राज्य अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, नीलोखेडी

State Institute of Engineering & Technology, Nilokheri

(Formerly Govt. Engineering College)

LABORATORY MANUAL

PRODUCTION TECHNOLOGY LAB

MEC 309LA

Department of Mechanical Engineering

STATE INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Affiliated to K.U. University)

NILOKHERI – 132117, KARNAL

EXPERIMENT-1

AIM:TOPREPAREAJOBONALATHEHAVINGVARIOUSOPERATIONSviz.DRILLING,BORING,TAPERTURNING,THREADCUTTING,KNURLING,etc.

INTRODUCTION:

- The lathe is one of the oldest machine tools, which is one of the most versatile andwidelyused machine tool, it is alsoknown as*mother of machinetool*.
- The job to be machined is held and rotated in a chuck, a cutting tool is advancedwhich is stationary against the rotating job. Since the cutting tool material is harderthanthework piece,sometal removal takesplacein theform of chips.
- Some of the common operations performed on a lathe are facing, turning, threading,knurlingand boring etc.

DRILLING: It is an operation of making a hole in the work piece with the help of a drill.The work piece is held in a chuck and the drill is held in the tailstock. The drill is feedmanually,into the rotatingwork piece,byrotatingthe tailstockhand wheel.

BORING: Boring is the operation of enlarging a existing hole in a work piece. In this,boringtool isheld inthe tailstock andis feed intothe worksimilarly asin caseof drilling.

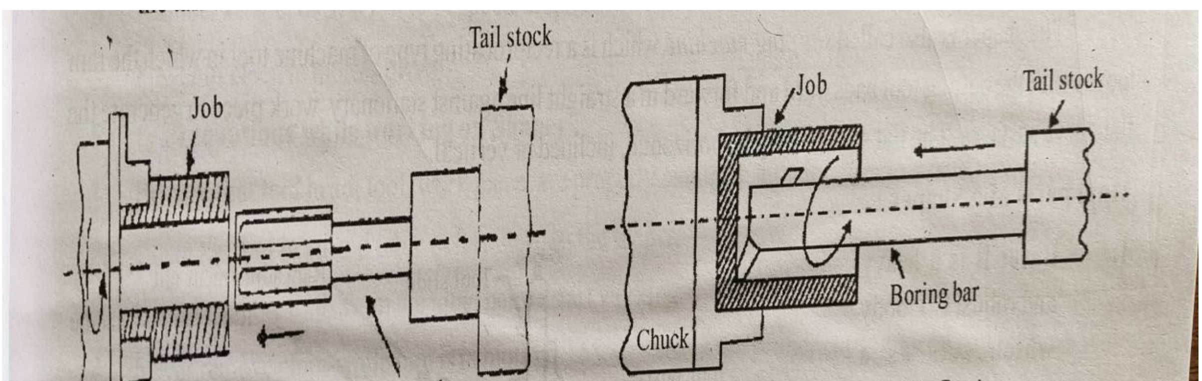


Figure 2.11: *Boring*

THREADING: Both the types of external and internalthreads can be cut on a lathe. Forthis operation a chart is provided on the head stock, which carries the information of speedand feed recommended for particular type of threads. With the help of gear change lever,requiredspeedandfeedcanbesetfirstofall.Thenengagethehalfnutfortheautomaticfeedto cut the threads.

KNURLING: Knurlingproducesaregularshaped pattern,rough surface onwork piece.The knurling tool is pressed against the work piece, which causes the slight outward andlateraldisplacement of themetal so as to form theknurl.

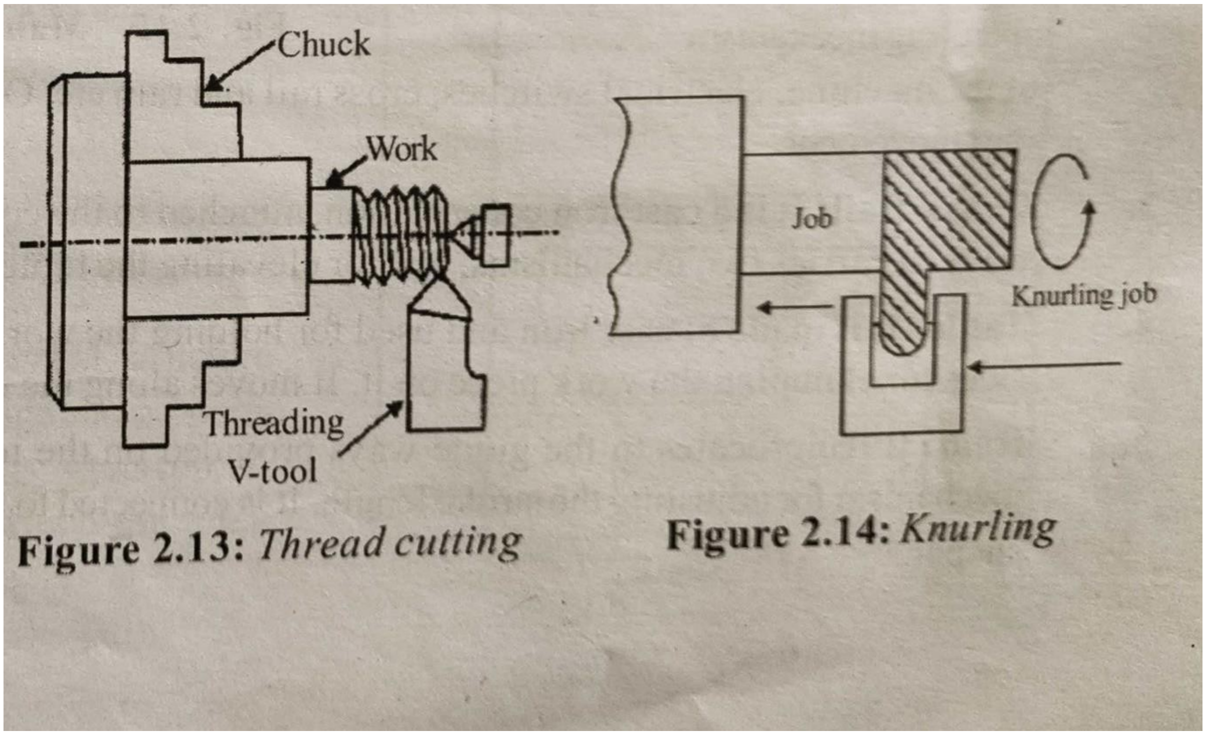


Figure 2.13: *Thread cutting* **Figure 2.14:** *Knurling*

TAPER TURNING: It is an operation of producing an external conical surface on aworkpiece. Taper turning can be performed by the tail stock offset method, by swiveling thecompound rest, or using the taper turning attachment. Most commonly used by swiveling thecompoundrest forsmaller sizejobs.

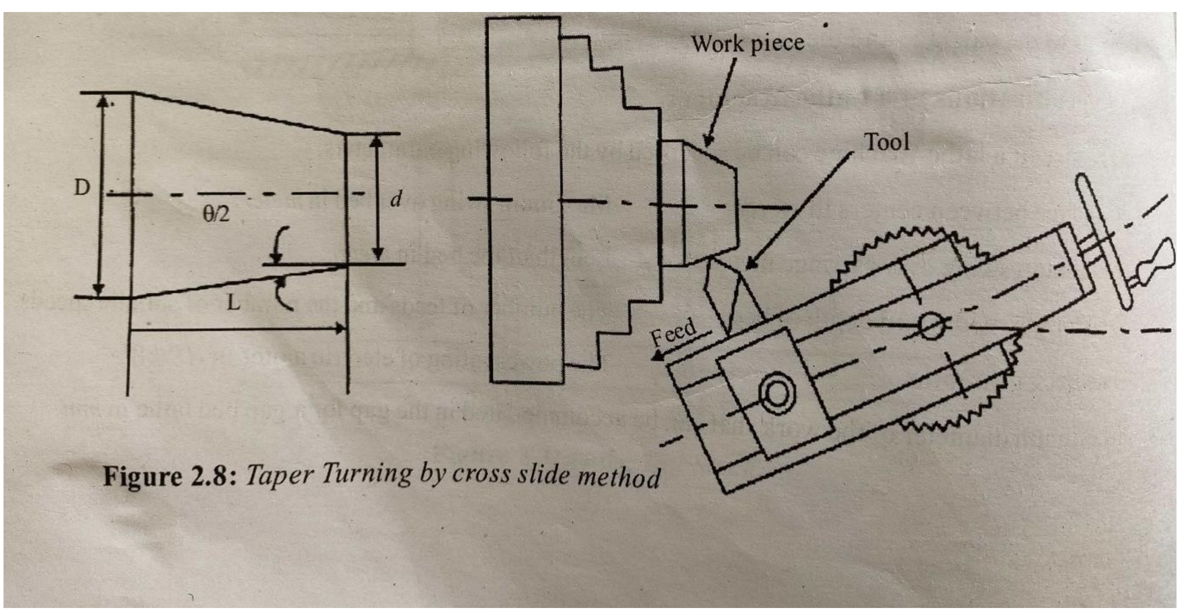


Figure 2.8: *Taper Turning by cross slide method*

EXPERIMENT-2

AIM:TOCUTEXTERNAL THREADSONA LATHEMACHINE.

APPARATUS: LatheMachine,ThreadingTool,VernierCaliperOil,ScrewthreadpitchGauge,Micrometeretc.

THEORY:

Cuttingscrewthreadsonacenterlatheisknownasscrew cutting.

- Threadcuttingconsistsinproducingahelicalformorthreadontherevolvingworkpiece,Figureshowscuttingof both externaland internal threads.
- Pitchisthedistancebetweenadjacent,correspondingpointsonthe-helixmeasuredparallelto the axis.
- Leadistheaxialdistanceapointmovesalongthehelixinonerevolution(i.e.,thedistanceanut would movealong a bolt in onerevolution).
- In asinglestarthelix,Lead=Pitch.
- Inamultistarthelix,lead=PitchxnumberofstartsExampleinadoublestartthread,leadis 2 times thepitch.
- Rootisthebottomsurfacejoining thesidesofadjacentthreads.
- Major diameter is the outside diameter as applied to the thread of a screw and fulldiameterasapplied to thethread of anut.
- Minor diameter is the smallest diameter of the thread of a screw or nut. The termreplaces core diameter as applied to the thread of a screw and inside diameter asappliedto thethread of a nut.

PROCEDURE

Figure shows the setup for thread cutting. For thread cutting, it is necessary that therelation between the axial movement of the cutting tool and the turns of the work should becarefully controlled. This is brought about by means of the lead screw, which is driven by atrain of gears from the spindle, to vary the relationship between the turns of lead screw andthoseofspindle, (i.e. thework)thegears in the geartrain may bevaried.

For cutting threads, the saddle (and hence the cutting tool) should move along thelathe bed a distance equal to the pitch of the lead screw for each turn of the screw. For this,the connection between the lead screw and the saddle is effected by a nut, fixed to the insideof the apron and screwed to suit the lead screw. This nut is made in two halves and arrangedin such a way that, by operating a lever at the front of the apron, the halves may be engagedwiththelead screw.

Thusweobtaintherotationofthework,combinedwithafixedlongitudinalmovement of the tool for each turn the work makes and the result is thread formed on thework

CHANGEGEARCALCULATIONS.

- Intheabsenceofanindexchartshowinggearcombinationsforvariousthreads,itisnecessary to calculate theproper gears to usefor cutting threads,
- Changegearsareeithersimpleorcompoundinform.

SIMPLEGEARING

Simplegeartrainconsistsofastudgear(ordrivinggearkeyedtothelathespindle),a screw gear or driven gear keyed to the lead screw and one (or two) intermediate gear oridler. Since change gearsof differentdiameterare used,thedistance betweenthemwillvary. An idler gear is, therefore, required to fill up the gap between the stud gear and thescrew gear. Idler gear also helps obtaining desired direction of rotationof the lead screwidlergear.However, does not changethe gear ratio.

$$\text{Gearingratio} = \frac{\text{Driverteeth}}{\text{Driventeeth}} = \frac{\text{Leadscrewturns}}{\text{Spindleturns}} = \frac{\text{Pitchtobecut}}{\text{Pitchofleadscrew}}$$

When the fraction representing drivers/driven has been found it must be thrown into onecontainingnumbersequaltothenumbersofteethinwhatevergearsateavailableto.makeup the drive, Often lathes are equipped with a set of gears ranging from 20 teeth to 120 teethinsteps of 5 teeth.

COMPOUNDGEARTRAIN ORCOMPOUND GEARING

Like simple gearing. Compound gearing also has a stud gear and a screw gear, butinstead of having an idler, the compound gear train contains a compound gear assembly, Acompound gear assembly is nothing but a combination of two gears keyed together Whichrevolveas one(i,e, with thesame R.P.M.)

A compound gear train is used when the calculated gearing ratio is such that it is notpossibleto arrangeasimplegear train out of theavailable set of (change) gears.

DETAILPROCEDUREFOREXTERNALTHREADSCUTTING

1. The work piece is setup in the lathe & it is turned to the major diameter of the thread.(Figureshows)
2. A V-thread cutting tool is ground & then checked for accuracy using a screw cuttinggauge. The radius on the tip of the cutting tool produces root radius on the threadbeing cut. This radius must be carefully ground and then checked (Fig. 4’63 g) byusing a screw thread pitch gauge. This radius must never be exceeded or a slackthreadmay result.

The shape of the cutting end of the tool should conform to the standard cross-sectional shape of the thread to be cut; consequently, it is essential to ‘‘now about thevariousimportant screw thread standards.

3. Figure show the screw cutting set up. It can be seen that the compound slide is set tohalf the thread angle. In other words for cutting a 60°, right hand, external thread, setthecompound rest at 29° or30°(for metricthreads).
4. Properly ground and checked thread cutting tool is placed in the tool holder and itsheightis adjusted by setting it t6the-tip of thetailstock center.
5. Thetool bitis setsquarewiththeaxis ofthe work, using asetting gauge.
6. For cutting required number of thread per unit length on ‘the work, quick changegearbox is used If the required pitch is not available on this gearbox, it will benecessaryto, calculate and thenchangetheGearsoftheGear train.
7. For thread cutting use the back gear and set the lathe rpm for about one-third thespeednormally used for turningmaterial of that kind anddiameter.
8. Using carriage hand wheel, position, the tool just off the end of the work piece. Startthe lathe and engage the half nut lever when a line (say 2) on the thread dial (Fig.465) is even with the reference mark on the thread dial housing (not visible becauseorsectional view).
9. It is always better first to take a very light trial cut to I make sure that the desiredthread pitch is being obtained. The thread pitch can be checked with the help of ascale. For this purpose, as the tool moves across the surface of the work-piece,advance it with compound rest crank until the tool enters the work-piece surfaceslightly.
10. Attheendofthecut,stopthecarriagebydisengagingthehalfnutleverandwithdraw the tool with the cross-slide crank far enough for it to clear the work-piece.Check the pitch of the thread. If it is correct,crank the carriage to the right toposition the tool for the next cut and return the cross-side crank to its zero readingposition.
11. Using compound rest crank, advance the tool for the next cut. Engage Inc half nutlevel as the line (again 2) on the thread dial is even with the reference mark on thethread dial housing and let the thread be cut. At the end of cut repeat, step 10 above.For first several cuts, the tool should be advanced into the work about 0’08mm. thisamount should be reduced to about 005 mm when the thread is, about half’ deep andto 0025 mm when the thread nears full depth. Figure shows how thread is formed bytaking anumberof successivecuts.
12. After taking first cut on the work, and before Going for the second, one has to makesurethatthetoolwillfollowthesamepathasithastaken(orproducedontheworkin the previous cut, otherwise the work will get spoiled. A few methods used for thesaidpurposeare:
    (a) Usingthread dialorindicatoras has beenexplained above10 steps 8to 11.
    (b) Allowing the carriage to remain in engagement with the lead screw and reversingthe lathe andleadscrew atthe completionon of eachcut.Sucha method,however,is consuming if thework-pieceis long.

13. Whilecuttingthreadsuse agoodcuttingoilforlubrication purposes.
14. As the thread approaches completion, stop and check it for size. A nut may be triedand screwed onto the work to check. If the nut fits wed without play, the work maybe said to have correct threads. Figure shows straight and angular methods of feedingtoolintotheworkwhencuttingthreadsinlathe.Instraightcuttingmethod,thetoolis fed at right angles to the axis of the work whereas in angular cutting, it is at anangleof30eand hencethecompound rest is set atan angle of30º.

    The objection withstraightcuttingmethod (A) isthat the cuttingaction isnotasgood as when one edge 01 the tool does practically all the cutting (B and C) and theother edge moves parallel to the opposite side of the thread. Angular cutting does nottear the thread andthus unlike straight cuttingproducesa smoother thread. Aftermost of metal has been removed by angular cutting, the tool may be fed straight in totake a light finishing cut. A screw thread pitch gauge can be used to check the finerpitchesof threads.

Experiment 3

AIM: To calculate the machining time for cylindrical turning on a Lathe and compare with the actual machining time.

APPARATUS: Lathe Machine

THEORY: The major aim and objectives in machining industries generally are;

- reduction of total manufacturing time, T
- increase in MRR, i.e., productivity
- reduction in machining cost without sacrificing product quality
- increase in profit or profit rate, i.e., profitability.

Hence, it becomes extremely necessary to determine the actual machining time, TC required to produce a job mainly for,

- assessment of productivity
- evaluation of machining cost
- measurement of labour cost component
- assessment of relative performance or capability of any machine tool, cutting tool, cutting fluid or any special or new techniques in terms of saving in machining time.

The machining time, TC required for a particular operation can be determined o roughly by calculation i.e., estimation o precisely, if required, by measurement. Measurement definitely gives more accurate result and in detail but is tedious and expensive. Whereas, estimation by simple calculations, though may not be that accurate, is simple, quick and inexpensive. Hence, determination of machining time, specially by simple calculations using suitable equations is essentially done regularly for various purposes.

Procedure: The factors that govern machining time will be understood from a simple case of machining. A steel rod has to be reduced in diameter from D1 to D2 over a length L by straight turning in a centre lathe as indicated in Fig.

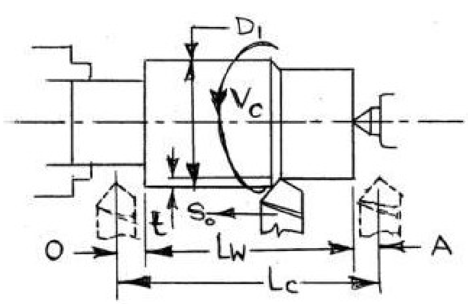


Fig. Estimation of machining time in turning.

Calculations: Sl No L A O LC VC D N SO D1 D2 T npTc Where, L= length of the work piece in mm; A= approach run in mm; O= over run in mm; Lc=actual length of cut in mm; Vc= cutting velocity in mm/min; D= diameter of the job before cut in mm; N=spindle speed in rpm; So= tool feed in mm/rev; D1= initial diameter before passes in mm; D2=final diameter after passes in mm; t=depth of cut in one pass in mm; np=no of passes; Tc=machining time in min; Result: The machining time of the turning operation is done and compared.

Here, $T_C = \frac{L_C}{Ns_o} x n_p$

where, L_C = actual length of cut
= L + A + O

A, O = approach and over run as shown

N = spindle speed, rpm

s_o = feed (tool), mm/rev

n_p = number of passes required

Speed, N, is determined from cutting velocity, V_C

$$V_C = \frac{\pi DN}{1000} m/\min$$

where, D = diameter of the job before cut

Therefore, $N = \frac{1000V_C}{\pi D}$

The number of passes, n_p is mathematically determined from,

$$n_p = \frac{D_1 - D_2}{2t}$$

here, t = depth of cut in one pass, mm.

Calculations:

Sl No	L	A	O	L_C	V_C	D	N	S_O	D1	D2	T	n_p	T_c

Where,
L= length of the work piece in mm;
A= approach run in mm;
O= over run in mm;
Lc=actual length of cut in mm;
Vc= cutting velocity in mm/min;
D= diameter of the job before cut in mm;
N=spindle speed in rpm;
So= tool feed in mm/rev;
D1= initial diameter before passes in mm;
D2=final diameter after passes in mm;
t=depth of cut in one pass in mm; np=no of passes;
Tc=machining time in min;

Result: The machining time of the turning operation is done and compared.

Experiment-4

AIM: To prepare a useful product containing different types of welded joints using simple TIG/MIGweldingset.

OBJECTIVES

- WhatisTIGwelding?
- Howto doTIG welding?
- Howtopreparesingle-vonmetalplates?

EXPERIMENT

Tomakeasinglev-buttjointusingTIG welding.

EQUIPMENTS/INSTRUMENTS/SYSTEMREQUIRED

Tungsten Inert Gas welding set (TIG), hand hacksaw, bench vice, bastard file 12', steel scale, trysquare,scriber, welding shield,tong,apron, hand gloves.
Materialrequiredforjob—Mildsteelflat,Finishsize-100×98mm.

THEORY

Gas tungsten arc welding (**GTAW**), also known as**tungsten inert gas**(**TIG**)**welding**, is anarc welding process that uses a non-consumable tungsten electrode to produce the weld. Theweld area is protected from atmospheric contamination by an inert shielding gas (argon orhelium), and a filler metal is normally used, though some welds, known as autogenous welds, donot require it. A constant-current welding power supply produces energy which is conductedacrossthearcthrougha columnof highlyionized gasand metal vapoursknown asplasma.
GTAW is most commonly used to weld thin sections of stainless steel and non-ferrous metalssuch as aluminium, magnesium, and copper alloys. The process grants the operator greatercontrolovertheweldthancompetingprocessessuchasshieldedmetalarcweldingandgasmetalar cwelding,allowingforstronger,higherqualitywelds.However,GTAWiscomparatively more complex and difficult to master, and furthermore, it is significantly slowerthanmost other welding techniques.

OPERATION

Manualgas tungsten arc welding is often considered themostdifficultof alltheweldingprocessescommonlyusedinindustry.Becausetheweldermustmaintainashortarclength, great care and skill are required to prevent contact between the electrode and the work piece.Similar to torch welding, GTAW normally requires two hands, since most applications requirethat the welder manually feed a filler metal into the weld area with one hand while manipulatingthe welding torch in the other.However, some welds combining thin materials (known asautogenous or fusion welds) can be accomplished without filler metal; mostnotably edge,corner,and butt joints.

To strike the welding arc, a high frequency generator provides an electric spark; this spark is aconductive path for the welding current through the shielding gas and allows the arc to beinitiatedwhiletheelectrodeandtheworkpieceareseparated,typicallyabout1.5–3mm(0.06–0.12in) apart.

Once the arc is struck, the welder moves the torch in a small circle to create a welding pool, thesize of which depends on the size of the electrode and the amount of current. While maintainingaconstant separationbetweenthe electrode and theworkpiece,theoperatorthen moves thetorch back slightly and tilts it backward about 10–15 degrees from vertical. Filler metal is addedmanuallyto the front endof the weld poolasitisneeded.

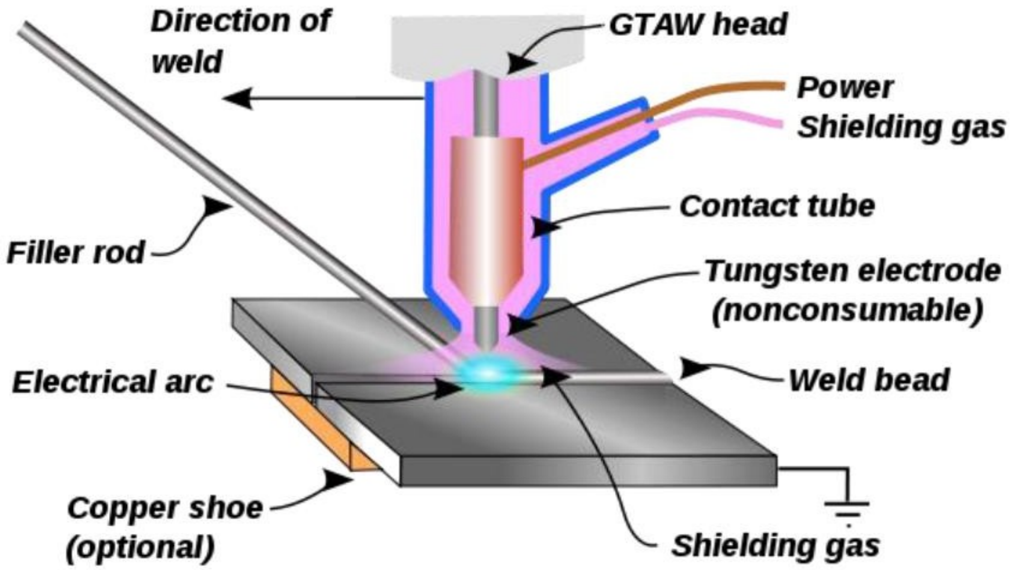
Fillerrodscomposedofmetalswithlowmeltingtemperature,suchasaluminium,requirethatthe operator maintain some distance from the arc while staying inside the gas shield. If held tooclose to the arc, the filler rod can melt before it makes contact with the weld puddle. As the weldnears completion, the arc current is often gradually reduced to allow the weld crater to solidifyandpreventthe formationof cratercracksattheendof theweld.

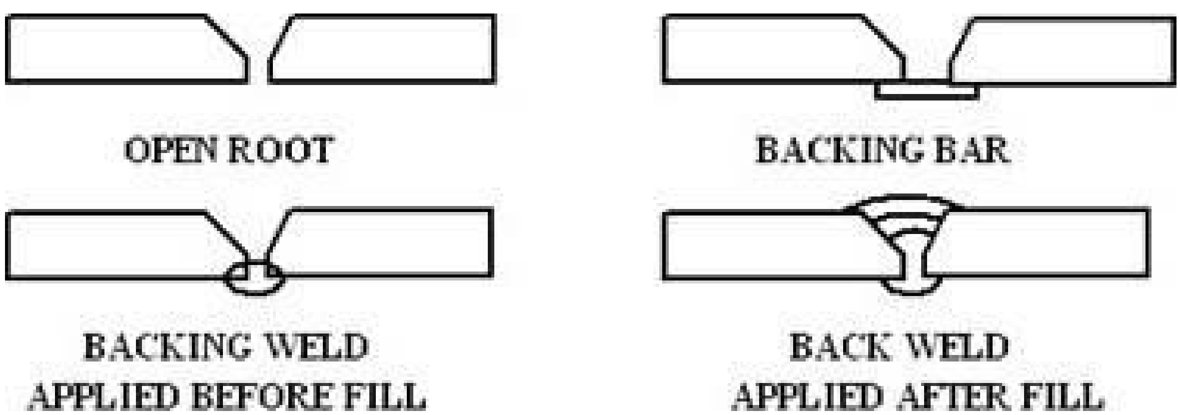
PROCEDURE

1. Check the work strips size. Grip the strip in bench vice and curt the strip of the requireddimensionsby using handhacksaw.
2. Fileallthe sidesofstripsbyusingbastarad fileforrightangle.
3. Mark on the strips of required dimension using scriber, steel scale, and try square according tothegiven sketch.
4. Filethestrips(lengthwise),removethematerialandpreparea‘V’shape.
5. Switch on the tungsteninert Gas welding Set; Open the valve of organ gas cylinder andswitchon the motor pumpfor watercooling.
6. Putthejobinpositionofbuttjointontheworkingtable.
7. Checkthesupplyof Gasandwater.
8. Touch the electrode with job take away for making spark between the work piece & electrode.Then add the filler material for preparing the joint. Do the welding as per above mentionedoperation.

PRECAUTIONS

- Edgesoftheworkpieceshouldbecleani.e.freefromdirt,greaseandoiletc.
- Alwaysuseweldingglassscreenwhilewelding.
- Neverseetheweldingarcwithnakedeye.
- Removeallsharpedgesbefore welding.
- Removescaleandburrsafterwelding.
- Picktheweldedjobwithtong.





RESULTS

Butt jointofrequiredsizeisprepared

AIM: TocarryouttheweldingusingTIG/MIGweldingset.

OBJECTIVES

- WhatisMIG welding?
- HowtoperformMIGwelding?
- KnowledgeaboutMIG welding.
- Howtopreparedouble-vonmetalplates?

EXPERIMENT

Tomakeadouble v-buttjointusingMIG welding.

EQUIPMENTS/INSTRUMENTS/SYSTEMREQUIRED

Metal Inert Gas welding set (MIG), hand hacksaw, bench vice, bastard file 12', steel scale, trysquare,scriber, welding shield,tong,apron, hand gloves.
Materialrequiredforjob—Mildsteelflat,Finishsize-100×98mm.

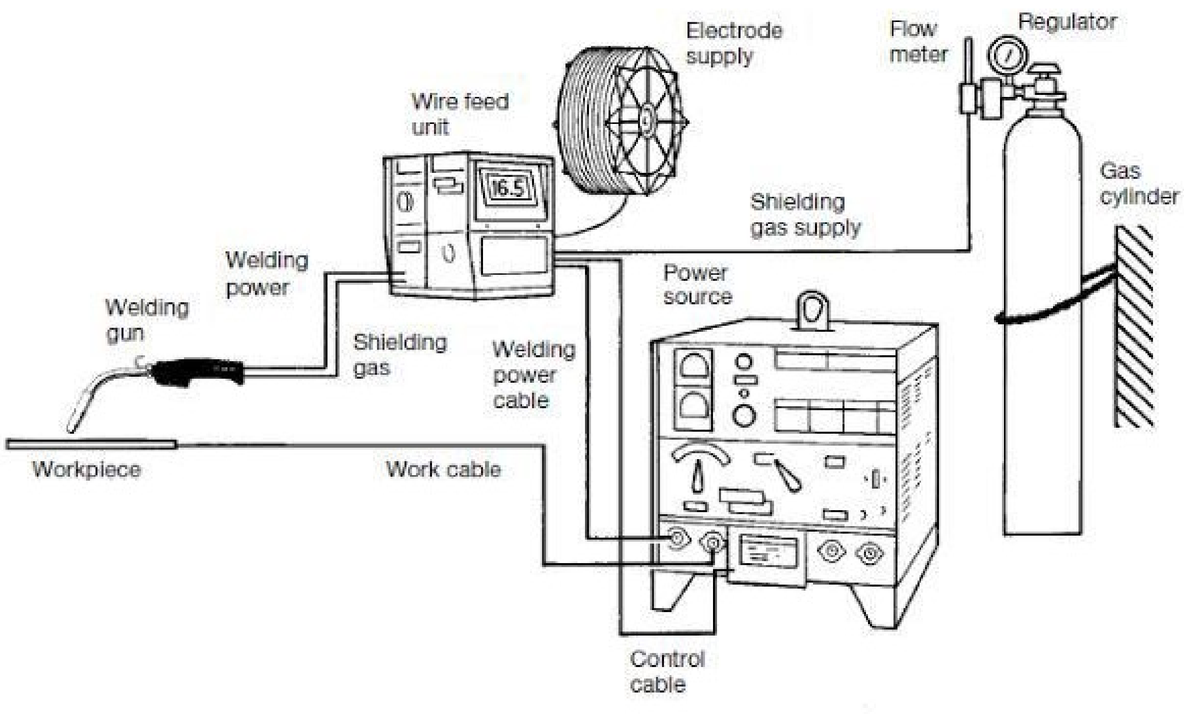
THEORY

Gas metal arc welding (**GMAW**), sometimes referred to by its subtypes**metal inert gas**(**MIG**) **welding** or **metal active gas** (**MAG**) **welding**, is a welding process in which an electricarc forms between a consumable wire electrode and the workpiece metal(s), which heats theworkpiece metal(s), causing them to melt, and join. Along with the wire electrode, a shieldinggas feeds through the welding gun, which shields the process from contaminants in the air. Theprocess can be semi-automatic or automatic. A constant voltage, direct current power source ismost commonly used with GMAW, but constant current systems, as well as alternating current,can be used. There are four primary methods of metal transfer in GMAW, called globular, short-circuiting, spray, and pulsed-spray, each of which has distinct properties and correspondingadvantagesand limitations.
GMAWrequiresonlythattheoperatorguidetheweldinggunwithproperpositionandorientation along the area being welded. Keeping a consistent contact tip-to-work distance (the*stick out* distance) is important, because a long stick out distance can cause the electrode tooverheat and also wastes shielding gas. Stick out distance varies for different GMAW weldprocesses and applications. The orientation of the gun is also important—it should be held so asto bisect the angle between the workpieces; that is, at 45 degrees for a fillet weld and 90 degreesfor welding a flat surface. The travel angle, or lead angle, is the angle of the torch with respect tothe direction of travel, and it should generally remain approximately vertical. However, thedesirable angle changes somewhat depending on the type of shielding gas used—with pure inertgases, the bottom of the torch is often slightly in front of the upper section, while the opposite istruewhenthe welding atmosphere iscarbon dioxide.

OPERATION

Manual gas tungsten arc welding is often considered the most difficult of all the weldingprocesses commonly used in industry. Because the welder must maintain a short arc length,great care and skill are required to prevent contact between the electrode and the work piece.Similar to torch welding, GTAW normally requires two hands, since most applications requirethattheweldermanuallyfeedafillermetalintotheweldareawithonehandwhilemanipulatingth e welding torch in the other. However, some welds combining thin materials (known asautogenous or fusion welds) can be accomplished without filler metal; most notably edge,corner,and butt joints.

Tostriketheweldingarc,ahighfrequencygeneratorprovidesanelectricspark;thissparkisaconductivepa thfortheweldingcurrentthroughtheshieldinggasandallowsthearctobe



initiatedwhiletheelectrodeandtheworkpieceareseparated,typicallyabout1.5–3mm(0.06–0.12in) apart.

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Filler rods composed of metals with low melting temperature, such as aluminium, require thattheoperatormaintainsomedistancefromthearcwhilestayinginsidethegasshield.Ifheldtoo closetothearc,thefillerrodcanmeltbeforeitmakescontactwiththeweldpuddle.Astheweldnears completion, the arc current is often gradually reduced to allow the weld crater to solidifyandpreventthe formationof cratercracksattheendof theweld.

PROCEDURE

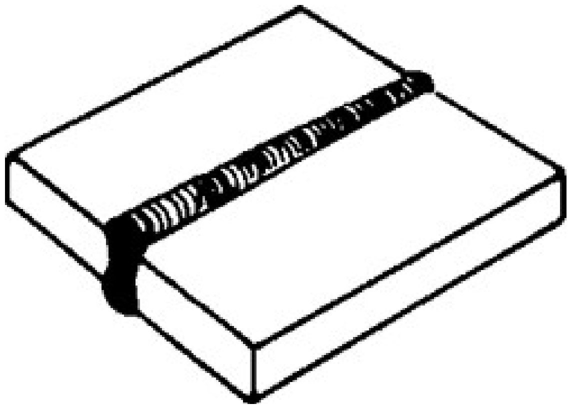
1. Checktheworkstripssize. Gripthestripinbenchviceandcurtthestrip oftherequireddimensionsbyusing handhacksaw.
2. Fileallthesidesofstripsbyusingbastaradfileforrightangle.
3. Markonthestripsofrequireddimensionusingscriber,steelscale,andtrysquareaccordingtothegiven sketch.
4. File the strips (length wise), remove the material and prepare a ‘V’ shape on both sides asrequired.
5. SwitchonthemetalinertGasweldingset,Openthevalveofcarbondioxidegascylinder.
6. Putthejobinpositionofbuttjointontheworkingtable.
7. CheckthesupplyofGas.
8. Touchtheelectrodewithjobtakeawayformakingsparkbetweentheworkpiece&electrode.Dothe weldingasper above mentioned operation.

PRECAUTIONS

- Edgesoftheworkpieceshouldbecleani.e.freefromdirt,greaseandoiletc.
- Alwaysuseweldingglassscreenwhilewelding.
- Neverseetheweldingarcwithnakedeye.
- Removeallsharpedgesbefore welding.
- Removescaleandburrsafterwelding.
- Picktheweldedjobwithtong.

RESULTS

Butt jointofrequiredsizeisprepared.



QUESTIONSFORVIVA VOCE

ForExperimentNo.2

Q:DefineT.I.GandM.I.Gwelding.
Q: Differentiate between T.I.G and M.I.G weldingQ:StatetheapplicationsofT.I.GandM.I.Gwelding
Q:Whichgasesareused inT.I.GandM.I.GWELDING?
Q:State thefunction ofinertgasinT.I.Gand M.I.Gwelding

Experiment- 5

AIM: TO CUT GEAR TEETH ON MILLING MACHINE USING DIVIDING HEAD.

APPARATUS: Steel rule, Milling cutter, Spanner, Mandrel, Dog carrier

THEORY: Milling is the machining process of using rotary cutters to remove material froma work piece advancing (or feeding) in a direction at an angle with the axis of the tool. Itcovers a wide variety of different operations and machines, on scales from small individualparts to large, heavy-duty gang milling operations. It is one of the most commonly usedprocesses in industry and machine shops today for machining parts to precise sizes andshapes.

Main Componentsofmillingmachine:

Base,column,knee,saddle,table

Typeofmillingmachine:

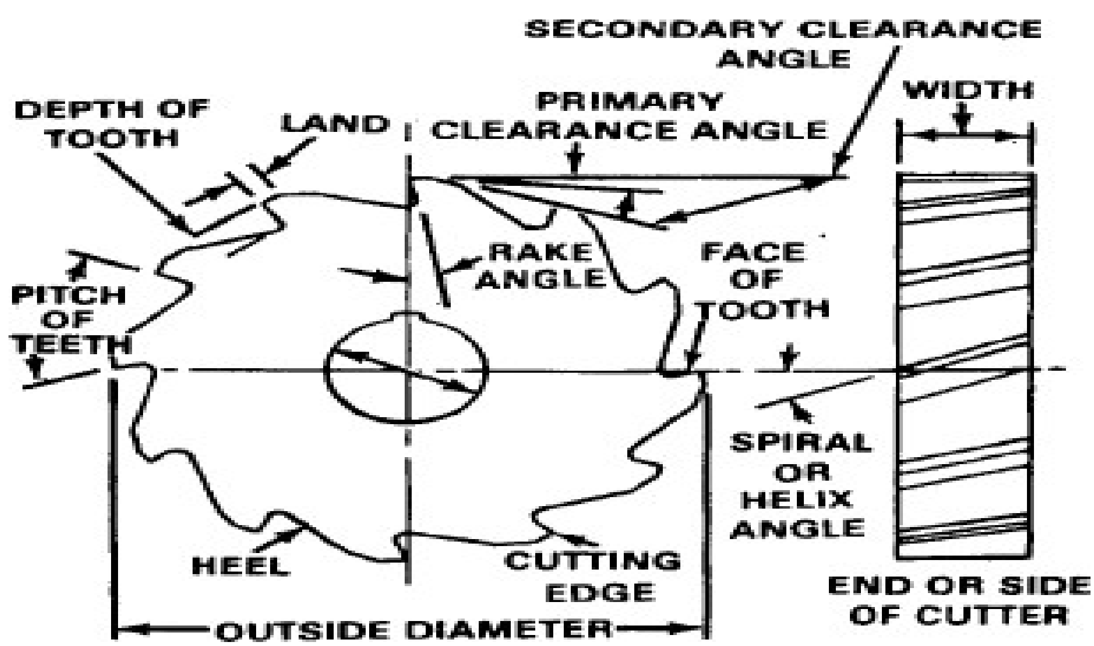
Plain milling machine, vertical milling machine, universal milling machine,

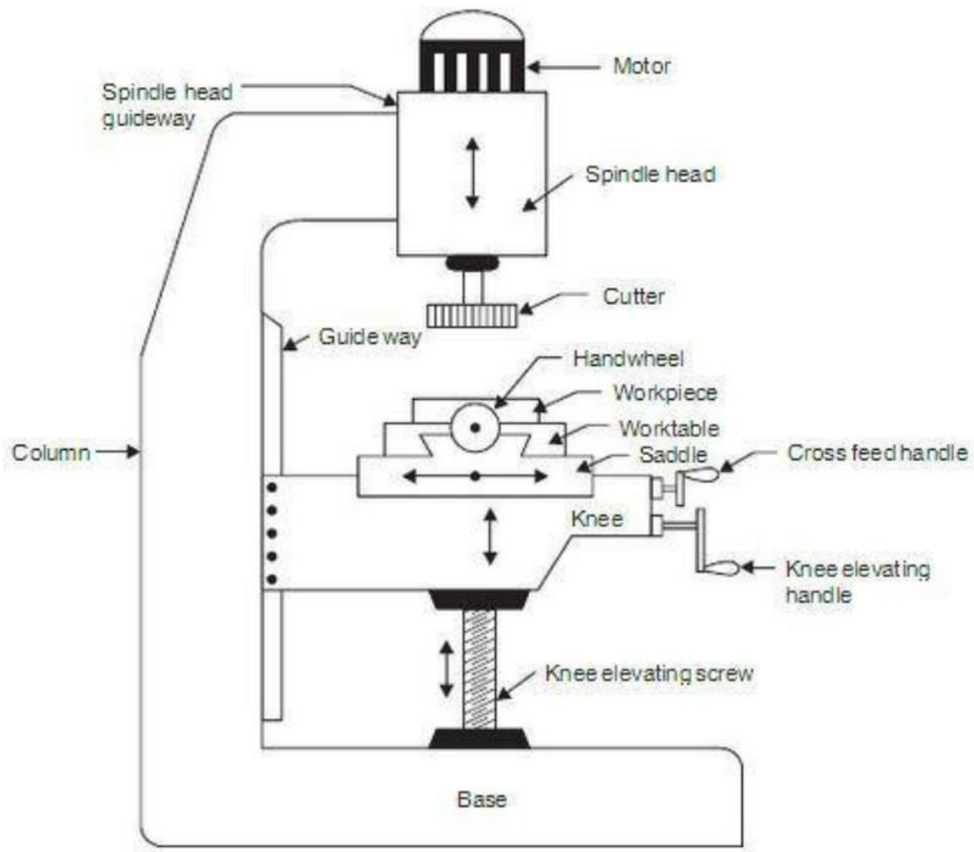
simplex milling machine, triplex milling machine

Type of Milling Cutter:

Plain milling cutter, slide milling cutter, arbor cutters, shank cutters, face cutters.

PROCEDURE:





1. The raw blank is selected with reference to the number of teeth to be cut.

2. Indexing number is calculated to the position of the blank.

3. Gear blank is mounted on mandrel in milling machine.

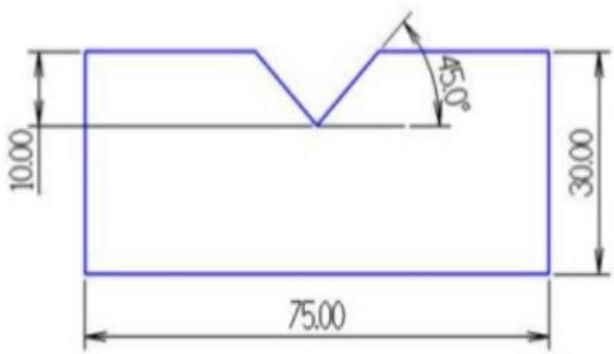
4. Centering of the blank is done by upward and cross feed.

5. The depth of the cut is calculated for the given module.

Result: Thus the gear cutting is performed in a milling machine.

Experiment-6

AIM: TO CUT V GROOVE USING A SHAPER.



TOOLSREQUIRED:

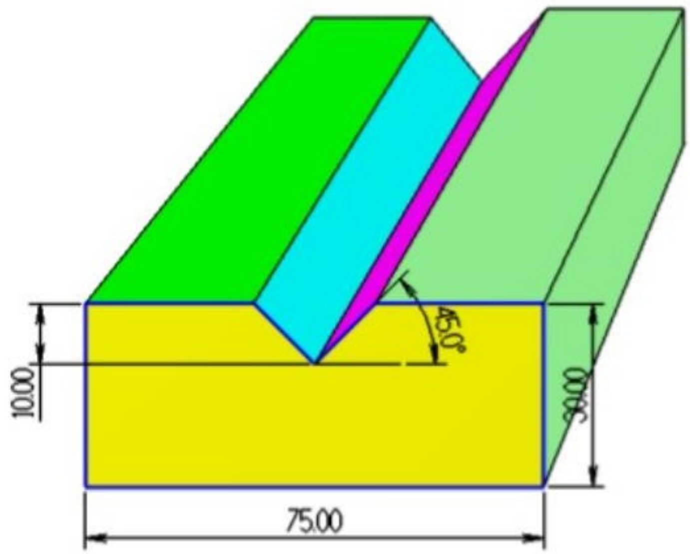
- SINGLE POINT THREAD CUTTING TOOL
- SHAPER MACHINE
- VERNIER CAPLIPER
- TRY SQUARE
- VISE

PROCEDURE:

1. Work piece of required dimension to be cut on power hack saw.
2. The job is fixed in vice of shaper machine.
3. Top surface is machined first.
4. The job surface is inverted and clamped tight in the vice.
5. All the remaining surfaces are machined in sequence.
6. Then marking is done as per the drawing for making groove.
7. The groove is machined using round nose cutting edge.
8. For making the groove feed to the table and tool is given simultaneously.
9. The groove is the shaped in different cuts to achieve the desired depth.

Drawing of V-Groove on Job

Length of Block = 75 mm



Material used

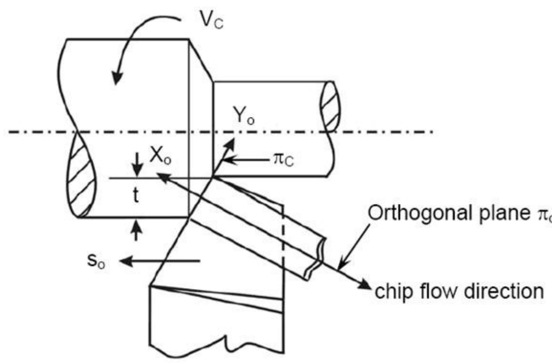
Mild steel block having sides 75x30x75 mm sides.

Experiment 7

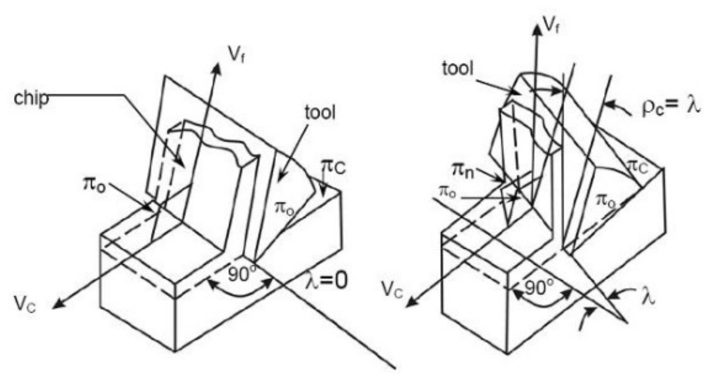
AIM: To study of Orthogonal & Oblique Cutting on a Lathe.

APPARATUS: Lathe Machine

THEORY: It is appears from the diagram in the following figure that while turning ductile material by a sharp tool, the continuous chip would flow over the tool's rake surface and in the direction apparently perpendicular to the principal cutting edge, i.e., along orthogonal plane which is normal to the cutting plane containing the principal cutting edge. But practically, the chip may not flow along the orthogonal plane for several factors like presence of inclination angle, λ, etc.



The role of inclination angle, λ on the direction of chip flow is schematically shown in figure which visualizes that, • when λ=0, the chip flows along orthogonal plane, i.e, ρ = 0 • when λ≠0, the chip flow is deviated from π and ρ = λ where ρ is chip flow deviation (from π) angle.



(a) λ = 0 (b) λ ≠ 0

Orthogonal cutting: when chip flows along orthogonal plane, π , i.e., ρ = 0 Oblique cutting : when chip flow deviates from orthogonal plane, i.e. ρ ≠0 But practically ρ may be zero even if λ= 0 and ρ may not be exactly equal to λ even if λ≠0. Because there are some other (than λ) factors also which may cause chip flow deviation. Result: Hence the study of Orthogonal & Oblique Cutting on a Lathe is completed.

Experiment-8

AIM: TO DEMONSTRATE SLOT MILLING.

THEORY: Slot milling is the operation of producing slots in solid workpiece on a milling machine. These slots can be varied shapes such as plain slots, T-slots, etc.

TOOLS AND TECHNIQUES: Milling machine, vice slotting cutter, slotting cutter,scale, vernier caliper, wire brush, spanner set, clamping device (clamps, bolts, nuts, blocks, etc).

PROCEDURE:

1. Clamp the slotting cutter on the arbor of milling machine.
2. Tight the arbor support nut properly.
3. Check the rotation of cutter, that it should not rotate outward side.
4. Hold the work piece in the vice or on the table accordingly with the help of clamping device.
5. Start the milling and set the work piece against the rotating cutter.
6. Give the depth of cut and feed to the work piece as per requirements. Ensure depth of cut should not too much.
7. Stop the machine, remove the work piece and check its dimensions with the help of measuring instruments.

PRECAUTIONS:

1. Do not wear loose cloth during working on the machine.
2. Slotting cutter must be tight properly on the arbor.
3. Work piece also must be tight properly in the vice or on the table of the machine with the help of clamping device.
4. Correct cutting speed and feed should be used for long life of cutter.
5. Give minimum depth of cut to the work piece. Do not give too much depth of cut.
6. Do not run machine without cutting fluid.
7. When cutters become dull, they should be sharped immediately.