Comment and Response

Manuscript ID: metals-1276337

Type of manuscript: Article

Title: Development Research on Integrating CNC Machine Tool with Plasma for

On-line Surface Heat Treatment

Authors: Shao Hsien Chen \*, Bo-Ting Wang

#Reviewer-1

Q1. In the last paragraph of the Introduction section, first define the shortcomings of previous research, then the goal and scientific hypotheses of your research, and finally highlight the scientific contribution of your research.

A1. Thanks to the reviewer, The Introduction section has been revised and supplementary. “The objectives of this study include (1) evaluating the hardening efficiency of plasma heat treatment, (2) comparing the effects of experimental parameters current、spindle speed and feed on hardening results, and (3) investigating the optimization and verification of plasma heat treatment parameters.”

Q2. Section 2. Research content and method is not necessary. These are all generally known facts.

A2. Original sections 2.1 and 2.3 are combined as section 2, section 2 mainly explains plasma heat treatment parameters and applications.

Q3. Table 1 shows the experimental factors and levels. How are these levels chosen? Based on what? Why are these representative levels?

A3. On page 5, the original table 1 is a revised table 3, the section 4-1-1 has been revised and supplementary.” parameter setting refers to equation 2, the voltage, current, and plasma thermal efficiency of the parameter were V=220 V, I=40A~60A, and η=0.23, respectively.”

Q4. What are the dimensions after treatment?

A4. Table 7 shows the original hardness and the optimized hardness.

Q5. Figure 9 is not legible. Color images are not clear and no scale is visible.

A5. Thanks to the reviewer, The original figure 9 is a revised figure 5, the labeling and resolution has been revised in Figure 5.

Q6. Discuss the obtained results scientifically.

A6. This article on sentence and content has been supplemented and revised.

Q7. Figure 23 is not necessary.

A7. Original Figure 23 is combined as Table 7.

Q8. What are the limitations, i.e. research shortcomings?

A8. On page 15, the section 6 has been revised and supplementary.” In our simulated heating experiment, the simultaneous movement of the spindle and the saddle causes the difficulty of temperature measurement technology, so the high temperature and speed do not consider the measurement, however, not considered in the current and quenching study and maybe research topic in the future.”

Q9. What is future work?

A9. On page 15, the section 6 has been revised and supplementary.” In our simulated heating experiment, the simultaneous movement of the spindle and the saddle causes the difficulty of temperature measurement technology, so the high temperature and speed do not consider the measurement, however, not considered in the current and quenching study and maybe research topic in the future.”

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#Reviewer-2

Q1.The current study investigates the development of integrating a machine tool equipped with plasma for performing surface heat treatments. The authors install this tool on a cnc machine and the aim is to use the plasma for improving mechanical strength and hardness through heat treatment. The authors change the spindle speed, feed rate and current and the aim is to optimise the process. The authors carry out statistical analysis to analyse the input parameters.

A1. Thanks to the reviewer, The objectives of this study include (1) evaluating the hardening efficiency of plasma heat treatment, (2) comparing the effects of experimental parameters current、spindle speed and feed on hardening results, and (3) investigating the optimization and verification of plasma heat treatment parameters.

Q2. The abstract needs some work, please show it in a separate paragraph and not combined with author details.

A2. On page 1, The Abstract section has been revised.

Q3. The abstract does not read well, there are some repetitive information which can be removed/ shortened, please consider reviewing the abstract and highlight the novelty, major findings, and conclusions.

A3. Thanks to the reviewer, the abstract section has been revised to make the article clearer.

Q4. The English of the paper is extremely poor. It is not written in a scientific manner and is sometimes difficult to understand.

A4.Thanks to the reviewer, this article on sentence and content for English has been supplemented and revised.

Q5. Why does the authors call spindle speed revolution?

A5. Revised the spindle speed (rpm) as indicated

Q6. Line 28 there is a gap in words please check.

A6. Thanks to the reviewer. Line 101 has been revised to make the article clearer.

Q7. What is the material studied in this work? Mention it in the abstract, the abstract lacks so many important information.

A7. On page 1, the abstract section has been revised and supplementary.” However, for online heat treatment cast iron FC25.

Q8. Line 60 “Iscussed” what does this word mean?

A8. Thanks to the reviewer. The was a slip of the pen that it has been deleted

Q9. After line 73 the authors should answer the following question: What is the research gap did you find from the previous researchers in your field? Mention it properly. It will improve the strength of the article.

A9. The introduction section has been revised and supplementary. “Reviewing data published in the literature reveals that the phenomenon reported in this paper has not surface hardening of the Plasma and lathe integration observed.”

Q10. At the end of the introduction the authors should

A10. Thanks to the reviewer, the introduction section has been revised and supplementary. “The objectives of this study include (1) evaluating the hardening efficiency of plasma heat treatment, (2) comparing the effects of experimental parameters current、spindle speed and feed on hardening results, and (3) investigating the optimization and verification of plasma heat treatment parameters.”

Q11.Line 66 “from Hv441 to Hv833” this is incorrect way to report hardness, it should be written as 833HV, please check this issue elsewhere in the manuscript.

A11. Revised the unit label as indicated.

Q12.Figure 2 should be removed, this is a research article and not a thesis, this figure is more suitable for a report or a student thesis..etc but not in here.

A12. Original sections 2.1 and 2.3 are combined as section 2, section 2 mainly explains plasma heat treatment parameters and applications.

Q13. Figures 3 and 4, please see comment above.

A13. Original sections 2.1 and 2.3 are combined as section 2, section 2 mainly explains plasma heat treatment parameters and applications.

Q14. Line 95 to 159 all this information is suitable for a report or a thesis but in a scientific paper, please consider removing it all or shortening it considerably.

A14. Thanks to the reviewer. Original sections 2.1 and 2.3 are combined as section 2, section 2 mainly explains plasma heat treatment parameters and applications.

Q15. Section 2.3 the author use a full section to explain to us what is RSM? This is a fundamental process and is well know and used in science, there is not need to explain to us what is RSM

A15.Thanks to the reviewer. Original sections 2.1 and 2.3 are combined as section 2, section 2 mainly explains plasma heat treatment parameters and applications.

Q16. Please combine figures 6 and 7 into one figure

A16.Original figure 6 and figure 7 are combined as figure 6.

Q17. Please move table 1 to the materials and methods section

A17. Table 1 is the experimental plan, so it has not moved.

Q18. Why the authors choose those specific parameters for their study?

A18. On page 5, the original table 1 is a revised table 3, the section 4-1-1 has been revised and supplementary.” parameter setting refers to equation 2, the voltage, current, and plasma thermal efficiency of the parameter were V=220 V, I=40A~60A, and η=0.23, respectively.”

Q19. Please add the mechanical and chemical properties (composition) of the material analyzed in this study

A19. Thanks to the reviewer, the labeling and resolution has been revised in tables 1~2.

Q20. It is difficult to read Figure 9, please enlarge and improve the resolution.

A20. Thanks to the reviewer, the original figure 9 is a revised figure 5, the labeling and resolution has been revised in Figure 5.

Q21. The paper is purely statistical, there is not scientific discussion at all. It only focuses on the design of experiment analysis and the weight of the input factor without providing scientific justification for the results observed.

A21. Thanks to the reviewer, this article on sentence and content has been supplemented and revised.

Q22. Table 3 quality needs improvement, also please use table format and not add the tables as screenshots or images.

A22. The original table 3 is a revised table 5. The table 5 resolution has been revised and improved.

Q23. Table 3 there are many decimal points for the error, perhaps consider reducing them to two or three decimal points, it is meaningless to have so many as this is just how it is generated by the software

A23. Table 5 has been revised the two decimal points as indicated.

Q24. Table 4 does not add any value, it is just thermographic images which are difficult to read or interpret, it is better if the temperature data is presented in a graph to make it easier for the readers to understand the data in a simple and clear way

A24. The original table 4 is a revised table 6. Table 6 has been revised and added temperature values for clarity.

Q25. Section 4.2 lacks any scientific discussion

A24. Thanks to the reviewer, this article on sentence and content has been supplemented and revised.

Q26. Section 4.2.1 the title does not read well, please modify

A26. On page 8, section 4.2.1 has been revised and supplementary “The influence of spindle speed and feed on material hardness”.

Q27. Please combine figures 12 and 13 and enlarge the figures and improve their resolution

A27.Original figures 12 and 13 are combined as figure 8, The figure 8 resolution has been revised and improved.

Q28. The number of levels for input parameters is so little that it is not possible to make any solid conclusion on the reported results

A28. The main purpose of section 4-2-1 and 4-2-2 is to observe the influence of parameters on hardness, so the scale is larger

Q29. How many times was the hardness measured for each sample?

A29. The hardness test is 5 times, as shown in Figure 11.

Q30. Please combine figures 14 and 15

A30.Original figures 14 and 15 are combined as figure 9.

Q31. Please combine figure 15 and 16

A31. Original figures 15 and 16 are combined as figure 10.

Q32. Line 327-328 how did you know that Fe3P is generated, did you see that under elemental analysis or something else? This is just an unsupported claim

A32. Thanks for the reviewer. Line 327~328 has been revised and delete to clarity.

Q33. I am afraid this paper lacks any scientific work, it is just a very basic statistical study with very few levels (small size experimental work), English is extremely poor in the paper.

A33. Thanks to the reviewer, this article on sentence and content for English has been supplemented and revised.

Q34. Therefore, I recommend against publishing this article.

A34. Thanks to the reviewer, this article on sentence and content for English has been supplemented and revised.