Program Optimization for batch production of baffle plate

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Abstract - *Paper introduces programming on multi-axis VMC machine method on baffle plates production based on CIMCO automatic simulation software. For batch production of baffle plates the time required for tool change is more and corresponding code also consumes time for machining. The program functions in NC system based on mass production were studied and optimised program for the system and through the simulation of graphical software is proposed in this paper. The code is fed to the machine and program is designed so as to produce number of baffle plates in batch production in least possible time.*

Key Words: VMC, FANUC controller, optimisation

1. INTRODUCTION

Automation is required in every field of manufacturing in batch production and mass production. Numerical Control (NC) is one in which functions and motions of machine tool are controlled by means of prepared programs containing coded alphanumeric data. NC controls the motion of workpiece and tool and input parameters such as speed, feed, depth of cut, functions such as turning spindle on/off and turning coolant on/off.

Baffle plates are used in reactors and heat exchangers. It contains tubes for carrying hot fluids and there by requires accurate machining. Modern machining focuses on quality in terms of surface finishing, material removal rate, tool and time required for production. Machine tool movements used in producing a part are of two basic types: point to point (straight line movements) and continuous path (contouring movements). Highly automated machine tools such as turning centre and machining centre will change cutting tools automatically under NC control developed program. Machining centres can use different controllers.

1.1 Literature Survey

VMC is a multifunctional machine capable of performing operations of many standalone CNC machines. In papers the various methods of performing operations are discussed i.e using 5 axis [1] for performing slant operations(i.e slant hole or slant drill).These operations can be easily and effectively performed by using 4 axis. Another aspect is to select appropriate software package depending upon requirement and type of application to be performed [3]. The other aspect while developing an efficient program for particular product will require a comparative study of program developed by personnel and program generated by CAD-CAM software packages [4].The program generated by any software package will be more effective and free from errors than by any author. Studies showed that NX 7.5 required 11.43 minutes while PROE/EW5 required 15.11 minutes. Also studies showed that speed for different trajectories using vertical and spherical cutters the time required by various softwares were not the same [4].

Integration of CAD/CAM will offer possibility to generate NC codes of design components [2]. Hence depending on the type of operation i.e trajectory and cost associated with software balance has to be made [4].

2. METHODOLOGY

2.1 Blue Print Analysis

A blue print of a plate is issued by the company for its local small scale industries. After a local industry acquires a contract for the batch production of the baffle plate, the first is the analysis of the blue prints. Blue prints contain the top view, front view and side view. It also has the dimensions and material details of the baffle plate.

The co-ordinates for drilling holes in baffle plate were as follows:

Rapid traversing of tool in first position was at X-104 and Y-135.84. The circles are arranged in rhombus form and each rhombus is 16 mm. Rapid traversing is performed in positive Y direction. X co-ordinate remains constant and corresponding Y coordinates are 108.13, 80.42, 52.71, 25, -25, -52.71, -80.42 and -108.13. This way the rapid traverse G00 performed drilling operation on all holes.

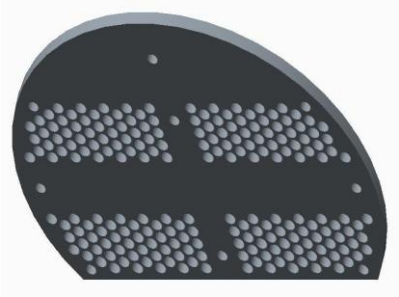

Fig -1: 3 Dimensional analysis of Baffle plate

3. DEVELOPMENT OF PROGRAM

Program : The program is designed for 212 holes.

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%
O010(FIXTUR BAFFLE-ALL HOLES-25-11-2014)
N4G0G17G40G49G80G90
S1650M3
G54
N8G0G90X103.998Y135.846
N10Z10.M8
N12G98G81Z-14.R2.F800.
N14Y108.134
N16Y80.422
N18Y52.71
N20Y24.998
N22Y-24.998
N24Y-52.71
N26Y-80.422
N28Y-108.134
N30Y-135.846
N32X95.998Y149.702
N34Y121.99
N36Y94.278
N38Y66.566
N40Y38.854
N42Y-38.854
N44Y-66.566
N46Y-94.278
N48Y-121.99
N50Y-149.702
N52X87.999Y163.558
N54Y135.846
N56Y108.134
N58Y80.422
N60Y52.71
N62Y24.998
N64Y-24.998
N66Y-52.71
N68Y-80.422
N70Y-108.134
N72Y-135.846
N74Y-163.558
N76X79.999Y177.414
N78Y149.702
N80Y121.99
N82Y94.278
N84Y66.566
N86Y38.854
N88Y-38.854
N90Y-66.566
N92Y-94.278
N94Y-121.99
N96Y-149.702
N98Y-177.414
N100X71.999Y163.558
N102Y135.846
N104Y108.134
N106Y80.422
N108Y52.71
N110Y24.998
N112Y-24.998
N114Y-52.71
N116Y-80.422
N118Y-108.134
N120Y-135.846
N122Y-163.558
N124X63.999Y177.414
N126Y149.702
N128Y121.99
N130Y94.278
N132Y66.566
N134Y38.854
N136Y-38.854
N138Y-66.566
N140Y-94.278
N142Y-121.99
N144Y-149.702
N146Y-177.414
N148X56.Y163.558
N150Y135.846
N152Y108.134
N154Y80.422
N156Y52.71
N158Y24.998
N160Y-24.998
N162Y-52.71
N164Y-80.422
N166Y-108.134
N168Y-135.846
N170Y-163.558
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N182Y38.854
N184Y-38.854
N186Y-66.566
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N188Y-94.278
N190Y-121.99
N192Y-149.702
N194Y-177.414
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N200Y135.846
N202Y108.134
N204Y80.422
N206Y52.71
N208Y24.998
N210Y-24.998
N212Y-52.71
N214Y-80.422
N216Y-108.134
N218Y-135.846
N220Y-163.558
N222Y-191.27
N224X-40.Y191.27
N226Y163.558
N228Y135.846
N230Y108.134
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N234Y52.71
N236Y24.998
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N240Y-52.71
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N258Y94.278
N260Y66.566
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N270Y-121.99
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N274Y-177.414
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N288Y-24.998
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N292Y-80.422
N294Y-108.134
N296Y-135.846
N298Y-163.558
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N304Y121.99
N306Y94.278
N308Y66.566
N310Y38.854
N312Y-38.854
N314Y-66.566
N316Y-94.278
N318Y-121.99
N320Y-149.702
N322Y-177.414
N324X-71.999Y163.558
N326Y135.846
N328Y108.134
N330Y80.422
N332Y52.71
N334Y24.998
N336Y-24.998
N338Y-52.71
N340Y-80.422
N342Y-108.134
N344Y-135.846
N346Y-163.558
N348X-79.999Y177.414
N350Y149.702
N352Y121.99
N354Y94.278
N356Y66.566
N358Y38.854
N360Y-38.854
N362Y-66.566
N364Y-94.278
N366Y-121.99
N368Y-149.702
N370Y-177.414
N372X-87.999Y163.558
N374Y135.846
N376Y108.134
N378Y80.422
N380Y52.71
N382Y24.998
N384Y-24.998
N386Y-52.71
N388Y-80.422
N390Y-108.134
N392Y-135.846
N394Y-163.558
N396X-95.998Y149.702
N398Y121.99
N400Y94.278
N402Y66.566
N404Y38.854
N406Y-38.854
N408Y-66.566
N410Y-94.278
N412Y-121.99
N414Y-149.702


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N416X-103.998Y135.846
N418Y108.134
N420Y80.422
N422Y52.71
N424Y24.998
N426Y-24.998
N428Y-52.71
N430Y-80.422
N432Y-108.134
N434Y-135.846
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N442G28Y0.
N444M30
%
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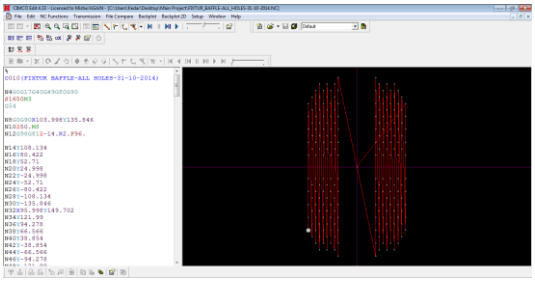
3. CIMCO SIMULATION



4. CONCLUSION

The time required for performing one operation is 5 hours. Previously the tool was brought from its home position(Z=0) to Z=50 and then operation was started. Then it was observed that if tool was brought to Z=10 then time was reduced by 18 minutes per piece. It could be inferred that significant time reduction could not be achieved considering that batch production was to be done. But had it been used for mass production, significant time reduction could be expected.

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BIOGRAPHIES

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