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Part Processing of a Bracket Support Product use in Tractor

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Abstract - : In today's dynamic industrial landscape, the integration of live projects into educational curricula has emerged as a vital component in fostering innovation and driving growth. Industrial live projects serve as a bridge between academia and industry, offering students the opportunity to apply theoretical knowledge to real-world challenges. Through hands-on experience, participants gain insights into industry practices, technological advancements, and market dynamics. Moreover, engagement in industrial live projects facilitates collaborative learning, as students work closely with industry professionals, academic mentors, and peers.

***Key Words*:** Bracket Support, Part Processing, gauge, Fixture, Automobile.

1. INTRODUCTION

The bracket support lever shifter, commonly used in tractors, plays a critical role in the operation of these agricultural vehicles. This component is an essential part of the tractor's transmission system, allowing the operator to control the selection of gears and, by extension, the tractor's speed and power. The bracket support lever shifter is a pivotal interface between the tractor operator and the mechanical components responsible for changing gears, making it a key component in the efficient and productive use of the tractor. Gauges should be designed with ease of use in mind, allowing for efficient and accurate measurements. The design must also take into account the repeatability of measurements, ensuring that different operators obtain consistent results when using the gauges.

2. LITERATURE REVIEW

Josco Jose has presented a project that showcases the design of a machining fixture for the bracket support utilized in machining operations on a VTC (Vertical Turning Centre). [1].

Alagu Sundara Pandian, The coordinate measuring machine (CMM) is a device that employs a measuring probe to ascertain the coordinates of points on the surface of a workpiece. [2].

Po Wu, Based on the structural features of the car engine bracket, a finite element model is created. The functionality of the automobile engine bracket, as the link between the engine and the body, has a direct impact on the vehicle's comfort and safety [3].

Jigar Shah, Welding is a commonly utilized technique in the manufacturing industry,This research paper focuses on investigating the impact of welding parameters such as welding current, welding voltage, gas flow rate, wire feed rate, and more on important aspects like weld strength, ultimate tensile strength, hardness of weld joint, and weld pool geometry for different metal materials. [4].

Rishi Kumar Prajapati, This research paper focuses on studying the impact of various process parameters, including voltage, welding current, welding speed, gas flow rate, and gas pressure, on the mechanical properties of MIG welded joints of MS 1018 plates [5].

Chetan B. Vyavahare, This study examines how welding current, welding voltage, feed rate, gas flow rate, and other parameters impact factors such as weld strength and weld pool geometry of medium carbon steel using Taguchi's Design of Experiments (DOE) method [6].

D.Mavrikios, The manufacturing education is tackling significant challenges to prepare the workforce for the Factories of the Future. This paper presents a framework for delivering industrial learning and training to meet the requirements of future factory workers. [7].

Hiroshi Watanabe, This report was created in response to a request from the U.S. Army Natick Research, Development and Engineering Center. [8].

Rahul Wagh, Study aims to analyze the current state of Indian agriculture, identify the challenges faced by farmers, agro-industries, and governments in the development of agriculture in challenging and uncontrollable environments. [9].

M. Rizal, The cutting force holds immense importance in various aspects of machining processes, such as optimizing cutting parameters and tool geometry, designing machine tools, conducting machinability tests on new materials, and monitoring tool conditions. [10].

3. PART PROCESSING

3.1 CONTROL PLAN

A control plan is a document that outlines the methods and processes used to control the quality of products. It is a vital part of the quality process and is updated as processes improve. Control plans are used in the industrial part manufacturing industry to ensure that products meet quality standards, customer requirements, and safety regulations.

3.1 Precision Manufacturing: Part processing is at the heart of manufacturing the bracket support side shifter lever, and it involves a series of precision machining and fabrication operations. These processes are essential for transforming raw materials into the final, functional component.

3.2 Material Selection: The choice of materials for the lever is a fundamental decision in the part processing design. Typically, high-strength steel or durable alloys are used to withstand the mechanical stresses and wear and tear that the lever may encounter in tractor operation.

3.3 Laser cut Machining:

Laser cutting is a widely utilized technique in the metalworking sector for shaping metal according to specific requirements. Lasers find extensive applications in various domains, including the cutting of metal plates. When it comes to mild steel, stainless steel, and aluminum plates, laser cutting offers exceptional precision, ensuring excellent cut quality with minimal kerf width and heat affect zone. Moreover, this process enables the fabrication of intricate shapes and the creation of small holes with utmost ease.

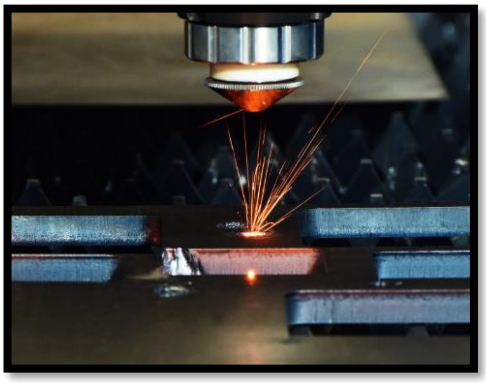


Fig3.1 Laser Cutting

3.4 CNC Machine

A CNC machine, also referred to as a Computerized Numerical Control machine, is a highly advanced piece of equipment that is computer-operated. CNC machines are widely used in the manufacturing industry due to their ability to speed up part production, reduce waste, and eliminate the risk of human errors. In the case of a CNC laser cutter, the cutting head moves across the metal plate in the shape of the desired part, effectively cutting it out. A capacitive height control system is in place to maintain a precise distance between the nozzle's end and the plate being cut. This distance is crucial as it determines the focal point's position relative to the plate's surface, impacting the quality of the cut based on the focal point's height adjustment.

3.5 First part Inspection

Inspection is the initial phase where the very first part produced in a production run, as shown in figure 3.2, is thoroughly inspected to ensure it meets all design specifications. This part serves as a standard for subsequent parts. Throughout the production process, regular inspections are conducted on the parts at different machining stages to guarantee consistent quality.

Fig.3.2 Part (a).Child part Fig.3.2 Part (b).Larger part

3.6 Receiving Inspection

Receiving inspection, also referred to as incoming inspection or quality control, is a procedure that assesses the quality of materials, components, or parts prior to their utilization in the manufacturing process.

3.7 Welding Processes

Welding, on the other hand, is a simple technique for connecting two metal pieces. Although there are alternative methods for joining metal, such as riveting, brazing, and soldering, welding has emerged as the preferred method due to its strength, efficiency, and versatility. There exists a wide range of welding methods, some of which involve the application of heat to effectively fuse two metal pieces together, often incorporating a "filler metal" to serve as a binding agent in the joint. Other methods rely on pressure to unite metal, while certain techniques utilize a combination of both heat and pressure.

Metal inert gas (MIG) welding is a type of arc welding process that uses gas and heat to join two pieces of metal.

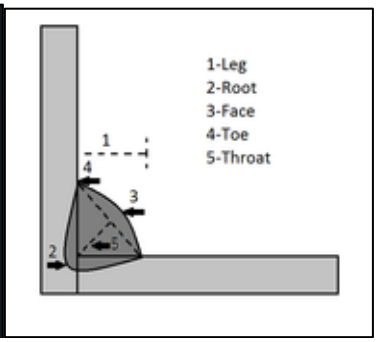


Fig.3.3 Welding Machine Fig 3.4 Modal Weld Stimulation

3.9 Part Fixing

The fixture in the simplest form possible to facilitate easy operation, as well as quick and effortless clamping and de-clamping of the parts as shown in fig3.5.

Fig.3.5 Fixed part

3.10 Cleaning Weld Spatter

Weld spatter can be removed using mechanical methods like grinding, sanding, blasting, or scraping.

Use a chipping hammer: A chipping hammer can remove small amounts of spatter quickly without damaging the base metal.

Use a surface grinder: A surface grinder can clean the surface of the weld.

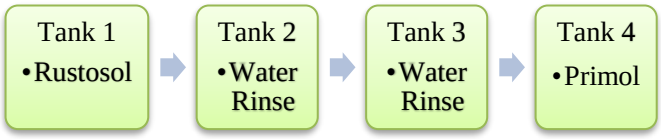
Use a wire brush: A wire brush can remove dirt, oil, and rust on each side of the weld.

After cleaning weld spatters fig.3.6 shows cleaned parts.

Fig.3.6 Parts

3.11 Deeping Process of Tanks

Deeping flow chart



(Tank 1) Rustosol (Antirust oil)

RUSTOSOL is used for removing heavy scale and pitted rust from ferrous surface. This process use for mounting a layer on Component. Time Duration 15-30 min Bath in solution.

(Tank 2) & (Tank 3) Water Rinse

It is use for removal of previous oil or chemical from the surface of part.

In (Tank 2) Almost 50% Cleaning is done. PH 2-7.

In (Tank 3) 99% Cleaning is done. PH 5-7.

(Tank 4) Primer Preparation

A linseed oil-based primer that can be used on raw timber surfaces. It helps regulate moisture entering and leaving the timber to minimize cracking. It also provides an excellent basecoat for finishing with oil or acrylic top coats.

Stoving Thinner: Stoving thinner consists of a combination of mixed solvents that are utilized to decrease the viscosity of stoving paints. It can also be used to formulate heat curing alkyd/amino resin based products.

3.12 Painting Surface Finish and Protection

The processing design should specify the type of surface finish, such as painting, to protect the lever from corrosion and environmental factors. This ensures the lever's longevity and visual appeal.

3.13 Baking

Baking paint in an oven can make it dry faster and create a durable, chip-resistant coating. Many craft projects, like beads, use enamel paint that's specifically made for baking. Mechanical behavior of the heat-treated welds reveals an increase in maximum cross-tension strength, displacement and subsequently energy absorption capability when 30-40 Micron (140º-150ºC) 20 min a bake thermal cycle is applied after welding.

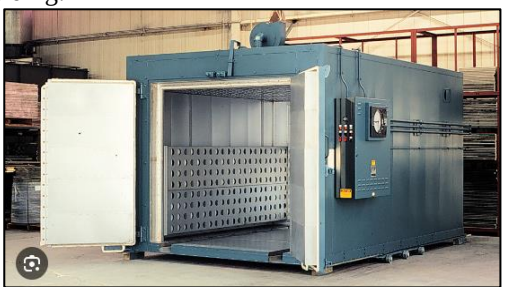


Fig 3.7 Oven OV|200|01

Installing an Industrial Paint Curing Oven in a manufacturing facility accelerates the paint drying process, enhances product quality, increases product longevity, reduces painting costs, and results in a dust-free product.

3.14 Final Part

The design of part processing for the bracket support side shifter lever is a multifaceted process that involves defining the materials, manufacturing methods and quality control procedures necessary to produce a reliable and high-quality tractor component. An effective part processing design ensures that the lever meets design specifications, performs its intended function, and meets safety and quality standards in the agricultural and land management sectors.

Fig 7.4 Part of Bracket support

8.15 Quality Control and Inspection:

The part processing design should incorporate quality control steps, such as in-process inspections and final inspections, to verify that each bracket support meets design specifications and quality standards. This includes dimensional checks and visual inspections.

4. CONCLUSION

The Bracket support side Shift lever product has been effectively manufactured using fixture and gauge designing. Following this, the product was manufactured through Control Plan. Quality control and inspection were conducted to ensure the successful development of the product for mass production.

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