International Journal of Mechanical, Electrical and Civil Engineering
Volume.1 No.3 July 2024
e-ISSN: 3047-4531; p-ISSN: 3047-4523, Page: 38-44

Techniques In Dowel Pin Manufacturing With S45c Material For Quality Control

Abdul Rahman Agung Ramadhan
Gunadarma University

Sandy Suryady
Gunadarma University

Jl. Kenari III No. 33 Jakarta Pusat
Correspondence author: abdulrahman02@staff.gunadarma.ac.id

Abstract. The cylinder block is a housing of cylindrical tubes in which there is a cooling water channel. In these channels there is also the camshaft housing and the bearing seat tube, which is equipped with holes with various threads for attaching other parts that have to do with the cylinder block. One of the components to bind or connect the cylinder block is the Dowel Pin. The function of the Dowel Pin is to lock and close the connection between the engine block, cylinder block and head. Making Dowel Pins using S45C carbon steel material. S45C carbon steel is a medium steel with a carbon content of 0.48% already in rolled form. The process of making Dowel Pins includes, The cutting process is cutting from the initial length of 12 meters to 109 mm. The turning process is a machining process for the workpiece feeding process where the incision is made by rotating the workpiece, in this process a level lathe is carried out with a length of 109 mm and a width of 16 mm, 14 mm, 11 mm, and 7 mm. Drilling process where this process expands / enlarges the plate hole which can be done with a drill rod with a hole diameter of 4 mm. The grinding process is part of the finishing process used to remove parts of the workpiece that are uneven. And finally, Quality Control is done to check whether or not an item is produced.

Keywords: Cylinder Block, Dowel Pin, Manufacturing Process, S45C Material.

INTRODUCTION

The cylinder block is a housing for cylindrical tubes in which there are cooling water channels. Cooling water enters at the bottom of the cylinder tube, while at the top there is a hole for the cooling water channel that goes to the cylinder head to provide cooling. Apart from that, there are also oil channels which are useful for providing lubrication. In these channels there is also the camshaft housing and the bearing tube, which is equipped with holes with various threads to fasten other parts related to the cylinder block. One of the components for binding or connecting the cylinder block is Dowel Pin. Function Dowel Pin is as a locking and bridging connection between the engine block, cylinder block and head. And also functions as a lubricant flow protector from the oil pump in crankcase which will be streamed to head. The right material to use as a pump shaft is S45C steel. S45C steel is steel that has a carbon content of around 0.51% and is classified as medium carbon steel. S45C steel is a standardized product from Japan which is usually abbreviated as JIS (Japan Industrial Standart). S45C steel contains the main elements carbon (C), Sulfur (S), Manganese (Mn), Phosphorus (P), Iron (Fe). Making process Dowel Pin also includes the machining process for producing pump shafts from semi-finished materials, namely S45C steel, until they are ready for use. The machining process

Received May 28, 2024; Accepted June 10, 2024; Published July 31, 2024
* *Abdul Rahman Agung Ramadhan, abdulrahman02@staff.gunadarma.ac.id*

carried out to produce Dowel Pin with S45C material, among other things, the cutting process using a cutting saw machine, level lathe process, drilling process, Grinding. Therefore, the author considers writing scientific writing using material on the manufacturing process Dowel Pin.

LITERATURE REVIEW

Manufacturing is a branch of industry that operates equipment, machines and labor in a process medium to process raw materials, spare parts and other components to be produced into finished goods that have selling value. Manufacturing industrial activities often use machines, robots, computers and human power to produce goods or services and assembly, to produce a product and the manufacturing that I will discuss is manufacturing using a lathe. The lathe itself is a machine tool that is used to cut objects. played. The lathe itself is a process of cutting a workpiece in which the incision is made by rotating the workpiece and then applying it to a chisel which is moved translationally parallel to the rotational axis of the workpiece.

S45C is medium steel with a carbon content of 0.45%, already in rolled or normalized form. Available in round and flat axles. S45C has weldability and machinability, and can undergo various heat treatments based on the JIS G 4051-2009 standard. S45C carbon steel is similar to S45C, both in properties and applications, but differs in carbon content, namely 0.50%. For some customers in different areas will have different habits for S45C or S50C. S50C steel is available in plate form. In figure 2.6 there is a picture of S45C Steel. Material is something that is composed or made by materials. The definition of material is raw material processed by industrial companies, which can be obtained from local purchases, imports or processing carried out by yourself. From these definitions, it can be concluded that materials are materials that are used to make a product or finished goods that are more useful.

RESEARCH METHODS

This research is to simplify the manufacturing process Dowel Pin. Function Dowel Pin is as a locking and bridging connection between the engine block, cylinder block and head. And also functions as a lubricant flow protector from the oil pump in crankcase which will be streamed to head.

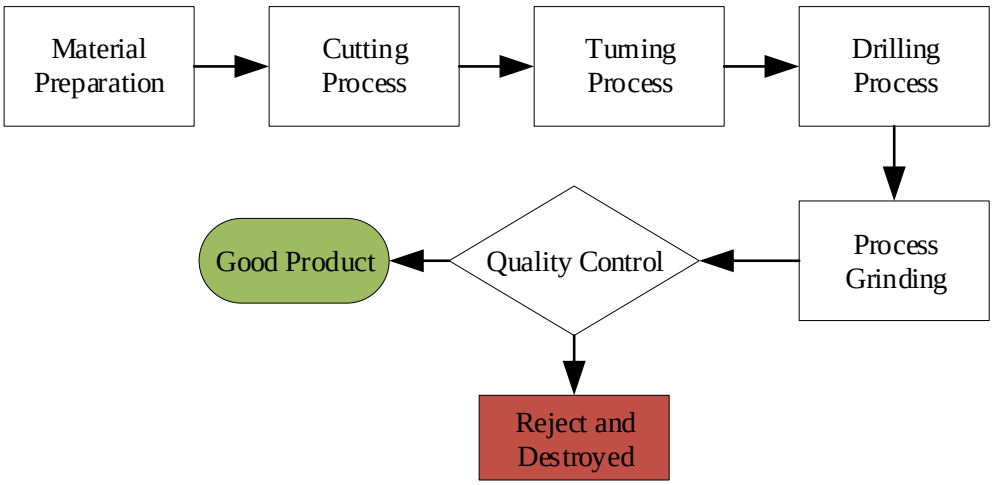

Figure 1. Flowchart Making process Dowel Pin

In the making Dowel Pin, working drawings are very necessary and play an important role in getting the best quality work results. The process of making Anchor Bolts uses several machines, namely lathes, machines drilling and grinding.

Process drilling or often called the drilling process, is the simplest machining process among other machining processes. Usually in a workshop or workshop This process is called the drilling process, although this term is actually less precise. The drilling process is intended as the process of making a round hole using a drill bit (twist drill). While the drilling process (boring) is the process of expanding/enlarging the hole which can be done with a drill rod (boring bar) which is not only done on a drill machine, but can also be done with a lathe, milling machine or drilling machine. The drilling process is used to make round holes. Making holes with a spiral drill in a solid workpiece is an abrasive process with great chipping power. If high precision (accuracy of size or surface quality) of the hole walls is required for the workpiece, further work with a sinker or drill is required. In the drilling process, furious (chips) must exit through the helix groove of the drill bit to the outside of the hole. The tip of the chisel sticks to the workpiece being cut, making the cooling process relatively difficult. The cooling process is usually carried out by dousing the drilled workpiece with coolant, spraying it with coolant, or inserting coolant through the hole in the center of the drill bit.

Process grinding is part of the finishing process which is used to remove uneven parts of the workpiece. This process is widely used in industry, because it can produce better surface quality and very close tolerances, and is very precise for component designs. During the surface grinding process, the grinding wheel rubs against the workpiece, causing an increase in temperature along the surface of the workpiece. The amount of heat generated predominantly

depends on the feed rate (feeding), feeding depth (depth of cut), engine speed (Revolutions per minute–Rpm), type of workpiece material being machined and water usage. These factors must be handled to avoid losses in production.

RESULTS AND DISCUSSION

Before carrying out the work process on the workpiece, first prepare the materials that will be used. In Figure 2, the semi-finished S45C material is cylindrical in shape (rolled) or normalized, as well as in table 1 are mechanical properties from S45C material.

Table 1. Mechanical Properties S45C

No	Item	Composition %
1	Carbon (C)	0,42 – 0,48
2	Silicon (Si)	0,15 – 0,35
3	Manganese (Mn)	0,6 – 0,9
4	Phosphorus (P)	0,03
5	Sulphur (S)	0,03
6	Chrom (Cr)	≤ 0,2
7	Nickel (Ni)	≤ 0,2
8	Tembaga (With)	≤ 0,3

S45C carbon steel is a medium quality steel with a carbon content of 0.42-0.48%, silicon 0.15 – 0.35%, manganese 0.6 – 0.9%, phosphorus 0.03%, sulfur 0.03% , maximum 0.2% chrome, maximum 0.2% nickel, and maximum 0.3% copper.

Figure 2. Material Casting S45C

Cutting Process

The cutting process is the initial process of work where the cutting uses a saw band saw. The working process of this band saw is to use an iron band or saw blade which rotates through two wheels as the axis and rotating medium. In the cutting process, the workpiece being cut is S45C steel. S45C steel material is cut from 12 m to 109 mm long.

Turning Process

Next is the turning process, where the lathe process itself is a machining process for the process of cutting a workpiece in which the incision is made by rotating the workpiece and then applying it to a chisel which is moved translationally parallel to the rotational axis of the workpiece. This turning process uses an iron lathe Bench Lathe Type CQ 6125. The lathe process for making anchor bolts uses a conventional lathe. In this process, the workpiece will be machined in a multi-level lathe.

Drilling Process

The next process is process Drilling where this process expands/enlarges the hole which can be done with a drilling bar (boring bar) used to make round holes. Process drilling This uses a drilling machine Drilling 32mm Westlake. The size of the hole to be made is 4 mm.

Figure 3. Drilling Machine

Process Grinding

The next process is the process Grinding that is part of the process finishing which is used to remove uneven parts of the workpiece. Where this process is used to smooth parts of the turning process. Grinding machines are more appropriate to use than other machines, because grinding machines are used for the final process (finishing). The smoothing process takes about 4 minutes.

Figure 3. Grinding machine

Quality Control

Quality is often used as a benchmark and differentiator for a product and service between one producer and another. Quality can be interpreted as the level of good or bad of a product produced and whether the product produced complies with predetermined specifications or conforms to needs. As for standards Quality Control What must be checked by the operator is during the manufacturing process Dowel Pin. The following if the workpiece can be said YES among others:

1. Check regularly visual all surfaces, whether rust, defects and burry.
2. Check size dowel pin whether it corresponds or not check sheet.

The things that must be considered if the workpiece is found to be NG include:

1. The NG part must be immediately separated
2. Parts identified as NG will immediately be rechecked to ensure NG or OK status

The NG parts will later be collected and then destroyed.

CONCLUSION

From the discussion of scientific writing that has been explained, conclusions can be drawn according to the topic in this scientific writing process Dowel Pin. These conclusions include:

1. On manufacture Dowel Pin This material uses S45C carbon steel. S45C carbon steel is medium steel with a carbon content of 0.42 - 0.48%, silicon 0.15 - 0.35%, manganese 0.6 - 0.9%, phosphorus 0.03%, sulfur 0.03%, maximum 0.2% chrome, maximum 0.2% nickel, and maximum 0.3% copper, and already in rolled form (rolled) or normalized. Available in round and flat axles. The S45C has welding capabilities and machinability.
2. Making process Dowel Pin First prepare the materials before carrying out work. Making Dowel Pin uses carbon steel material (S45C) where this material is included in the class Carbon Medium. The process of feeding the workpiece with carbon steel material where the workpiece is machined includes the cutting process, namely cutting from an initial length of 12 meters to 109 mm. After that, the turning process is a machining process for the process of feeding the workpiece in which the cuts are made by rotating the workpiece. In this process a level lathe is carried out with a length of 109 mm and a width of 16 mm, 14 mm, 11 mm and 7 mm. Process dshiver where this process expands/enlarges the plate hole which can be done with a drill rod with a hole diameter of 4 mm. Process grinding that is part of the process finishing which is used to remove uneven parts of the workpiece. And the last is Quality Control carried out to check whether or not an item is produced.

REFERENCES

Dedy Muklis, S. B. 2019. Causes of Cracks in the Generator Cylinder Liner on the Spob Mahakam Ship PT. Pertamina Trans Continental Jakarta. Papers.

Zarkasyi, A. 2022. TA: Development of Eco-Design Pouffe Chair Products by Utilizing Waste Tires for Cafe Otewe Surabaya (Doctoral dissertation, Dinamika University).

Ahmadi, Ali Soleh. 2018, GSK 928'TE CNC Machining Technique.

Advanced Machine Techniques. 2021. Material Formation Engineering Practical Module. Gunadarma University.

Roby, B. (2020). Operation and Maintenance of Lathe Machines at the PT Shipyard. Yasa Wahana Tirta Samudera Semarang. papers.

Mariadi, M. (2019). Lathe Machine Maintenance and Operation to Support Smooth Repairs AT KM. Covery PT. Indovitex Pontianak Shipping. Papers.

Hermawan, Y. 2012. The influence of spindle rotation, feed motion and depth of cut on spindle head vibrations resulting from the drilling process. ROTOR, 5(1), 18- 25.

Suroso, B., & Prayogi, D. 2019. The influence of spindle rotation speed and grinding depth on the surface roughness of St 37 steel material using a grinding lathe. Journal of Materials, Manufacturing and Energy Engineering, 2(1), 24-33.