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Cost Analysis Of Tools Production For Shaft Fabrication Process Using Cam

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Abstract

Based on the PO from the customer, namely the manufacture of shafts using SS 316 material, so that the estimated price calculation for the shaft fabrication process is carried out. In order to complete the work, a design/drawing shaft is made according to the acceptance criteria from the customer by the engineering team. To find out the estimated cost of the fabrication process, it is necessary to calculate the fabrication cost. The method used is a tool path simulation using CAM ESPRIT 2017. The simulation process in the CAM ESPRIT 2017 application aims to determine the estimated time required for the shaft fabrication process. The machining parameters used are Sandvik tool and standard tool. After obtaining the simulation time, it can be calculated to estimate the required cost. To determine the number and cost of the required tool, the calculation of the tool life between the Sandvik tool and the standard tool is carried out.

Keywords : Chisel Path, Fabrication Cost, Chisel Cost, Tool Life

INTRODUCTION

A manufacturing company is a type of company that was founded with the aim of obtaining a defined profit and being able to maintain its survival. There are many ways that are used by the company's management in managing the company to achieve these goals, one of which is trying to make the right decisions. Manufacturing companies need to calculate production costs for a product before deciding to take on a job.

Production costs (Cost of Production) are costs that arise from a company's production process in making goods or services. Production costs are one of the factors that affect the size of the level of profit earned by the company. In calculating the fabrication costs, calculations are carried out starting from the material costs, production costs and the required chisel costs.

In accordance with the customer's PO (Purchase Order) that shaft fabrication will be carried out. This fabrication must obtain cost data in a systematic and detailed manner. Shafts will be fabricated according to engineering drawings using SS 316 material. Shaft fabrication is carried out using a DMG MORI NLX 3000 x 3000 CNC machine. To support CNC work time, it is necessary to calculate the number of chisels and the type of chisel to be used. The author proposes calculating costs by simulating time using ESPRIT CAM software and

calculating tool requirements based on tool life and comparing the benefits between using SANDVIK tools with standard tools. The results of this thesis are the number and type of chisels used, the cost of fabrication and the profits.

RESEARCH METHODOLOGY

This study uses a tool path simulation method and the calculation of tool life in order to determine the cost and time of the simulation. This study also compares the simulation using sandvik tool parameters and standard tools.

DATA PROCESSING

PO (Purchase Order)

Based on the PO from the customer, the price for the manufacture of the shaft is Rp. 150,000,000,-. Machine specifications

In completing the data for calculating production costs, we must first adjust the simulation from the ESPRIT 2017 software with the type of CNC lathe DMG MORI NLX 3000x3000 machine used and the area of use of the machine in order to find out the machine price, depreciation time, machine power and wages. the machine operator. In this study, researchers took a sample of the DMG MORI NLX 3000x3000 CNC Turning Machine at PT. X . The engine specifications are as follows:

Max. Turning diameter	**340 mm**
Max. Workpiecer lenght with tailstock	3123 mm
Max. Chuck size	305 mm
Max. Spindle motor speed	3000 rpm
Drive power rating (100% DC)	25 kW (AC)
Max. Bar capacity diameter	102 mm
Controler	CELOS/ MITSUBISHI

Material specification

The material used for the manufacture of the shaft is Stainless Steel 316 with a material length of 1450 mm and a diameter of 150 mm. The selection of 316 Stainless Steel material is carried out on the basis of a work contract that requires the use of this material.

Specifications of the chisel used

The tools used in the process of making this shaft are carbide inserts and carbide endmills. Carbide chisels have cutting speeds 3 to 5 times faster than HSS cutting speeds.

Carbide chisels have high hardness properties at various temperature levels, high thermal conductivity as well as high modulus and good wear resistance, so that cutting tools made of carbide are effective and efficient cutting tools.

CALCULATION

Process Cost Calculation Based on the Tool Used in Production

Based on the simulation results using ESPRIT 2017 software, the time required for all machining shaft processes using SANVIK chisels is 10 hours 36 minutes 2 seconds or about 636 minutes 2 seconds. After the simulation time is obtained, the initial preparations made to calculate production costs are as follows:

1. Material Cost (CM)

The price of 316 stainless steel in the market based on kilograms is around Rp. 200,000, -/Kg. The 316 stainless steel material used is 150 mm x 1450 mm with a weight of 204.99 kilograms. For material costs can be calculated using Equation 1 as follows.

CM = CMo + CMi (assume 10% CMo)
= (Price/gram x Weight of material) + (10% CMo)
= (Rp.200/gram x 204,990 gram) + (10% CMo)
= Rp. 40,998,000,- + (10% Rp. 40,998,000,-)
= Rp. 40.998.000,- + Rp. 4099,800,-
= Rp. 45,097,800,-

Rent a CNC Lathe Machine (Cf)
Cf = Rp. 5,000,000,000,-/(4 years x 365 days x 24 hours)
= Rp. 142,694,- /hour.

2. Engine Power Cost (Ci)
Ci nominal power of the engine x price per Kwh Ci
25Kwh x Rp. 1380,-
Ci Rp.34,500,□/hour

Total Machine Operating Cost (Cj)
Cj = Cf+Cd+Ci
= Rp. 142,694,- + IDR 26,250,- + IDR 34,500,-
= Rp. 203.444,- /hour
= Rp. 3.390,- /minute
Based on the production time obtained using the ESPRIT 2017 software, the production costs for each process can be calculated using Equation 6 as follows.

machining process

C = CM + (Cj x total machining time)
= Rp. 45,097,800,- + (Rp. 3,390,- /minute x 636.2 minutes)
= Rp. 45,097,800,- + Rp.2.156,718,- = Rp. 47,254,518,-

Based on Standard Chisel

Based on the simulation results using ESPRIT 2017 software, the time required for all machining shaft processes using standard chisels is 21 hours 23 minutes 46 seconds or about 1283 minutes 46 seconds. After the simulation time is obtained, the difference between using a SANDVIK tool and an ordinary tool is in the simulation time of the tool path.

Based on the simulation time obtained using the ESPRIT 2017 software, the production costs for each process can be calculated using Equation 6 as follows.

C = CM + (Cj x total machining time)
= Rp. 45,097,800,- + (Rp. 3,390,- /minute x 1283.8 minutes)
= Rp. 45,097,800,- + Rp.4,352,082,-
= Rp. 49,449,882,-

CONCLUSION

The simulation process in the ESPRIT 2017 CAM application aims to determine the estimated time required for the shaft fabrication process. The machining parameters used are

Sandvik tool and standard tool. After obtaining the simulation time, it can be calculated to estimate the required cost. To determine the number and cost of the required tool, the calculation of tool life between the Sandvik tool and the standard tool is carried out.

The PO value from the customer is Rp. 150,000,000,-. for the estimated time required to manufacture the shaft using a Sandvik chisel is 636 minutes 2 seconds at a cost of Rp. 51,769,306, - while the standard chisel is 1283 minutes 46 seconds at a cost of Rp. 53,776,328, - . The total profit obtained using the Sandvik chisel is Rp. 98,230,698,- while the standard chisel is Rp. 96,223,672,-

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