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Modeling & Generating Manufacturing Process Plan For Satellite Camera Fixture Bracket

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ABSTRACT

Manufacturing process planning is the process of selecting and sequencing manufacturing processes such that they achieve one or more goals and satisfy a set of domain constraints. Pivot joint, also called rotary joint, or trochoid joint, a freely moveable joint that allows only rotary movement around a single axis. A fixture bracket having first and second hinged connectors, for attaching a satellite camera dish to a fascia and soffit/wall of a home.

A fixture bracket is a adjustably supporting for satellite camera about one or more axis. The bracket may pivotally attached to the camera member for selective pivotal travel about a pivot axis relative to the camera member and thereafter releasable locked in position. Here that fixture bracket has high complex shape. So need to develop NC program in smart way which is take less manufacturing time. The main aim of this project is to generating accurate NC program of Manufacturing of satellite camera fixture bracket. Design of satellite camera fixture bracket done using unigraphics software and Manufacturing process done in NX CAM for generating NC program.

INTRODUCTION

1.1 SATELLITE

Satellites are specifically made for telecommunication purpose. They are used for mobile applications such as communication to ships, vehicles, planes, hand-held terminals and for TV and radio broadcasting. They are responsible for providing these services to an assigned region (area) on the earth. The power and bandwidth of these satellites depend upon the preferred size of the footprint, complexity of the traffic control protocol schemes and the cost of ground stations. A satellite works most efficiently when the transmissions are focused with a desired area. When the area is focused, then the emissions don't go outside that designated area and thus minimizing the interference to the other systems.

This leads more efficient spectrum usage. Satellite's antenna patterns play an important role and must be designed to best cover the designated geographical area (which is generally irregular in shape). Satellites should be designed by keeping in mind its usability for short and long term effects throughout its life time. The earth station should be in a position to control the satellite if it drifts from its orbit it is subjected to any kind of drag from the external forces.

APPLICATIONS

1) Weather Forecasting Certain satellites are specifically designed to monitor the climatic conditions of earth. They continuously monitor the assigned areas of earth and predict the weather conditions of that region. This is done by taking images of earth from the satellite. These images are transferred using assigned radio frequency to the earth station. (Earth

Station: it's a radio station located on the earth and used for relaying signals from satellites.) These satellites are exceptionally useful in predicting disasters like hurricanes, and 4 monitor the changes in the Earth's vegetation, sea state, ocean color, and ice fields.

2) Radio and TV Broadcast These dedicated satellites are responsible for making 100s of channels across the globe available for everyone. They are also responsible for broadcasting live matches, news, world-wide radio services. These satellites require a 30-40 cm sized dish to make these channels available globally.

3) Military Satellites These satellites are often used for gathering intelligence, as a communications satellite used for military purposes, or as a military weapon. A satellite by itself is neither military nor civil. It is the kind of payload it carries that enables one to arrive at a decision regarding its military or civilian character.

4) Navigation Satellites The system allows for precise localization world-wide, and with some additional techniques, the precision is in the range of some meters. Ships and aircraft rely on GPS as an addition to traditional navigation systems. Many vehicles come with installed GPS receivers. This system is also used, e.g., for fleet management of trucks or for vehicle localization in case of theft.

5) Global Telephone One of the first applications of satellites for communication was the establishment of international telephone backbones. Instead of using cables it was sometimes faster to launch a new satellite. But, fiber optic cables are still replacing satellite communication across long distance as in fiber optic cable, light is used instead of radio frequency, hence making the communication much faster (and of course, reducing the delay caused due to the amount of distance a signal needs to travel before reaching the destination.). Using satellites, to typically reach a distance approximately 10,000 kms away, the signal needs to travel almost 72,000 kms, that is, sending data from ground to satellite and (mostly) from satellite to another location on earth. This cause's substantial amount of delay and this delay becomes more prominent for users during voice calls.

6) Connecting Remote Areas Due to their geographical location many places all over the world do not have direct wired connection to the telephone network or the internet (e.g., researchers on Antarctica) or because of the current state of the infrastructure of a country. Here the satellite 5 provides a complete coverage and (generally) there is one satellite always present across a horizon.

7) Global Mobile Communication The basic purpose of satellites for mobile communication is to extend the area of coverage. Cellular phone systems, such as AMPS and GSM (and their successors) do not cover all parts of a country. Areas that are not covered usually have low population where it is too expensive to install a base station. With the integration of satellite communication, however, the mobile phone can switch to satellites offering world-wide connectivity to a customer. Satellites cover a certain area on the earth. This area is termed as a „footprint' of that satellite. Within the footprint, communication with that satellite is possible for mobile users. These users communicate using a Mobile-User-Link (MUL). The base-stations communicate with satellites using a Gateway-Link (GWL). Sometimes it becomes necessary for satellite to create a communication link between users belonging to two different footprints. Here the satellites send signals to each other and this is done using Inter-Satellite-Link (ISL).

1.2 SATELLITE CAMERA FIXTURE BRACKET

A fixture bracket is a adjustably supporting for satellite camera about one or more axis. The bracket may pivotally attached to the camera member for selective pivotal travel about a pivot axis relative to the camera member and thereafter releasable locked in position.

LITERATRE REVIEW

Gaurav Bhusari, Prof. M. Sohail Pervez: worked on Design and Analysis of Fixture Bracket for Engine Assembly Line. The present proposed work in this paper aims at developing the easy to machine fixture which not only enhances the production rate but also reduces machining time. Presently in automobile industry, the production line for engine assembly is done in conventional method, due to which production takes too much time to produce a product. Sometimes it doesn't fulfill the demand due to lack of production technique and delays. We have proposed a design of a fixture bracket which will be very useful for production of engine in production line. With the help of this fixture bracket, the assembling of the engine block with its sub-parts will be quite easier than the conventional method. Also we calculate the strength equations and fatigue analysis on the fixture bracket for the safety of the operator and production system.

Umesh S.Ghorpade1 , D.S.Chavan2 , Vinay Patil3 , Mahendra Gaikwad4 – The automotive engine mounting systems are very important for vehicle performance. Early the engine, mounting improvement is checked and analyzed without sample of vehicle authorization. For frame support engine bracket is to be designed. Due to continue vibration and fatigue, the structural failure and high stressed are induced. So, investigation is done in structural analysis and its dynamic behavior. With the help of Finite Element Analysis [FEA] the engine bracket natural frequency is carried out.

Ashish Y.Dakhole1 and M.S.Tufail2 - For automated Banjo beam/ Case axle cleaning machine, there are 17 types of components are used to cleaned, dry and proceed for painting. Due to the special purpose of machine the manufacturing of case axle made 17 similar types of components. Components consider as similar standard with each component having different shape and size are universally used. With the help of cycle time the multistage processing is done. At every station provides sensors to conveyorised fixture for Banjo Beam. PLC programmed is used for operation cycles.

Pravin Gudale1 and Dr. Vinayak Naik2 - Failure Modes and Effects Analysis (FMEA) is used to analyzed the reliability in development cycle, due to these enhancing the reliability with the help of design. For engine cylinder block, the development of semi-automatic fixture is designed in the paper. The issue which is related to engine block fixture is resolved with methodology FMEA, the priority risk number is identified and minimized. Due to these cost saving in term of quality improvement is done.

Mr. Pramod Walunje1 and Prof. V.K.Kurkute2 - The engine is one of the most important of the automobile vehicle. Sports car needs high performance which is done by using bracket, due to which improving in comfort zone of driver. The engine bracket is very important component of framework of vehicle chassis. It also improves the efficiency of the vehicle, if the engine bracket is light weight. The objective of the paper is to highlight that how the light weight bracket improve efficiency.

MANUFACTURING OF SATELLITE CAMERA FIXTURE BRACKET
SELECTION OF SUITABLE MATERIAL
TYPES OF MATERIALS
Aluminum
Brass
Cast iron
Mild steel
Stainless steel
Plastics
Aluminum IS SUITABLE MATERIAL FOR FIXTURE BRACKET

4.2 CAM PROCESS
COMPUTER AIDED MANUFATURING

Computer-aided manufacturing (CAM) is the use of computer-based software tools that assist engineers and machinists in manufacturing or prototyping product components and tooling. CAM is a programming tool that makes it possible to manufacture physical models using computer-aided programs.

Manufacturing as the design stage is a set of activities assigned to the producing of the designed part. The manufacturing is one of other activities after design stage. The problem consists in transformation of the CAD data to the manufacturing data. The manufacturing data are sometimes called as CAM data.

The 10 largest CAM software products are:

- Catia
- Cimatron
- Edge cam
- Master cam
- NX Cam
- Power mill
- Pro/E
- Space-E/CAM
- Tebis
- WorkNC

SELECTION OF MACHINE

Number of different machines is used with an external controller and human or robotic operators that move the component from machine to machine. In either case, the complex series of steps needed to produce any part is highly automated and produces a part that closely matches the original CAD design.

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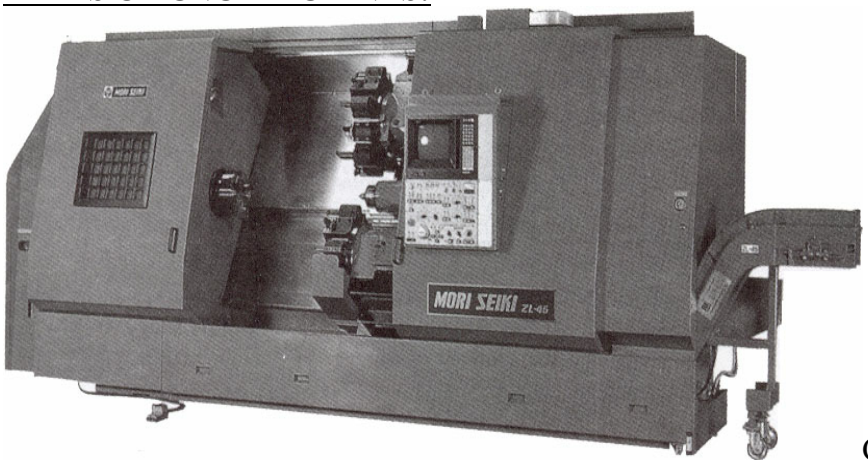
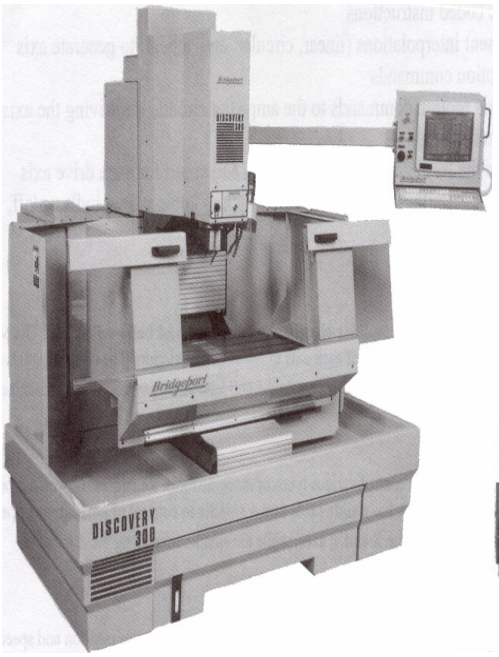
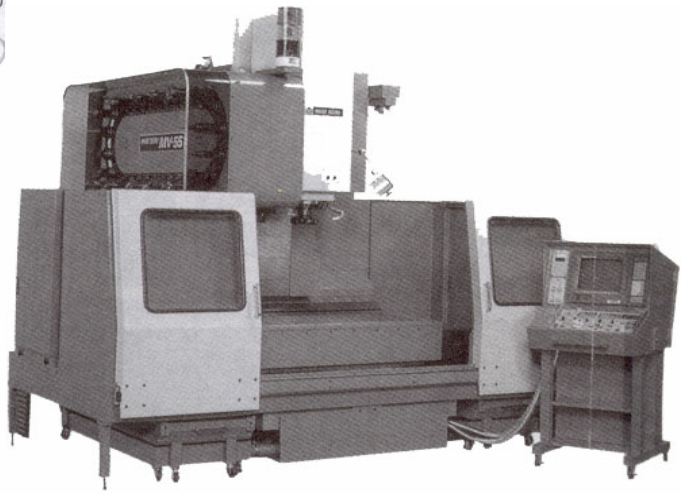
Volume 08 Issue 03
March 2021

TYPES OF CNC MACHINES:

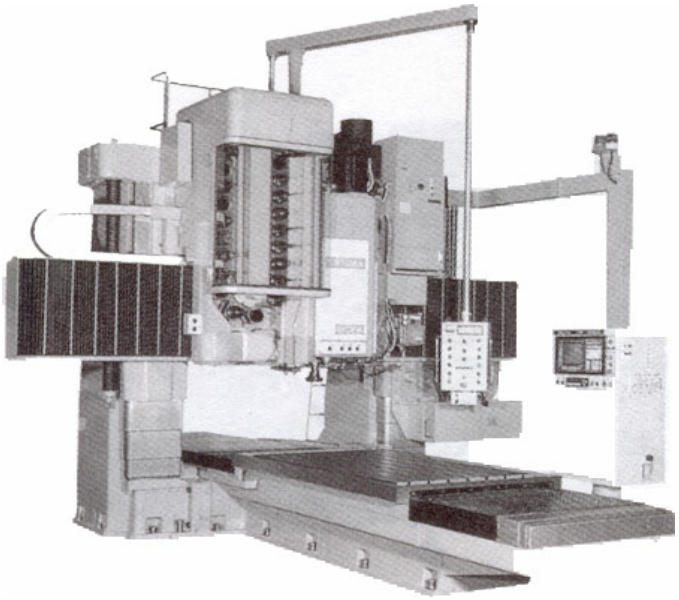


CNC Dual turret center





CNC vertical Milling Machine



Double axis machining center
Rotary table 5-axis machine is suitable for manufacturing mounting bracket

Rotary table 5-axis CNC vertical milling machine

1.1.1. Selection of tool

1.1.2. Slab mill

HSS slab mill

Slab mills are used either by themselves or in gang milling operations on manual horizontal or universal milling machines to machine large broad surfaces quickly. They have been superseded by the use of carbide-tipped face mills which are then used in vertical mills or machining centres.

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Volume 08 Issue 03
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1.1.3. Side-and-face cutter

Side and face cutter

The side-and-face cutter is designed with cutting teeth on its side as well as its circumference. They are made in varying diameters and widths depending on the application. The teeth on the side allow the cutter to make *unbalanced cuts* (cutting on one side only) without deflecting the cutter as would happen with a slitting saw or slot cutter (no side teeth).

Cutters of this form factor were the earliest milling cutters developed. From the 1810s to at least the 1880s, they were the most common form of milling cutter, whereas today that distinction probably goes to end mills.

1.1.4. Involute gear cutter

Involute gear cutter – number 4:
- 10 diametrical pitch cutter
- Cuts gears from 26 through to 34 teeth
- 14.5 degree pressure angle

There are 8 cutters (excluding the rare half sizes) that will cut gears from 12 teeth through to a rack (infinite diameter).

1.1.5. Hob

Hobbing cutter

Main article: Hobbing

Aluminum Chromium Titanium Nitride (AlCrTiN) coated Hob using Cathodic arc deposition technique

SETUP 1 TOOLING LIST

We need to select/create a tool for each of the Machining operations. In the Project Manager, you can create and automatically assign new tools to tool stations in the Tools view. You can also create tools from the Machining menu.

SHOP FLOOR DOCUMENTATION

TOOLING LIST

DRILLING TOOLS

TOOL NAME	DESCRIPTION	DIAMETER	TIP ANG	FLUTE LEN	ADJ REG
SPOTDRILLING_TOOL	Drilling Tool	2.0000	120.0000	35.0000	0
DRILLING_TOOL	Drilling Tool	4.2000	118.0000	35.0000	0
DRILLING_D3.2	Drilling Tool	3.2000	118.0000	35.0000	0
MILLING TOOLS					
TOOL NAME	**DESCRIPTION**	**DIAMETER**	**COR RAD**	**FLUTE LEN**	**ADJ REG**
FACE_MILL_D70	Milling Tool-5 Parameters	70.0000	1.0000	25.0000	0
MILL_D20	Milling Tool-5 Parameters	20.0000	0.0000	50.0000	0
MILL_D10	Milling Tool-5 Parameters	10.0000	0.0000	50.0000	0
COUNTERSINKING_T	Milling Tool-5	16.0000	0.0000	15.0000	0

OOL	Parameters				

SETUP 2 TOOLING LIST

We need to select/create a tool for each of the Machining operations. In the Project Manager, you can create and automatically assign new tools to tool stations in the Tools view. You can also create tools from the Machining menu.

SHOP FLOOR DOCUMENTATION

TOOLING LIST

DRILLING TOOLS

TOOL NAME	DESCRIPTION	DIAMETER	TIP ANG	FLUTE LEN	ADJ REG
SPOTDRILLING_TOOL	Drilling Tool	2.0000	120.0000	35.0000	0
DRILLING_TOOL	Drilling Tool	4.2000	118.0000	35.0000	0
DRILLING_D3.2	Drilling Tool	3.2000	118.0000	35.0000	0

MILLING TOOLS

TOOL NAME	DESCRIPTION	DIAMETER	COR RAD	FLUTE LEN	ADJ REG
FACE_MILL_D70	Milling Tool-5 Parameters	70.0000	1.0000	25.0000	0
MILL_D20	Milling Tool-5 Parameters	20.0000	0.0000	50.0000	0
MILL_D10	Milling Tool-5 Parameters	10.0000	0.0000	50.0000	0
COUNTERSINKING_TOOL	Milling Tool-5 Parameters	16.0000	0.0000	15.0000	0
EM_D10_R3	Milling Tool-5 Parameters	10.0000	3.0000	50.0000	0
EM_D5	Milling Tool-5 Parameters	3.0000	0.0000	50.0000	0

MACHINE SETUP OPERATIONS

SETUP 1
Face milling
Profile milling
Cavity milling
Drilling

SETUP 2
face milling
Profile milling
Cavity milling
Pocket milling

TOOLS USED IN MILLING OPERATION

The following is a list of Milling tools and the key dimensions that you can set for each tool foe deckel cover plate:.

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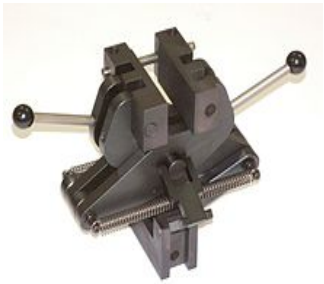
Volume 08 Issue 03
March 2021

FIXTURE DESIGN

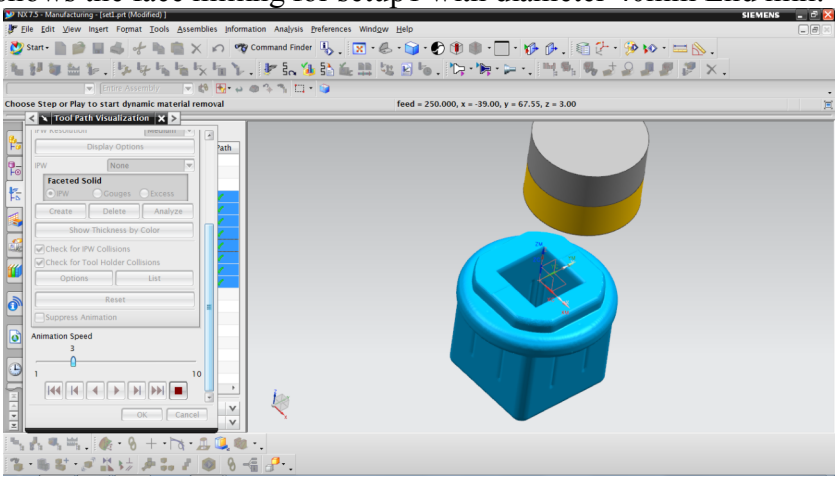
A **fixture** is a work-holding or support device used in the manufacturing industry. Fixtures are used to securely locate (position in a specific location or orientation) and support the work, ensuring that all parts produced using the fixture will maintain conformity and interchangeability. Using a fixture improves the economy of production by allowing smooth operation and quick transition from part to part, reducing the requirement for skilled labour by simplifying how workpieces are mounted, and increasing conformity across a production run.



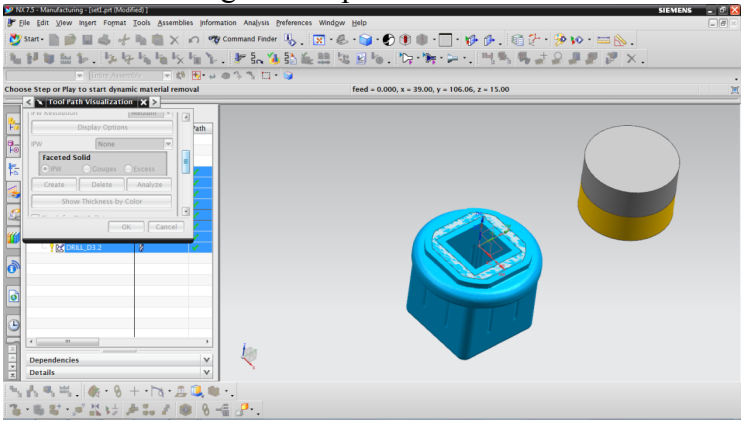
A common type of fixture, used in materials tensile testing
Bench vice used as a fixture for deckel cover plate

4.2 CAM GENERATION FOR SETUP 1

Below image shows the face milling for setup1 with diameter 40mm End mill.



Below image shows the face milling for setup1 with diameter 40mm End mill.



Below image shows the profile milling operation with diameter 10mm End mill.

International Journal of Research
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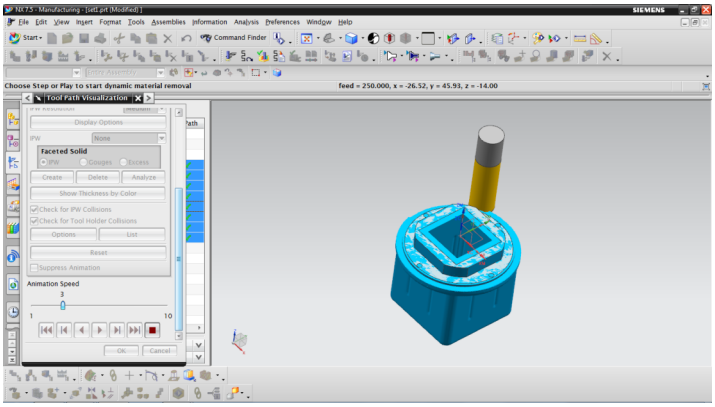
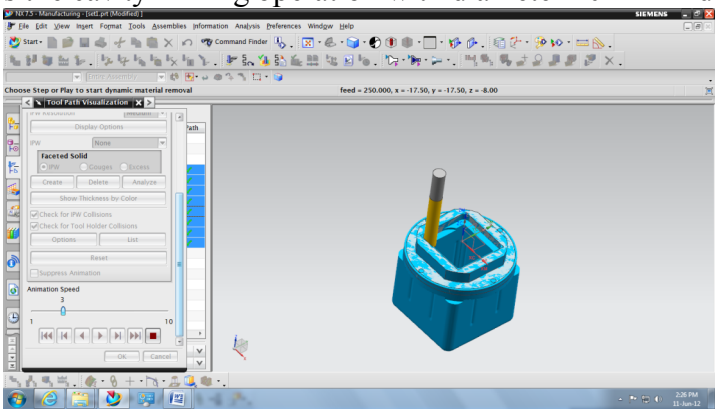
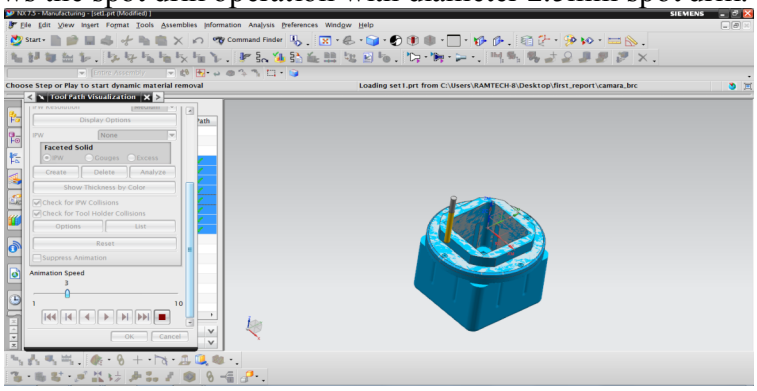
e-ISSN: 2348-795X
Volume 08 Issue 03
March 2021



Below image shows the cavity milling operation with diameter 10mm End mill.

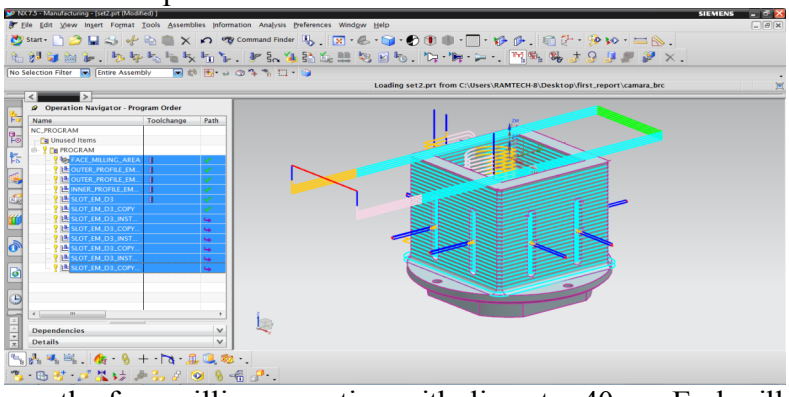


Below image shows the spot drill operation with diameter 2.5mm spot drill.



SETUP 2

Below image shows the tool path orientation in 2D



Below image shows the face milling operation with diameter 40mm End mill.

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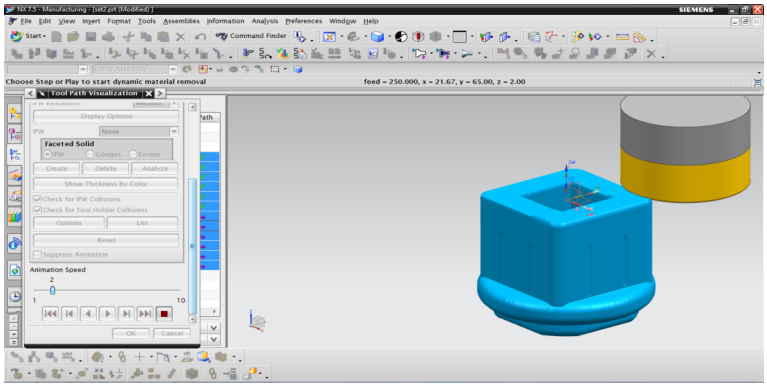
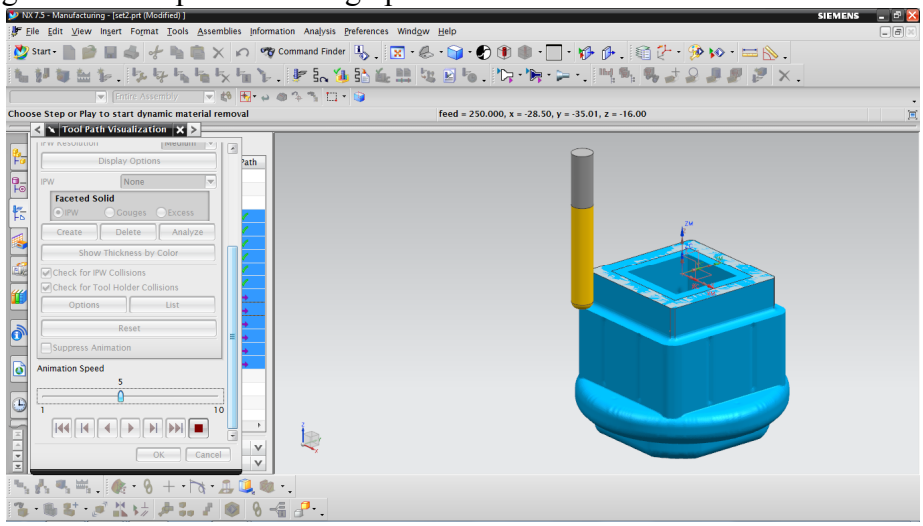
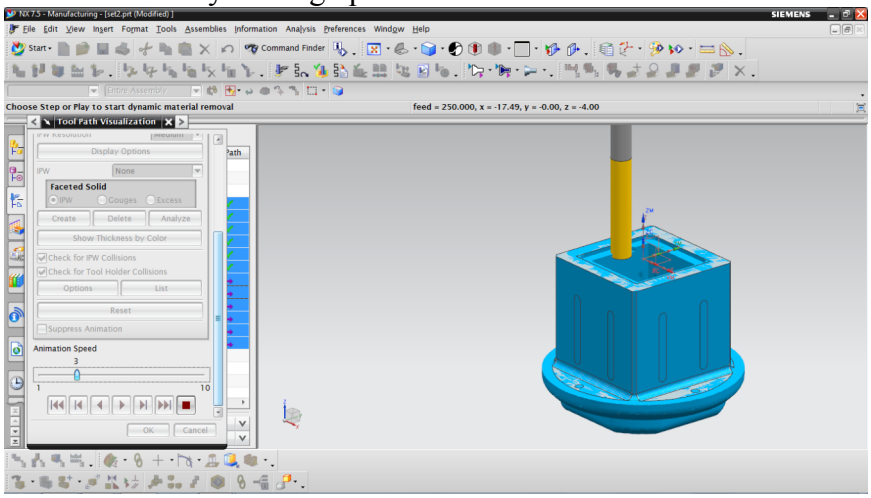
Volume 08 Issue 03
March 2021



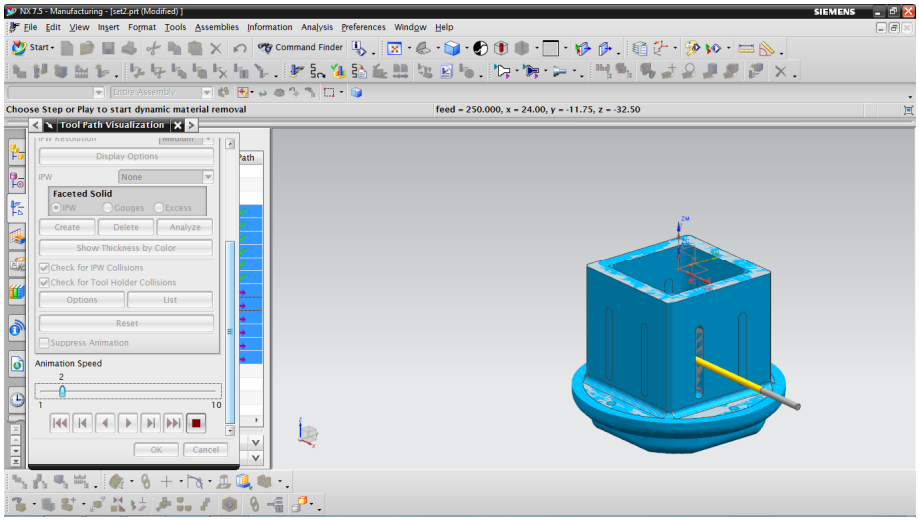
Below image shows the profile milling operation with diameter 10mm End mill.



Below image shows the cavity milling operation with diameter 10mm End mill.



Below image shows the pocket milling operation with diameter 10mm End mill.



CONVERT TO NC CODE

Using the post processor we have to convert CL file data into machine specified NC part program

1. In the Project Manager, select the first operation on the Operations page, then hold down the Shift key and select the last operation. All the cutting operations are selected.
2. Press the right mouse button and select NC Code from the menu.
3. Select a Machine Format file from the pull down list (3-Axis/5-Axis).
4. Select Apply.

PROCESS SHEET FOR SETUP 1

Operation No.	Machining Operation	Tools Used	Spindle Speed(rpm)	Cutting Feed(mm/min)	Setup time
10	Face Milling	Face mill ϕ 70 mm	1000	350	240/5
20	Profile milling	End mill ϕ20 mm	600	150 to 200	320/15
30	Cavity milling	End mill ϕ10 mm	1000	150	250/12
40	Spot drilling	End Mill ϕ 2 mm	800	150 to 200	240/5
50	Drilling	Drill tool ϕ4.2 mm ϕ 3.2 mm	800	150 to 200	240/5

Operation No.	Machining Operation	Tools Used	Spindle Speed(rpm)	Cutting Feed(mm/min)	Setup time
10	Face Milling	Face mill ϕ 70 mm	1000	350	240/5
20	Profile milling	End mill ϕ20 mm	600	150 to 200	320/15
30	Cavity milling	End mill ϕ10 mm	1000	150	250/12
40	Spot drilling	End Mill ϕ 2 mm	800	150 to 200	240/5
50	Drilling	Drill tool ϕ4.2 mm ϕ 3.2 mm	800	150 to 200	240/5

PROCESS SHEET FOR SETUP 2

RESULTS AND CONCLUSION

We have developed 3D design and tool path generation for "SATELLITE CAMERA MOUNTING BRACKET" component using CAM software ('UGNX-7.5' which is a CAD/CAM software used to generate part program by designing and feeding the geometry of the component) and defining the proper tool path and thus transferring the generated part program to the required CNC machine with the help of DNC lines.

REFERENCES

[1] Umesh S.Ghorpade1 , D.S.Chavan2 , Vinay Patil3 , Mahendra Gaikwad4 , "Finite Element Analysis and Natural Frequency Optimization of Engine Bracket", IJMIE, Vol. 2, ISSN No. 2231-6477, Iss-3, 2012, pp. 1-6

[2] Ashish Y.Dakhole1 and M.S.Tufail2 , "Design of Automated Conveyorised Fixture Arrangement for Banjo Beam in Special Purpose Machine", IJICA, Vol.- 1, ISSN: 2231-1890, Iss-3, 4, 2012, pp. 28-32

[3] Pravin Gudale1 and Dr. Vinayak Naik2 , "Use of FMEA Methodology for Development of Semiautomatic Averaging Fixture for Engine Cylinder Block". IJIRSET, Vol.-3, ISSN-2319-8753, Iss- 5, May 2014, pp. 12452-12462

[4] Mr. Pramod Walunje1 and Prof. V.K.Kurkute2 , "Optimization of Engine Mounting Bracket Using FEA", IJR, Vol.-2, ISSN-2250-1991, Issue- 12, Dec 2013, pp. 72-75

p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 08 Issue 03
March 2021

[5] Sahil Naghate1 and Sandeep Patil2 , "Modal Analysis of Engine Mounting Bracket using FEA", IJERA, Vol.-2, ISSN- 2248-9622, Issue-4, July-August 2012, pp. 1973-1979
[6] Cogun, Y.C. Geometric Reasoning for Layout Design of MACHINING Fixtures, Int. J. Computer Integrated Manufacturing, Vol. 7, No.3, pp- 175-185, 1994.
[7] Cogun C. The Importance of the Application Sequence of Clamping Forces, ASME Journal of engineering for Industry, Vol.114, pp. 539-543, 1992
[8] J.H.KIM, H.Y.JEONG and J.S.PARK, "Development of the FMECA Process and Analysis Methodology for Railroad System" IJAT, VOL.10, No. 6, pp. 753-759