Editor/Author Correspondence

Editor
2024-02-14 05:09 AM

DELETE
Subject: [IJAAS] (Scopus indexed journal) - revisions required
The following message is being delivered on behalf of International Journal of Advances in Applied Sciences.

-- Paper ID# 21157
-- Authors must strictly adhere to the guide for authors, MS Word: http://iaescore.com/gfa/ijaas.docx; LaTeX format: http://iaescore.com/gfa/ijaas.rar
-- Research Paper: min 25 references (primarily to journal papers) and Review/study/survey Paper: min 50 references (primarily to journal papers)

Dear Prof/Dr/Mr/Mrs. Muhira Dzar Faraby,

We have reached an initial decision regarding your paper submission entitled "Effect of Cutting Process Using Cutting Insert of Grade UTi20T" to International Journal of Advances in Applied Sciences, a Scopus indexed journal (https://www.scopus.com/sourceid/21101156891). This journal is also recognized ("SINTA 1" accredited) by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia (Decree No. 79/E/KPT/2023).

Our decision is: revisions required
Authors should have made substantial/intellectual contribution (the new findings with contrast to the existing works). Highlight the main theme of the work with the specific goals of the design and development approach. For preparing your paper strictly adhere to the guide of authors, please read the checklist for preparing your paper for publication at: https://ijaas.iaescore.com/index.php/IJAAS/about/editorialPolicies#custom-1. Please try to follow the format as closely as possible.

Please submit your revised paper in MS Word file format (or LATEX source files; ZIP your files if you present your paper in LaTeX). Refer to materials at: https://bit.ly/35R6JTs and https://bit.ly/2DxU9MI for further guidelines, and submit the revised paper within 8 weeks through our online system at the same ID number (NOT as a new submission) on Tab "Review" as an "Author Version" file for re-review by Reviewers. Then, your revised paper will be judged for acceptance, revision, or rejection based on the editor's and Reviewers comments.

I look forward for hearing from you

Thank you

Best Regards,
Dr. Qing Wang
Intelektual Pustaka Media Utama
ijaas@iaescore.com

EDITOR-IN-CHIEF COMMENTS:

1. The introduction should contextualize your study and give any specialized information the general measurement or control reader may require to understand what follows. It must describe the importance of relevant earlier work and the challenges your work solves. It should also list your work's comparators. The introduction should define the article's contribution(s) and show how it's shown in the rest of the manuscript. A typical introduction should be as brief as possible and would contain the following:
a). An outline of the problem.
b). A review of the relevant literature, noting briefly the major contributors and indicating:
- What the main contributors did?
- What the main contributors found?
c). A statement of unsolved problems and/or areas requiring improvement; particularly the one(s) considered in your manuscript.
d). In regard to the above, describe what you will perform that has not been done before (what are your new contributions?).
e). An outline of how the following sections show what you did and how its relevance will be demonstrated.

2. This paper contains no critical discussion, comparison, or interpretation. What are the ramifications of your findings? What will come in handy in the future?

ASSOCIATE EDITORS COMMENTS:

The method section is a detailed step-by-step description of the experimental procedure that includes all of the information needed to replicate the work described in the paper. The Method must include a description of both novel and standard experimental approaches, as well as whatever minimal justification is required to persuade the reader that the methods are correct.
A well-written Method section:
a). Is the "how-to" section of your paper, containing all of the pertinent details for producing your results.
b). Persuades the reader that your approach is correct by providing justification for selecting your methodology, which may include analysis or theoretical justification.
c). Gives readers the details, algorithms, and techniques necessary to confirm and/or replicate your findings
The Methods section's purpose is to describe how the questions and knowledge gaps raised in the Introduction will be addressed in the Results section.

Reviewer A:

The paper titled "Effect of Cutting Process Using Cutting Insert of Grade UTi20T" is interesting, but revisions are needed.

Introduction: This first section of the main text should describe the problem, any existing solutions you are aware of, and the major limitations. Also, explain what you hope to achieve through your research.

Method: Every article should have a detailed Method section that provides the reader with enough information to determine whether the study is valid and reproducible. Include sufficient details so that a knowledgeable reader can replicate the experiment. However, use references and supplementary materials to highlight previously published procedures.

Results and Discussion: In this section, you will present the essential or primary findings of your research. Summarize major findings in tables; be concise; and use online supplement tables or figures to keep the paper to a manageable length. Here, you should also explain to your readers what the results mean. Do explain how the results relate to the study's objectives and hypotheses, as well as how the findings compare to those from other studies. Explain every possible interpretation of your findings, as well as the study's limitations.

Conclusion: Your conclusion is not simply a summary of what you've already written. It should take your paper a step further by answering any outstanding questions. Summarize what you've shown in your study and suggest potential applications and extensions. The main question in your conclusion should be, "What do my findings mean for the research field and my community?"

Reviewer B:

When it comes to structuring the body of an article, it is critical to keep things organized and coherent. Begin with an effective introduction that captures the reader's attention. Follow it up with a logical sequence of paragraphs that each address a different aspect of the main topic. Use topic sentences to clearly state the main point of each paragraph. Smooth transitions between paragraphs help to keep the flow going. Finally, provide a concise summary or final thoughts that tie everything together.

Results and Discussion section: A great discussion should be well-organized. One of the keys to writing a great paper is having a thorough and concise discussion. It provides a critical platform for interpreting and connecting your findings to the larger scientific context. The structure presented below is a traditional 6-step approach to creating a well-crafted discussion section, which you should carefully consider.

1). Introduction—mention gaps in previous research
Example: This study looked into the effects of "....." While previous studies investigated the impact of ".....", they did not explicitly address its influence on ".....".

2). Summarizing key findings—let your data speak
Example: We found that "....." correlates with ".....". The proposed method in this study tended to have an inordinately higher proportion of "....." as ".....".

3). Interpreting results—compare with other papers
Example: Our findings indicate that higher "....." is not associated with poor performance in ".....". The proposed method may benefit from "....." without negatively affecting ".....".

4). Addressing limitations—their potential impact on the results
Example: This study investigated a comprehensive "....." and ".....". However, additional and in-depth research may be required to confirm its ".....", particularly regarding ".....".

5). Implications for future research—how to explore further
Example: Our research shows that "...." is more resilient than ".....". Future research may look into "....." and practical methods for producing ".....".

6). Conclusion—summarize content
Example: Recent observations indicate that the ".....". Our findings offer definitive proof that this phenomenon is linked to "....." alteration, rather than being caused by increased quantities of ".....".

-

Reviewer C:

As far as your knowledge, have the authors already published a very similar paper?:
No

If yes, kindly please cite below::

Does the title of the paper accurately reflect the major focus contribution of this paper?:
Yes

If No, Please suggest change of the title as appropriate::

Is the abstract a clear description of the paper?:
Yes

If No, Please suggest change of the abstract as appropriate::

Are the equations, figures and tables in this journal style, clear, relevant, and are the captions adequate?:
Yes

Is the paper written in correct English? Is the paper free from obvious errors, misconceptions, or ambiguity?:
Yes

If No, please note obvious errors, misconceptions, ambiguity, grammatical errors and suggest corrections::

Please score the paper on a scale of 0 - 10 as per the directions below:

9-10 Excellent - Outstanding
7-8 Good
5-6 Average
3-4 Poor
0-2 Very Poor
:
8

Comments to the Authors:
:
- The author should ensure that all paragraphs are complete. Each paragraph should have a minimum of three sentences, one of which should serve as the main or key statement and at least two others as supporting sentences.
- In Figure 9, it is better for the author to make the figure have a main figure and sub figures and each of them is explained in the body of the text before it is displayed. Don't forget to give a caption on the main figure and sub figure.

International Journal of Advances in Applied Sciences
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Editor 2024-02-28

DELETE
Subject: [IJAAS] Editor Decision (Scopus indexed: https://www.scopus.com/sourceid/21101156891)

10:35 AM The following message is being delivered on behalf of International Journal of Advances in Applied Sciences.

-- Paper ID# 21157
-- Please submit your final paper within 4 weeks!
-- The guide of authors: http://iaescore.com/gfa/ijaas.docx
-- We will usually expect a minimum of 25 references primarily to recently journal articles.

Dear Prof/Dr/Mr/Mrs. Muhira Dzar Faraby,

It is my great pleasure to inform you that your paper entitled "Effect of Cutting Process Using Cutting Insert of Grade UTi20T" is initially ACCEPTED and will be published on the International Journal of Advances in Applied Sciences (IJAAS), an Open Access Journal and Peer-Reviewed. This journal is indexed by Scopus (https://www.scopus.com/sourceid/21101156891). This journal is also recognized (accredited) "S1 (SINTA 1)" by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia. Congratulations!

A great discussion in the "Results and Discussion section" should be well-organized. One of the keys to writing a great paper is having a thorough and concise discussion. It provides a critical platform for interpreting and connecting your findings to the larger scientific context. Please prepare your final paper by considering the following six (6) points:

1). Introduction—mention gaps in previous research
Example: This study looked into the effects of "....." While previous studies investigated the impact of ".....", they did not explicitly address its influence on ".....".

2). Summarizing key findings—let your data speak
Example: We found that "....." correlates with ".....". The proposed method in this study tended to have an inordinately higher proportion of "....." as ".....".

3). Interpreting results—compare with other papers
Example: Our findings indicate that higher "....." is not associated with poor performance in ".....". The proposed method may benefit from "....." without negatively affecting ".....".

4). Addressing limitations—their potential impact on the results
Example: This study investigated a comprehensive "....." and ".....". However, additional and in-depth research may be required to confirm its ".....", particularly regarding ".....".

5). Implications for future research—how to explore further
Example: Our research shows that "...." is more resilient than ".....". Future research may look into "....." and practical methods for producing ".....".

6). Conclusion—summarize content
Example: Recent observations indicate that the ".....". Our findings offer definitive proof that this phenomenon is linked to "....." alteration, rather than being caused by increased quantities of ".....".

I would appreciate it if you could respond to this email with the following documents simultaneously within the next four weeks.
1. Final paper (read: https://ijaas.iaescore.com/index.php/IJAAS/about/editorialPolicies#custom-1)
2. Similarity report (by iThenticate/Turnitin), along with
3. Payment evidence

Your cooperation is very appreciated.

Thank you

Best Regards,
Prof. Dr. Ir. Tole Sutikno, ASEAN Eng.
Managing Editor, International Journal of Advances in Applied Sciences
ijaas@iaescore.com

--------------------------------- Pay attention to the following instructions carefully! -------------------------------
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1). Please ensure to adhere strictly to the journal presentation and formatting guidelines !! http://iaescore.com/gfa/ijaas.docx and pay attention to the checklist for preparing your FINAL paper for publication: http://ijaas.iaescore.com/index.php/IJAAS/about/editorialPolicies#custom-1

2). It is mandatory to present final paper in the sections structure: 1. INTRODUCTION - 2. The Proposed Method/Algorithm/Procedure specifically designed (optional) - 3. METHOD - 4. RESULTS AND DISCUSSION – 5. CONCLUSION "IMRADC style". See http://iaescore.com/gfa/ijaas.docx

3). Add biographies of authors as our template (include links to the authors' profiles, do not delete any icons in the template). It is mandatory!! See http://iaescore.com/gfa/ijaas.docx
--> Provide links for all authors to the 4 icons (Scholar, Scopus, Publons and ORCID)

4). Please ensure that all references have been cited in your text. Use a tool such as EndNote, Mendeley, or Zotero for reference management and formatting, and choose IEEE style. Each citation should be written in the order of appearance in the text in square brackets. For example, the first citation [1], the second citation [2], and the third and fourth citations [3], [4]. When citing multiple sources at once, the preferred

method is to list each number separately, in its own brackets, using a comma or dash between numbers, as such: [1], [3], [5]. It is not necessary to mention an author's name, pages used, or date of publication in the in-text citation [6]-[8]. Instead, refer to the source with a number in a square bracket, e.g. [9], that will then correspond to the full citation in your reference list. Examples of in-text citations:
This theory was first put forward in 1970 [9].
Zadeh [10] has argued that ...
Several recent studies [7], [9], [11]-[15] have suggested that....
... end of the line for my research [16].

Please present all references as complete as possible and use IEEE style (include information of DOIs, volume, number, pages, etc). If it is available, DOI information is mandatory!! See http://iaescore.com/gfa/ijaas.docx

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In order to cover part of the operational and management costs, the registration fee for each accepted paper is USD 169. This registration fee is for the first 8 pages, and any manuscript over 8 pages will incur extra registration fees of USD 45 per page. (For Indonesia Authors can transfer in IDR. For a currency converter, please refer to XE at:
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We really appreciate collaborative papers and do not appreciate papers with a single (sole) author. Papers with a single author will be rejected (or if they are very excellent, they will be considered for registration fees but will be charged twice the above fee of USD 338, and if any published manuscript is over 8 pages, it will incur extra charges of USD 40 per page).

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Subject: [IJAAS] Editor Decision (Scopus indexed: https://www.scopus.com/sourceid/21101156891)

The following message is being delivered on behalf of International Journal of Advances in Applied Sciences.

-- Paper ID# 21157

Dear Prof/Dr/Mr/Mrs. Muhira Dzar Faraby,

It is my great pleasure to inform you that your paper entitled "Effect of Cutting Process Using Cutting Insert of Grade UTi20T" is ACCEPTED and will be published on the International Journal of Advances in Applied Sciences (IJAAS), an Open Access Journal and Peer-Reviewed. This journal is indexed by Scopus (https://www.scopus.com/sourceid/21101156891). This journal is also recognized (accredited) "S1 (SINTA 1)" by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia. Congratulations!

Thank you

Best Regards,
Prof. Dr. Ir. Tole Sutikno, ASEAN Eng.
Managing Editor, International Journal of Advances in Applied Sciences
ijaas@iaescore.com

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International Journal of Advances in Applied Sciences (IJAAS)
Vol. 99, No. 1, Month 2099, pp. 1~1x
ISSN: 2252-8814, DOI: 10.11591/ijaas.v99.i1.pp1-1x

Dear Reviewers,

Thank you for your constructive comments concerning our manuscript entitled "**Effect of Cutting Process Using Cutting Insert of Grade UTi20T**". We have studied your valuable comments carefully and made mayor corrections. The review comments helped us to improve our work to a better scientific level. Detailed answers to review comments are appended below:

Author Response to Reviewer Comments:

Reviewer #1

Improvements made from comments given by reviewer #1 are marked in yellow

1. Introduction: This first section of the main text should describe the problem, any existing solutions you are aware of, and the major limitations. Also, explain what you hope to achieve through your research.
   Response :

   Thank you very much for your response. In this section, we will delineate the problem under investigation, providing a concise overview regarding the effect of the cutting process Using Cutting Insert of Grade UTi20T on MQL conditions. We will discuss existing solutions, highlighting their strengths and major limitations. Our research aims to address these limitations and contribute innovative insights to advance the field, ultimately striving for more effective and robust solutions. for this article. We only focus on the UTi20T and we will discuss comparisons with other materials in our next article**.**

2. Method: Every article should have a detailed Method section that provides the reader with enough information to determine whether the study is valid and reproducible. Include sufficient details so that a knowledgeable reader can replicate the experiment. However, use references and supplementary materials to highlight previously published procedures.
   Response :

   In this crucial section, we present a comprehensive and detailed account of our experimental procedures, allowing readers to assess the validity and reproducibility of the study. While providing sufficient information for replication, we leverage references and supplementary materials to direct readers to previously published procedures, ensuring a balance between clarity and brevity. This can be seen from the type of cutting machine and material used as well as several characteristics of the effect of the cutting process carried out on MQL conditions.

3. Results and Discussion: In this section, you will present the essential or primary findings of your research. Summarize major findings in tables; be concise; and use online supplement tables or figures to keep the paper to a manageable length. Here, you should also explain to your readers what the results mean. Do explain how the results relate to the study's objectives and hypotheses, as well as how the findings compare to those from other studies. Explain every possible interpretation of your findings, as well as the study's limitations.
   Response :

   In this section, we present the core findings concisely using tables, with additional details supplement provided tables or figures to maintain a manageable paper length. We delve into the meaning of the results, elucidating their relevance to the study's objectives of the effects of the cutting process carried out on a CNC machine for UTi20T Cutting insert material. We explore every possible interpretation of the results, ensure a comprehensive understanding, and transparently discuss the study's limitations to provide a balanced perspective on the findings on the process of cutting MQL conditions.

4. Conclusion: Your conclusion is not simply a summary of what you've already written. It should take your paper a step further by answering any outstanding questions. Summarize what you've shown in your study and suggest potential applications and extensions. The main question in your conclusion should be, "What do my findings mean for the research field and my community?"
   Response :

   The conclusion goes beyond summarizing the study, addressing outstanding questions and providing insights for the research field and the community. It encapsulates the implications of our findings, suggesting potential applications and extensions terhadap proses pemotongan menggunakan Cutting Insert of Grade UTi20T. The central question driving the conclusion is, "What do my findings mean for the research field and my community?" This forward-looking approach adds depth and relevance to the study's contribution mengenai proses pemotongan pada kondisi MQL.

International Journal of Advances in Applied Sciences (IJAAS)
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ISSN: 2252-8814, DOI: 10.11591/ijaas.v99.i1.pp1-1x

Reviewer #2

Improvements made from comments given by reviewer #2 are marked in red

1. Introduction—mention gaps in previous research
   Example: This study looked into the effects of "....." While previous studies investigated the impact of ".....", they did not explicitly address its influence on ".....".
   Response :

   Thank you for the response. We have made improvements by highlighting shortcomings in previous research.

   Applying Cutting Insert Grade UTi20T under MQL conditions enhances efficiency, tool life, and cutting results for several reasons. However, research [24] focuses on cutting speed in the cutting process by increasing the cutting parameters to determine the level of roughness of the surface of the object to be cut by paying attention to the occurrence of Built-Up Edge (BUE) in MQL conditions, so the cutting process must be stopped. This still requires some important information in the form of parameters such as cutting force, power consumed, tool wear development and others. UTi20T is designed with excellent wear properties, increasing

2. Summarizing key findings—let your data speak
   Example: We found that "....." correlates with ".....". The proposed method in this study tended to have an inordinately higher proportion of "....." as ".....".
   Response :

   Thank you for the response. We have made improvements.

   conditions, using a UTi20T cutting tool insert supplied by Mitsubishi. The analysis focuses on several important aspects such as cutting force, total power consumption, surface roughness, and tool life, with the hope of providing comprehensive insight into the efficiency of the cutting process industry so that cutting results can be obtained according to the user's expectations of the material that has been cut. This paper consists

3. Interpreting results—compare with other papers
   Example: Our findings indicate that higher "....." is not associated with poor performance in ".....". The proposed method may benefit from "....." without negatively affecting ".....".
   Response :

   Thank you for the response. We have made improvements

   significantly surpassing the feed force and radial force under any given experimental conditions. The cutting process that has been carried out with the insert material Using Cutting Insert of Grade UTi20T in MQL conditions provides an assessment result of the sustainability of the manufacturing industry by looking at several characteristics of the cutting results with the presence of insert cutting material.

4. Addressing limitations—their potential impact on the results
   Example: This study investigated a comprehensive "....." and ".....". However, additional and in-depth research may be required to confirm its ".....", particularly regarding ".....".
   Response :

   Thank you very much for the response. To answer this, we will assess other Cutting Insert of Grades in the cutting process in our next article.
   power consumption potential in other machining processes, particularly milling and drilling. Apart from that, our further research also assesses the cutting process using Using Cutting Insert of Other Grades as a comparative material in MQL conditions for sustainability in the manufacturing industry.

5. Implications for future research—how to explore further
   Example: Our research shows that "...." is more resilient than ".....". Future research may look into "....." and practical methods for producing ".....".
   Response :

   Thank you very much for the response. At the end of the conclusion, research has been added that we will carry out further regarding the assessment of the cutting process using Using Cutting Insert of Grade UTi20T which is not discussed in this article.
   machinability assessment employed sustainable machining practices. Future work recommendations include residual stress measurements on the machined surface, sustainability assessments for turning, and exploring power consumption potential in other machining processes, particularly milling and drilling.

6. Conclusion—summarize content
   Example: Recent observations indicate that the ".....". Our findings offer definitive proof that this phenomenon is linked to "....." alteration, rather than being caused by increased quantities of ".....".
   Response :

   Thank you very much for the response. The increase in efficiency of the cutting process with the cutting technique that we propose can be compared with our article which further discusses other additional insert materials. However, the research results provided from the assessment results can show efficiency with several parameters when carrying out the cutting process which can be seen in the last paragraph in the abstract section.
   comprehensive insights into the efficiency of the cutting process. The findings of this study significantly contribute to the understanding of how the integration of Grade KC5410 cutting inserts under MQL conditions can enhance the overall efficiency of metal cutting operations. The successful machinability assessment was conducted by implementing sustainable machining practices.

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Reviewer #3

Improvements made from comments given by reviewer #3 are marked in green

1. The author should ensure that all paragraphs are complete. Each paragraph should have a minimum of three sentences, one of which should serve as the main or key statement and at least two others as supporting sentences.
   Response :

   Thank you very much for the response. We have corrected the last paragraph in the results section according to the suggestions given.

   An elevation in the feed rate during the cutting process would lead to a rise in cutting forces across all cutting speed conditions. This is because the primary force exerted on the tool was the tangential force, significantly surpassing the feed force and radial force under any given experimental conditions. The cutting process that has been carried out with the insert material Using Cutting Insert of Grade UTi20T in MQL conditions provides an assessment result of the sustainability of the manufacturing industry by looking at several characteristics of the cutting results with the presence of insert cutting material.

2. In Figure 9, it is better for the author to make the figure have a main figure and sub figures and each of them is explained in the body of the text before it is displayed. Don't forget to give a caption on the main figure and sub figure.
   Response :

   Thank you very much for the response. We provide the template in figure 9 to show and emphasize the comparison results on different flank faces and rake faces Vc, f and T. This can provide an understanding of the work efficiency provided when carrying out the cutting process using Grade UTi20T cutting inserts in MQL conditions.

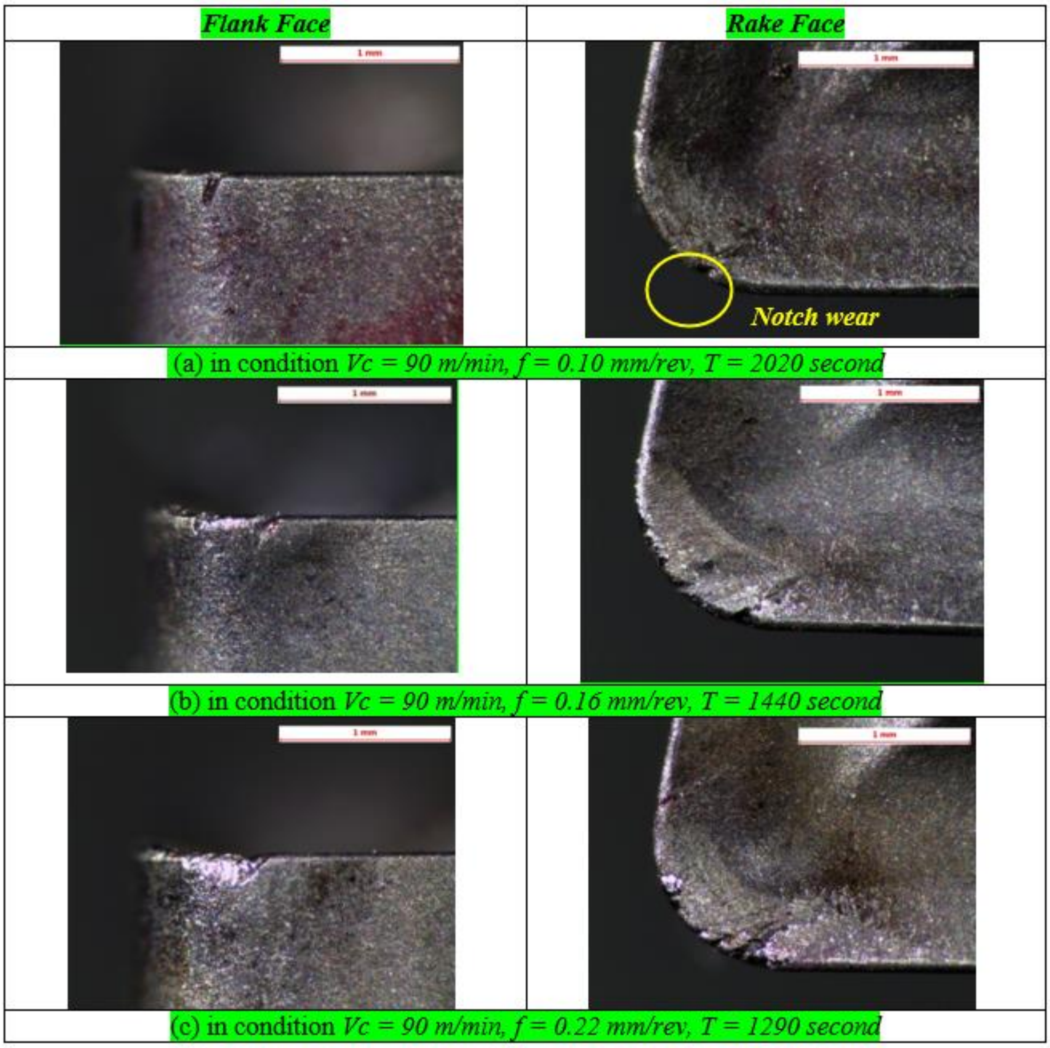

Figure 9. Optical microscope pictures of UTi20T inserts that have experienced wear during the turning process of austenitic stainless steel

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Effect of Cutting Process Using Cutting Insert of Grade UTi20T

Rusdi Nur[1], Arthur Halik Razak[2], Yosrihard Basongan[3], Muhira Dzar Faraby[4], Syahrisal[5], Asrul Hidayat[6]
[1,2,3]Department of Mechanical Engineering, Polytechnic State of Ujung Pandang, Makassar Indonesia
[4]Department of Electrical Engineering, Polytechnic State of Ujung Pandang, Makassar Indonesia
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Article Info

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Keywords:

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Minimum Quantity Lubrication
KC5410

ABSTRACT

In the metal cutting industry, the precision of the metal cutting process is of paramount importance. Errors in the metal cutting process not only leading to damage to the cutting tool but also result in the production of low-quality materials. The incorporation of insert materials in the cutting process is aimed at maintaining cutting precision and achieving superior results. This research seeks to investigate the impact of the Cutting Process Utilizing Grade KC5410 Cutting Insert under Minimum Quantity Lubrication (MQL) Conditions. In this study, machining tests were conducted using the ALPHA 1350S 2-axis CNC lathe machine under MQL conditions, employing cutting tool inserts UTi20T supplied by Mitsubishi. Two types of tools were utilized in the cutting process, namely UTi20T. Critical aspects such as cutting force, total power consumption, surface roughness, and tool life were analyzed to provide comprehensive insights into the efficiency of the cutting process. The findings of this study significantly contribute to the understanding of how the integration of Grade KC5410 cutting inserts under MQL conditions can enhance the overall efficiency of metal cutting operations. The successful machinability assessment was conducted by implementing sustainable machining practices.

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1. INTRODUCTION

The metal cutting process and the metal forming process in the manufacturing industry are activities that are often carried out, especially in producing machine components. The use of cutting tools in the metal cutting process as the main component in producing machine components desired by consumers according to their needs. This is known as a machining process where the process can produce a product by using cutting tools and machine tools to cut the workpiece [1]-[3]. The metal cutting operation known as the turning process is most widely used to shape the surface of the workpiece. Cutting parameters such as cutting speed and resistance and feed rate [4]-[6].

Production results in all manufacturing industries with quality precision in the automated world are greatly influenced by machine tools such as cutting inserts. Technological advances in the manufacture of components needed by consumers from the manufacturing industry using CNC machines that work automatically have widely used cutting inserts to maintain cutting precision [7]-[9]. Implementing more economical processes, conserving natural resources, increasing the level of safety for workers, communities and production results in the manufacturing sector is a sustainable practice. Cutting parameters, machine surface quality, cutting tool performance and power required in the cutting process are also important considerations in implementing a sustainable manufacturing industry [10]-[12].

The global growth of the manufacturing industry and increasing environmentally conscious consumer preferences compel researchers and production plants to seek alternatives to traditional cutting fluids [13]-[15]. Over the past decade, various techniques, such as wet machining, minimum quantity lubricants (MQL), cryogenic cooling, and solid lubricant-assisted machining, have emerged as environmentally friendly solutions [16]. While cutting fluids enhance machining quality through cooling and lubrication, flood cooling, a widely used method, is deemed inefficient from social, economic, and ecological perspectives. MQL, also known as near dry machining (NDM), has been developed as a low-consumption alternative to conventional methods [17]-[19]. The insert material grade significantly impacts cutting performance, affecting tool wear, heat resistance, surface quality, and tool lifespan. Proper material selection, considering the workpiece type, cutting conditions, and final product requirements, enhances cutting efficiency and quality [20]. Incorporating grade inserts in MQL conditions affects cutting performance and tool lifespan, necessitating careful consideration of factors like workpiece material, cutting speed, and conditions for optimal results. This approach improves cutting efficiency, optimizes tool lifespan, and ensures high-quality cutting results in MQL conditions [21]-[23].

Applying Cutting Insert Grade UTi20T under MQL conditions enhances efficiency, tool life, and cutting results for several reasons. However, research [24] focuses on cutting speed in the cutting process by increasing the cutting parameters to determine the level of roughness of the surface of the object to be cut by paying attention to the occurrence of Built-Up Edge (BUE) in MQL conditions, so the cutting process must be stopped. This still requires some important information in the form of parameters such as cutting force, power consumed, tool wear development and others. UTi20T is designed with excellent wear properties, increasing the tool's lifespan. MQL reduces friction and heat during cutting, allowing UTi20T to last longer. The high hardness and strength of UTi20T improve cutting efficiency in MQL conditions by minimizing friction, reducing energy losses, and optimizing cutting performance. MQL also decreases the required cutting force by reducing friction. UTi20T's wear and heat-resistant properties reduce the load on the cutting process [25]-[27]. Additionally, MQL minimizes fluid use, reducing contamination risks and enhancing surface quality. UTi20T maintains cutting sharpness, delivering better cutting results. Its thermal stability and toughness ensure consistent performance under varying MQL conditions. This approach aligns with environmental efforts by minimizing cutting fluid use, making Grade UTi20T a sustainable choice [28].

This research aims to evaluate the impact of the cutting process by utilizing KC5410 grade cutting insert material. In a series of machining tests, a 2-axis CNC lathe ALPHA 1350S was carried out in MQL conditions, using a UTi20T cutting tool insert supplied by Mitsubishi. The analysis focuses on several important aspects such as cutting force, total power consumption, surface roughness, and tool life, with the hope of providing comprehensive insight into the efficiency of the cutting process industry so that cutting results can be obtained according to the user's expectations of the material that has been cut. This paper consists of: Part 2 is the methodology which is divided into three parts: first is the experimental setup, second is the material of workpiece and third is the cutting tool insert. In section 3 presents experimental results, modeling response and discussion. Last section 4 is the conclusion

2. RESEARCH METHOD

2.1. Experimental Setup

Widespread use of statistical experimental design in investigating machining process capabilities. In this paper, a Three Level full factorial design was utilized to examine the effects of cutting parameters such as cutting force, total power consumption, surface roughness, and tool life. The advantage of this design is that it is able to analyze experimental data using an experimental approach one factor at a time. The experimental design was formulated utilizing Design-Expert software version 7.1. The set of experiments consisted of eleven trials, as detailed in Table 1.

Table 1. Plan of Experimental.

No.	Cutting Speed *(Vc)* [m/min]	Feed rate (*f*) [mm/rev]	Coded form	
			x_1	x_2
1	90	0.10	– 1	– 1
2	150	0.10	0	– 1
3	210	0.10	1	– 1
4	90	0.16	– 1	0
5	150	0.16	0	0
6	210	0.16	1	0

7	90	0.22	– 1	1
8	150	0.22	0	1
9	210	0.22	1	1

The work material, an austenitic stainless steel AISI 316L in bar form, was secured using a three-jaw chuck on one end and supported by a center mounted on the tailstock at the opposite end. Due to the larger diameter of the supplied bar compared to the clamping capacity of the ALPHA 1350S 2-Axis CNC lathe machine, preliminary steps were taken using a larger lathe machine. These steps included reducing the diameter of one end of the bar, creating a center hole with a center drill mounted on the tailstock, and making a groove at the chuck jaws' front to indicate the tool travel endpoint during turning. After completing these preparations, the workpiece was positioned on the lathe for turning experiments. The skinning process followed, aiming to reduce the diameter of the newly mounted bar by approximately 2 mm. The tool holder was carefully placed and clamped onto one of the tool holder positions.

In this research, the ALPHA 1350S 2-axis CNC lathe machine was used for the machining test under dry cutting conditions, employing two distinct cutting tool inserts, namely UTi20T. Both inserts were affixed to the TCLNR 2020K12 tool holder. The machine's motor horsepower was 8.3 kW, and the spindle speed ranged from 100 to 6000 rpm. Feed rates varied between 0.04 and 10 mm/rev (see Figure 1). Each trial utilized a new insert to eliminate wear-related influences. Machining occurred for a set duration (60 seconds for each cutting process). Upon completion, cutting force measurements and total power consumption data were stored on the PC. The tool holder was then removed for tool wear measurement and capturing images of the worn insert. Surface roughness on the turned surface was measured at five different locations on the work material circumference. Following these tasks, the tool holder was repositioned, clamped onto the same tool holder position, and the entire procedure was repeated. This cycle continued until the tool life was determined based on predefined criteria.

Figure 1. CNC lathe machine with 2 axes, known as ALPHA 1350S.

The cutting forces were assessed using a three-component dynamometer connected to a charge amplifier via a well-insulated, low-noise, and high-impedance cable (Kistler, Type 1689 B5). The charge amplifier was linked to the PC using standard cables, with the analogue output and RS232C ports on the multi-charge amplifier connecting to the A/D board and COM ports on the PC, respectively. Total power consumption and related data were gauged with three split-type CT pieces (ZN-CT11) affixed to the three-wire power supply (main power, spindle power, and carriage power) in the panel box. This split was linked to three portable power sensors (ZN-CTX21A) via a branch cable (ZN-CTM11C). Subsequently, the power sensor was connected to a PC using an Ethernet hub and LAN cables. For surface roughness measurements in the turning process, a portable surface roughness tester (Mitutoyo Surftest SJ-301) was employed, adhering to ISO97/DIN standards, with measuring and cut-off wavelengths set at 4.0 mm and 0.8 mm, respectively.

2.2. The Material of Workspace

While previous researchers have explored the use of stainless steels, the investigation of the austenitic stainless steel AISI 316L grade has been relatively rare, likely due to its higher cost. In recent years, this steel type has gained popularity, particularly in biomedical implant applications. This study focuses on the turning process, employing a workpiece made of austenitic stainless steel AISI 316L with a diameter of 150 mm and length of 300 mm. Refer to Tables 2 and 3 for the detailed composition and general properties of AISI 316L.

Table 2. AISI 316L composition.

Grade		C	Mn	Si	P	S	Cr	Mo	Ni	N
316L	Min	-	-	-	-	-	16.0	2.00	10.0	-
	Max	0.03	2.0	0.75	0.045	0.03	18.0	3.00	14.0	0.10

Table 3. AISI 316L General Proporties.

Grade	Tensile Strength (MPa) min	Yield Strength 0.2 % Proof (MPa) min	Elongation (% in 50 mm) min	Hardness	
				Rockwell C (HRC)	Brinell (HB)
316L	485	170	40	89.5	181

2.3. The Cutting Tool Insert

Mitsubishi supplied the cutting tool inserts for this experiment, specifically the UTi20T. The UTi20T is an uncoated cemented carbide designed for various materials, including steel, cast iron, and stainless steel. The specific UTi20T insert used is CNMG120408-MS, positioned in the right tool holder labeled TCLNR 2020K12 which can be seen in figure 2 and 3.

Figure 2. UTi20T Cutting insert [29].

Figure 3. Tool holder of TCLNR 2020K12 [29].

3. EXPERIMENTAL RESULT AND DISCUSSION

The experimental outcomes, focusing on tool wear and surface roughness, are regularly documented during the conducted experiments following the outlined procedures in the previous section. Post-machining analysis results obtained through optical microscope examination are also outlined. This chapter broadly covers various aspects, including cutting force, overall tool lifespan, power consumption, tool failure modes, surface roughness, experimental design analysis, and ensuing discussion. Figures 4 illustrate how cutting forces (Fr, Ff, and Fc) are affected by cutting conditions during the turning process of austenitic stainless steel with UTi20T inserts. Figure 4 illustrates the correlation between cutting forces and feeds for UTi20T at different cutting speeds. Fc consistently emerged as the primary force, followed by Ff. The forces increased with higher feed rates, with Fc showing a notably steeper rise compared to Ff and Fr. Similar trends were observed across all instances for UTi20T tools.

Figures 5 depict the impact of cutting conditions on total power consumption during the turning of austenitic stainless steel using UTi20T tools. The noticeable trend reveals a slight rise in total power consumption as the feed increases. This indicates that a higher material removal rate, resulting from increased cutting speed and feed, demands more power to drive the spindle motor.

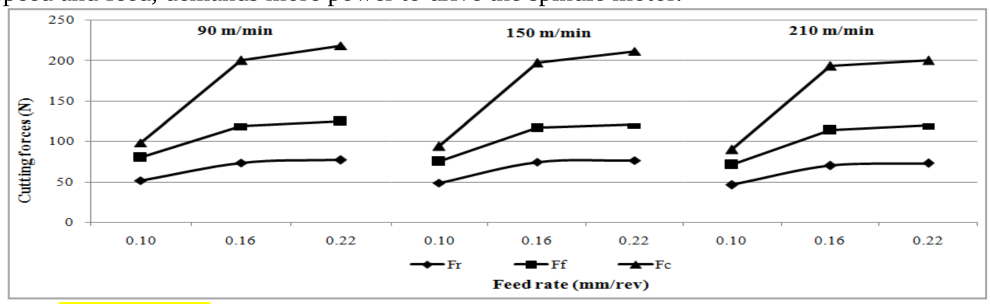

Figure 4. Cutting forces are impacted by different feed rates across various cutting speeds when using UTi20T.

The correlation between the average surface roughness value and feeds for UTi20T, under different cutting speeds, is depicted in Figure 6. The data distinctly indicates that the average surface roughness values rise with an increase in feed. Ra values tend to increase with higher feed rates but decrease with increasing cutting speed. The tool wear growth over time was plotted for different cutting speeds (90, 150, and 210 m/min) and feed rates (0.10 mm/rev) in Figure 7. The graph shows that the cutting tool experienced rapid wear during the initial machining. Wear readings were taken at corresponding machining times. Following the initial period, wear steadily propagated until it reached the VB_N tool life criterion. Tool life, determined by the VB_N criterion, generally increased as cutting speed and feed rate decreased. Tool life ranged from 180 seconds (3 minutes) to 2020 seconds (33.67 minutes), with the shortest observed at the highest cutting speed and feed rate, while the longest occurred at the lowest cutting speed and feed rate.

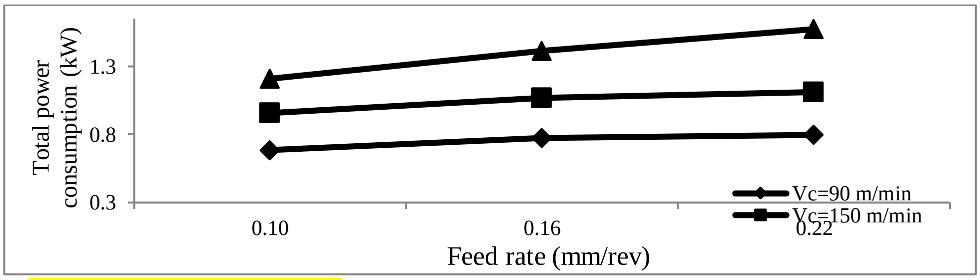

Figure 5. The total power consumption is affected by different feed rates across various cutting speeds for UTi20T.

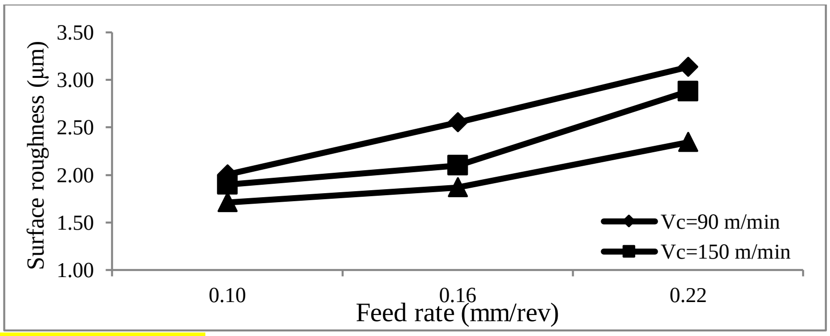

Figure 6. The surface roughness is affected by different feed rates at various cutting speeds for UTi20T.

Figure 7 illustrates that lower cutting speeds correspond to lower tool wear rates. As cutting speed increases, tool wear rates rise, leading to shorter tool life. The impact of cutting speed and feed rate on the tool life for the UTi20T insert during the turning of AISI 316L is presented in Figures 8. These figures reveal a decrease in tool life with higher cutting speed and feed rate. Tool life diminishes significantly with the escalation of cutting speed and feed rate, likely attributed to the elevated temperature generated during cutting. Increased temperature weakens the tool strength, consequently reducing tool life. This decline in tool life with increasing cutting speed and feed rate is observed when turning duplex stainless steel using CVD-coated carbide (CTC 1135). The phenomenon is attributed to abrasive actions, resulting in higher wear intensity at the cutting edge.

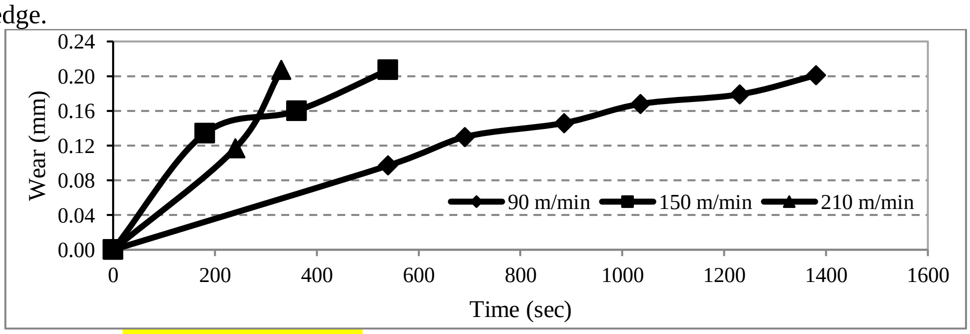

Figure 7. Tool wear progression for UTi20T at different cutting speeds and 0.10 mm/rev.

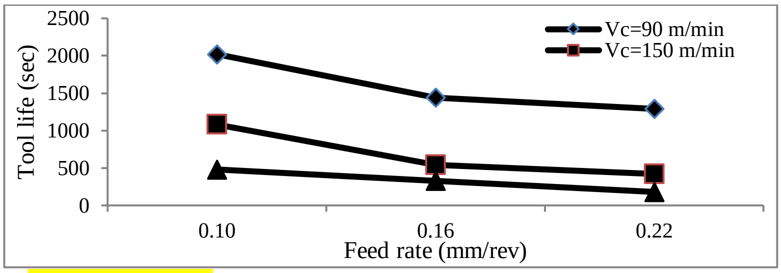

Figure 8. Tool life affected by different feed rates at various cutting speeds for UTi20T.

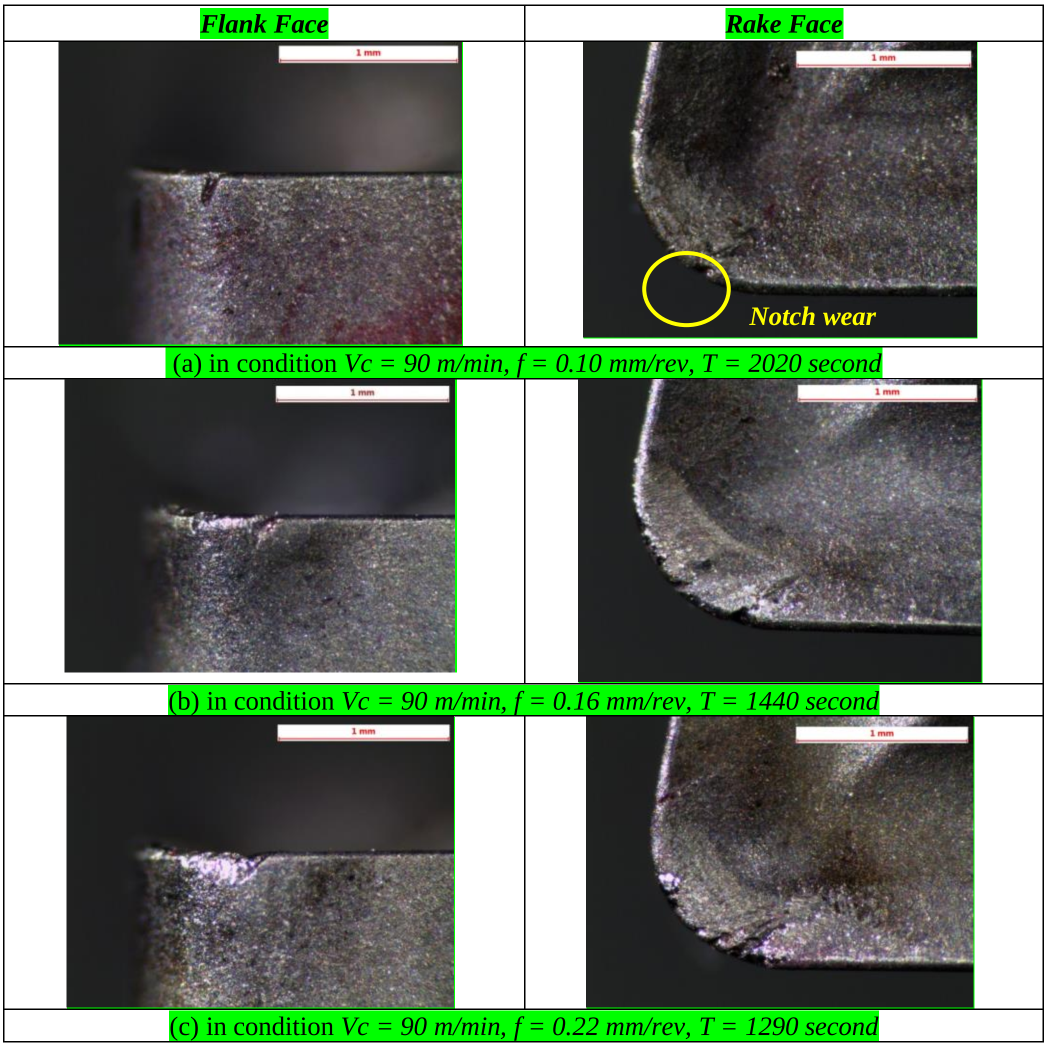

Figure 9. Optical microscope pictures of UTi20T inserts that have experienced wear during the turning process of austenitic stainless steel

Figure 9 displays worn carbide inserts under various cutting conditions for the UTi20T insert. The two-dimensional views captured using an optical microscope depict worn inserts on the flank face and rake face. The wear pattern, identified as notch wear, primarily occurs in the nose region of the insert. Notch wear, a specific type of flank wear, develops at the intersection of the major cutting edge and the workpiece surface. This wear is a consequence of abrasion and is particularly prevalent when machining parts experiencing localized effects, such as the formation of a hardened layer on the uncut surface due to previous cutting, the presence of an oxide scale, and localized high temperatures resulting from the edge effect. Notch wear is common in the machining of materials with high work-hardening characteristics, including many stainless steels and heat-resistant nickel or chromium alloys. In this experiment, notch wear predominated over other tool wear phenomena. The maximum width of the notch wear (VBN) can serve as a tool wear measure according to the International Organization for Standardization (ISO) 3685.

The primary wear mechanism observed when turning Inconel 718 with coated carbide, both in wet and dry cutting, is notch wear. This dominant wear mechanism results in tool life being consistently less than 10 minutes in all scenarios. Similarly, when investigating the impact of cutting speed on the rate of tool wear during the turning of NiTi shape memory alloys using a TiB2-coated KC5410 cutting insert, it was observed that notch wear was notably high within the first minute of the cutting process under both dry and Minimum Quantity Lubrication (MQL) conditions. Notably, under MQL conditions, the most substantial notch wear occurred after one minute of cutting, followed by a gradual increase in wear with extended cutting time.

An elevation in the feed rate during the cutting process would lead to a rise in cutting forces across all cutting speed conditions. This is because the primary force exerted on the tool was the tangential force, significantly surpassing the feed force and radial force under any given experimental conditions. The cutting process that has been carried out with the insert material Using Cutting Insert of Grade UTi20T in MQL conditions provides an assessment result of the sustainability of the manufacturing industry by looking at several characteristics of the cutting results with the presence of insert cutting material.

4. CONCLUSION (10 PT)

The experimental design utilized a 2-factor, three-level full factorial design with two center points to assess the impact of cutting parameters on machinability responses in turning AISI 316L on MQL condition. Cutting forces were predominantly influenced by the feed rate, while cutting speed had a limited impact. Increasing the feed rate raised cutting forces across all cutting speeds. Tangential force, surpassing feed and radial forces, was the primary force on the tool. Total power consumption increased with cutting speed and was influenced to some extent by higher feed rates, with cutting speed having the most substantial impact. Surface quality improved with higher cutting speeds but declined sharply with increased feed rates. The optimal condition for minimal surface roughness was achieved with high cutting speed and low feed rate. Surface roughness was mainly affected by feed force and temperature rise during cutting. Elevated cutting speeds reduced surface roughness due to softened material, enhancing cutting performance. Tool life decreased with higher cutting speed and feed rate, with coated carbide inserts outlasting uncoated ones. The successful machinability assessment employed sustainable machining practices. Future work recommendations include residual stress measurements on the machined surface, sustainability assessments for turning, and exploring power consumption potential in other machining processes, particularly milling and drilling. Apart from that, our further research also assesses the cutting process using Using Cutting Insert of Other Grades as a comparative material in MQL conditions for sustainability in the manufacturing industry.

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