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A Review Paper on Drilling Process Parameters

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Abstract—
Drilling is a cutting technique that uses a drill bit to create a hole with a circular cross section. It is one of the most essential machining processes with a wide range of applications. This paper presents a review of the literature on drilling processes for various metals and alloys, focusing on chip thickness, cutting speed, machining feed rate, temperature distribution during drilling, surface integrity after machining, surface roughness, and burr formation while taking into account various input process parameters. The primary challenges encountered during the drilling of various sections are discussed in this paper. Titanium and its alloys are utilised in key aeronautic and automotive industries, as well as jet engine components and turbine blades, due to their excellent corrosion resistance even at high temperatures. Because of its great strength-to-weight ratio, titanium is often employed to substitute human body parts. It offers exceptional qualities like as hardness and tensile stress at high temperatures, yet it is considered a difficult-to-machine material. As a result, cost-effective drilling in titanium and related alloys must be developed. Based on the findings, it is critical to increase the quality of the drilling process while keeping costs low.

***Keywords*—Drilling process, Machinability, Input process Parameters, Output responses.**

I. Introduction

Titanium and its alloys are one-of-a-kind materials because of their high strength-to-weight ratio, which is maintained at high temperatures, and their outstanding corrosion resistance. It has outstanding mechanical qualities and can be used in a wide range of applications due to its low density, good erosion resistance, and low modulus of elasticity. Titanium alloys are extremely difficult to manufacture due to their mechanical and chemical qualities, and their use is growing in popularity, resulting in high machining costs per part. High material strength of titanium alloys results in higher cutting forces and temperatures, making the material more difficult to drill. Other factors, such as low thermal conductivity and maximum heat generated, are also important factors to consider during machining, as too much heat can quickly damage the tool. The friction between the tool and the chip, as well as the friction between the tool and the work piece, are the primary sources of heat generation. Inconsistent cutting pressure, vibration, and a lack of stiffness in the tool's grasp all contribute to tool damage. Drilling is the technique of creating a hole in a solid circular cross-section material. When compared to milling and turning, conventional drilling in titanium alloy is considered more challenging. This review of the literature looked at a number of reports on the drilling process and the study of titanium alloy under various working conditions.

Li, Yanlong, et al. (2020) demonstrated as Drilling exploration is the most common approach for studying rocks and soil geology. For a project's safety and economic benefits, choosing suitable drilling settings is critical. The relationship between vertical drilling efficiency and drilling parameters such as speed of rotation, thrust force, and rotation torque was deduced in this work utilising the energy equilibrium method and the force limit equilibrium of rock during rotary drilling. It was feasible to gather drilling parameters quickly, efficiently, and quantitatively during rock drilling thanks to advances in the drilling process monitoring (DPM) system. An orthogonal test revealed the sensitivity of the drilling efficiency to each drilling parameter in an in situ drilling test of granite utilising the upgraded DPM system. According to the findings, the best drilling efficiency (= 13.2%) was attained under the following test conditions: 128 r/min rotation speed, 788 kPa thrust force, and 64 N•m rotating torque. The thrust force had a 57.87 percent influence on drilling efficiency, the sensitivity of this parameter was strong, and the weight value of the thrust force had a high influence among the others. Furthermore, the rotating torque had a substantial impact on the drilling efficiency index, its sensitivity was neither high nor low, and its weight value was 36.82 percent. The impact of rotation speed on the index, on the other hand, was negligible, sensitivity to this parameter was low, and its weight value was 5.31 percent. The research methodologies and findings reported here can be used as guidelines for designing the best drilling construction and selecting appropriate drilling parameters.

Balaji, M., et al. (2018) optimized as Titanium alloys are difficult to machine because of their low elasticity, high formability, and inclination to break. Drill bits are susceptible to chatter vibration when drilling TI-6Al-4V alloy, which results in poor surface quality and tool failure. Using Response Surface Methodology, the effect of drilling parameters such as spindle speed, helix angle, and feed rate on surface roughness, flank wear, and drill vibration velocity acceleration was examined. The vibration of the drill bit was measured using a Laser Doppler Vibrometer (LDV) and an Acousto Optic Emission (AOE) signal. Using a high-speed fast Fourier transformer, these signals were translated into time domain with distinct time frequency zones. Response Surface Methodology (RSM) was used to analyse experimental data in order to find important parameters for surface roughness, flank wear, and drill vibration velocity acceleration. To optimise drilling parameters for minimum surface roughness, flank wear, and drill vibration velocity acceleration, a multi-response optimization was used. The best cutting settings were discovered to be 26.16 degrees helix angle, 10.0 mm/min feed rate, and 600rpm spindle speed.

Wei, Yingying, et al. (2016) demonstrated an To evaluate the cutting process, three types of drills were used in an experimental investigation on drilling carbon fiber–reinforced plastic/titanium alloy. The drilling forces, drilling temperatures, chips, and delamination area were all studied in relation to cutting parameters and tool geometries. This study used one type of tungsten carbide twist drill and two types of chemical vapour deposition diamond-coated drills, namely a multi-facet drill and a brad spur drill. The impact of drilling parameters and tool geometries was investigated, and it was concluded that good drilling parameter and drill geometries selection could result in superior hole quality. The drilling forces and hole quality have a substantial relationship with feed rate, according to the experimental data, whereas cutting speed has a minor impact. The findings of the study also revealed that using a multi-facet drill reduced delamination significantly, resulting in improved surface integrity. Drilling temperature and titanium alloy chips were also investigated in this study. Chen, Xuyue, et al (2016) optimized as Mechanical specific energy (MSE) has been frequently employed in oil and gas well drilling to assess drilling efficiency and maximise rate of penetration (ROP). Given that there are currently few effective MSE models to accurately describe actual downhole drilling for rotating drilling with positive displacement motor (PDM), this work establishes a novel MSE model for rotating drilling with PDM based on PDM performance analysis. In the meantime, a method for real-time optimization of drilling parameters based on MSE is described for rotational drilling with PDM in the hard formation. The MSE(min) calculated by the novel MSE model is almost comparable to the confined compressive strength (CCS) of the formation along the well depth, indicating that it may satisfy the needs of applications in the field when drilling with high efficiency and without drilling problems. It also demonstrates that for rotational drilling with PDM, ROP is sensitive to high weight on bit (WOB), and the optimum WOB is low; raising WOB does not always enhance ROP, but is more likely to decrease ROP. The approach for optimising drilling parameters may calculate the best WOB values at various RPMs in real time to drill a specified formation interval with PDM. It can be used to increase ROP and allow operators to drill for longer periods of time without making unnecessary visits.

Çiçek et al., (2015) examined that the effects of cryogenic treatment and drilling parameters on surface and hole quality in the drilling of AISI 304 stainless steel under dry drilling circumstances were explored in this study. The Taguchi approach was used to discover the control parameters that would produce better surface roughness (Ra) and roundness error (Re). RSM was also utilized to figure out how the control factors interacted. The most significant control factors on surface roughness and roundness error were also determined using analysis of variance. Three drill types (conventional heat treatment—CHT, cryogenic treatment—CT, cryo-tempering—CTT), cutting speeds, and feed rates were used as control factors, and experimental trials were conducted using a L 27 L 27 full factorial design with a mixed orthogonal array. As a consequence, it was discovered that the feed rate and cutting speed, with percentage contributions of 83.07 and 64.365 percent, were the most significant variables on surface roughness and roundness error, respectively. The RSM developed predictive quadratic models to determine the best surface roughness and roundness error as a function of drilling parameters and drill heat treatments.

Steinzig, M et al (2014) examined that the multiple measurements were taken in samples with a "known" condition of residual stress using the hole drilling method. Drilling parameters (bit rotation speed, bit diameter, and hole depth) were adjusted independently to see how they affected accuracy and repeatability. The study found that reliable results can be obtained without using ultra-high drill rotation speeds, and that speeds of over 5k rpm and 10k rpm (respectively) were sufficient in aluminium and stainless steel. At speeds below 10k rpm, inaccuracies were visible in the stainless steel, which were attributed to non-circular holes, which could have been caused by bit vibration. There were no significant patterns when it came to changing the hole depth, and just a minor trend when it came to changing the bit diameter. Pandey et al., (2014), investigated that a modified algorithm (grey based fuzzy algorithm) is employed in this research to enhance numerous performance aspects in bone drilling. Experiments with various cutting circumstances were conducted using a full factorial design. Temperature, force, and surface roughness are the quality criteria that are taken into account. To generate a grey fuzzy reasoning grade (GFRG) that combines all of the quality features, grey relational analysis (GRA) is combined with fuzzy logic. The optimal level of GFRG is attained when the feed rate is 40 mm/min and the speed is 500 rpm. The feed rate has the biggest contribution to GFRG, followed by the spindle speed, according to an analysis of variance (ANOVA) conducted to determine the impact of factors on different performance aspects. The confirmation experiment validates the obtained optimum level of process parameters.

Karaca, Faruk, and Bunyamin Aksakal (2013) investigated that the Bone necrosis is likely to develop as a result of the increased temperature during bone drilling. A detailed in vitro experimental investigation was conducted using fresh calf cortical bones and various combination drilling parameters, such as drilling environment, drill diameter, drill speed, drill force, feed-rate, and drill coating, to reduce bone tissue injury during drilling. Multi-thermocouples positioned around the tibial diaphyseal cortex were used to record bone temperatures at the drilling locations with great accuracy. It was discovered that as drill speeds increased, temperatures rose. It also reduced as the feed rate and drill force were increased. TiBN coated drills also induced higher temperatures in the bone than uncoated drills, and the temperatures increased as drill diameters grew larger. Although the TiBN coated drills had a greater influence of Simulated Body Fluid (SBF) on rising temperatures during drilling, it was discovered that these drills caused more damage to the bone structure. Orthopaedic surgeons should think about the best drilling parameters to reduce or avoid bone deformities and necrosis.

Naveen P.N.E et al., (2012) Composite materials are lightweight, incredibly robust, and reasonably priced. These materials are now used in a variety of automotive applications. It's challenging to process hemp fibre composite materials efficiently enough to provide high-quality results. In the aerospace and automotive industries, conventional drilling with twist drilling is still one of the most cost-effective and efficient machining processes for producing holes as well as riveting and fastening structural assemblies. The current study examines the impacts of drilling parameters such as speed and feed on the damage factor when drilling composites such as glass, hemp, and sandwich fibres with various fibre volume fractions (i.e10 percent ,20 percent &30 percent). In this experiment, three speeds, four feeds, and three volume fractions were used. The goal of this work is to use drill parameters like speed and feed to reduce the damage factor of composite materials with variable fibre volume fractions. The drill diameter was 6 mm and the composite material was 100 503 mm in size. Kıvak et al (2012) focusing on the goal of this work is to apply the Taguchi technique to optimise drilling parameters in order to achieve the lowest surface roughness (Ra) and thrust force (Ff). On a CNC vertical machining centre, a variety of drilling experiments were carried out utilising the L16 orthogonal array. Under dry cutting conditions, the trials were carried out on AISI 316 stainless steel blocks using uncoated and coated M35 HSS twist drills. The most significant control parameters impacting surface roughness and thrust force were determined using analysis of variance (ANOVA). Control factors were the cutting tool, cutting speed, and feed rate. After sixteen experimental runs, it was discovered that the cutting tool had the most impact on surface roughness and the feed rate had the greatest impact on thrust force. The Taguchi approach was particularly successful in optimising drilling parameters for better surface roughness and thrust force, according to the results of the confirmation experiments. Krishnamoorthy, A., et al (2012) demonstrated on Carbon Fibre Reinforced Plastic (CFRP) composite materials have a wide range of uses. Drilling is vital in machining because it allows diverse structures to be joined together. However, drilling using CFRP has a number of drawbacks that lower hole quality. The L27 orthogonal array of Taguchi is used to drill CFRP composite plates in this paper. The best combination of drilling settings is found utilising grey relational analysis to increase the quality of the holes bored. Drilling parameter optimization is based on five different output performance characteristics: thrust force, torque, entry delamination, exit delamination, and hole eccentricity. The percentage contribution of the drilling parameters is determined using analysis of variance (ANOVA), and feed rate is found to be the most influential element in drilling CFRP composites.

Tsao, C. C., and Y. C. Chiu (2011) Evaluated as the drilling is the most common secondary machining method for fibre reinforced composite laminates, and delamination occurs commonly at the drill exit. Core drills provide a higher drilling quality than twist drills, according to industrial experience. When using the core drill, however, chip removal is a major issue. Compound core-special drills (core-special drills and step-core-special drills) are designed to eliminate drilling clogs caused by chip removal. But the cutting velocity ratio (relative motion) between outer drill and inner drill is nil for standard compound core-special drills. The current study introduces a new device and to tackle the problems of relative motion and chip removal between the outer and inner drills in drilling CFRP composite laminates. Furthermore, the impact of drilling parameters (cutting velocity ratio, feed rate, stretch, inner drill type, and inner drill diameter) on thrust force of compound core-special drills is investigated in this work. In the future, a new gadget could be used in the use of compound core-special drill in various sectors. Kilickap, et al (2011) optimized that the one of the most significant aspects of machining processes is the modelling and optimization of cutting parameters. The current research looked at the effect of machining parameters on the surface roughness obtained during AISI 1045 drilling. Cutting speed, feed rate, and cutting environment were the matrices of test conditions. Using response surface methods, a mathematical prediction model of surface roughness was built (RSM). Using RSM and a genetic algorithm, the impacts of drilling parameters on surface roughness were studied, and the best machining conditions for decreasing surface roughness were established. As a consequence, the projected and measured values were quite near, indicating that the created model may be utilized to forecast surface roughness successfully. The given model could be used to choose the drilling parameter level. Using this model, you can save a significant amount of time and money on machining. Karaca F., et al., (2011) demonstrated that surgical drilling without the use of optimal operating conditions can result in bone defects such as fractures, cracks, osteolysis, and tissue loss in the drilling zone. An in vitro study was conducted to determine the best drilling settings, taking into account bone mineral density, bone sex, drill tip angle, drill speed, drill force, and feed rate. The samples were collected from fresh male and female calf tibias that had been drilled. Throughout the statistical and histological examination, the temperature variations at the drill site were studied. The temperature increased with rising drill speed and dropped with high feed-rates and applied drill forces, according to the findings. Female bovine tibia drilling temperatures were shown to be greater than male tibia drilling temperatures, and drill speed was revealed to be a significant factor in the maximum temperature. Furthermore, as the drill tip angle and bone mineral density rose, the maximum temperature increased. As a result, the quality of the bone at the drill site was shown to be worse than that of bone samples subjected to cold temperatures.

Eren et al. (2010) examined that real time optimization of drilling parameters during drilling operations aims to optimize weight on bit, bit rotation speed for obtaining maximum drilling rate as well as minimizing the drilling cost. The process is formation specific. A Statistical method namely multiple linear regression technique is used for the drilling optimization methodology. An extensive literature survey on drilling optimization was conducted for this research study. For this reason, a model is being built that will forecast the pace of drilling penetration as a function of available parameters using actual field data obtained using contemporary well monitoring and data recording systems. At each data point, the rate of penetration general equation is tuned for effective functions. A computer network must be established in order to optimize the settings in the field. The piped data will be kept on the computer network straight from the data source, and new data will be collected on a regular basis. A database on the central computer will calculate the developed model parameters using the multiple regression technique in real time and notify the field crew. The field engineer will send the current drilling parameters back to the central computer, and the headquarters will use the newly obtained data to determine the new model parameters and optimum drilling parameters. As a result, a real-time optimization procedure will be implemented.

Latha, B., and V. S. Senthilkumar (2009) Analyzed as Because of its mechanical and other qualities, fibre reinforced composite materials are used in a variety of industries. Drilling is one of the most significant processes in the industrial industry, and it is mostly utilised for joining. It's frequently the last step in the assembly process. Drilling flaws result in rejection and significant losses. Delamination is a significant problem that must be managed while drilling glass fibre reinforced plastic (GFRP) composites. Drilling experiments were performed on GFRP composite specimens using solid carbide drill bits in this investigation. For the testing, an L27 orthogonal array was used. To anticipate delamination in GFRP composite drilling, a fuzzy rule-based approach is created. The prediction model results and experimental values are in good agreement. The Fuzzy rule-based approach may be used to accurately anticipate delamination in GFRP composite drilling.

Tsao C.C (2008) investigated that the Induced-delamination in drilling composite materials is influenced by the geometry and material of the drill, as well as drilling conditions. Three step-core drills for drilling composite materials were studied in this work due to chips clogging the core drill. To understand the impacts of drilling parameters (diameter ratio, feed rate, and spindle speed) on induced-delamination for various step-core drills, the Taguchi technique with orthogonal array of L18 (2 37) was chosen. The diameter ratio, feed rate, and spindle speed all have a substantial impact on delamination, with A2B1C3 (diameter ratio = 0.74 mm/mm, feed rate = 8 mm/min, and spindle speed = 1200 rpm) being the best combination for all step-core drills within the studied range. Furthermore, while first cycle drilling composite materials, the influence of inner drill diameter and geometry for the step-core drill on induced-delamination must be considered. Akin, Serhat, and Celal Karpuz (2008) Because of its higher rate of penetration and core recovery in the hardest rocks, the ability to drill in any direction with less deviation, and the ability to drill with greater precision in coring and prospecting drilling, diamond bit drilling is one of the most widely used and preferred drilling techniques. Mathematical methods such as specific energy and formation drillability are used in traditional bit analysis procedures. In this study, rather than using traditional mathematical methodologies, artificial neural network (ANN) analysis was utilised to predict major drilling parameters for diamond bit drilling, such as bit weight, rotational speed, and bit type. The suggested methodology is presented using an ANN that was trained with data from [Math Processing Error] 45,000m of diamond bit drilling operations carried out on numerous formations and locations throughout Turkey. The strata explored in the Zonguldak hard coal basin comprise shallow carbonates and sandstones. The results of the neural network are compared to those produced using traditional approaches like specific energy analysis. The proposed methodology was found to produce satisfactory results in both less well-documented and drilled formations as well as well-known formations. Augustin, Goran, et al. (2008) The temperature of the bone may rise above 47°C during drilling, resulting in permanent osteonecrosis. As a result, implant-bone contact is diminished, and rigid fixation may be lost. The goal of this research was to discover an ideal setting in which the increase in bone temperature during the drilling operation was negligible. The effect of various drill parameters on the increase in bone temperature was investigated. Drill diameters were 2.5, 3.2, and 4.5 mm, with drill speeds of 188, 462, 1,140, and 1,820 rpm, feed rates of 24, 56, 84, and 196 mm/min, and drill point angles of 80, 100, and 120 degrees.

Segui, J. B., and M. Higgins (2002) investigated that the In open cut mining, measurement while drilling (MWD) techniques can be a useful tool for drill and blast engineers. MWD techniques can not only reduce time but also increase the reliability of the blast design by supplying the drill and blast engineer with information specifically customised for use, such as scan-lines and rock sample collection for laboratory tests. While most mines utilise a standard blast pattern and charge per blasthole based on a single rock factor for the whole bench or blast zone, MWD parameters can help enhance blast design by providing more precise rock attributes for each individual blasthole. This information can be used to determine the best type and amount of explosive charge to use in each blasthole, as well as the best inter-hole timing detonation time for different decks and blastholes. Where real-time calculations are possible, the system could be used to extend the current blast design by determining the placement of additional holes, perhaps leading to a more appropriate blasthole pattern design, such as asymmetrical blasting.

Finfinger, Gerald L., et al (2000) in underground mining operations, determining the characteristics of overlaying rocks is critical to ensuring that the appropriate roof support design is used to keep mine entry stable. J. H. Fletcher & Co. recently created a roof bolter monitoring and control system for the underground mining business. The system keeps track of the drilling parameters utilised during roof bolt drilling, which can provide insight into the roof strata's physical qualities. Thrust, rotational speed, torque, and velocity are among the characteristics that are measured every 0.1 second during the operation. The drilling parameters were studied to see if they could be used to determine the strength of the rocks being drilled based on the data. The data was transformed into drilling specific energy, which is a measurement of the amount of energy required to remove a unit of rock during a drilling operation. To present, laboratory investigations have found a strong relationship between the specific energy of drilling and the unconfined compressive strength of the drilled rocks. Furthermore, the drilling parameters were found to be efficient in detecting cracks or bed separations between rock strata. Drilling thrust, torque, and specific energy were all useful markers for locating fractures or separations. The position of the fractures was recognised regardless of the drilling settings utilised during the drilling experiments.

Ohashi, H., et al (1994) demonstrated that the Orthopaedic and dental biomaterials are frequently implanted into bone after drilling for biocompatibility testing. Bone repair in the drilled hole may be influenced by drilling-related bone injury, altering bone responsiveness to biomaterials. Drilling parameters (rotational speed and irrigation) were studied histologically. Each rabbit tibia was drilled three times with three different conditions: three speeds (200, 500, and 5000 r.p.m.) and whether or not to employ central irrigation. Rabbits were killed three days, two weeks, or four weeks after surgery. To determine the amount of local ischaemia, India ink was injected into multiple rabbits shortly after drilling. The quality of the drilling was assessed in terms of hole geometry, early thermal damage, and the subsequent bone healing process. The initial thermal damage, as measured by the degree of ischaemia, was smaller for 500 or 200 r.p.m. drilling than for 5000 r.p.m. drilling, but the hole edge was not always cleanly cut. The bone-healing process was thought to be unaffected by the uneven sliced edge. The degree of circularity was reduced when drilling at 200 rpm. Drilling at 5000 rpm slowed the development of bone, possibly due to heat damage and vascular blockages. Irrigation was efficient in reducing the area that was affected. These findings imply that for intraosseous biomaterial implantation, a speed of around 500 rpm may be appropriate. The central irrigation method is thought to be useful in lowering the area that is ischaemic.

Hareland, Geir et al., (1993)The theory, procedure, and results of using drilling parameters acquired during typical drilling operations to determine boundaries on the rock's minimal principal in-situ stress are presented in this study. These predictions are sought in order to better evaluate the hydraulic fracturability of reservoir rock and construct fracturing programmes without the use of costly fracturing stress testing, guessing, or empiricism. To forecast in-situ ultimate compressive rock strength, a high-fidelity tri-cone roller bit drilling model is utilised in a "inverted" mode. This compressive rock strength is a function of effective confining pressure, which may be calculated using published laboratory data for a variety of rock types. Drilling data has been used to estimate drilling rock strength for a lot of years as drilling models for various types of bits have improved over time. Although models for polycrystalline diamond compact bits and natural diamond bits have been proposed, the more classic tricone roller bit has gotten the most attention due to its extensive use. As a result, the penetration rate models for this bit are the most advanced. The drill bit penetration rate is determined using this model, which takes into account known operating circumstances, bit coefficients, mud characteristics and hydraulics, and ultimate compressive rock strength and ductility.

Tagliaferri, V et al., (1990) investigated that the Drilling studies on glass fibre reinforced plastic composites were conducted to determine the impact of machining parameters on the cut quality and mechanical behaviour of the material under investigation. The width of the damage zone was measured using a unique method. The experimental results revealed that the width of the damage zone is proportional to the Vr/Vt (drilling speed/feed rate) ratio; the greater the Vr/Vt number, the better the cut quality. For a certain Vr/Vt, the damage zone shrinks to a minimal value, after which the damage zone remains constant. When the damage zone width is considerable, the tensile strength of specimens with holes is unaffected by the quality of the material at the hole's edge, but the bearing strength suffers a significant loss with growing damage zone width. There appears to be no association between bearing strength and damage zone breadth for small damage zones.

Pfister, Paul (1985) examined that the employment of drilling parameters recorders has ushered in a new era of soil investigation, monitoring, and verification of soil improvement approaches. The invention of such recorders can be traced back to the early 1970s. The goal of their development was to make use of all the holes that had to be drilled as part of soil improvement techniques, as well as to reduce the cost of soil studies by using a quick extrapolation method that could be calibrated on a small number of cored boreholes and would give a continuous image of the ground regardless of soil or rock type. An overview of analogue drilling parameters (adp) recorders is provided, as well as how they are employed. These flaws led to the invention of the enpasol, a digital computerised recorder that outperformed analogue systems and could record up to eight distinct parameters on magnetic tape cassettes. The enpasol gadget, its operation, and the analysis of its data are all described in detail. The availability of such powerful tools, it is believed, has broadened the method's potential to the point where design itself should be influenced by the availability of such powerful tools. (TRRL)

II. CONCLUSION

Many applications favour magnesium and copper and their alloys, and drilling is required in almost every manufacturing process. Traditional drilling in Magnesium alloy is influenced by cutting speed, feed rate, chip thickness, and temperature distribution, as well as the following elements, according to the literature review.

- As the feed rate and depth of cut increase, the surface roughness increases progressively. It does not alter considerably as the cutting speed is increased.

- With increasing cutting speed, minimum feed rate, and depth of cut, the temperature of the material rises dramatically.
- At high cutting speeds, heat builds up at the narrow contact area between the tool and the work piece, lowering the coefficient of friction and increasing surface roughness.
- As the cutting speed increases, the torque and thrust force values drop, while the feed rate gradually increases.
- The most important process parameter that impacts thrust force, torque, and work vibration is the feed rate. Axial trust diminishes as cutting speed increases, increases as feed rate increases, and decreases as the hardest tool used increases.

References

[1] Li, Yanlong, et al. "Sensitivity analysis of drilling parameters in rock rotary drilling process based on orthogonal test method." Engineering Geology 270 (2020): 105576.

[2] Balaji, M., et al. "Optimization of drilling parameters for drilling of TI-6Al-4V based on surface roughness, flank wear and drill vibration." Measurement 114 (2018): 332-339.

[3] Chen, Xuyue, et al. "Real-time optimization of drilling parameters based on mechanical specific energy for rotating drilling with positive displacement motor in the hard formation." Journal of Natural Gas Science and Engineering 35 (2016): 686-694.

[4] Wei, Yingying, et al. "Effect of drilling parameters and tool geometry on drilling performance in drilling carbon fiber–reinforced plastic/titanium alloy stacks." Advances in Mechanical Engineering 8.9 (2016): 1687814016670281.

[5] Çiçek, Adem, Turgay Kıvak, and Ergün Ekici. "Optimization of drilling parameters using Taguchi technique and response surface methodology (RSM) in drilling of AISI 304 steel with cryogenically treated HSS drills." Journal of Intelligent Manufacturing 26.2 (2015): 295-305.

[6] Pandey, Rupesh Kumar, and S. S. Panda. "Optimization of bone drilling parameters using grey-based fuzzy algorithm." Measurement 47 (2014): 386-392.

[7] Steinzig, M., D. Upshaw, and J. Rasty. "Influence of drilling parameters on the accuracy of hole-drilling residual stress measurements." Experimental Mechanics 54.9 (2014): 1537-1543.

[8] Karaca, Faruk, and Bunyamin Aksakal. "Effects of various drilling parameters on bone during implantology: An in vitro experimental study." Acta of bioengineering and biomechanics 15.4 (2013).

[9] Krishnamoorthy, A., et al. "Application of grey fuzzy logic for the optimization of drilling parameters for CFRP composites with multiple performance characteristics." Measurement 45.5 (2012): 1286-1296

[10] Kıvak, Turgay, Gürcan Samtaş, and Adem Çiçek. "Taguchi method based optimisation of drilling parameters in drilling of AISI 316 steel with PVD monolayer and multilayer coated HSS drills." Measurement 45.6 (2012): 1547-1557.

[11] Naveen, P. N. E., M. Yasaswi, and R. V. Prasad. "Experimental investigation of drilling parameters on composite materials." J. Mech. Civ. Eng 2 (2012): 30-37.

[12] Tsao, C. C., and Y. C. Chiu. "Evaluation of drilling parameters on thrust force in drilling carbon fiber reinforced plastic (CFRP) composite laminates using compound core-special drills." International Journal of Machine Tools and Manufacture 51.9 (2011): 740-744.

[13] Karaca, F., Bünyamin Aksakal, and M. J. M. E. Kom. "Influence of orthopaedic drilling parameters on temperature and histopathology of bovine tibia: an in vitro study." Medical engineering & physics 33.10 (2011): 1221-1227.

[14] Kilickap, Erol, Mesut Huseyinoglu, and Ahmet Yardimeden. "Optimization of drilling parameters on surface roughness in drilling of AISI 1045 using response surface methodology and genetic algorithm." The International Journal of Advanced Manufacturing Technology 52.1-4 (2011): 79-88.

[15] Eren, Tuna, and M. Evren Ozbayoglu. "Real time optimization of drilling parameters during drilling operations." SPE oil and gas India conference and exhibition. OnePetro, 2010.

[16] Latha, B., and V. S. Senthilkumar. "Fuzzy rule based modeling of drilling parameters for delamination in drilling GFRP composites." Journal of Reinforced Plastics and Composites 28.8 (2009): 951-964.

[17] Augustin, Goran, et al. "Thermal osteonecrosis and bone drilling parameters revisited." Archives of orthopaedic and trauma surgery 128.1 (2008): 71-77.

[18] Akin, Serhat, and Celal Karpuz. "Estimating drilling parameters for diamond bit drilling operations using artificial neural networks." International Journal of Geomechanics 8.1 (2008): 68-73.

[19] Tsao, C. C. "Investigation into the effects of drilling parameters on delamination by various step-core drills." Journal of materials processing technology 206.1-3 (2008): 405-411.

[20] Segui, J. B., and M. Higgins. "Blast design using measurement while drilling parameters." Fragblast 6.3-4 (2002): 287-299.

[21] Finfinger, Gerald L., et al. "An approach to identifying geological properties from roof bolter drilling parameters." (2000).

[22] Ohashi, H., et al. "The effect of drilling parameters on bone." Journal of Materials Science: Materials in Medicine 5.4 (1994): 225-231.

[23] Hareland, Geir, and L. L. Hoberock. "Use of drilling parameters to predict in-situ stress bounds." SPE/IADC Drilling Conference. OnePetro, 1993.

[24] Tagliaferri, V., G. Caprino, and A. Diterlizzi. "Effect of drilling parameters on the finish and mechanical properties of GFRP composites." International Journal of Machine Tools and Manufacture 30.1 (1990): 77-84.

[25] Pfister, Paul. "Recording drilling parameters in ground engineering." Ground Engineering 18.3 (1985).