



**NEW APPROACH TO INNOVATIVE TECHNOLOGIES
IN MANUFACTURING**

Deliverable 3.2

Focus group reports & Exploratory Research

Report

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1. Introduction

Focus groups are directly connected to the Exploratory Research Project to be realized within the project, as well as other research activities undertaken within the NEPTUN project. ERP goal stated in the project proposal consisted in the investigation of the influence of technological parameters during the fabrication of samples (by means of additive technologies) on strength and fatigue life. Focus groups taking place during partner's meetings are aimed at identifying the research gap, formulation of a research problem, determination of research questions, designing research methodology (research strategy, data collection, analysis techniques), conducting research process that will result in formulating research hypothesis. Focus groups are also designed to help create research groups which will work on scientific papers and other research activities, as well as specify the equipment to be purchased within the NEPTUN project activities. First focus group was organized during the second Partners' meeting in September 2023.

2. Focus group reports

2.1 Focus group during second Partners meeting in September 2023

NEPTUN Project Focus Group took place on the third day of the partners meeting, i.e. on September 13, 2023. To provide a basis for discussion and help define the research areas, the Focus Group was preceded by a presentation of the capacities of the Institute of Mechanics and Machine Design delivered online by Wiktoria Wojnicz, PhD, the head of the institute. Next, participants of the focus group visited the laboratories run by the Faculty of Mechanical Engineering and Ship Technology, including the labs which had been recently launched: Robotics and Haptics Lab, Additive Manufacturing and Reverse-Engineering Lab, Tribology Lab and Materials Strength lab. Each visit included a presentation of the available equipment and its capacities and a short Q&A session.



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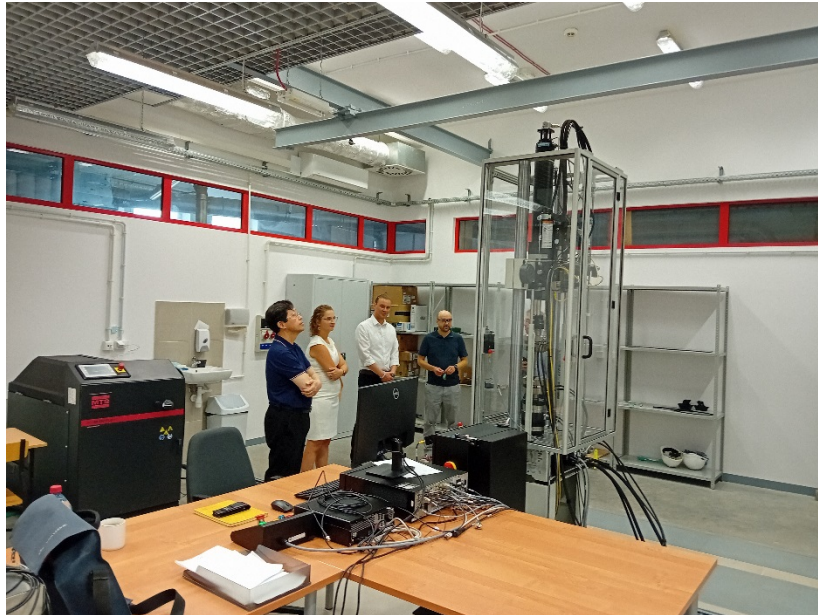


Fig. 1 Visit to Materials strength lab



Fig. 2 Visit to tribology lab

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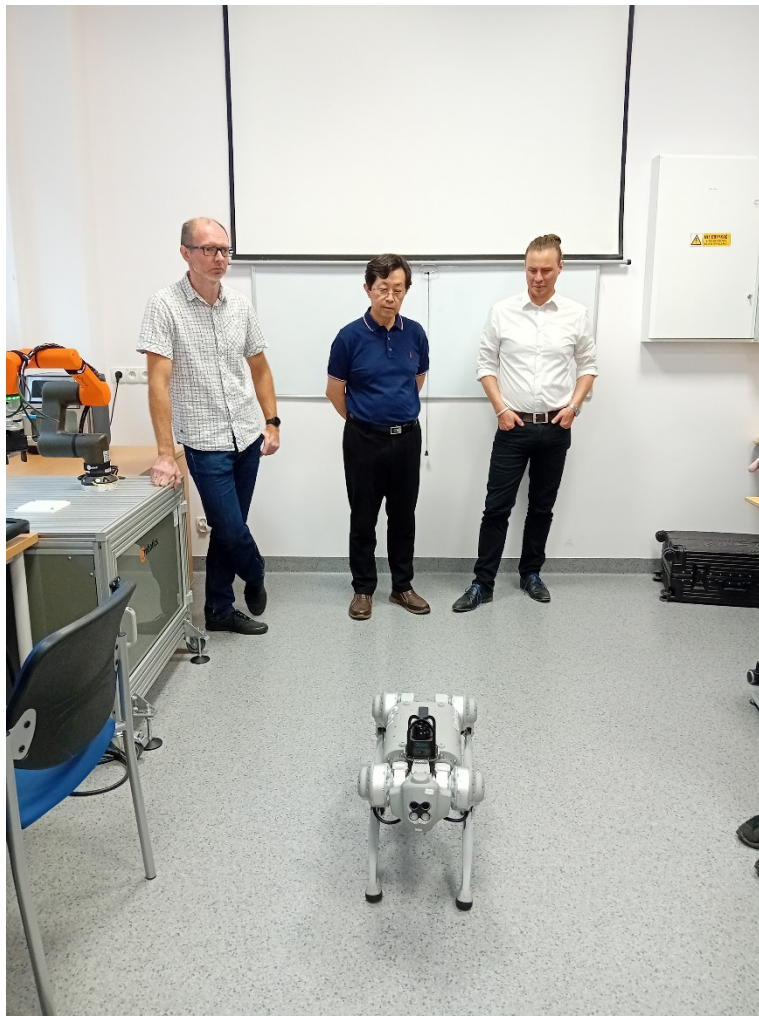


Fig. 3 Visit to Robotics and Haptics lab

Focus group that took place was centered on the areas of cooperation, exploratory research project and future project proposals. Gdansk Tech scientists discussed their current research interests and fields of interests. Together with the guests representing KTH, TUB and NTUA, they discussed the possibilities of scientific cooperation, which included: metamaterials, additive manufacturing and testing methods; metal powder printing, with recycling metal into powder which can be used as a base material for 3D printing; project planning, part planning, monitoring, parameters selection; human-robot interaction, especially predicting human behaviour in robot-rich environment, safety measures and protocols; cyber-physical systems and



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digital twins. The attendees agreed that the area for cooperation is very wide and that it can be strengthened through staff exchange between the institutions.



Fig. 4 Focus group – GDANSK TECH scientists



Fig. 5 Focus group – Prof. G. Vosniakos (NTUA), Prof. M. Deja (Gdansk Tech), Prof. L. Wang (KTH)





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After the discussion, professor Mariusz Deja (Gdansk Tech) summarized the focus group proceedings. Professor Deja said that the discussion was very important and valuable. In turn, Marek Chodnicki (Gdansk Tech) proposed creating working groups composed of scientists representing the institutions partnered in the NEPTUN Project. These groups will cooperate more closely in terms of specific research, publications and project proposals. The working groups will be established after the Gdansk Tech's team visit to TU Berlin.

Professor George Vosniakos (NTUA) mentioned that the papers should primarily be written by these working groups.

Professor Lihui Wang (KTH) stated that it is necessary to start working on the papers as soon as possible, since the publication process is a time-consuming one. He also mentioned that due to the nature of the project it might be difficult to generate the publication material, he also said that working groups mentioned earlier are a sensible approach to the problem. Possible research topics are listed in the table 1 below.

University	Research topic	Subtopic
NTUA	Carbon fibre reinforced polymer 3D printing	1. Path and parameter optimization 2. Mechanical testing 3. Design for AM
	Human-Robot collaboration in manufacturing	4. Manufacturing tasks recognition of humans 5. Extended reality human operator interface for collaboration 6. Grasping strategies and sensor for H-R collaboration
	Intelligent add-ons for smart manufacturing	7. MI process model based on sensors and cameras 8. Manufacturing process optimization, including correction using AI 9. FPGA deployment of intelligent prediction-correction tools
KTH	10. Human-Robot collaboration.	
	11. Cloud and function block-based processes planning, remote control	



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	and manufacturing systems	
KTH	12. 3D printing for shape memory polymers	
TU Berlin	13. Additive Manufacturing of lightweight components (e.g. carbon fiber enforced)	
	14. Topology optimization for complex geometries	
	15. LPBF/SLS Manufacturing system modulization and process monitoring	
	16. AM-process chain evaluation and optimization including pre- and post-processing	

Table 1. Possible research topics defined during the focus group

Professor Deja proposed a modus operandi on writing papers, resembling a peer-review model. Papers written by the working groups will be sent to other partners who will review them and, if necessary, add some content or expand the existing one. In this case, the contributors will be listed as co-authors.

Marek Chodnicki mentioned that it is also possible to invite other universities to the paper writing process.

Finally, the partners discussed possible journals where papers written within NEPTUN project can be published.

2.2 Conclusions

Discussion and findings from the focus group proved to be very valuable. The cooperation within the consortium is very good, which results not only from the long-lasting cooperation of the personnel involved in the NEPTUN project but also from convergent scientific interests. There are many ideas for the cooperation in the future, in many areas such as scientific papers, project proposals, research projects. Working groups consisting of the members of each institution involved in NEPTUN project will contribute to reaching the set goals of the project and they will also translate into new opportunities beneficial for each involved institution.



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