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DESIGN AND MANUFACTURE OF SEAT GRINDING BENCH

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Abstract
The working principle of grinding is a grinding stone rotates in contact with the workpiece so that erosion, sharpening, grinding, or cutting. The shape and size of the base material will certainly not correspond to the shape and dimensions of a machine component.
On the purchase of a grinding seat, is not included as a complementary tool holder or frame grinding sitting, therefore grinding sitting placed on the floor. It is very uncomfortable in the use of grinding to sit. Therefore, it is necessary to have a tool or a place to put the grinding seated. Tools or place holder for grinding is expected to create more comfortable when sitting grinding process use.
Making bench grinder can be done with a series of processes, ie material cutting, making holes, grinding and welding. The strength of the bench grinder that has been made is 29821.26 N so that it can be said that has created a bench grinder is able to sustain grinding.

Keywords: *grinding, erosion, sharpening, grinding, cutting.*

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Introduction

The ability to sharpen cutting tools by sharpening them with sand or stone has been discovered by primitive humans since several centuries ago. Scrapers were used to make grinding stones for the first time in the Iron Age, and they were later made better for the sharpening process.

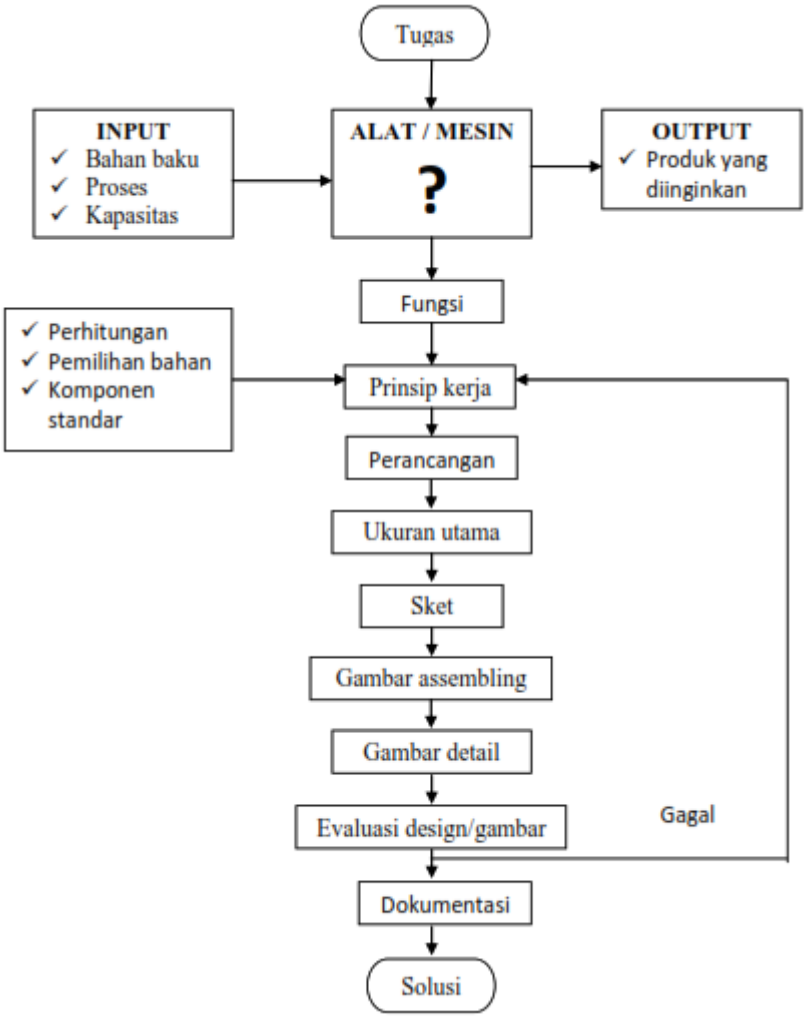
In the early 1900s, grinding experienced rapid development along with the human ability to make abrasive grains such as silicon carbide and aluminum carbide. Subsequently developed a more effective sharpening machine called the Grinding Machine, this machine can scrape metal surfaces quickly and has a high degree of accuracy according to the desired shape.

When purchasing a seated grinder, complementary tools such as a seat or a seated grinding wheel are not included, so the seated grinder is placed on the floor. It is very inconvenient to use a seated grinder.

Therefore, it is necessary to have a tool or place to put the grinding wheel. The tool or holder for the grinding wheel is expected to make it more comfortable when using the sitting grinder.

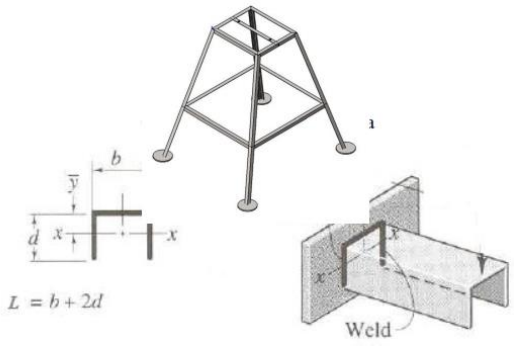
Research methods

The planning flow chart in the structured design method can be seen in Figure 3.1



Results and Discussion

In the manufacture of this frame, the welding uses electric arc welding (SMAW) with electrodes of type E6013 JIS Z 3211. And there are several welding connections used. In calculating the strength of the welded connection, what is calculated is the part of the lower frame where the electric motor and reducer is stored and the base where the measuring instrument is stored that receives the most load..



Strength of transverse fillet welded joint

Transverse fillet welded joints are designed for tensile strength consider a double fillet welded transverse joint. From Figure 4.3 the schematic and dimensions of the welded joint can be seen to determine the strength of a joint, it is assumed that the fillet portion of a triangle ABC with the hypotensus angle AC is equal to the sum of the angles AB and AC.

The length of each side is also called the leg or weld size and the perpendicular distance from the hypotenuse from the intersection of the legs (line BD) is also called the throat thickness. The minimum known welding area is the throat bd, which is the result of neck thickness and weld length.

Schematics and dimensions of welded joint sections can be seen to determine the strength of a joint, assuming the fillet portion of a triangle ABC with the hypotensus angle AC equal to the sum of the angles AB and AC. The length of each side is also called the leg or weld size and the perpendicular distance from the hypotenuse comes from the intersection of the legs

(BD line) is also known as throat thikness. The minimum known welding area is the throat bd, which is the result of neck thickness and weld length.

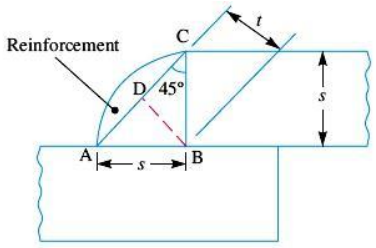


Figure 4.2 Schematic and dimensions of welded joints

Knownt = 5 mm

L = 50.

Minimum welding area or neck area 17,78 cm2

Tensile strength of single fillet joint 3733,8 kg/cm

Bearing Load on Welded Joints

The welding carried out is a parallel fillet weld joint.

P = σ . A

Dik: s = 5 mm

b = 65 mm

d = 40 mm

First we find the thickness of the weld from the equation (2.4) :

a = s . sin 45°

= 5 mm . sin 45°

= 3,535 mm

So that the area of the weld can be found from the equation (2.5) :

A = L .a

= 400 mm 3,535 mm

= 1414 mm²

Allowable stress for steel ST 37 is = 37 N/mm²

Meanwhile, to find the allowable stresses for the weld ridges, because the angle formed by the weld shear force is 0° :

$$\sigma_\alpha = 37\ \text{N/mm}^2 \times \frac{1}{\sqrt{Sin^2 0° + 3\,Cos^2 0°}}$$

$$= 37\ \text{N/mm}^2 \times 0{,}57$$

$$= 21{,}09\ \text{N/mm}^2$$

After obtaining the cross-sectional area of the weld and the allowable stresses of the weld ridges, input them into the equation:

= . A

= 21,09 N/mm² × 1414 mm²

= 29821,26 N

So this weld joint is declared safe to support a grinding machine of 29821,26 N.

Stress Occurs In The Welding Area

Welding used angle welding and the stress that occurs is shear stress

$$\tau_g = \frac{F}{A} (\text{N/mm}^2)$$

$$\tau_g = \frac{34\ N}{1414\ \text{mm}^2}$$

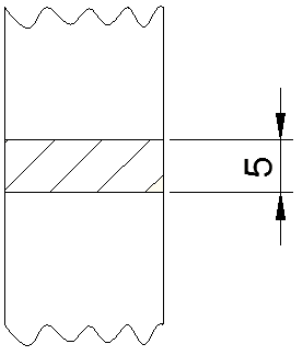
$$\tau_g = 0{,}024\ \text{N/mm}^2$$

Each weld that is outside has a stress of 0.024 N/mm², and the maximum shear stress from the type of electrode used is 21.09 N/mm². So that The stress that occurs has met the requirements of 0.024 N/mm² < 21.09 N/mm².

Making Product

Frame making

- Perform sawing steel profiles with dimensions according to working drawings.
- Make a 45 angle at the end of the sawed steel profile to be joined.
- Make holes for connecting bolts with a diameter according to the working drawings with a drilling machine.
- Connecting sawn profiles with spot welding.
- Setting the level and angle of connection by using a spirit level and angle.
- Perform final welding with two sides, namely from outside and inside.
- Smooth the welding results with hand grinding.
- Combination of front, middle and rear frames.
- Finishing with putty and painting.



Hole making

- Hole making Ø 5 mm

Known :

v = 30 m/menit

d = 5 mm

z = 2 mata potong

a = 15 mm

π = 3,14

- **Rotating Speed**

$$n = \frac{V \times 1000}{D \times \pi} rpm \text{ dari persamaan(2-1).}$$

$$n = \frac{30 \times 1000}{5 \times 3,14}$$

$$n = \frac{30.000}{15,7}$$

$$n = 1910,83 \text{ rpm}$$

- **Feeding Speed**

$$f = 0,084\sqrt[3]{d} \text{ mm/r}$$

$$f = 0,084\sqrt[3]{5} \text{ mm/r}$$

$$f = 0,084 \, . \, 1,70$$

$$f = 0,1425 \text{ mm/r}$$

$$v_f = f \times (n.z)$$

$$v_f = 0,1425 \times (1910,83 \, .2)$$

$$v_f = 0,1425 \times 3821,66$$

$$v_f = 544,59 \text{ mm/min}$$

- **Drilling Time**

$$t_c = \frac{lt}{Vf}(min) \text{ dari persamaan (2-3).}$$

$$t_c = \frac{15\ mm}{544,59\ mm/min}$$

$$t_c = 0,0275 \text{ min}$$

- **Speed earning furious**

$$Z = \frac{\pi \, .d^2}{4} \ \frac{v_f}{1000} \text{ dari persamaan (2-4).}$$

$$Z = \frac{3,14 \, .5^2}{4} \ \frac{544,59}{1000}$$

$$Z = 10,69\ mm^3/min$$

$$Z = 0,011\ cm^3/min$$

Conclusion

From the results of the design and manufacture of the grinding bench, there are several conclusions that can be drawn. Among them:

1. Making a grinding bench can be done in several series of processes. Namely cutting materials, making holes, grinding and welding.
2. The strength of the grinding bench that has been made is 29821.26 N so that it can be said that the grinding bench that has been made is able to support the grinder

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