

PILOT ACTION EVALUATION

DT252 - PP5 - Partner Report on Pilot 1
Mentoring programme
01.07.2017 - 15.12.2017

Version 1
06 2018





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1. Short overview of the Pilot Action

The pilot action was a mentoring programme for university communities aiming to open the collaboration and widen the communities' knowledge about digital fabrication technologies available in local FabLab - StrojLab at Faculty of Mechanical Engineering Brno University of technology. The mentoring programme was open to motivated students with an interest in competition based projects. Three student teams were selected after the call addressed to faculty communities:

1. Formula Student Team - TU Brno Raing
2. Pneumobil Racing Team Brno
3. Aircraft Builders Team

The pilot action 1 - mentoring programme was done during the winter semester of academic year 2017/2018. Overall 9 students from 3 student teams participated in the programme. At the beginning of the programme, students chose the topic of the project which was interesting for the further development and competitiveness of their team. E.g. faster fabrication of components or additive design enabling more complex shapes. The mentoring programme itself consist of three phases, initial training, project design and project prototyping. Firstly the students passed the courses relevant to the chosen project topics. Then during the design phase were led by mentors to successfully implement the knowledge gained during courses into the manufacturable prototype. Third part was manufacturing of designed prototypes using stroLab equipment with assistance of mentors. Each student team finally produced one prototype.

- **Moulds of sidepod for formula student monopost**

The team of Formula student decided to use robotic machining workplace of the StrojLab to fabricate the master moulds for manufacturing of carbon or laminate parts of the formula student monopost. According to actual design of the monopost they designed the moulds with respect to achievable tool positions by robot and programmed the machining process.





- **Steering wheel for Pneumobile**

Pneumobile racing team decided to design the new steering wheel for their newly built pneumobile car. They needed to improve the ergonomics and weight. After comparing several concepts, they chose a variant consisting of a supporting plate and ergonomically shaped 3D-printed plastic with an internal lightweight structure.



- **Heat switch calibration components**

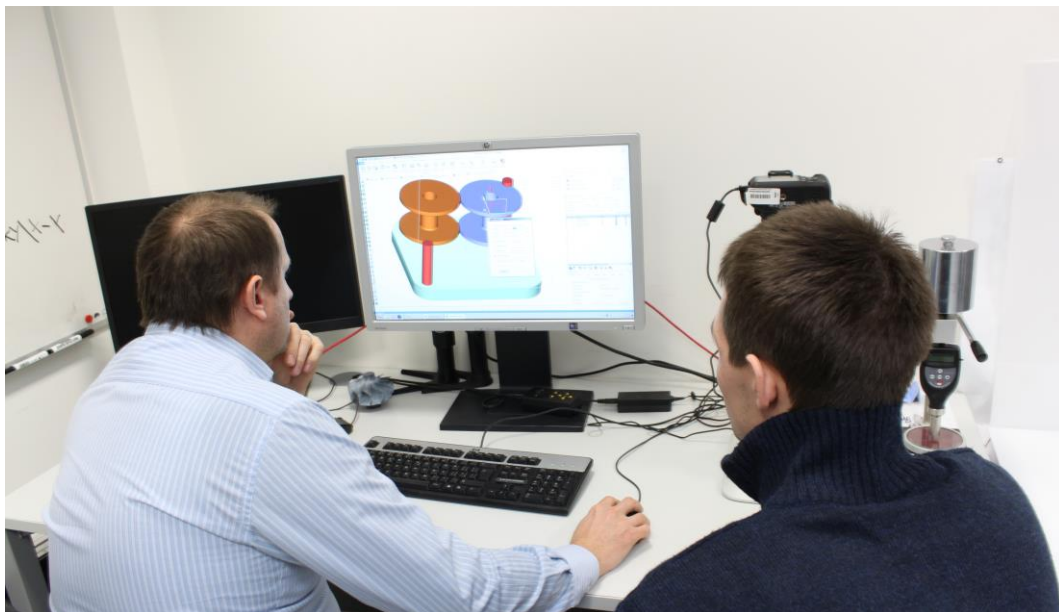
The aircraft builders team decided to test the new concept of their heat switch working in vacuum. They designed two components for calibration of thermal conductivity measurement in vacuum chamber which would be difficult to manufacture by conventional machining due to very thin central part.



Examples from mentoring programme are shown on following figures.









2. Lessons learnt

The pilot action 1 - mentoring programme was perceived by students as a useful and effective way to quickly get acquainted with the technologies needed to make their own prototypes. We found, that if the real application is planned at the end, the timing of the design phase and prototyping phase need to be adapted. Although not all prototypes were at the end of the activity in expected final shape, further work proved its applicability. Some ideas could not be implemented due to limited portfolio of technologies, students expressed their interest to extend it.

Stop Doing

- Time limitations of academic year. Start and end of the activity limit the possible time for real student action, which need to be during semester. Some projects need to continue over the end of the year.
- Available portfolio of technologies limit the possible project topics.

Keep doing

- Good discussion about the project topic at the beginning
- Offer and recommend the trainings according project topic, students were interested

Start doing

- Better timing of the Pilot action and schedule of student's projects at the beginning. Timing of the pilon action need to be linked to the timing of the project application.
- Widen the portfolio of available technologies.



3. Outcomes

Three student teams gained knowledge in use of basic StrojLab tools and particular topics of digital fabrication tools, and gained real experience from design and prototyping process led by the mentors.

- 3D printing basics

Introduction to basic 3D printer Falshforge Dreamer, data preparation in FlashPrint SW, machine handling, material change, what to do in case of troubles, part postprocessing.

- Vacuum forming

Introduction to Formech machine use, mould design and preparation, material preparation, often moulding errors and how to eliminate/minimize it, part postprocessing.

- 3D printing advanced

Introduction to 3D printer Dimension SST1200es, machine control, replacement of material, device maintenance, calibration of nozzles, data preparation in Catalyst SW, 3D printing, postprocessing of parts, troubleshooting.

- Robotic machining

HW robot control and accessories, tool change and adjustment, manual program creation with Kuka Control Panel (KCP), clamping the workpiece, starting the prepared machining program, production control and troubleshooting.

- 3D scanning

HW scanner control and accessories, preparation of parts matting+ reference points, basic settings for scanning, scanning with a rotating table and lift, replacement and calibration of measurement volume, basic data post-processing, fundamentals of work in SW GOM inspect, comparison of scanned and CAD data.

Three prototypes were done during the pilot action, the moulds for formula student sidepod, the steering wheel for Pneumobile, the heat switch calibration components.

4. Sustainability

Generally, the feedback on the results are positive, current student teams expressed interest to continue. In case there would appear new student teams, the pilot action could be sucesfully repeated. The extension of pilot action to wider audience of the university can be concerned, e.g. student teams from other faculties could be contacted or more general audience, currently not forming a comunity, but interested to form a group, could be addressed in open call.