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Design of Fixture to Optimise Process Plan of Aerospace Component

¹G Sunil Reddy, ²S. Mohan Kumar, ³Dr. B Nageshwara Rao

¹M.Tech student, ²Assistant professor, ³Assistant professor. Department of Mechanical Engineering, Avn Institute of Engineering and Technology, Hyd, T.S

ABSTRACT

Missile shield is aero space component protects the missile by covering the entire body. Designing and process planning of aerospace component are studied in detail. Missile shield is aero space component it requires accurate machining and high finishing and it is typical to manufacture in 3-axis machines and it is highly impossible using 3-jaw chuck or machine vice for holding aerospace component rigidly. To manufacture aerospace component per requirement with accurate dimension it demands a fixture to design considering the part holding points. It requires a designed fixture and clamping to hold the part rigidly. If part is fixed rigidly easily we can obtain smooth surfaces on part.

The main aim of this project is to optimize process plan and creating 3D model using Unigraphics software. Generating NC program of aerospace component using NX-CAM software which is exclusively CAM software used to generate part program by 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. The operator thus executes the program with suitable requirements. The project deals with optimizing process plan by specifying appropriate tools, developing tools design if demanded.

INTRODUCTION

Designing a fixture for aerospace component:

The purpose of figures is to hold the work piece tightly or rigidly during manufacturing. Figures are developed to manufacture the critical and complex parts which are not holded by chucks. by

fixtures, part can be obtained with required design specifications. Developing or designing of fixtures require little more cost, the design cost of fixture is reduced by implementing various computer-aided fixture design methods in market to support the fixture designer

Fixture layout design is a major concern in the development of automated fixture design systems. the task of fixture layout design is to layout a set of locating & clamping points on work piece surfaces such that the work piece is accurately located & completely restrained during manufacturing operations.

Fixture design concepts: (managing degree of freedom).

3:2:1 \rightarrow (3 at least 3-point to define a plane) (2 at least 2-points to define location) (1 at least 1-point for clamping).

CAD:

CAD is computer aided designing or computer aided drafting. CAD is used for developing the 3d model from the 2d input. It is also used to drafting sheets which are used to inspection. CAD software has different modules. They are:

- 1. Modeling
- 2. Assembly
- 3. Drafting
- 4. Sheet metal
- 5. Piping
- 6. Shape studio
- 7. Welding

CAM:

CAM is computer aided manufacturing. In cam software, the processes from selection of raw material to NC program generation were done. Finally NC program was optimized using post builder and given to the machine. Generally, process involved in the CAM software.



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- 1. Selection of raw material
- 2. Selection of machine
- 3. Selection of tools
- 4. Selection of process
- 5. Sequencing of the processes
- 6. Generation of the NC program
- 7. Optimization of the NC program

3D MODELING OF AEROSPACE COMPONENT

2d drawing:

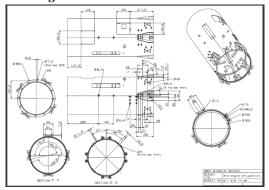
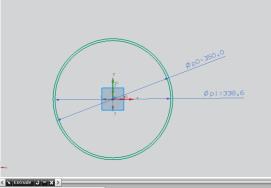


Fig shows drawing of aerospace component **3d modeling of aerospace component:** Below image shows sketch and extrude of shield



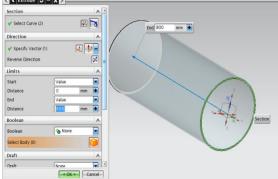


Fig shows Sketch and extrude of shield

Below image shows sketch and extrude of slots around shield

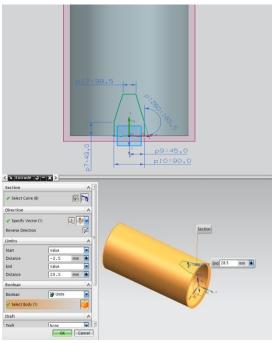
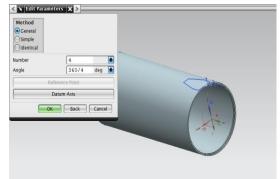


Fig shows Sketch and extrude of slots around shield Below image shows sketch and extrude of slots around shield



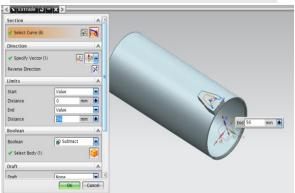


Fig shows Sketch and extrude of slots around shield



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Below image shows circular array of slots around shield

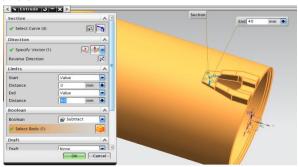
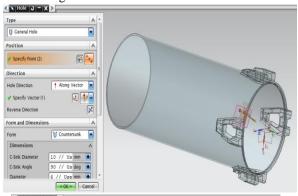


Fig shows Circular array of slots around shield Below image shows countersunk holes



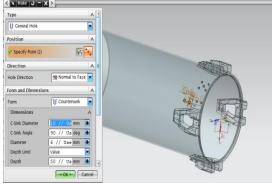


Fig shows countersunk holes Below image shows sketch and extrude

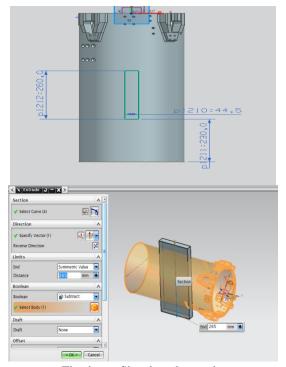
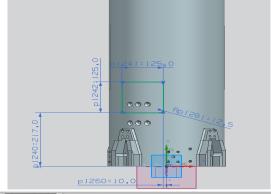


Fig shows Sketch and extrude Below image shows sketch and extrude



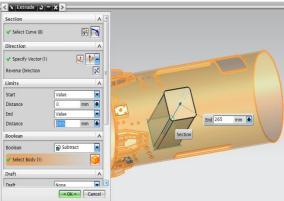


Fig shows Sketch and extrude

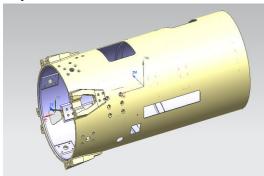
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Below image shows 3d models of aerospace component



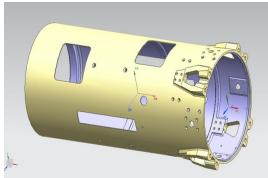


Fig shows 3dmodels of aerospace component

COMPUTER AIDED MANUFACTURING PROCESS

Methodology used in manufacturing of aerospace component is as mentioned below:

- Identifying suitable machine.
- Selecting suitable tools for manufacturing thin walled component.
- Designing fixture/mandrel to support aerospace component for external operations.
- Listing down the Sequence of operations performed on aerospace component.
- Generating tool path at specified cutting speed.
- Generating NC program using NX-CAM software.

Identify suitable machine.

Types of CNC machine used in this project are MORI SEIKI 4-AXIS CNC turning machine and DMG 5-axis milling machine



Fig shows 4-axis CNC MORI SIEKI turning machine



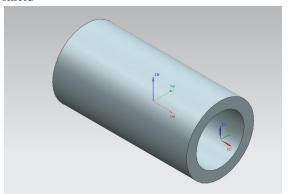
Fig shows DMG 5-axis machine

Selection of tools:

- ➤ OD_80_L facing
- OD_80_L rough
- ➤ OD_55_L finish
- ➤ ID_80_L rough
- ➤ ID_55_L finish

Generating tool path on aerospace component:

Below image shows Raw material and part of missile shield



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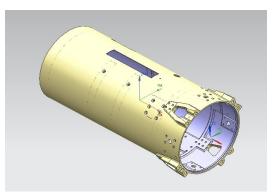


Fig shows Raw material and part of aerospace component

Spun generated in turning

Below image shows spun generated by part and raw material

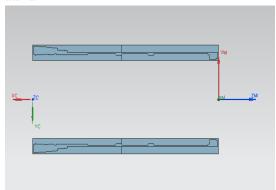
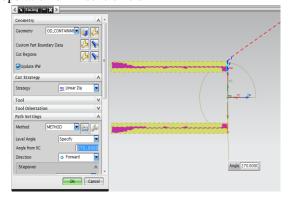


Fig shows spun generated by part and raw material **Set_up_1 tool path generation**

Below image shows the creation of FACING operation on missile shield



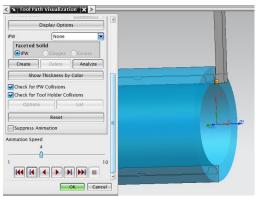


Fig shows FACING operation on aerospace component

Below image shows the creation of OD_Rough operation on aerospace component

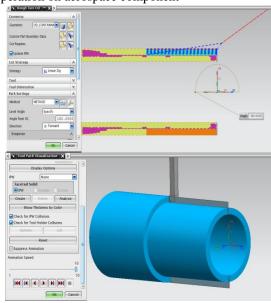
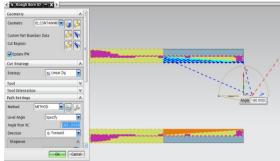


Fig shows OD_Rough operation on aerospace component

Below image shows the creation of ID_Rough operation on aerospace component



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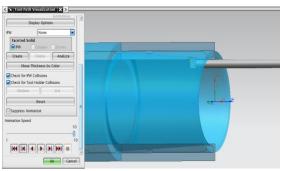
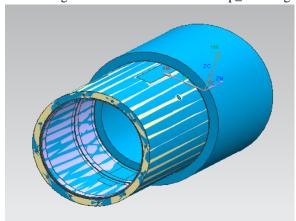
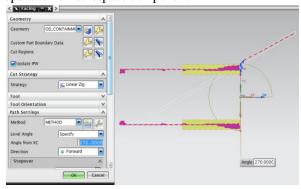


Fig shows ID_Rough operation on aerospace component

Set_up_2 Below image shows Raw material for setup_2 turning



In setup_2 raw material will be semi finished part which means the part left after setup_1 operations. Below image shows the creation of FACING operation on aerospace component



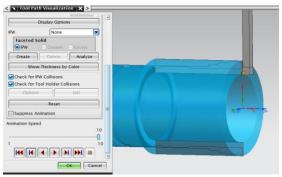


Fig shows FACING operation on aerospace component

Below image shows the creation of OD_Rough operation on aerospace component

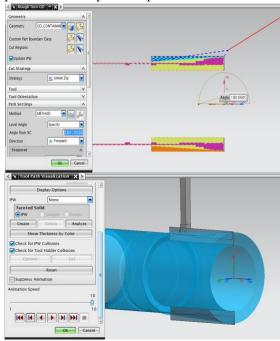
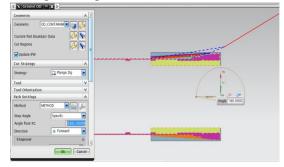


Fig shows OD_Rough operation on aerospace component

Below image shows the creation of Groove operation on aerospace component





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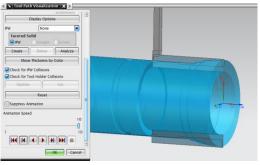


Fig shows Groove operation on aerospace component Below image shows the creation of ID_Rough operation on aerospace component

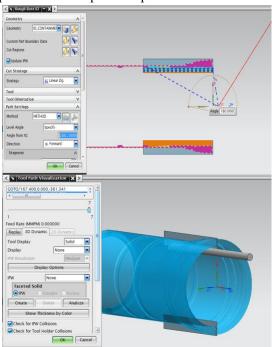


Fig shows ID_Rough operation on aerospace component

Milling operations

Below image shows Raw material for milling

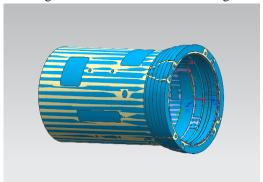


Fig shows Raw material for milling Below image shows planar mill operations

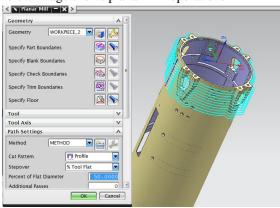


Fig. planar mill operations
Below image shows face mill area operations

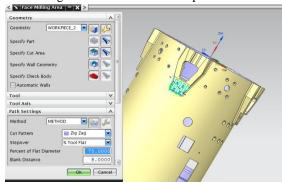


Fig shows face mill area operations Below image shows planar mill operations



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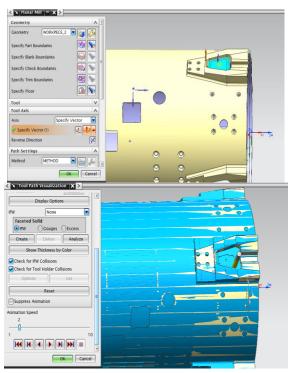


Fig shows planar mill operations Below image shows planar mill operations

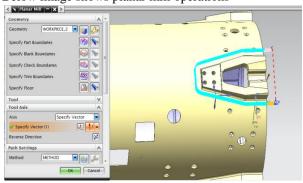


Fig shows planar mill operations Below image shows planar mill operations

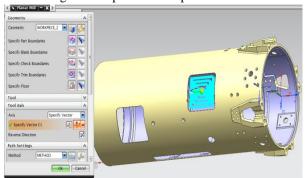


Fig. planar mill operations Below image shows planar mill operations

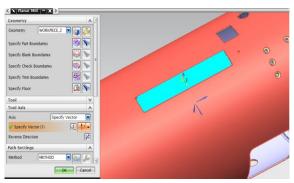


Fig. planar mill operations Below image shows planar mill operations

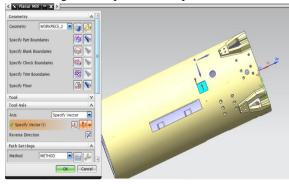
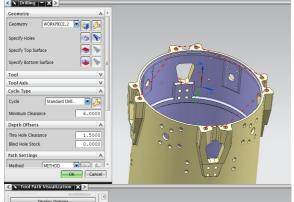


Fig. planar mill operations Below image shows drilling operations



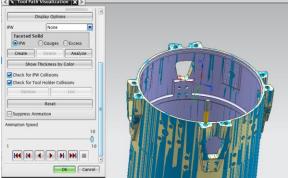


Fig shows Drilling operations Below image shows drilling operations



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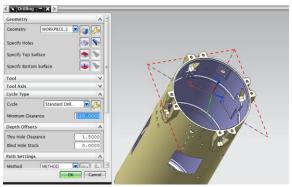


Fig shows Drilling operations Below image shows drilling operations

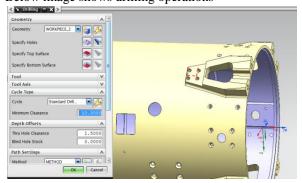


Fig shows Drilling operations

Below image shows Final part after operations

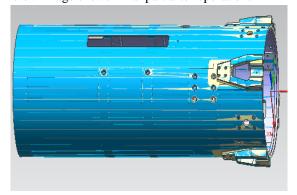


Fig. Final part after operations

me	To	P	Tool	Time	Feed	Speed
_PROGRAM				13:41:34		
PROGRAM PROGRAM				13:41:34		
- ? 😭 FACING	6	~	OD_80_L	00:00:10	.8 mmpr	3000 rpm
₹ ROUGH_TURN_OD		4	OD_80_L	00:03:01	.5 mmpr	2600 rpm
- ? ROUGH_BORE_ID	6	*	ID_80_L	00:02:16	.45 mmpr	2560 rpm
- ₹ GROOVE_ID	8	*	ID_GROOVE_L	00:01:36	.4 mmpr	2600 rpm
🖁 😭 FACING_1	6	~	OD_80_L_1	00:00:08	.9 mmpr	2900 rpm
ROUGH_TURN_OD_1		~	OD_80_L_1	00:00:59	.7 mmpr	2700 rpm
- FINISH_TURN_OD	Ö	~	OD_55_L	00:00:05	.4 mmpr	2650 rpm
- ₹ GROOVE_OD	8	4	OD_GROOVE_L	00:01:15	.4 mmpr	2540 rpm
- ₹ ROUGH_BORE_ID_1	8	~	ID_80_L_1	00:01:36	.5 mmpr	2540 rpm
- P GROOVE_ID_1	8	4	ID_GROOVE_L_1	00:00:08	.5 mmpr	2800 rpm
- ₹ GROOVE_ID_2		*	ID_GROOVE_L_2	00:00:08	.4 mmpr	2400 rpm
- ₹ GROOVE_ID_3		~	ID_GROOVE_L_1	00:00:15	.55 mmpr	2600 rpm
- PLANAR_MILL		~	MILL	01:02:15	260 mmpm	3500 rpm
PLANAR_MILL_1	1	~	MILL_1	01:00:39	260 mmpm	3500 rpm
- Y S FACE_MILLING_AREA	1	~	MILL_2	00:03:30	250 mmpm	2350 rpm
- ₹ E PLANAR_MILL_2	1	4	MILL_3	00:20:36	240 mmpm	2150 rpm
- Y E PLANAR_MILL_3		1	MILL_4	00:13:00	261 mmpm	2347 rpm
FACE_MILLING_ARE	1	4	MILL_2	00:03:30	250 mmpm	2350 rpm
FACE_MILLING_ARE		4	MILL_2	00:03:30	250 mmpm	2350 rpm
FACE_MILLING_ARE		4	MILL_2	00:03:30	250 mmpm	2350 rpm
FACE_MILLING_ARE		4	MILL_2	00:03:30	250 mmpm	2350 rpm
- PLANAR_MILL_2_IN		4	MILL_3	00:20:36	240 mmpm	2150 rpm
PLANAR_MILL_2_IN		4	MILL_3	00:20:36	240 mmpm	2150 rpm
PLANAR_MILL_2_IN		4	MILL_3	00:20:36	240 mmpm	2150 rpm
PLANAR_MILL_2_IN		4	MILL_3	00:20:36	240 mmpm	2150 rpm
- PLANAR_MILL_3_IN		4	MILL_4	00:13:00	261 mmpm	2347 rpm
PLANAR_MILL_3_IN		4	MILL_4	00:13:00	261 mmpm	2347 rpm
PLANAR_MILL_3_IN		4	MILL_4	00:13:00	261 mmpm	2347 rpm
PLANAR_MILL_3_IN		4	MILL_4	00:13:00	261 mmpm	2347 rpm
PLANAR_MILL_4	1	*	MILL_5	00:36:26	270 mmpm	2620 rpm
PLANAR_MILL_5	8	*	MILL_6	02:11:11	268 mmpm	3100 rpm
PLANAR_MILL_6	1	~	MILL_7	00:12:19	260 mmpm	2800 rpm
PLANAR_MILL_5_IN		4	MILL_6	02:11:11	268 mmpm	3100 rpm
PLANAR_MILL_7	3	~	MILL_8	00:49:15	267 mmpm	3150 rpm
PLANAR_MILL_8		*	T_CUTTER	00.11.23	250 mmpm	2900 rpm
PLANAR_MILL_8_IN		4	T_CUTTER	00:11:23	250 mmpm	2900 rpm
PLANAR_MILL_8_IN		4	T_CUTTER	00:11:23	250 mmpm	2900 rpm
PLANAR_MILL_8_IN		4	T_CUTTER	00:11:23	250 mmpm	2900 rpm
PLANAR_MILL_8_IN		4	T_CUTTER	00:11:23	250 mmpm	2900 rpm
PLANAR_MILL_9		*	T_CUTTER	00:07:34	250 mmpm	2900 rpm
PLANAR_MILL_10		~	T_CUTTER	00:05:14	250 mmpm	2900 rpm
PLANAR_MILL_11		*	T_CUTTER	00:03:16	250 mmpm	2900 rpm
PLANAR_MILL_12		1	T_CUTTER	00:04:43	250 mmpm	2900 rpm
PLANAR_MILL_13		Y.	T_CUTTER T_CUTTER	00:14:15	250 mmpm 250 mmpm	2900 rpm 2900 rpm
PLANAR_MILL_14	DR.	*	DRILLING_TOOL	00:19:06	240 mmpm	2900 rpm 2640 rpm
- Y & DRILLING - Y & DRILLING_1	2	Y.	DRILLING_TOOL	00:01:24	240 mmpm 240 mmpm	2640 rpm 2640 rpm
- Y & DRILLING_1	2	-	DRILLING_TOO	00:02:27	240 mmpm 240 mmpm	2640 rpm
- Y & DRILLING_2 - Y & DRILLING_2_INSTA	6		DRILLING TOO	00:00:29	240 mmpm 240 mmpm	2640 rpm
PRILLING_2_INSTA		4	DRILLING_TOO	00:00:29	240 mmpm 240 mmpm	2640 rpm
- PRILLING_2_INSTA		-	DRILLING_TOO	00:00:29	240 mmpm	2640 rpm
- PE DRILLING_2_INSTA		-	DRILLING_TOO	00:00:29	240 mmpm	2640 rpm
		-	DRILLING TOO	00:08:14	240 mmpm	2640 rpm
DRILLING_3	2	*	COUNTERSINKI	00:08:14	and the transfer of	and the right to
- ? COUNTERSINKING	1	*		00:01:02	230 mmpm	2600 rpm
- COUNTERSINKING_1 COUNTERSINKING_2		Y	COUNTERSINKI	00:01:02	230 mmpm 230 mmpm	2600 rpm 2600 rpm
- Y COUNTERSINKING_2 - Y C DRILLING_4	2	*	DRILLING_TOO	00:01:02	240 mmpm	2640 rpm
- Y C DRILLING_4		×.	DRILLING_TOO	00:00:48	240 mmpm 240 mmpm	2640 rpm
- Y & DRILLING_5	2	*	DRILLING TOO	00:00:32	240 mmpm 240 mmpm	2640 rpm 2640 rpm
- Y COUNTERSINKING_3		1	COUNTERSINKI	00:00:32	240 mmpm 230 mmpm	2640 rpm 2600 rpm
	-	*		00:00:18		2600 rpm 2600 rpm
- Y COUNTERSINKING_4	rae .	Y .	DRILLING TOO	00:00:18	230 mmpm	
- Y C DRILLING_7	8	*			240 mmpm	2640 rpm
P C DRILLING_8		*	DRILLING_TOO	00:00:04	240 mmpm	2640 rpm
- P C DRILLING_9	8	*	DRILLING_TOO	00:00:12	240 mmpm	2640 rpm
			DRILLING_TOO	00:00:12	240 mmpm	2640 rpm
- ₹ C DRILLING_10						
- PE DRILLING_10 - PE COUNTERSINKING_5 - PE COUNTERSINKING_6	1	+	COUNTERSINKI	00:00:07	230 mmpm 230 mmpm	2600 rpm 2600 rpm

3D MODELLING OF FIXTURE

Below image shows 2D drawing of fixture part1 Below images shows sketch and extrude of fixture part1

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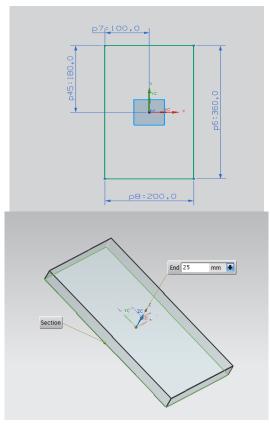
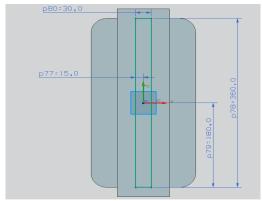


Fig. sketch and extrude of fixture part1 Below images shows sketch and extrude of fixture part1



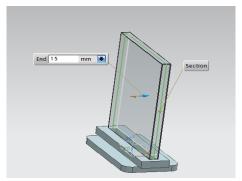


Fig. sketch and extrude of fixture part1 Below image sketch and extrude of fixture part1

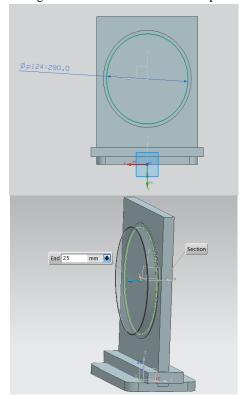


Fig. sketch and extrude of fixture part1 Below image shows 3D model of fixture part1

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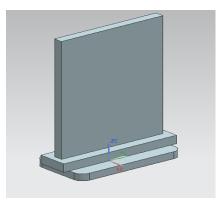


Fig. 3D model of fixture part1 Below image shows 2D drawing of fixture part2

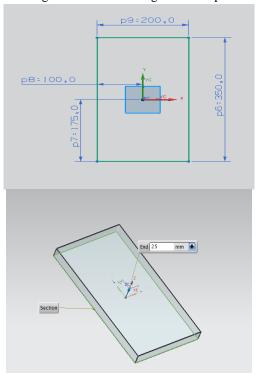
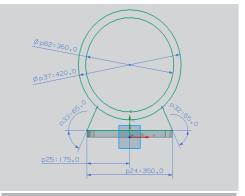


Fig. sketch and extrude of fixture part2
Below images shows sketch and extrude of fixture part2



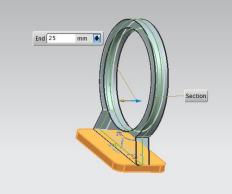


Fig. sketch and extrude of fixture part2
Below images shows sketch and extrude of fixture part2



Fig. sketch and extrude of fixture part2 Below image shows 3D model of fixture part2

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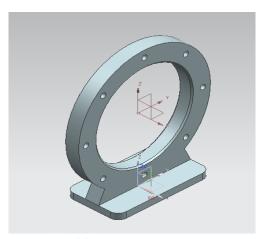


Fig. 3D model of fixture part2 Below image shows sketch and extrude of clamp stud

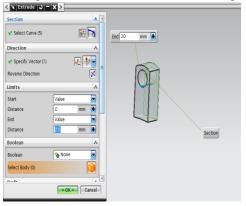


Fig. sketch and extrude of clamp stud

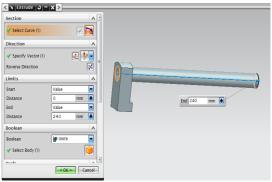


Fig. sketch and extrude of clamp stud Below image shows 3D model of clamp stud

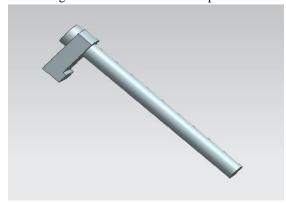


Fig. 3D model of clamp stud

Below image shows sketch and extrude of clamp stud

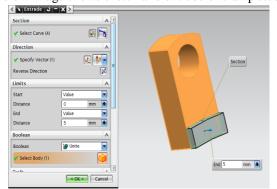
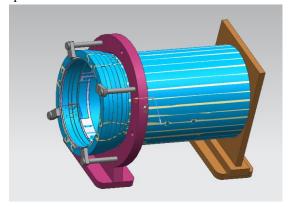


Fig. sketch and extrude of clamp stud Below image shows sketch and extrude of clamp stud

Fixture assembly

Assembly of fixture after completing turning operations





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lame	To	P	Tool	Time	Feed	Speed
C_PROGRAM				08:51:59		
PROGRAM				08:51:59		
Y ROUGH_TURN_OD	(5)	1	OD_SO_L OD_SO_L	00:00:10	.8 mmpr .5 mmpr	3000 rpm 2600 rpm
P ROUGH_TURN_OD	All	*	ID_80_L	00:03:01	.5 mmpr	2560 rpm
- Y GROOVE_ID	All All	~	ID_GROOVE_L	00:02:16	.4 mmpr	2600 rpm
- Y RACING_1	All All	-	OD_80_L_1	00.01.38	.9 mmpr	2900 rpm
ROUGH_TURN_OD_1	44	-	OD_80_L_1	00:00:59	.7 mmpr	2700 rpm
- V SE FINISH_TURN_OD	A11	-	OD 55 L	00:00:05	4 mmpr	2650 rpm
- Y of GROOVE_OD	41	-	OD_GROOVE_L	00:01:15	.4 mmpr	2540 rpm
- Y ROUGH_BORE_ID_1	All	~	ID_80_L_1	00:01:36	.5 mmpr	2540 rpm
- ₹ M GROOVE_ID_1	/£3	~	ID_GROOVE_L_1	00:00:08	.5 mmpr	2800 rpm
- ₹ GROOVE_ID_2	40	~	ID_GROOVE_L_2	00:00:08	.4 mmpr	2400 rpm
- GROOVE_ID_3	81	~	ID_GROOVE_L_1	00:00:15	.55 mmpr	2600 rpm
- PLANAR_MILL	-	4	MILL	00:40:37	290 mmpm	4000 rpm
PLANAR_MILL_1		~	MILL_1	00:39:34	290 mmpm	4000 rpm
- Y S FACE_MILLING_AREA		~	MILL_2	00:03:30	250 mmpm	2350 rpm
PLANAR_MILL_2		~	MILL_3	00:12:03	250 mmpm	2350 rpm
PLANAR_MILL_3		~	MILL_4	00:13:00	261 mmpm	2347 rpm
FACE_MILLING_ARE		4	MILL_2	00:03:30	250 mmpm 250 mmpm	2350 rpm 2350 rpm
P kg FACE_MILLING_ARE		-	MILL_2	00:03:30	250 mmpm 250 mmpm	2350 rpm 2350 rpm
FACE_MILLING_ARE		-	MILL_2	00:03:30	250 mmpm 250 mmpm	2350 rpm
V DE PLANAR MILL 2 IN		-	MILL_2	00:03:30	250 mmpm 250 mmpm	2350 rpm
PLANAR_MILL_2_IN		4	MILL 3	00:12:03	250 mmpm	2350 rpm
Y PLANAR_MILL_2_IN			MILL 3	00:12:03	250 mmpm	2350 rpm
PLANAR_MILL_2_IN		-	MILL 3	00:12:03	250 mmpm	2350 rpm
Y PLANAR MILL 3 IN		4	MILL_4	00:13:00	261 mmpm	2347 rpm
PLANAR_MILL_3_IN		4	MILL_4	00:13:00	261 mmpm	2347 rpm
PLANAR_MILL_3_IN		4	MILL_4	00:13:00	261 mmpm	2347 rpm
PLANAR_MILL_3_IN		4	MILL_4	00:13:00	261 mmpm	2347 rpm
PLANAR_MILL_4	-	~	MILL_5	00:36:26	270 mmpm	2620 rpm
— ▼ PLANAR_MILL_5		~	MILL_6	00:29:43	280 mmpm	3800 rpm
PLANAR_MILL_6		*	MILL_7	00:12:19	260 mmpm	2800 rpm
- PLANAR_MILL_5_IN		4	MILL_6	00:29:43	280 mmpm	3800 rpm
PLANAR_MILL_7		~	MILL_8	00:49:15	267 mmpm	3150 rpm
PLANAR_MILL_S		4	T_CUTTER	00:11:23	250 mmpm 250 mmpm	2900 rpm 2900 rpm
Y L PLANAR_MILL_8_IN V L PLANAR_MILL_8_IN		4	T_CUTTER T_CUTTER	00:11:23	250 mmpm 250 mmpm	2900 rpm
PLANAR_MILL_S_IN.		1000	T_CUTTER	00:11:23	250 mmpm	2900 rpm
PLANAR_MILL_S_IN		7	T CUTTER	00:11:23	250 mmpm	2900 rpm
PLANAR_MILL_9		7	T_CUTTER	00:07:34	250 mmpm	2900 rpm
- PLANAR_MILL_10		-	T_CUTTER	00:05:14	250 mmpm	2900 rpm
Y L PLANAR_MILL_11		4	T_CUTTER	00:03:16	250 mmpm	2900 rpm
PLANAR_MILL_12		4	T_CUTTER	00:04:43	250 mmpm	2900 rpm
PLANAR_MILL_13		~	T_CUTTER	00:14:15	250 mmpm	2900 rpm
─		~	T_CUTTER	00:19:06	250 mmpm	2900 rpm
- Y C DRILLING	2	*	DRILLING_TOOL	00:01:17	263 mmpm	2790 rpm
- P C DRILLING_1	8	~	DRILLING_TOO	00:02:15	263 mmpm	2790 rpm
- P C DRILLING_2	2	~	DRILLING_TOO	00:00:27	263 mmpm	2790 rpm
P C DRILLING_2_INSTA		4	DRILLING_TOO	00:00:27	263 mmpm	2790 rpm
PRILLING_2_INSTA		4	DRILLING_TOO	00:00:27	263 mmpm	2790 rpm
P C DRILLING_2_INSTA P C DRILLING_2_INSTA		4	DRILLING_TOO	00:00:27	263 mmpm 263 mmpm	2790 rpm 2790 rpm
Y C DRILLING_2_INSTA	1 22	-	DRILLING_TOO	00:00:27	263 mmpm 263 mmpm	2790 rpm 2790 rpm
- Y C COUNTERSINKING	1	1	COUNTERSINKI	00.07.34	263 mmpm 230 mmpm	2790 rpm 2600 rpm
- Y COUNTERSINKING_1	100	1	COUNTERSINKI	00:01:02	230 mmpm	2600 rpm
COUNTERSINKING_2		1	COUNTERSINKI	00:01:02	230 mmpm	2600 rpm
- Y COULLING_4	82	~	DRILLING_TOO	00:00:48	240 mmpm	2640 rpm
P DRILLING_5	8	4	DRILLING_TOO	00:00:32	240 mmpm	2640 rpm
- Y R DRILLING_6	-	-	DRILLING_TOO	00:00:32	240 mmpm	2640 rpm
- Y COUNTERSINKING_3	18	4	COUNTERSINKI	00:00:18	230 mmpm	2600 rpm
- COUNTERSINKING_4		~	COUNTERSINKI	00:00:18	230 mmpm	2600 rpm
- Y C DRILLING_7	2	~	DRILLING_TOO	00:00:04	240 mmpm	2640 rpm
- PRILLING_8		4	DRILLING_TOO	00:00:04	240 mmpm	2640 rpm
- Y C DRILLING_9	2	~	DRILLING_TOO	00:00:12	240 mmpm	2640 rpm
- P C DRILLING_10	1	~	DRILLING_TOO	00:00:12	240 mmpm	2640 rpm
- Y COUNTERSINKING_5	18	4	COUNTERSINKI	00:00:07	230 mmpm	2600 rpm
- PC COUNTERSINKING_6		~	COUNTERSINKI	00:00:07	230 mmpm	2600 rpm
P DRILLING_11	8	~	DRILLING_TOO	00:02:06	240 mmpm	2640 rpm

Time taken to manufacture a single component with fixture on CNC machine = 8hr 51min 59sec=532min

If the time in seconds is above 30 then it is taken as 1min, if it is below 30 then it is exception Manufacturing cost of CNC machine per hour =

Machining cost per piece (machining cost per min x machining time in min) = (1200/60)*532=10640rs Manufacturing cost of single aerospace component= 10640rs

Direct Labour Cost = Tm * Man Hour Rate Rs. Man Hour Rate = 500 Rs.

Tm= machining time

Tm = (532/60) hrs = 8.9 hrs

Direct Labour Cost = 8.9*500=4450 Rs.

Total cost of part =raw material cost + labour cost +manufacturing cost =

1040+4450+10640= 16130rs

RESULTS

Manufacturing of aerospace component without fixture:

Time taken to manufacture a single component without fixture on CNC machine = 13hr 41min 34sec=822min

If the time in seconds is above 30 then it is taken as 1min, if it is below 30 then it is exception Manufacturing cost of CNC machine per hour = 1200rs/hr

Manufacturing cost of single aerospace component = (1200/60)*822=16440rs

Direct Labour Cost = Tm * Man Hour Rate Rs.

Man Hour Rate = 500 Rs.

Tm= machining time

Tm = (822/60) hrs = 13.7 hrs

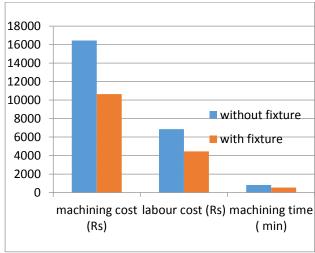
Direct Labour Cost = 13.7*500 = 6850 Rs.

Total cost of part =raw material cost + labour cost +manufacturing cost =

1040+6850+16440= 24330rs

Manufacturing of Aerospace component with fixture:

Graphical representation



CONCLUSION

It is difficult to manufacture aerospace component with 3-jaw chuck because it cannot hold the part rigidly for machining slots around the aerospace component. More number of parts is rejected.



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Manufacturing time, labour cost, manufacturing cost where reduced Using designed fixture.

Inspection charts are shown in report

Graphical representation of reduction of time and cost are in and shown in results.

There is a drastic reduction of reworks and rejection rate using designed fixture.

REFERENCES

- [1] A book of tool design by Pollack, Publisher: Reston Pub. Co, 1976
- [2] ERROR BUDGETING AND THE DESIGN OF LARGE AEROSTRUCTURES, R. Odi, G. Burley, S. Naing, A. Williamson, J. Corbett School of Industrial and Manufacturing Science, Cranfield University, UK
- [3] A literature survey of fixturedesign automation, <u>J. C. Trappey</u>, <u>C. R. Liu</u> The International Journal of Advanced Manufacturing Technology, August 1990, Volume 5, <u>Issue 3</u>, pp 240-255
- [4] Design & Development of Fixture for CNC Reviews, Practices & Future Directions, N. P. Maniar, D. P. VakhariaInternational Journal of Scientific & Engineering Research Volume 4, Issue 2, February-2013.
- [5] Mr. A.H. Nalbandh and PROF. C. C. Rajyaguru, "Fixture design optimization using genetic algorithm a review", Journal of information, Knowledge and Research inMechanical Engineering.
- [6] A.D.Kachare, G.M.Dahane and Dipti D. Kachare, "First Operation Machining Fixture", International Journal of Engineering and Innovative Technology (IJEIT), Volume 2, Issue 4, October 2012.
- [7] Amar Raj Singh Suriand A.P.S. Sethi, "Development of Gear Hobbing Fixture Design for Reduction in Machine Setting Time", International Journal of Scientific and Research Publications, Volume 2, Issue 10, October 2012, ISSN 2250-3153.
- [8] Research, Industrial Systems (2002-05-20). "Manufacturing and Investment Around the World: An International Survey of Factors Affecting Growth and Performance".

[9] P.Maheandera, Dr.K.P.Padmanaban, R.Rajasekar, R.Devaraja Vignesh, Dr.S.Navaneetha santhakumar, "Scatter Search Optimization for Multi Node Machining Fixture Layout", The International Journal of Engineering and Science (IJES), Volume-3, Issue-01, Pages 30-37, 2014, ISSN (e): 2319 – 1813, www.theijes.com, The IJES Page 30