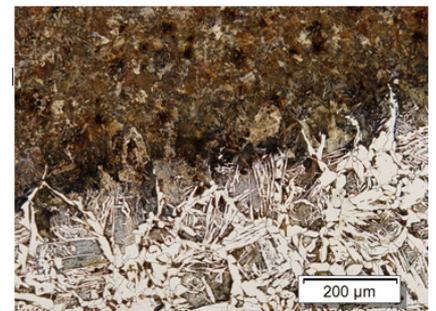
investigate its structure with a microscope for the determination of the powder and process efficiency. Of course, we had to communicate with the workers and to maintain good relations, what was also a great communicative experience.



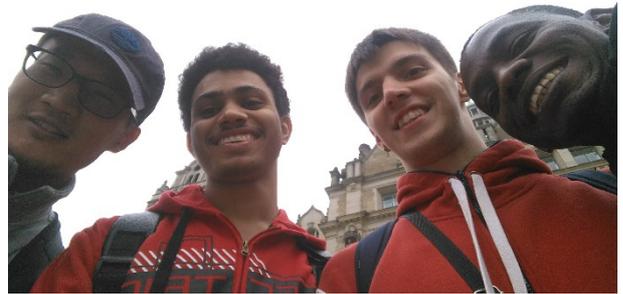
Also, micro-hardness tests were done, videos from the pyrometer were analyzed to determine the preheating temperature and the deposited area was counted for the samples exploring.

As a result of the work, the following conclusions were reached:

1. By increasing the current in increments of 10A, the **mixing** of the samples without preheating increases by only 5% or less and the character of the mixing value changing can be quite well described by a linear function;
2. By increasing the current in increments of 10A, **powder efficiency** grows up to 3-7% and the character of the powder efficiency changing can be quite well described by a linear function in the frame of the permissible process parameters;



3. The **hardness** of the most heated weld (third) is always the lowest compared to the hardness of the first and second weld and a sharp border between coating and base material can explain the hardness jumps.



Stay in Hannover

Everything was so great: from the private room to the relationship in the faculty. It were a lot of entertainment programs, excursions and parties. I have traveled through the lands of Lower Saxony, visited Hamburg, Dresden, Kiel, Bremen and many other cities.

Although it was a pity, that there was not any German language course for A1-level from October until February and tandem-language lessons did not take place. I went to courses on German A2, it was difficult to learn the language without the basic knowledge, even though I wrote the final test, but it has not been checked before my departure.



News from the international office were timely and useful. By the way, there were some problems with the period of my stay in the dormitory, but we have solved it very well due to Andrea Arnecke.

During this winter semester, I have learned many new and useful things, achieved the goals, explored Lower Saxony, did many sports (juggling, swimming, slackline, gymnastics, parkour & snowboarding) and my level of English has increased.

Conclusion

As a summary, I can say that this trip was so incredibly wonderful, the goals were achieved and the experience, which I got, would be unforgettable. I am very grateful to everyone, who contributed to this opportunity. Also it was very useful for me to improve my language skills and learn more about Germany and studying abroad.