MASTER'S THESIS EVALUATION REPORT

Name and surname of the student: Jitendra Reddy Kondapally

Master's thesis topic: Fatigue properties of H13 tool steel processed with use of Selective Laser Melting Technology

Master's thesis of student Jitendra Reddy Kondapally deals with a vital topic of fatigue properties evaluation for additively manufactured material – specifically AISI H13 tool steel. In present days, additive manufacturing technologies are more and more used for end-use parts and thus it is needed to know mechanical properties of the final product. Topic of the thesis arose from research activities of Laboratory of Rapid Prototyping at Technical University of Liberec.

Master's thesis contains 69 pages (including figures, tables and appendices) and it is divided into two major parts.

In the first part, which is contained in chapters 2-4, student presents the latest knowledge in three topics which forms a basis for experimental part of the work. In chapter 2, Selective Laser Melting (SLM) technology, its applicability and limitations are described. Chapter 3 brings information about fatigue testing of the materials and depicts available life evaluation methods. In the final chapter of state-of-the-art section, properties of H13 are described with special aim to its processability with use of additive manufacturing methods and fatigue properties.

In practical part of the work, student firstly describes building strategy for H13 tool steel in combination with SLM method. Then, microstructure of the H13 specimens in as-built and annealed condition is studied and related parameters such as porosity and hardness are evaluated. Finally, the fatigue properties are experimentally evaluated and the results are presented in Chapter 6.

Structure of the work is very convenient with clear border between state-of-the-art and experimental sections. Master's thesis contains a number of typing errors but the level of English is, in general, good and comprehensive. For most of the time, student was able to prepare and carry on the experiments on his own. On the other hand, student needed increased attention during evaluation of the data and writing of the report. This fact is most probably caused by gaps in student's knowledge at the beginning of the work and it must be taken into account that the student had to study substantially more material than what is described in the thesis. Aims of the thesis were fulfilled partially due to the fact that only annealed material was tested. This fact was not caused by fault of the student but because of time limitations and technical problems with hydraulic testing frame.

I strongly believe that this master's thesis contains new and valuable data and it contributes to deepening the knowledge about SLM technology and properties of SLM-built H13 tool steel.

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Level of Master's thesis fulfils the requirements for granting the Engineer (Ing.) degree

I recommend Master's thesis of Jitentra Reddy Kondapally for defence

QUESTIONS FOR THE STUDENT

1. Describe the method for splitting of total strain to plastic and elastic part presented in subsection 6.3.3 and table 6.2.

2. Describe the basics of least square method used for curve fit to the experimental strain-life data.
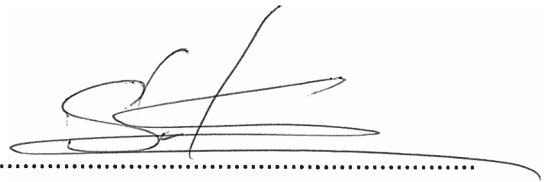
THE MASTER'S THESIS GRADE PROPOSITION

I propose the Master's thesis of **Jitentra Reddy Kondapally**, elaborated on the topic *'Fatigue properties of H13 tool steel processed with use of Selective Laser Melting Technology'*

to be graded: - Very good -

In Liberec, June 7th 2017

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Ing. Jiří Šafka, Ph.D

Supervisor