1-Aug-2021  
  
Dear Dr. CAROU:

Manuscript ID JEM-21-0255 entitled "Feasibility study on the use of recycling materials for prototyping purposes: a comparative study based on the mechanical resistance" which you submitted to Journal of Engineering Manufacture, has been reviewed.  The comments of the reviewer(s) are included at the bottom of this letter.

The reviewer(s) have recommended major revisions to your manuscript. Therefore, I invite you to respond to the reviewer(s)' comments and revise your manuscript. May I also draw your attention to the attached Editorial Checklist as the issues should also be addressed when preparing for submission of your amended version.

To revise your manuscript, log into <https://mc.manuscriptcentral.com/joem> and enter your Author Center, where you will find your manuscript title listed under "Manuscripts with Decisions."  Under "Actions," click on "Create a Revision."  Your manuscript number has been appended to denote a revision. You may also click the below link to start the revision process:

\*\*\* PLEASE NOTE: This is a two-step process. After clicking on the link, you will be directed to a webpage to confirm.

<https://mc.manuscriptcentral.com/joem?URL_MASK=61549428037546ccbaccd3fe15f9653f>  
  
When submitting your revised manuscript, please respond to the comments made by the reviewer(s) in the space provided.  You can use this space to document any changes you make to the original manuscript.  In order to expedite the processing of the revised manuscript, please be as specific as possible in your response to the reviewer(s). Please also highlight the changes to your manuscript within the document by using bold or coloured text.

IMPORTANT:  Your original files are available to you when you upload your revised manuscript.  Please delete any redundant files before completing the submission.

Because we are trying to facilitate timely publication of manuscripts submitted to Journal of Engineering Manufacture, your revised manuscript should be uploaded within 6-8 weeks.  If it is not possible for you to submit your revision in a reasonable amount of time, we may have to consider your paper as a new submission.

Please note that resubmission of a revised manuscript does not guarantee acceptance.  Any revised manuscripts will be subject to the same rigorous, independent, peer review as any original version of the same manuscript.

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Before submitting your revision please check for any misspellings or other errors in the author list. Please note that if there are any changes in the order or number of authors at this stage all authors will be required to complete and sign a form authorising the change.

Failure to provide all permissions and/or sufficient explanation for any changes to authorship may delay publication of your manuscript.

Once again, thank you for submitting your manuscript to Journal of Engineering Manufacture and I look forward to receiving your revision.

Sincerely,  
Ms. Annapurna Gupta,

Associate Editor

The Journal of Engineering Manufacture Editorial Office

ANSWER TO REVIEWERS

We would like to thank all reviewers because of the time expend with our paper and for their insightful comments. We are coming up with a new draft in which we are considering these comments. Moreover, we have edited the manuscript aided by professional services that may help us improving its quality. We are answering all the comments below. Moreover, you can see all main changes highlighted in red in the manuscript (English changes are not highlighted).

Reviewer(s)' Comments to Author:

Reviewer: 1

Comments to the Author

The authors presented feasibility study on the use of recycled materials for prototyping purposes. The paper has original content and worthy for publication in the journal. I can recommend it for a possible publication. However, following comments must be considered carefully before this recommendation.

- Supply research highlights.

Thanks for requesting it. We are including the highlights in this new version.  
  
- In introduction section, clearly describe the relevance of the study to the journal's scope.

We agree on that. There are several parts of the text clearly related to the journal’s scope. For instance, this one related to additive manufacturing:

***Fused filament fabrication (FFF) is a major additive manufacturing (also called 3D printing) technology, which have found considerable number of applications in different types of manufacturing sectors.***[***1***](#ref-Singh2020d)

Besides, we have added some words in the following to refer to sustainable and clean manufacturing (scope) that we consider interesting for the paper:

***Nowadays, there is a need to find ways to reduce the ecological impact of manufacturing processes, pursuing sustainable and clean manufacturing processes.***[***4***](#ref-Niaki2019)***,***[***5***](#ref-Peng2018)

Finally, we are including “digital manufacturing” as a keyword in this new   
  
- The contribution of the research to the relevant literature should be defined in a better way.

We consider that our approach and results are discussed in the text against the current literature in parts like the following:

***While a large body of literature is focused on the optimization of the parameters for obtaining functional printed objects using 100 % of the printed material, the approach taken here is to observe the influence of a wide range of factors that are critical within conventional printing ranges. This type of approach enables designers and users to utilize printing setups that are designed for object prototypes, providing certainty about the quality of the printed products.***

Moreover, in the conclusions, we have added some words that strength one of the key points that is the analysis of the printing conclusions:

***The paper aims to improve the sustainability of the 3D printing process, proposing a methodology based on Design of Experiments approach in order to asess the technical feasibility of the substitution of recycled filaments for virgin ones by means of a better knowledge on the influence of the printing conditions.***

- Present the figures with larger fonts.

FABIO

- Kindly provide some recommendations for future studies in conclusion section.

Thanks for the comment. We consider that this is discussed in the “Discussion and limits of the results” section. Please, see the following text:

***There are certain limitations to this work in the perspective of materials and parameters tested. Certainly, the use of other materials is needed to confirm the main findings. Moreover, other factors are needed in order to consider the quality of a prototype. Clearly, other variables, such as aesthetic design, dimensional accuracy and surface quality***[***5***](#ref-Jin2017)***4 are also key variables to include for the printed objects in addition to the mechanical properties in the prototypes where the main goal is user acceptability.***[***5***](#ref-Sauer2009)***5,***[***5***](#ref-Sauer2010)***6***

- I also recommend editing your paper according to the instructions for authors in the journal website.

Thanks for this comment. We are doing that in this new version.

Reviewer: 2

Comments to the Author

Recycling concepts have been already discussed by many authors.

Novelty is not seen in the workFollowing are similar works on the above topic

<https://doi.org/10.1016/j.jclepro.2020.121602>  
<https://doi.org/10.1007/s11356-020-10657-8>  
<http://dx.doi.org/10.1089/3dp.2016.0054>

Thanks for the comments. We agree that some works on the use of recycled materials in 3D printing have been recently published. However, we considered that the knowledge on this field is still limited. We are contributing to the issue with a comprehensive experimental study focused on printing conditions. Please, consider that the first two references that you are kindly providing us are review studies and in the third one, which is an interesting experimental study, all samples were printed using the same printing conditions.

We think that our paper can contribute in consolidating knowledge and providing insights for using recycled materials, particularly in rapid prototyping applications, improving performance by means of adjusting the setting.

Reviewer: 3

Comments to the Author

(There are no comments.)

Thanks for your time.

Reviewer: 4

Comments to the Author

Hello dear authors,

The work sounds very interesting, but there are many similar works on virgin PLA and recycled PLA such as below, so the paper cannot be accepted for publication in the journal of Engineering manufacture.

A comparison between mechanical properties of specimens 3D printed with virgin and recycled PLA

3D printing goes greener: Study of the properties of post-consumer recycled polymers for the manufacturing of engineering components

On Process Capability of Multi Stage Primary and Secondary Recycled PLA Composite Matrix for 3D Printing Applications

Regards,

Thanks for your time. We agree with the reviewer that there are some works dealing with recycled materials and 3D printing as reviewer 2 also indicated. However, we considered that the knowledge on this field is still limited, and these studies are certainly based on different approaches. We are contributing to the issue with a comprehensive experimental study focused on printing conditions. We developed a three phases program that allowed us to evaluate the most important printing factors: infill density, infill pattern, layer height, printing speed and printing orientation with a “limited” number of experiments: 56. We think that our paper can contribute in consolidating knowledge and providing insights for using recycled materials, particularly in rapid prototyping applications.

Reviewer: 5

Comments to the Author

Authors have done appreciable work; however the following points should be addressed –

•        Phase III study should be included in the Phase I study by incorporating ‘printing orientation’ as one of the process parameters. Please justify, why is Phase III study performed separately?

Firstly, we would like to explain that the three phases were done in this order. So, we did each phase, analyse the results and move to the next one. In this sense, in the first one we decided not to include the orientation when designing the experiment because the standard requires to perform 5 tests in each of the 3 orientations. This would result in 16\*15 specimens.

If we include Phase III into Phase I, we would be giving more weight to the printing conditions used in Phase III and the conclusions may be highly dependent on this decision. So, we think that Phase I is well designed as a screening phase, maintaining Phase III as a specific experimental study of the orientation.

We fully understand the point and we wanted to do it like the reviewer proposes from beginning on, but we couldn’t work with such many specimens to do it properly. Thanks for understanding it.

•        Please include names of process parameters and mention meaning of ‘\*\*’ and ‘\*\*\*’ in the Table 3.

Sure. Thanks a lot! We don’t what happened here. We are including the first column in the new version. Regarding the coding, we are not using that. These are the significance codes provided by R software. We are just using 0.95 and these symbols add little to our work.

•        Page 7, Line 29 – It is written that ‘In the A region, infill … with an approximately linear.’ However, from the equation written in the Figure 4 (b), it is clear that the curves are represented by second order polynomial. Therefore, please make necessary corrections in the sentence.  
Also, please ensure similar changes on Page 9, Line 53 - ‘The influence of … : from 40 to 80%, linear behavior with a slight slope, and from 80 to 100 % … a greater extent.’

FABIO

•        From the study of Babagowda et al. it is observed that lower percentage of recycled PLA in the blend results in the higher ultimate tensile strength. However, in the present study, 90% recycled PLA is used in the blend. Please explain the reason behind the use of 90 % recycled PLA in the blend.

We use that work as reference. In our case, our percentage was established by the manufacturer. We worked with a commercial recycled PLA.

•        Investigation related to the maximum load attained after 2nd and 3rd recycling of PLA should be incorporated in the present study.

Unfortunately, we cannot go back to these experiments and conduct new research as the proposed. The tests were performed several months ago, and we consider that some degradation is likely to occur. Besides, as we commented before, our recycled filament was commercial, and we can’t obtain new filament by reprocessing our samples with the same extruding conditions.

Reviewer: 6

Comments to the Author

Please consider these comments for improving the paper quality:

-        Pag. 2: Details about the authors are missing.

Thanks. We have submitted a fully anonymised manuscript as requested for the revision.

-        Comma should be put after the reference number. See for instance pag 2-line 35-35-36-44 etc (..processes.4,5       …with users.11  etc etc).

Thanks for the comment. We are updating the reference style in order to meet the guidelines of the journal.

-        Table 1: Text font is too big.

We changed the font size in this table (and the rest). We think that in any case the editing services of the journal should solve some editing problems like this one.

-        Try to put Figure 2 closer to the text where it is cited, therefore before section 4.

We agree. We moved the figure.

-        Pag. 5-Line 28: “Based on the literature research presented in section 2, the critical parameters for the study are the (1) layer height (0.15 and 0.3 mm) and (2) infill pattern (tri-hexagonal and grid).” Add reference/s.

Thanks for the comment. We are including these references.

-        Pag. 5-Line 34: “(3) infill density -ID- and (4) printing speed -PS- were considered.40,41 These four factors were selected using two levels for each of them with large ranges. The printing temperature was 210 °C, which was the recommended for PLA material. This phase ends with an analysis of variance (ANOVA) to identify the influential factors on the response variable.” Maybe this part has to be merged with the previous sentence (it also has a different formatting). Please check.

-        Figure 3: Description of (a) and (b) should be reported in the figure caption directly (not next to (a) and (b)). Same comment for Figures 4 and 5.

FABIO  
-        Pag. 8-Line 12: “..each of the factors. and the Table..” Remove the dot.

Thanks for that. Done!

-        Pag. 8-Line 30: The sentence is in bolt.

We’ve checked that the manuscript do not include bolt letters.   
-        Section 5 should highlight and discuss better the obtained results.

FABIO

Reviewer: 7

Comments to the Author

Dear Author.

thank you for work on recycling

1. General review this paper needs more proof reads

Thank you for the advice. We have revised the manuscript and we required professional editing for this new version.

2. Page 2, line 17 existing theories and previous can be merged with introduction and literature

We are doing it in the new version. We were afraid to have a very large introduction section.

3. overall please cut short introduction and literature

We find difficult to do that. We have shortened the text a lot in our first version (We removed around 2000 words). We consider that the background is adequate and interesting to readers. We are trying to cut it again in order to keep the relevant text. But please, feel free to give us advice in case that you find some text to be removed. Thanks.

4. for tensile test how many sets were fabricated for each combination of parameters in all phases?.

Phase I: 16

Phase II: 10

Phase III: 30

Total: 56

In the text you can find details of the two first phase, but it’s true that we have not included the number of specimens in the third one. So, we are adding this text for clarifying phase III:

***A total of 30 samples were tested.***

Moreover, we believe that the pictures of the specimens are also helpful for readers.

5. page 5 table 2, please could you add young’s modulus data also?

FABIO  
6. page 6. Figure 3.(a) sample no : RE 2 U, what kind of fracture ?

This is a case in which more research for sure is needed. In this case, in fact, there were no full fracture of the specimen. There were two starting points for fracture, creating two parallel lines, but in the middle some fibers seem to show high resistance to fracture. We think that we can’t go further without additional research, so we are describing the result like this:

***The breakage in these cases occurred at a 45****°* ***angle and, in the case of the RE-2 specimen, two parallel fracture lines can be clearly seen.***

Associate Editor's Comments to the Author:

Associate Editor

Comments to the Author:

Please revise the paper carefully. The use of the phase "mechanical résistance" in the abstract and paper does not seem to be correct. Please modify to the actual parameter evaluated in the study. Please correct the title as well.

Thanks for the comment. We agree on that and we removed all “mechanical resistance” in the text. We are using “Tensile strength” when referring to our results. When referring to general mechanical characteristics of the parts, we are using “mechanical properties”.   
Editor in Chief’s Comments to the Author:

The paper will benefit from a thorough proof-reading to improve the quality of English and enhance its readability. The use of professional proof-reading services is recommended.

We have revised the manuscript and use professional guidance in this new version.

The referencing needs strengthening and updating. In the process, the authors may wish to recognise the contribution of the Journal of Engineering Manufacture in the knowledge of this field of manufacturing by considering relevant papers, recently published in the Journal.

We have revised some of the references used in our background and enlarged the list.