Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Aleksandr Vedernikov

PhD Program: Mathematics and Mechanics

Title of Thesis: Effects of technological regimes on structural performance of pultruded profiles

Supervisor: Assistant Professor Alexander Safonov

Name of the Reviewer: Costanzo Bellini

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	**Date: 22-09-2022**

The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.

If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.

Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

The presented Doctoral thesis deals with the impact of process parameters on the quality of fibre-reinforced polymer profiles made through pultrusion process. The work of the candidate is composed of both experimental and numerical activities: the former is used to delineate the effect of the investigated variables on the process outcomes, extract the properties of the materials necessary for the numerical analysis, and obtain results for the validation of the numerical model. For its part, the numerical activity was used to extend the results regarding the influence of process parameters and material characteristics on the quality of the obtained products. In any case, the presented numerical model is a tool that can be used in industry to design the pultrusion process of multiple types of pultruded sections.

The thesis is composed of some chapters that introduce the topic, explain the motivation behind the work, relate the state of the art, describe the implemented numerical model and show the obtained results. Then, some journal articles are presented: they describe in more detail what has been shortly presented in the introductory chapters. Finally, the last chapter contains a summary of the obtained results and an outlook on the future and possible developments of the thesis. Therefore, the thesis is structured as a collection of already published papers concerning the topic of the work, supported by an extensive description of the carried out activities, specifically prepared for the thesis. It can be concluded that the manuscript is well structured, and the organization is logically coherent.

The actual content of the thesis is relevant to the topic of the dissertation. In fact, both the numerical and experimental activities carried out to achieve the research objectives are well described, as well as the obtained results.

The experimental tests are based on internationally-recognized standards for testing materials and practices applied in the actual industrial fields, while the models taken into consideration for the numerical simulation of the pultrusion process have already been successfully applied to other processes for composite material. Therefore, the employed method is certainly relevant for the intended aims.

The candidate aims to investigate areas that have not previously been the subject of research activities, such as the study of the effect of high production speeds on the quality of wide-section profiles or the effect of resin additives on profile deformations. The obtained results are absolutely interesting, and they constitute a good contribution to the advancement of the state of the art, also at the international level.

The results obtained certainly find application in industry, since, as explained in the thesis, there are several fields that need large-section composite profiles, and it is hence necessary to optimize and speed up their production.

The articles presented by the candidate have been published in highly recognized journals and the entire candidate's scientific production, composed of 13 articles, has achieved more than 170 citations, with an H-index of 8 (according to the Scopus database): these bibliometric parameters are quite elevated and testify the high quality of the publications.

In conclusion, the candidate may be admitted to the thesis defense. However, the following indication may be considered to improve the text:

- The English language is good and the usage of the technical terms is correct, but there are some typos and other minor errors to be emended. In particular, pay attention to the use of verb tenses.
- Subsection 1.3.1 outlines what has not been investigated in the previous research activities, but it is recommended that a summary of the pulling speed/composite quality trends that have been observed be added at the end of this subsection, perhaps even in tabular form, so that the reader can quickly get a picture of the situation.

- At the end of page 25, it is recommended to better explain the reasons for considering convective heat exchange also within the die, i.e. where there is contact between two solids, instead of thermal contact.

Provisional Recommendation

☒ *I recommend that the candidate should defend the thesis by means of a formal thesis defense*

☐ *I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*

☐ *The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*