

I. IDENTIFICATION DATA

Thesis title:	Mechanical Stability of Carbon fiber reinforced composite pipe for ion accelerator research facility.
Author's name:	Ali Sadig
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Power and Process Engineering
Thesis reviewer:	Mgr. Ing. Daniel Hadraba Ph.D.
Reviewer's department:	Designing and Machine Components

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	extraordinarily challenging
<i>How demanding was the assigned project?</i>	
The field of composite pipes and buckling under external pressure is highly challenging. In addition to that, the direct measurement of deformation under irradiation of the pipe and the change in performance of strain gauges after irradiation provides valuable information for further research in composite materials.	

Fulfilment of assignment	fulfilled with minor objections
<i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	
The student target both hypothesis, however, should conclude on the results as being a case study. The comparison of experimental, FEA and theoretical approach could be more linked. Finally, the intro section is rather long.	

Activity and independence when creating final thesis	C - good.
<i>Assess whether the student had a positive approach, whether the time limits were met, whether the conception was regularly consulted and whether the student was well prepared for the consultations. Assess the student's ability to work independently.</i>	
The major difficulty of the thesis was a cooperation of three institutions from academic and industrial environment. This fact required high demand for management skills. On the other hand, the student was able to work on the manuscript rather independently including Matlab or ABAQUS implementations.	

Technical level	B - very good.
<i>Is the thesis technically sound? How well did the student employ expertise in his/her field of study? Does the student explain clearly what he/she has done?</i>	
As this topic exceeds the curriculum in the bachelor study program, the student had to apply new approaches and extend his knowledge to answer the questions. On the other hand, the terminology and the identification and description of the problems and results is sometimes ambiguous.	

Formal level and language level, scope of thesis	B - very good.
<i>Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?</i>	
The chapter Introduction is well organized but the result section would deserve more thorough composition. Sometimes the flow of the text is difficult to follow and styles through the text are incoherent. The student should avoid phrasal verbs. The thesis would also benefit from a proper proof reading as sometimes pipes numbering is confusing (page 84) or commas, spaces and capital letters are often misplaced.	

Selection of sources, citation correctness**C - good.**

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

The student heavily relies on non-reviewed resources such as company manuals or Wikipedia even the basic knowledge is discussed. It would be much more beneficial to use more reviewed books or impact factor articles and cite in the order of appearance.

Additional commentary and evaluation (optional)

Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

The topic of the thesis is highly innovative as the usage of composite materials and the parameters delivered by the companies are often disputable. Therefore, the topic of the thesis and the comparison of the different approaches presented in the thesis is its major strength. The student was able to demonstrate the ability to write the academic work independently, however, to reach perfect result, more time or effort would need to be invested in the manuscript.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

The thesis is balancing between B and C. The topic is highly innovative, however, in my opinion, some of the formal and theoretical – experimental conclusions are ambiguous or even incorrect.

Content related questions:

Page 81. *Why does the control SFx1 pipe exhibit any strain? Do you think this is really the measurement of the mechanical load on the pipe?*

Page 82. *How do you differentiate between stress and temperature effect while having a quarter bridge connection? Is there a way to compensate for the temperature effect?*

Page 83. *You mention "internal compression" due to evacuation. What does it means? Can you draw the pressure distribution situation in your experimental set-up?*

Page 83. *What is the major disadvantage of using the thin-wall cylinder theory for composite materials such as carbon fiber pipes?*

Page 87. *Based on one measurement, it is difficult to state "there is no significant difference". Why?*

Page 92 – 94: *Why are the stresses and strains so low for the analytical solution? Couldn't you make a mistake while defining the pressure conditions?*

General questions:

- 1) *When considering buckling what component of the carbon composite pipes is mostly responsible for the pipe's stability?*
- 2) *How would you comment on the orientation of the used strain gauges and expected principal stresses in the composite pipe?*
- 3) *What is the major problem while identifying the strain of the composite pipe while the strain gauge is attached only to the surface layer?*

The grade that I award for the thesis is **C - good**.

Date: **15.8.2022**

Signature:

