MACHINABILITY ASSESSMENT WHEN TURNING AISI 316L AUSTENITIC STAINLESS STEEL USING UNCOATED AND COATED CARBIDE INSERTS

RUSDI NUR

UNIVERSITI TEKNOLOGI MALAYSIA

MACHINABILITY ASSESSMENT WHEN TURNING AISI 316L AUSTENITIC STAINLESS STEEL USING UNCOATED AND COATED CARBIDE INSERTS

RUSDI NUR

A thesis submitted in fulfilment of the
requirements for the award of the degree of
Doctor of Philosophy (Mechanical Engineering)

Faculty of Mechanical Engineering
Universiti Teknologi Malaysia

JANUARY 2016

To my beloved mother and father,
Hj. Habesiah, and H. Muhammad Nur Pilo

To my honored mother and father in law,
Hj. Sitti. Marhamah, and Muh. Syabiruddin Abdolo

To my lovely wife and daughter
Asmeati and Ainayah Zalikhah Rusdy

Also to my brothers and sisters,
H. Ramli Nur, Rusli Nur, Rais Nur,
Ramlah Nur, Ramsiah Nur and Rosmiati Nur

ACKNOWLEDGEMENT

First of all, I would like to thank Allah SWT for giving me the strength and guidance to finish this research. In preparing this thesis, I was in contact with many people including academicians, technicians and fellow researchers. They have contributed enormously towards my understanding of the subject. In particular, I wish to express my sincere thanks and appreciation to my supervisor, Prof. Dr. Noordin Mohd Yusof, and co supervisors Assoc. Prof. Dr. Izman Bin Sudin and Dr. Denni Kurniawan for their encouragement, guidance and constructive criticisms. Without their continued support and interest, this thesis would not have been possible. My sincere gratitude is also extended to the lecturers of the Department of Materials, Manufacturing and Industrial Engineering, Faculty of Mechanical Engineering for their valuable contributions towards my research and education in Universiti Teknologi Malaysia.

My study would not have been possible without the funding from my country Indonesia. I wish to thank the Governor, Province of South Sulawesi and the State Polytechnic of Ujung Pandang for the financial and moral support.

I would also express my deepest gratitude to my family. My sincere thanks to my wonderful mother, Hj. Habesiah, and my lovely wife and my daughter, Asmeati and Ainayah Zalikhah Rusdi, who have always given me encouragement and support in completing this thesis. I am also grateful to my brothers, sisters, and other family members for their love, constant support, understanding, and caring for all these years.

I am also indebted to my fellow postgraduate students and colleagues especially Ahmad Zubair Sultan, Muhammad Anshar, Nur Hamzah Said, Wibowo, and Toto who have provided assistance on various occasions. My thanks also go to all the technicians especially Mr. Aidid Hussin and Mr. Sazali Ngadiman from the Production Laboratory for their valued assistance during my experimental work. My sincere appreciation also extends to all my colleagues and others who have provided assistance directly or indirectly throughout this research. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space.

ABSTRACT

Austenitic stainless steel AISI 316L is mostly used as an implant material and is customarily applied as impermanent devices in orthopedic surgery because of its low cost, adequate mechanical properties, and acceptable biocompatibility. AISI 316L is an extra-low carbon type 316 (austenitic chromium nickel stainless steel containing molybdenum) that minimizes harmful carbide precipitation at elevated temperature. Machining is part and parcel during the fabrication of implants and medical devices made from stainless steels and thus it is of interest to evaluate the machinability of AISI 316L. In this study, austenitic stainless steel AISI 316L was turned using two commercially available cutting tool inserts at various cutting speeds (90, 150, and 210 m/min) and feeds (0.10, 0.16, and 0.22 mm/rev) and at a constant depth of cut of 0.4 mm. The turning of AISI 316L was implemented in dry cutting. The cutting tools used were an uncoated tungsten carbide-cobalt insert (WC-Co) and a multi coated nano-textured TiCN, nano-textured Al_2O_3 thin layer, and a TiN outer layer insert. The cutting forces, total power consumption, surface roughness, and tool life were measured/obtained and analyzed. The total power consumption of the turning process was obtained from direct measurements as well as using a combination of theoretical formulas and experimental cutting force data. The machining experiments and their responses were designed and evaluated using the three-level full factorial design and the analysis of variance (ANOVA). It was found that the cutting speed and feed significantly affect the various machining responses observed. The cutting force and total power consumption increased with increasing cutting speed, but the surface roughness and tool life decreased. With increasing feed, surface roughness and tool life decreased but the cutting force and total power consumption increased. The empirical mathematical models of the machining responses as functions of cutting speed and feed developed were statistically valid. Confirmation runs helped to prove the validity of the models within the limits of the factors investigated.

ABSTRAK

Keluli tahan karat austenit AISI 316L digunakan secara meluas sebagai bahan implan dan sering digunakan untuk peranti sementara dalam pembedahan ortopedik kerana kos yang rendah, sifat mekanikal yang memadai, dan biokeserasian yang boleh diterima. AISI 316L adalah versi karbon terendah-sangat bagi keluli jenis 316 (keluli austenit kromium nikel tahan karat yang mengandungi molibdenum) yang mengurangkan pemendakan karbida yang merbahaya pada suhu tinggi. Proses pemesinan digunakan dalam pembuatan implan dan peranti perubatan yang diperbuat daripada keluli tahan karat dan oleh itu adalah penting untuk menilai kebolehmesinan AISI 316L. Dalam kajian ini, keluli tahan karat austenit AISI 316L dilarik menggunakan dua mata alat sisipan komersial pada pelbagai kelajuan pemotongan (90, 150, dan 210 m/min) dan uluran (0.10, 0.16, dan 0.22 mm/putaran) dan pada kedalaman potongan tetap 0.4 mm. Larikan AISI 316L dijalankan dalam keadaan pemotongan kering. Mata alat sisipan yang digunakan adalah karbida tungsten-kobalt (*tungsten carbide-cobalt*, WC-Co) tak bersalut dan mata sisipan yang disalut berlapis dengan lapisan nano-bertekstur TiCN, lapisan nipis nano-bertekstur Al_2O_3 dan lapisan luar TiN. Daya pemotongan, jumlah penggunaan kuasa, kualiti permukaan, dan hayat mata alat diukur/diambil dan dianalisa. Jumlah penggunaan kuasa bagi proses larikan diperoleh secara pengukuran langsung dan juga gabungan formula teori dan data ujikaji daya pemotongan. Ujikaji pemesinan dan responnya telah direkabentuk dan dinilai menggunakan reka bentuk faktorial tahap tiga dan analisa varians (*analysis of variance*, ANOVA). Kelajuan pemotongan dan suapan didapati memberi kesan kepada pelbagai respon pemesinan yang diperhatikan. Daya pemotongan dan jumlah penggunaan kuasa meningkat dengan peningkatan kelajuan pemotongan, tetapi kekasaran permukaan dan hayat mata alat menurun. Dengan peningkatan uluran, kualiti permukaan dan hayat mata alat berkurangan tetapi daya pemotongan dan jumlah penggunaan kuasa meningkat. Model matematik empirikal bagi respon pemesinan sebagai fungsi kelajuan pemotongan dan uluran yang dibangunkan adalah sah secara statistik. Ujian pengesahan telah membantu dalam membuktikan kesahihan model dalam had bagi faktor-faktor yang dikaji.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

a_p	-	Depth of cut
b	-	Shank width
C	-	Constant
C_e	-	End cutting edge angle
C_s	-	Side cutting edge angle
E	-	Energy required for machining process
ε	–	Experimental error
f	-	Feed rate
F_C	-	Main cutting force
F_X	-	Radial force
F_Y	-	Feed force
F_Z	-	Cutting force
h	-	Shank height
I	-	Current
l	-	Tool length
k	-	Specific energy requirement
KI	-	Crater index
KT	-	Depth of the crater
n	-	Exponent varies
P	-	Power consumed by machining process
P_C	-	Power consumption
P_0	-	Idle power
r	-	Nose radius
Ra	-	Surface roughness
Rt	-	Surface profile
T	-	Tool life
V	-	Voltage

VB_B	-	Average of flank wear width in zone B
VB_{Bmax}	-	Maximum of flank wear width in zone B
VB_N	-	Maximum width of notch wear
Vc	-	Cutting speed
$\dot{v}$	-	Material removal rate (MRR)
x_1	-	Coded form for the cutting speed
x_2	-	Coded form for the feed rate
α_b	-	Back rake angle
α_s	-	Side rake angle
θ_e	-	End relief angle
θ_s	-	Side relief angle

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

The first chapter begins with the background of the problem, which covers the problem statement. Following the problem statement are the objectives, scope and significance of the study, and the organization of the thesis.

1.1 Background

Machining processes are complex and dependant on many factors such as the process under consideration and its operating conditions, the workpiece material, and the cutting tool material. A particular combination of these factors will have an effect on machinability. In the case of the turning process, attempts have been made to measure or quantify machinability and it was done mostly in terms of:

1. Tool life which substantially influences productivity and the economics in machining. Investigations on the tool life as the response when cutting tool and cutting parameters are varied have been studied in several investigations, such as by Kurniawan *et al.* (2010), Rao *et al.* (2014), and Hu and Huang (2014).
2. Magnitude of cutting forces which affects dimensional accuracy. Cutting forces have been measured in several studies, such as by Kamely and Noordin (2011), Kadirgama *et al.* (2010), and Xie *et al.* (2013).
3. Surface finish which plays an important role on performance and service life of the product. Surface roughness at various machining conditions have been

investigated by several researchers, such as Devillez *et al.* (2011), Asiltürk and Akkuş (2011), Krishna *et al.* (2010), and Hwang and Lee (2010).

Nowadays sustainable development has been emphasized. In order to attain sustainable development, industries have resorted to sustainable manufacturing where the three pillars, namely; economic, social, and environmental were considered (Pusavec *et al.*, 2010; Westkämper *et al.*, 2000). Application of sustainability practices have been carried out in the various engineering fields, including manufacturing and design. It is known that industries gained financial and environmental advantages, produce products of best quality, became more competitive, have a larger market share and achieved increased profitability when these industries applied sustainable practices (Nambiar, 2010; Rusinko, 2007).

In manufacturing, sustainable practices include conserving energy and natural resources, implementing economically sound processes, and keeping negative environmental impacts to the minimum level, and simultaneously enhancing the safety of employee, community, and the products. Such practices can also be applied to machining processes which is part of the manufacturing system. Machining as an industry, is acknowledged as a production system, which is associated with the creation of economic wealth as well as the impact on the natural environment (Sarkis *et al.*, 2010; Warren *et al.*, 2001). Specifically for the turning process, sustainable machining can be implemented by taking into account the cutting conditions used during turning; such as the cutting parameters and cutting fluids, the cutting tool performance, the quality of machined surface, and the power consumed for cutting.

Use of cutting fluids is a common practice in machining, for increasing overall machinability, by reducing friction or temperature at the cutting region. However, their use has been recommended to be minimized whenever possible. Dry machining, without the use of any cutting fluid, has been investigated as a means towards sustainable manufacturing. Previous research was on dry turning was performed by Davoodi *et al.* (2012), Devillez *et al.* (2011), Kadirgama *et al.* (2010), Noordin *et al.* (2007), to name a few, with success to some extent. The use of proper cutting tools at suitable cutting parameters is determinant for optimal tool life, which in turn influences the sustainability of the turning process. The quality of machined surface, or sometime termed as surface integrity, reflects the performance of the machining process. This includes the surface roughness of the machined surface. The power consumption during the cutting process needs serious attention since it is related to various aspects of sustainable manufacturing. Some works have been done on some machining processes, such as Aggarwal *et al.* (2008), Bhattacharya *et al.* (2009), Hanafi *et al.* (2012), and Bhushan (2013), but works involving the turning process are still lacking. Combination of the first three considerations with power consumption in turning is a good way forward towards sustainable machining.

1.2 Problem Statement

The machining industry is an important and strategic industry for the manufacturing sector (Wang *et al.*, 2013). Based on the above, investigations have been carried out on machining processes by varying the cutting conditions and measuring the various machinability responses. Additionally, investigations involving newly developed cutting tools as well as newly developed workpiece materials were also undertaken. As mentioned previously; tool life, cutting forces and surface roughness are the responses normally investigated in machinability studies. The power consumption during machining is often neglected, and this holds true in the case of turning process. There was very limited research performed in investigating the power consumption machinability response. In line with making the turning process sustainable, there is a need to conduct a study on the turning process machinability, which also considers power consumption.

Stainless steel AISI 316L is the workpiece material of interest. Being highly corrosion resistant, this type of stainless steel is often used in medical devices, especially those in direct contact with the human body. Machining process is widely used in the manufacture of medical devices. However machinability data for this material is very limited. Therefore there is a need to evaluate the machinability during turning of stainless steel AISI 316L towards sustainable machining. The availability of machinability data obtained from the implementation of sustainable machining of turning process will benefit the manufacturer of these high value added products as guidelines to calculate and measure the total power consumption is available in addition to information on common machinability aspects of cutting forces, surface roughness, and tool life.

1.3 Objectives

The objectives of the research are as follows:

1. To examine the influence of cutting conditions on various machinability parameters during the turning of stainless steel AISI 316L using uncoated and coated carbide tools.
2. To develop the mathematical models for the various machinability parameters thus enabling the determination of the optimized as well as the feasible region of cutting conditions for a given set of machinability parameters' requirement.

1.4 Scope of Study

Considering the wide area of possible methods to achieve the objectives, some boundaries must be set and this research focuses within the following scope:

1. The cutting parameters were varied at 90, 150, and 210 m/min for cutting speed and 0.10, 0.16, and 0.22 mm/rev for feed, while the depth of cut was set constant at 0.4 mm. The turning process was performed dry (without cutting fluid).
2. Austenitic stainless steel AISI 316L was the workpiece material turned.
3. MC7025 coated carbide tool and UTi20T uncoated tool was the cutting tool materials used.
4. The machinability parameters investigated were the cutting forces, the total power consumption, the surface roughness and the tool life.
5. ALPHA 1350S 2-Axis CNC lathe was used to perform the cutting tests.
6. A three-component dynamometer, multi channel amplifier and the data acquisition system were utilized to obtain the cutting force data.

7. Mitutoyo Surftest SJ-301 was used to measure the surface roughness of the turned specimen.
8. Carl Zeiss Stemi 2000-C optical microscope was used to capture the wear of the cutting tool.
9. Portable power monitor ZN-CTX21 and its components were used to measure the power consumed on the main cable, spindle cable, and carriage cable which were installed in the box panel of the CNC lathe machine.
10. Wave Inspire ES software was used to display the total power consumed during turning.
11. The 3^2 or 3-level, 2-factor, full factorial design with 2 center points was used to develop the experimental plan.

1.5 Significance of Study

It was expected outcomes of this study would provide the followings:

1. By incorporating power consumption consideration together with the other machinability data, a reduction in energy consumption is expected thus making the machining process more sustainable.
2. Enhance our knowledge thereby providing a better understanding of the characteristics and application of the different cutting tools with the different cutting parameters when turning AISI 316L austenitic stainless steel.
3. The mathematical models developed will facilitate the optimization process.

1.6 Organization of Thesis

This thesis consists of six chapters, which begin with Chapter 1 as an introduction that contains the background, problem statement, objectives, scope and significance of study, and finally organization of thesis.

Chapter 2 provides the literature review for some topics, such as the definition of sustainability, sustainable production, power consumption, metal cutting and turning process, surface integrity, cutting insert, tool life and tool failure, and austenitic stainless steel. Chapter 3 describes the equipment and methodologies that were used and adopted.

The experimental results were presented in Chapter 4 and this includes the machining response data, such as cutting forces, total power consumption, surface roughness, and tool life. It also presents the data analysis and the development of the various mathematical models using the Design of Experiments (DOE) technique for predicting and optimizing the machinability parameters. Lastly, Chapter 5 provides the conclusion and recommendation for future work.

REFERENCES

Abhang, L., & Hameedullah, M. (2010). Power prediction model for Turning En-31 steel Using Response surface methodology. *Journal of Engineering Science and Technology Review, 3*(1), 116-122.

Aggarwal, A., Singh, H., Kumar, P., & Singh, M. (2008a). Optimization of multiple quality characteristics for CNC turning under cryogenic cutting environment using desirability function. *Journal of Materials Processing Technology, 205*(1), 42-50.

Aggarwal, A., Singh, H., Kumar, P., & Singh, M. (2008b). Optimizing power consumption for CNC turned parts using response surface methodology and Taguchi's technique-A comparative analysis. *Journal of Materials Processing Technology, 200*(1-3), 373-384.

AKKO. (2014). Catalogue. In AKKO. Turkey: Akko Makina Takim Hirdavat San. VE TiC. LTD. ŞTİ.

Alting, L. (1995). Life Cycle Engineering and Design. *CIRP Annals - Manufacturing Technology, 44*(2), 569-580.

Arifvianto, B. (2009). *Surface roughness and wettability of AISI 316L induced by surface mechanical attrition treatment with different milling ball diameter*. Paper presented at the Instrumentation, Communications, Information Technology, and Biomedical Engineering (ICICI-BME), 2009 International Conference on.

Asiltürk, I., & Akkuş, H. (2011). Determining the effect of cutting parameters on surface roughness in hard turning using the Taguchi method. *Measurement: Journal of the International Measurement Confederation, 44*(9), 1697-1704.

Astakhov, V. P., & Xiao, X. (2008). A Methodology for practical cutting force evaluation based on the energy spent in the cutting system *Machining Science and Technology, 12*(3), 325-347.

Attanasio, A., Umbrello, D., Cappellini, C., Rotella, G., & M'Saoubi, R. (2011). Tool wear effects on white and dark layer formation in hard turning of AISI 52100 steel. *Wear*.

Bagci, E., & Işik, B. (2006). Investigation of surface roughness in turning unidirectional GFRP composites by using RS methodology and ANN. *International Journal of Advanced Manufacturing Technology, 31*(1-2), 10-17.

Baker, R. D. (1981). Ceramic Cutting Tools: Application Guidelines. *Carbide and Tool Journal, 9-10*, 182-188.

Balakrishnan, S. (2003). *Performance Evaluation of Whisker Reinforced Ceramic Insert during Hard Turning.* Master, Universiti Teknologi Malaysia Skudai.

Belluco, W., & De Chiffre, L. (2004). Performance evaluation of vegetable-based oils in drilling austenitic stainless steel. *Journal of Materials Processing Technology, 148*(2), 171-176.

Benardos, P., & Vosniakos, G.-C. (2003). Predicting surface roughness in machining: a review. *International Journal of Machine Tools and Manufacture, 43*(8), 833-844.

Bevilacqua, M., Ciarapica, F., & Giacchetta, G. (2007). Development of a sustainable product lifecycle in manufacturing firms: a case study. *International Journal of Production Research, 45*(18-19), 4073-4098.

Bhatt, A., Attia, H., Vargas, R., & Thomson, V. (2010). Wear mechanisms of WC coated and uncoated tools in finish turning of Inconel 718. *Tribology International, 43*(5-6), 1113-1121.

Bhattacharya, A., Das, S., Majumder, P., & Batish, A. (2009). Estimating the effect of cutting parameters on surface finish and power consumption during high speed machining of AISI 1045 steel using Taguchi design and ANOVA. *Production Engineering, 3*(1), 31-40.

Bhushan, R. K. (2013). Optimization of cutting parameters for minimizing power consumption and maximizing tool life during machining of Al alloy SiC particle composites. *Journal of Cleaner Production, 39*, 242-254.

Bhushan, R. K., Kumar, S., & Das, S. (2010). Effect of machining parameters on surface roughness and tool wear for 7075 Al alloy SiC composite. *International Journal of Advanced Manufacturing Technology, 50*(5-8), 459-469.

Black, Chiles, V., Lissaman, A. J., & Martin, S. J. (2004). *Principles of Engineering Manufacture*. New Delhi: Viva Books Private Limited.

Boothroyd, G., & Knight, W. A. (2006). *Fundamentals of Machining and Machine Tools* (3rd ed.). New York: CRC Press.

Bouacha, K., Yallese, M. A., Mabrouki, T., & Rigal, J. F. (2010). Statistical analysis of surface roughness and cutting forces using response surface methodology in hard turning of AISI 52100 bearing steel with CBN tool. *International Journal of Refractory Metals and Hard Materials, 28*(3), 349-361.

Bouchelaghem, H., Yallese, M. A., Amirat, A., Mabrouki, T., & Rigal, J. F. (2010). Experimental investigation and performance analyses of CBN insert in hard turning of cold work tool steel (D3). *Machining Science and Technology, 14*(4), 471-501.

Camposeco-Negrete, C. (2013). Optimization of cutting parameters for minimizing energy consumption in turning of AISI 6061 T6 using Taguchi methodology and ANOVA. *Journal of Cleaner Production*, *53*, 195-203.

Canteli, J. A., Cantero, J. L., Marín, N. C., Gómez, B., Gordo, E., & Miguélez, M. H. (2010). Cutting performance of TiCN-HSS cermet in dry machining. *Journal of Materials Processing Technology, 210*(1), 122-128.

Cantero, J., Díaz-Álvarez, J., Miguelez, M., & Marín, N. (2013). Analysis of tool wear patterns in finishing turning of Inconel 718. *Wear, 297*(1), 885-894.

Chandrasekaran, H., & Johansson, J. O. (1994). Chip Flow and Notch Wear Mechanisms during the Machining of High Austenitic Stainless Steels. *CIRP Annals - Manufacturing Technology, 43*(1), 101-105.

Chandrasekaran, H., M'Saoubi, R., & Chazal, H. (2005). Modelling of material flow stress in chip formation process from orthogonal milling and split hopkinson bar tests. *Machining Science and Technology, 9*(1), 131-145.

Chavoshi, S. Z., & Tajdari, M. (2010). Surface roughness modelling in hard turning operation of AISI 4140 using CBN cutting tool. *International Journal of Material Forming, 3*(4), 233-239.

Che Haron, C. H., Ginting, A., & Goh, J. H. (2001). Wear of coated and uncoated carbides in turning tool steel. *Journal of Materials Processing Technology, 116*(1), 49-54.

Choudhury, S. K., & Rao, I. V. K. (1999). Optimization of cutting parameters for maximizing tool life. *International Journal of Machine Tools and Manufacture*, *39*(2), 343-353.

Ciftci, I. (2006). Machining of austenitic stainless steels using CVD multi-layer coated cemented carbide tools. *Tribology International*, *39*(6), 565-569.

Colding, B. N. (1982). Coated Cutting Tools. *SME's Cutting Tools Clinic. March. Michigan: Society of Manufacturing Engineers*, 54-77.

Correia, A. E., & Davim, J. P. (2011). Surface roughness measurement in turning carbon steel AISI 1045 using wiper inserts. *Measurement: Journal of the International Measurement Confederation*, *44*(5), 1000-1005.

Dahmus, J. B., & Gutowski, T. G. (2004). An environmental analysis of machining. *Proceedings of 2004 ASME International Mechanical Engineering Congress and RD&D Expo*, 1-10.

Davim, J. P., & Figueira, L. (2007). Machinability evaluation in hard turning of cold work tool steel (D2) with ceramic tools using statistical techniques. *Materials and Design*, *28*(4), 1186-1191.

Davim, J. P., Gaitonde, V. N., & Karnik, S. R. (2008). Investigations into the effect of cutting conditions on surface roughness in turning of free machining steel by ANN models. *Journal of Materials Processing Technology, 205*(1-3), 16-23.

Davoodi, B., Gholam Hassan Payganeh, & Eslami, M. R. (2012). Cutting Forces in Dry Machining of Aluminum Alloy 5083 with Carbide Tools. *Advanced Materials Research, 445*, 259-262.

De Godoy, V. A. A., & Diniz, A. E. (2011). Turning of interrupted and continuous hardened steel surfaces using ceramic and CBN cutting tools. *Journal of Materials Processing Technology, 211*(6), 1014-1025.

Dee, K. C., Puleo, D. A., & Bizios, R. (2002). *An Introduction To Tissue-Biomaterial Interactions* (1st ed.). New Jersey: John Wiley & Sons Inc.

Devillez, A., Le Coz, G., Dominiak, S., & Dudzinski, D. (2011). Dry machining of Inconel 718, workpiece surface integrity. *Journal of Materials Processing Technology, 211*(10), 1590-1598.

Devillez, A., Schneider, F., Dominiak, S., Dudzinski, D., & Larrouquere, D. (2007). Cutting forces and wear in dry machining of Inconel 718 with coated carbide tools. *Wear, 262*(7–8), 931-942.

Donaldson, C., LeCain, G. H., Goold, V., & Ghose, J. (2012). *Tool design*: Tata McGraw-Hill Education.

El-Hossainy, T. M., El-Zoghby, A. A., Badr, M. A., Maalawi, K. Y., & Nasr, M. F. (2010). Cutting parameter optimization when machining different materials. *Materials and Manufacturing Processes*, *25*(10), 1101-1114.

Elmunafi, M. H. S., Noordin, M., & Kurniawan, D. (2015). Tool Life of Coated Carbide Cutting Tool when Turning Hardened Stainless Steel under Minimum Quantity Lubricant using Castor Oil. *Procedia Manufacturing, 2*, 563-567.

Elmunafi, M. H. S., Yusof, N. M., & Kurniawan, D. (2015). Effect of cutting speed and feed in turning hardened stainless steel using coated carbide cutting tool under minimum quantity lubrication using castor oil. *Advances in Mechanical Engineering, 7*(8).

Foroozmehr, A., Enayati, M. H., & Karimzadeh, F. (2011). Austenite-martensite transformation in nanostructured aisi316l stainless steel powder induced during mechanical milling. *Journal of Materials Science and Engineering with Advanced Technology, 4*(2), 93-105.

Fratila, D., & Caizar, C. (2011). Application of Taguchi method to selection of optimal lubrication and cutting conditions in face milling of AlMg3. *Journal of Cleaner Production, 19*(6), 640-645.

Gaitonde, V., Karnik, S., & Davim, J. (2009). Multiperformance Optimization in Turning of Free-Machining Steel Using Taguchi Method and Utility Concept. *Journal of Materials Engineering and Performance, 18*(3), 231.

Gaitonde, V. N., Karnik, S. R., Achyutha, B. T., & Siddeswarappa, B. (2008). Taguchi optimization in drilling of AISI 316L stainless steel to minimize burr size using multi-performance objective based on membership function. *Journal of Materials Processing Technology, 202*(1–3), 374-379.

Gaitonde, V. N., Karnik, S. R., Figueira, L., & Davim, J. P. (2011). Performance comparison of conventional and wiper ceramic inserts in hard turning through artificial neural network modeling. *International Journal of Advanced Manufacturing Technology, 52*(1-4), 101-114.

Gaitonde, V. N., Karnik, S. R., Siddeswarappa, B., & Achyutha, B. T. (2008). Integrating Box-Behnken design with genetic algorithm to determine the optimal parametric combination for minimizing burr size in drilling of AISI 316L stainless steel. *International Journal of Advanced Manufacturing Technology, 37*(3-4), 230-240.

Galanis, N., & Manolakos, D. (2010). Surface roughness prediction in turning of femoral head. *The International Journal of Advanced Manufacturing Technology, 51*(1), 79-86.

Ghani, M. U., Abukhshim, N. A., & Sheikh, M. A. (2008). An investigation of heat partition and tool wear in hard turning of H13 tool steel with CBN cutting tools. *International Journal of Advanced Manufacturing Technology, 39*(9-10), 874-888.

Grzesik, W. (1998). The role of coatings in controlling the cutting process when turning with coated indexable inserts. *Journal of Materials Processing Technology, 79*(1), 133-143.

Grzesik, W., Bartoszuk, M., & Nieslony, P. (2005). Finite element modelling of temperature distribution in the cutting zone in turning processes with differently coated tools. *Journal of Materials Processing Technology, 164*, 1204-1211.

Grzesik, W., & Wanat, T. (2006). Surface finish generated in hard turning of quenched alloy steel parts using conventional and wiper ceramic inserts. *International Journal of Machine Tools and Manufacture, 46*(15), 1988-1995.

Gutowski, T., Dahmus, J., & Thiriez, A. (2006). Electrical Energy Requirements for Manufacturing Processes. *13th CIRP International Conference on Life Cycle Engineering*.

Gutowski, T. G. (2004). Design and Manufacturing for the Environment. *chapter in the Handbook of Mechanical Engineering*(Springer-Verlag, in press).

Hale, T. E. (1985). United States Patent No.: U. S. Patent.

Hamdan, A., Sarhan, A. A., & Hamdi, M. (2012). An optimization method of the machining parameters in high-speed machining of stainless steel using coated carbide tool for best surface finish. *The International Journal of Advanced Manufacturing Technology, 58*(1-4), 81-91.

Hanafi, I., Khamlichi, A., Cabrera, F. M., Almansa, E., & Jabbouri, A. (2012). Optimization of cutting conditions for sustainable machining of PEEK-CF30 using TiN tools. *Journal of Cleaner Production, 33*, 1-9.

Horng, J. T., Liu, N. M., & Chiang, K. T. (2008). Investigating the machinability evaluation of Hadfield steel in the hard turning with Al2O3/TiC mixed ceramic tool based on the response surface methodology. *Journal of Materials Processing Technology, 208*(1-3), 532-541.

Hu, H. J., & Huang, W. J. (2014). Tool life models of nano ceramic tool for turning hard steel based on FEM simulation and experiments. *Ceramics International*, *40*(7, Part A), 8987-8996.

Huang Y., S. Y. L. (2005). Modeling of Cutting Forces Under Hard Turning Conditions Considering Tool Wear Effect. *Journal of Manufacturing Science and Engineering, Transactions of the ASME, 127*, 262-270.

Hwang, Y. K., & Lee, C. M. (2010). Surface roughness and cutting force prediction in MQL and wet turning process of AISI 1045 using design of experiments. *Journal of Mechanical Science and Technology, 24*(8), 1669-1677.

Islam, M., & Boswell, B. (2013). Effect of Cutting Parameters on Surface Finish for Three Different Materials in Dry Turning. In S.-I. Ao & L. Gelman (Eds.), *Electrical Engineering and Intelligent Systems* (Vol. 130, pp. 389-402): Springer New York.

ISO-3685. (1993). Tool-Life Testing with Single-Point Turning Tools. Appendix G. (pp.41)

Jawahir, I. S., & Jayal, A. D. (2011). Product and Process Innovation for Modeling of Sustainable Machining Processes. *Advances in Sustainable Manufacturing: Proceeding of the 8th Global Conference on Sustainable Manufacturing*, 299-305.

Jayal, A. D., Badurdeen, F., Dillon Jr, O. W., & Jawahir, I. S. (2010). Sustainable manufacturing: Modeling and optimization challenges at the product, process and system levels. *CIRP Journal of Manufacturing Science and Technology, 2*(3), 144-152.

Jindal, P., Santhanam, A., Schleinkofer, U., & Shuster, A. (1999). Performance of PVD TiN, TiCN, and TiAlN coated cemented carbide tools in turning. *International Journal of Refractory Metals and Hard Materials*, *17*(1), 163-170.

John, P. (2000). *EC&M's Electrical Calculations Handbook* (1st ed.). New York: McGraw-Hill Co. Inc.

Jovane, F., Yoshikawa, H., Alting, L., Boër, C. R., Westkamper, E., Williams, D., et al. (2008). The incoming global technological and industrial revolution towards competitive sustainable manufacturing. *CIRP Annals - Manufacturing Technology, 57*(2), 641-659.

Kadirgama, K., Noor, M. M., Abou-El-Hossein, K. A., H.H. Habeeb, M.M. Rahman, B. Mohamad, et al. (2010). Effect of Dry Cutting on Force and Tool Life When Machining Aerospace Material. *International Journal of Mechanical and Materials Engineering, 1*(2).

Kalpakjian, S., & Schmid, S. (2001). *Manufacturing engineering and technology* (4th ed.). London: Prentice-Hall International (UK) Ltd.

Kalpakjian, S., & Schmid, S. R. (2006). *Manufacturing Engineering and Technology* (5th ed.). New Jersey: Prentice Hall.

Kalpakjian, S., & Schmid, S. R. (2008). *Manufacturing Processes for Engineering Materials* (5th ed.). New York: Persons Prentice Hall.

Kamely, M. A., & Noordin, M. Y. (2011). The Impact of Cutting Tool Materials on Cutting Force. *World Academy of Science, Engineering and Technology, 51*, 903-906.

Kandananond, K. (2010). Using the response surface method to optimize the turning process of AISI 12L14 steel. *Advances in Mechanical Engineering, 2*, 6.

Karnik, S., Gaitonde, V., & Davim, J. P. (2007). Integrating Taguchi principle with genetic algorithm to minimize burr size in drilling of AISI 316L stainless steel using an artificial neural network model. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 221*(12), 1695-1704.

Kaynak, Y., Karaca, H. E., Noebe, R. D., & Jawahir, I. S. (2013). Tool-wear analysis in cryogenic machining of NiTi shape memory alloys: A comparison of tool-wear performance with dry and MQL machining. *Wear, 306*(1–2), 51-63.

Khidhir, B. A., & Mohamed, B. (2009). Selecting of Cutting Parameters from Prediction Model of Cutting Force for Turning Nickel Based Hastelloy C-276 Using Response Surface Methodology. *European Journal of Scientific Research, 33*(3), 525-535.

Kıvak, T., Samtaş, G., & Çiçek, A. (2012). Taguchi method based optimization of drilling parameters in drilling of AISI 316 steel with PVD monolayer and multilayer coated HSS drills. *Measurement, 45*(6), 1547-1557.

Knight, W. A., & Boothroyd, G. (2005). *Fundamentals of Metal Machining and Machine Tools* (3rd ed.): Taylor & Francis.

Koehler, C. J. (1982). The Application of Ceramic Cutting Tools. *In: Kane, G. E. Modern Trends in Cutting Tools. Michigan: Society of Manufacturing Engineers*, 167-168.

Koepfer, C. (2005, August 20). Successful Application of Ceramic Inserts. Retrieved from http://www.mmsonline.com/articles/successful-application-of-ceramic-inserts

Kopac, J. (2009). Achievements of sustainable manufacturing by machining. *Journal of Achievements in Materials and Manufacturing Engineering, 34*(2), 180-187.

Krishna, P., Srikant, R., & Rao, D. (2010). Experimental investigation to study the performance of solid lubricants in turning of AISI1040 steel. *Proceedings of the Institution of Mechanical Engineers, 224*(J12), 1273.

Krolczyk, G., Gajek, M., & Legutko, S. (2013). Predicting the tool life in the dry machining of duplex stainless steel. *Eksploatacja i Niezawodność, 15*, 62-65.

Królczyk, G., Gajek, M., & Legutko, S. (2013). Effect of the cutting parameters impact on tool life in duplex stainless steel turning process. *Tehnički Vjesnik-Technical Gazette, 20*(4), 587-592.

Kulkarni, A. P., Joshi, G. G., & Sargade, V. G. (2013). Dry Turning of AISI 304 Austenitic Stainless Steel Using AlTiCrN Coated Insert Produced by HPPMS Technique. *Procedia Engineering, 64*(0), 737-746.

Kurniawan, D., Yusof, N. M., & Sharif, S. (2010). Hard Machining of Stainless Steel Using Wiper Coated Carbide: Tool Life and Surface Integrity. *Materials and Manufacturing Processes, 25*(6), 370-377.

Lalwani, D., Mehta, N., & Jain, P. (2008). Experimental investigations of cutting parameters influence on cutting forces and surface roughness in finish hard turning of MDN250 steel. *Journal of Materials Processing Technology, 206*(1), 167-179.

Lawal, S. A., Choudhury, I. A., & Nukman, Y. (2012). Application of vegetable oil-based metalworking fluids in machining ferrous metals - A review. *International Journal of Machine Tools and Manufacture, 52*(1), 1-12.

Leppert, T. (2011). *The effects of cooling and lubrication on tool wear in turning 316L steel.* Paper presented at the International Conference on Management and Service Science, MASS 2011, Wuhan.

Li, W., Zein, A., Kara, S., & Herrmann, C. (2011). An Investigation into Fixed Energy Consumption of Machine Tools. *Glocalized Solutions for Sustainability in Manufacturing: Proceedings of the 18th CIRP International Conference on Life Cycle Engineering*, 268-273.

Lin, W. S., Lee, B. Y., & Wu, C. L. (2001). Modeling the surface roughness and cutting force for turning. *Journal of Materials Processing Technology, 108*(3), 286-293.

Ljungberg, B., & Castner, M. (2001). Coating improvements for steel turning. *Modern Machine Shop(USA), 73*(8), 100-105.

M'Saoubi, R., & Chandrasekaran, H. (2011). Experimental study and modelling of tool temperature distribution in orthogonal cutting of AISI 316L and AISI 3115 steels. *The International Journal of Advanced Manufacturing Technology, 56*(9), 865-877.

Malik, M., Ghoni, R., Sharif, S., & Wan Yusoff, W. (2014). Performance of TiAlN Coated Carbide Tool in Peck Drilling Stainless Steel SS316L with Pressurized Minimum Quantity Lubrication (PMQL). *Australian Journal of Basic & Applied Sciences, 8*(4).

Maranhão, C., & Paulo Davim, J. (2010). Finite element modelling of machining of AISI 316 steel: Numerical simulation and experimental validation. *Simulation Modelling Practice and Theory, 18*(2), 139-156.

Mativenga, P. T., & Rajemi, M. F. (2011). Calculation of optimum cutting parameters based on minimum energy footprint. *CIRP Annals - Manufacturing Technology, 60*(1), 149-152.

Mitchell, P. E. (1996). *Tool and Manufacturing Engineers Handbook: A Reference Book for Manufacturing Engineers, Managers and Technicians*. Michigan: Society of Manufacturing Engineers.

Mitsubishi. (2013). Catalogue. In Mitsubishi. Japan: Mitsubishi materials.

Montgomery, D. C. (2001). Design and analysis of experiments 5th edition: New York: John Wiley and Sons.

Muñoz-Sánchez, A., Canteli, J. A., Cantero, J. L., & Miguélez, M. H. (2011). Numerical analysis of the tool wear effect in the machining induced residual stresses. *Simulation Modelling Practice and Theory, 19*(2), 872-886.

Nalbant, M., Gökkaya, H., Toktaş, İ., & Sur, G. (2009). The experimental investigation of the effects of uncoated, PVD- and CVD-coated cemented carbide inserts and cutting parameters on surface roughness in CNC turning and its prediction using artificial neural networks. *Robotics and Computer-Integrated Manufacturing, 25*(1), 211-223.

Nambiar, A. N. (2010). *Challenges in sustainable manufacturing.* Paper presented at the Proceedings of the 2010 international conference on industrial engineering and operations management, Dhaka, Bangladesh.

Nasr, M. N. A., Ng, E. G., & Elbestawi, M. A. (2007). Modelling the effects of tool-edge radius on residual stresses when orthogonal cutting AISI 316L. *International Journal of Machine Tools and Manufacture, 47*(2), 401-411.

Nath, C., Rahman, M., & Andrew, S. (2007). A study on ultrasonic vibration cutting of low alloy steel. *Journal of Materials Processing Technology, 192*, 159-165.

Ng, E.-G., Aspinwall, D., Brazil, D., & Monaghan, J. (1999). Modelling of temperature and forces when orthogonally machining hardened steel. *International Journal of Machine Tools and Manufacture, 39*(6), 885-903.

Niinomi, M. (2002). Recent metallic materials for biomedical applications. *Metallurgical and materials transactions A, 33*(3), 477-486.

Noordin, M., Jiawkok, N., Ndaruhadi, P., & Kurniawan, D. (2015). Machining of bone: Analysis of cutting force and surface roughness by turning process. *Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine, 229*(11), 761-768.

Noordin, M. Y. (2003). *Performance evaluation of coated carbide and coated cermet tools when turning hardened tool steel.* PhD Thesis, Universiti Teknologi Malaysia Johor Bahru.

Noordin, M. Y., Kurniawan, D., Tang, Y. C., & Muniswaran, K. (2012). Feasibility of mild hard turning of stainless steel using coated carbide tool. *International Journal of Advanced Manufacturing Technology, 60*(9-12), 853-863.

Noordin, M. Y., Venkatesh, V. C., Chan, C. L., & Abdullah, A. (2001). Performance evaluation of cemented carbide tools in turning AISI 1010 steel. *Journal of Materials Processing Technology, 116*(1), 16-21.

Noordin, M. Y., Venkatesh, V. C., & Sharif, S. (2007). Dry turning of tempered martensitic stainless tool steel using coated cermet and coated carbide tools. *Journal of Materials Processing Technology, 185*(1-3), 83-90.

Nur, R., Noordin, M., Izman, S., & Kurniawan, D. (2014). The Effect of Cutting Parameters on Power Consumption during Turning Nickel Based Alloy. *Advanced Materials Research, 845*, 799-802.

OECD (Organization for Economic Co-operation and Development). (2009). Sustainable manufacturing and eco-innovation: towards a green economy. Retrieved from htttp://www.oecd.org.

Outeiro, J. (2014). Surface integrity predictions and optimisation of machining conditions in the turning of AISI H13 tool steel. *International Journal of Machining and Machinability of Materials, 15*(1), 122-134.

Outeiro, J. C., Dias, A. M., Lebrun, J. L., & Astakhov, V. P. (2002). Machining residual stresses in AISI 316l steel and their correlation with the cutting parameters. *Machining Science and Technology, 6*(2), 251-270.

Outeiro, J. C., Umbrello, D., & M'Saoubi, R. (2006). Experimental and numerical modelling of the residual stresses induced in orthogonal cutting of AISI 316L steel. *International Journal of Machine Tools and Manufacture, 46*(14), 1786-1794.

Ozarkar, M., Bhatkhande, R., Jerath, S., & Kulkarni, A. (2014). Investigation on Surface Roughness and Cutting Temperature in Turning AISI 316 Austenitic Stainless Steel Using TiAlSiN Coated Carbide Insert. *Applied Mechanics and Materials, 446*, 291-295.

Ozcelik, B., Kuram, E., & Simsek, B. (2011). Comparison of dry and wet end milling of AISI 316 stainless steel. *Materials and Manufacturing Processes, 26*(8), 1041-1049.

Özel, T., & Altan, T. (2000). Determination of workpiece flow stress and friction at the chip–tool contact for high-speed cutting. *International Journal of Machine Tools and Manufacture, 40*(1), 133-152.

Özel, T., Hsu, T.-K., & Zeren, E. (2005). Effects of cutting edge geometry, workpiece hardness, feed rate and cutting speed on surface roughness and forces in finish turning of hardened AISI H13 steel. *The International Journal of Advanced Manufacturing Technology, 25*(3-4), 262-269.

Öztürk, O. (2009). Microstructural and mechanical characterization of nitrogen ion implanted layer on 316L stainless steel. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms, 267*(8-9), 1526-1530.

Petropoulos, G., Pandazaras, C., Vaxevanidis, N., & Antoniadis, A. (2006). Multi-parameter identification and control of turned surface textures. *The*

International Journal of Advanced Manufacturing Technology, 29(1-2), 118-128.

Pfouts, W. R. (2000). Cutting Edge Coatings. *Manufacturing Engineering, 125*(1).

Philip Selvaraj, D., Chandramohan, P., & Mohanraj, M. (2014). Optimization of surface roughness, cutting force and tool wear of nitrogen alloyed duplex stainless steel in a dry turning process using Taguchi method. *Measurement, 49*, 205-215.

Pusavec, F., & Kopac, J. (2009). achieving and Implementation of Sustainability Principles in Machining Processes. *Advances in Production Engineering & Management, 4*(3), 151-160.

Pusavec, F., Krajnik, P., & Kopac, J. (2010). Transitioning to sustainable production – Part I: application on machining technologies. *Journal of Cleaner Production, 18*(2), 174-184.

Rachuri, S., Sriram, R. D., & Sarkar, P. (2009). *Metrics, standards and industry best practices for sustainable manufacturing systems.* Paper presented at the Automation Science and Engineering, 2009. CASE 2009. IEEE International Conference on.

Rajemi, M. F., Mativenga, P. T., & Aramcharoen, A. (2010). Sustainable machining: selection of optimum turning conditions based on minimum energy considerations. *Journal of Cleaner Production, 18*(10-11), 1059-1065.

Rao, C. J., Sreeamulu, D., & Mathew, A. T. (2014). Analysis of Tool Life during Turning Operation by Determining Optimal Process Parameters. *Procedia Engineering, 97*, 241-250.

Rao, K. V., Murthy, B., & Rao, N. M. (2015). Experimental study on tool condition monitoring in boring of AISI 316 stainless steel. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, 1-12.

Rashad, R. M., & El-Hossainy, T. M. (2006). Machinability of 7116 Structural Aluminum Alloy. *Materials and Manufacturing Processes, 21*(1), 23-27.

Razavykia, A., Yusof, N. M., & Yavari, M. R. (2015). Determining the Effects of Machining Parameters and Modifier on Surface Roughness in Dry Turning of Al-20% Mg 2 Si-PMMC using Design of Experiments (DOE). *Procedia Manufacturing, 2,* 280-285.

Rech, J., Kusiak, A., & Battaglia, J. (2004). Tribological and thermal functions of cutting tool coatings. *Surface and Coatings Technology, 186*(3), 364-371.

Roy, P., Sarangi, S. K., Ghosh, A., & Chattopadhyay, A. K. (2009). Machinability study of pure aluminium and Al–12% Si alloys against uncoated and coated carbide inserts. *International Journal of Refractory Metals and Hard Materials, 27*(3), 535-544.

Rusinko, C. A. (2007). Green Manufacturing: An Evaluation of Environmentally Sustainable Manufacturing Practices and Their Impact on Competitive Outcomes. *Engineering Management, IEEE Transactions on, 54*(3), 445-454.

Saglam, H., Yaldiz, S., & Unsacar, F. (2007). The effect of tool geometry and cutting speed on main cutting force and tool tip temperature. *Materials & Design, 28,* 101-111.

Sahoo, A. K., & Sahoo, B. (2012). Experimental investigations on machinability aspects in finish hard turning of AISI 4340 steel using uncoated and multilayer coated carbide inserts. *Measurement, 45*(8), 2153-2165.

San-Juan, M., Martín, Ó., de Tiedra, M. d. P., Santos, F., López, R., & Cebrián, J. (2015). Study of Cutting Forces and Temperatures in Milling of AISI 316L. *Procedia Engineering, 132,* 500-506.

Sarkis, J., Nunes, B., & Bennett, D. (2010). Green operations initiatives in the automotive industry: An environmental reports analysis and benchmarking study. *Benchmarking: An International Journal, 17*(3), 396-420.

Schade, Schaberl, J., & Lawley, A. (2007). Stainless Steel AISI Grades for PM Applications. *Advances in Powder Metallurgy and Particulate Materials, 2,* 7.

Schey, J. A. (2000). *Introduction to Manufacturing Processes* (3rd ed.). United State: McGraw Hill Co. Inc.

Seidel, R., Shahbazpour, M., & Oudshoorn, M. (2006). Implementation of sustainable manufacturing practices in SMEs—case study of a New Zealand furniture manufacturer. *Katholieke Universiteit Leuven: Leuven, Belgium*.

Seliger, G., Kim, H., Kernbaum, S., & Zettl, M. (2008). Approaches to sustainable manufacturing. *International Journal of Sustainable Manufacturing, 1*(1-2), 58-77.

Senthil Kumar, A., Raja Durai, A., & Sornakumar, T. (2006). The effect of tool wear on tool life of alumina-based ceramic cutting tools while machining hardened martensitic stainless steel. *Journal of Materials Processing Technology, 173*(2), 151-156.

Sharan, D. (1999). The problem of Corrosion in Orthopaedic Implants. *Orthopaedic Update (India), 9*(1), 27-31.

Sharma, V., Dhiman, S., Sehgal, R., & Sharma, S. (2008). Estimation of cutting forces and surface roughness for hard turning using neural networks. *Journal of Intelligent Manufacturing, 19*(4), 473-483.

Sharman, A., Hughes, J., & Ridgway, K. (2004). Workpiece surface integrity and tool life issues when turning Inconel 718™ nickel based superalloy. *Machining Science and Technology, 8*(3), 399-414.

Shaw, M. C. (2005). *Metal Cutting Principles* (2nd ed.). New York: Oxford University Press.

Singh, D., & Rao, P. V. (2007). A surface roughness prediction model for hard turning process. *The International Journal of Advanced Manufacturing Technology, 32*(11-12), 1115-1124.

Stachowiak, G. W., & Stachowiak, G. B. (1994). Wear behaviour of ceramic cutting-tools. *Key Engineering Materials, 96*, 137-164.

Stat-Ease, I. (2000). Design-Expert Software Version 7.1 User's Guide. Minneapolis.

Suhail, A. H., Ismail, N., Wong, S. V., & Abdul Jalil, N. A. (2011). Workpiece surface temperature for in-process surface roughness prediction using response surface methodology. *Journal of Applied Sciences, 11*(2), 308-315.

Thakkar, J., & Patel, M. I. (2014). A Review on Optimization of Process Parameters for Surface Roughness and Material Removal Rate for SS 410 Material During Turning Operation. *International Journal of Engineering Research and Applications, 4*(2), 235-242.

Trent, E. M. (1977). *Requirements for Tool Materials for Cutting Metals.* Paper presented at the New Tool Materials and Cutting Techniques International Conference, London.

Trent, E. M., & Wright, P. K. (2000). *Metal Cutting* (4^{th} ed.). Woburn: Butterworth Heinamann.

Umbrello, D., M'Saoubi, R., & Outeiro, J. C. (2007). The influence of Johnson–Cook material constants on finite element simulation of machining of AISI 316L steel. *International Journal of Machine Tools and Manufacture, 47*(3-4), 462-470.

US Department of Commerce. (2009, April 29). *Sustainable manufacturing initiative.* Paper presented at the Proceedings of the 2nd Annual Sustainable Manufacturing Summit, Chicago, USA.

Valiorgue, F., Rech, J., Hamdi, H., Gilles, P., & Bergheau, J. M. (2007). A new approach for the modelling of residual stresses induced by turning of 316L. [doi: 10.1016/j.jmatprotec.2007.03.021]. *Journal of Materials Processing Technology, 191*(1–3), 270-273.

Vasilash, G. S. (1982). Ultrathin Coating Makes a Big Difference. *In: Kane, G. E. Modern Trends in Cutting Tools. Michigan: Society of Manufacturing Engineers*, 88-89.

Venkatesh, V. C. (1989). *A Discussion on Tool Life Criteria for HSS, Carbides and Oxide Ceramics.* Paper presented at the 1989 SME International Conference and Exposition. May 1-4., Michigan.

Venkatesh, V. C., & Chandrasekaran, H. (1987). *Experimental Techniques in Metal Cutting* (1st ed.). New Delhi: Prentice-Hill Inc.

Venkatesh, V. C., Kattan, I. A., Hoy, D., Ye, C. T., & Vankirk, J. S. (1996). An Analysis of Cutting Tools with Negative Side Cutting Edge Angles. *Elsevier Journal of Materials Processing Technology, 58*, 351-361.

Venkatesh, V. C., & Sudin, I. (2005). *Precision Engineering* (1st ed.). New York: Tata McGraw-Hill Publishing Co. Ltd.

Venkatesh, V. C., Ye, C. T., Quinto, D. T., & Hoy, D. E. P. (1991). Performance Studies of Uncoated, CVD-Coated and PVD-Coated Carbides in Turning and Milling. *CIRP Annals - Manufacturing Technology, 40*(1), 545-550.

Wagh, S. S., Kulkarni, A. P., & Sargade, V. G. (2013). Machinability Studies of Austenitic Stainless Steel (AISI 304) Using PVD Cathodic Arc Evaporation (CAE) System Deposited AlCrN/TiAlN Coated Carbide Inserts. *Procedia Engineering, 64*(0), 907-914.

Walsh, R. A. (2001). *Handbook of Machining and Metalworking Calculations* (1st ed.). New York: McGraw-Hill Co. Inc.

Wang, J. (2000). The effects of the multi-layer surface coating of carbide inserts on the cutting forces in turning operation. *Elsevier Journal of Materials Processing Technology, 97*, 114-119.

Wang, Q., Liu, F., & Li, C. (2013). An integrated method for assessing the energy efficiency of machining workshop. *Journal of Cleaner Production, 52*, 122-133.

Warren, J. P., Rhodes, E., & Carter, R. (2001). A total product system concept. *Greener Management International, 35*, 89-104.

Westkämper, E., Alting, & Arndt. (2000). Life Cycle Management and Assessment: Approaches and Visions Towards Sustainable Manufacturing. *CIRP Annals - Manufacturing Technology, 49*(2), 501-526.

Whitney, E. D. (1982). New Advances in Ceramic Tooling. *In: Kane, G. E. Modern Trends in Cutting Tools. Michigan: Society of Manufacturing Engineers*, 91-112.

Xavior, M. A., & Adithan, M. (2009). Determining the influence of cutting fluids on tool wear and surface roughness during turning of AISI 304 austenitic stainless steel. *Journal of Materials Processing Technology, 209*(2), 900-909.

Xie, J., Luo, M. J., Wu, K. K., Yang, L. F., & Li, D. H. (2013). Experimental study on cutting temperature and cutting force in dry turning of titanium alloy using a non-coated micro-grooved tool. *International Journal of Machine Tools and Manufacture, 73*, 25-36.

Yan, J., & Li, L. (2013). Multi-objective optimization of milling parameters – the trade-offs between energy, production rate and cutting quality. *Journal of Cleaner Production, 52*(0), 462-471.

Yigit, R., Celik, E., Findik, F., & Koksal, S. (2008). Effect of cutting speed on the performance of coated and uncoated cutting tools in turning nodular cast iron. *Journal of Materials Processing Technology, 204*(1–3), 80-88.

Zhou, Z., Zhang, Y., Li, X., Zhou, H., & Sun, B. (2011). Influences of various cutting parameters on the surface roughness during turnings stainless steel. *Acoustical Physics, 57*(1), 114-120.

Zhuang, K., Zhu, D., Zhang, X., & Ding, H. (2014). Notch wear prediction model in turning of Inconel 718 with ceramic tools considering the influence of work hardened layer. *Wear, 313*(1–2), 63-74.