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MANUFACTURING THE SIDE FRAME ZX – 200 5G

Andika Wishnu[1], Abdul Muchlis[2], Sandy Suryady[3]
[1,2,3]Mechanical Engineering, Gunadarma University, Indonesia

Abstract: *An excavator is one of the heavy equipment used to move materials from one place to another. An excavator consists of several parts, one of which is the side frame. The side frame is the lower part of the excavator that functions to bear the load, provide direction, support the unit, and serve as the driving component of the heavy equipment. The data collection method involved consulting reference books, conducting direct observations, and performing interviews. The side frame uses SS400 material, which is low-carbon steel with a carbon content of up to 0.17% (max) and falls under ASTM (American Society for Testing and Materials) A36 or JIS (Japanese Industrial Standards) G3101 standards. SS400 steel can only be hardened through surface hardening processes such as carburizing. In the manufacturing process of the ZX-200 5G side frame, the first step involves tack welding the idler bracket and motor bracket using 322 amperes and a voltage of 29–36 V. This is followed by full welding of the idler and motor brackets, which takes approximately 42 minutes. The process continues with the full welding of the idler and motor brackets with the center body, using 275–300 amperes and a voltage of 33–35 V. Finally, the process concludes with the creation of the centerline and a visual welding inspection.*

KeyWords: Material SS400, Welding, Side Frame

INTRODUCTION

Technology in the industrial sector is increasingly developing rapidly, triggering competition between manufacturing industrial companies. Heavy equipment transportation is an important part of the construction industry. There are various types of heavy equipment used in the construction industry, such as *excavator*, bulldozers, tractors, forklifts, graders, and so on. *Excavator* is a piece of heavy equipment used to move material from one place to another. Judging from its structure, *excavator* consists of three parts, namely: *upperstructure* (upper structure), *front attachment* (the front), And *undercarriage* (*side frame*) [1].

Undercarriage (side frame) is the bottom *excavator* which functions to hold the load, direct, support the unit and act as a driver for heavy equipment. *Undercarriage (side frame)* in direct contact with the ground until. *Undercarriage (side frame)* can maintain the stability of the heavy equipment unit. System *Undercarriage (side frame)* can function well if well-scheduled maintenance is carried out during the operational process[2]. Making process *undercarriage* must also be paid close attention. One of the production processes on *undercarriage* namely polishing.

The (*welding*) is a way to connect solid objects by melting them through heating. For a successful connection, several requirements must be met, such as that the solid object can be melted by heat. Welding has several types such as carbon steel welding (*Shielded Metal Arc Welding*/ SMAW), *gas metal arc welding* (GMAW)/MIG *welding*, gas tungsten arc *welding* (GTAW)/TIG *welding* [3].

PT. OHGISHI INDONESIA has extensive experience in the heavy equipment field. The products that will be discussed are *side frame* Because *side frame* is one of the important components in *excavator*. This writing was carried out to describe the manufacturing process *SIDE FRAME ZX – 200 5G* with SS400 material.

The research objectives are: first, to know the manufacturing process *Side Frame* ZX – 200 5G at PT. OHGISHI INDONESIA. Second, understand and know the materials chosen in manufacturing *Side Frame*.

METHODS AND MATERIALS

Workflow Manufacturing *Side frame* ZX – 200 5G

This flowchart illustrates the workflow process for material preparation, welding, assembly, and quality inspection to ensure the proper completion of the task.

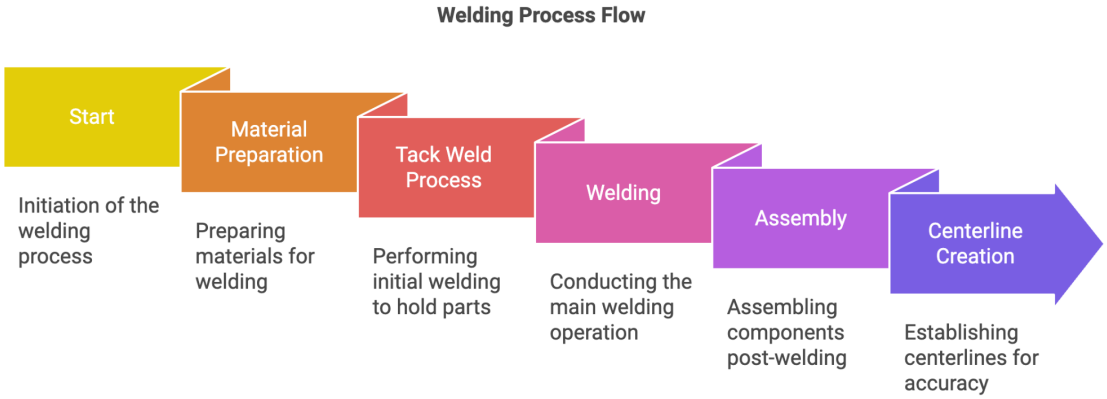


Figure 1. Workflow Manufacturing *Side frame* ZX – 200 5G

Welding

Making process *side frame ZX – 500 G,* this uses the GMAW (Gas metal arc welding) welding method. GMAW welding has two types of protective gas, namely inert gas and active gas, which is often known as MIG welding (*metal inert gas*) and MAG welding (*active metal gas*). In GMAW this protection is in the form of gas. The gas in question can be inert or active. Thus, because no flux is used, there are no cracks in the welding results. The GMAW process is often used to weld carbon steel and is also very good for welding stainless steel and welding other metals whose affinity for oxygen is very large, such as aluminum (Al) and titanium (Ti). [4].

Material

This time it's for manufacturing *side frame ZX – 200 5G* using JIS G 3101 / SS400 steel material. SS400 steel is a structural hot rolled steel in sheet plate form for general structural applications. SS400 is a material class and designation specified in the JIS G 3101 standard. JIS G 3101 is a Japanese material standard for hot-rolled steel plate, sheet, strip for general structural use. In this material, SS400 Steel is classified as low alloy steel because its alloy composition is less than 8%. The following is table 1 *mechanical properties* from SS400 steel.

Table 1. Mechanical properties SS400 steel[5]

Grade	C	And	Mn	P	S
SS400/HE G3101	0.1786%	0.149%	0.298%	0.0127%	0.0045%

DISCUSSION

Thanks Weld* Slab *Idler bracket

This stage is a process *thanks weld* slab *idler bracket.* At this stage the idlet bracket is placed on the jig according to the jig holder. After *idler bracket* Once the jig is in place, the jig is tightened to carry out the process *Thanks weld*. The following picture 2 is the installation *idler bracket* on jigs.

Figure 2. Installation *idler bracket* on jigs

Process *tack welding* using the GMAW welding type with the machine used, namely a robot *control unit* kobelco AB500 and assisted by KM-58Z welding wire with a diameter of 1.2 mm, an amperage of 322 watts and a voltage of 29 – 36 V. In this process the time required from setting the component to completion takes ± 18 minutes for the right and left *idler bracket* with a welding thickness of 7 mm. The following figure 3 is the result of the process *thanks weld* on the slab *idler bracket*.

Figure 3. Results *thanks weld* slab *idler bracket*

Thanks Weld* Slab *Motor bracket

In this process, 5 iron components are set using a jig. Before carrying out the process *thanks weld* All materials are prepared in advance to be lifted onto the jig. The following figure 4 is a component of *motor bracket*.

Figure 4. Component *motor bracket*

Once all the components are on the jig, tighten the jig lock so that none of the components move. After setting with the jig, the components are installed *thanks weld* with a KR II 500 welding machine. The following figure 3.8 is the jig used for the process *thanks weld motor bracket.*

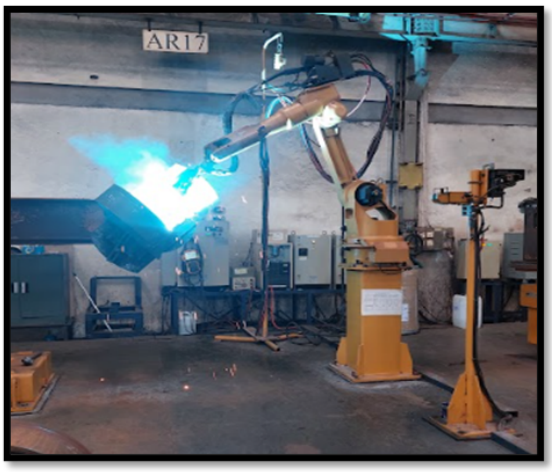
Figure 5. Jig used for the process *thanks weld motor bracket*

And the following figure 3.9 is the result *tack welding* on *motor bracket*.

Figure 6. Results *thanks weld motor bracket*

Process *Full Weld Idler Bracket*

Idler bracket which is already in *thanks weld* Leave it for 3-5 minutes to cool after that *idler bracket* immediately fully welded so that it becomes one complete unit. This process takes time for the right and left parts, namely 17 minutes for a weld thickness of 20 mm and a welding area length of 438 mm, a welding width of 50 mm for each part. The machine used is a robot *control unit* kobelco AB500 and assisted with KM-58Z welding wire with a diameter of 1.2 mm where the amperage used is 343 A and the voltage used is 33.9 V. The following is picture 7 of the full welding process on *idler bracket* and figure 8 is the result of full welding on *idler bracket*.



Gambar 7. proses pengelasan penuh pada idler bracket

Gambar 8. Hasil *full weld idler bracket*

Process *Full* The *Motor bracket*

At this level *motor bracket* which is already in *thanks weld* will be immediately fully welded so that it becomes a complete unit. This welding uses the GMAW welding type where the amperage used is 250 - 350 A and the voltage used is 33.9 V. This process takes time for the right and left parts, namely 25 minutes for a weld thickness of 20 mm, length of the welding area 438 mm and width 50 mm in each part.

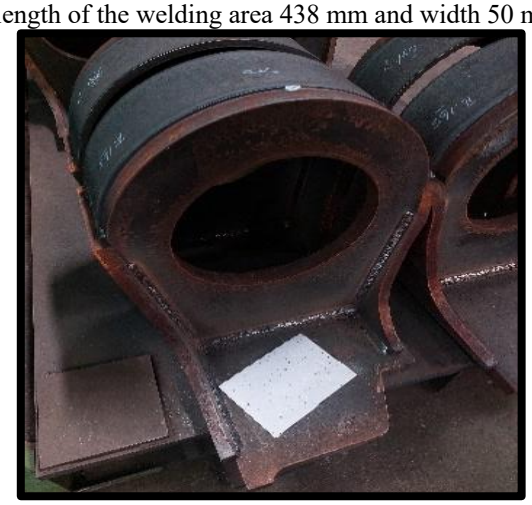


Figure 10. The result of the full welding process *motor bracket*

Process *Assembly*

Assembling is a process of mechanically connecting or combining two or more components into a unit. In this case in the production process *side frame ZX – 200 5G, idler bracket* And *motor bracket* If full welding has been carried out, the connection process will immediately be carried out to the frame body using welding.

***Tack Weld Idler* And *Motor bracket* With *Body/Frame* Middle**

The first step, the body frame is lifted using a crane and then placed on the jig, after that tighten the jig so that the body frame does not shift when welding. After that, install it *idler bracket* And *motor bracket* on the body frame that was previously attached, then tighten the jig that is attached to it *idler bracket* And *motor bracket*, after that is done This welding process uses the GMAW welding type with a KRII 500 welding machine using 275 – 300 *ampere* with a voltage of 33 – 35 V. The following figure 11 is the installation of the idler and *motor bracket* on jigs.

Figure 11. idler assembly and *motor bracket* on jigs

And the following image 12 is the result *Thanks weld* Idler and *Motor bracket* With body frame.

Figure 12. Results *Tack weld Idler* and Motorbikes *bracket* With Middle Frame

Process *Full* The *Idler* And *Motor bracket Body/Frame* Middle

Welding process *full Idler* And *Motor bracket Body/Frame* Middle. This process uses amperes 275 - 300 A, voltage 33 - 35 V, and uses a welding wire diameter of 1.2 mm. The weld thickness at this stage is 7mm. The following picture 13 is the process *full welding* on *idler bracket, motor bracket* And *body frame.*

Figure 13. Process *full welding Idler* And *Motor bracket Body frame*

Figure 14 shows the outcome of the full welding process applied to the idler and motor bracket body frame. The image highlights the structural integrity and precision of the welding, which ensures the durability and functionality of the component within the assembly process.

Figure 14. Result of *full welding* idler and *motor bracket body frame*

Manufacturing *Center line*

Position 1 is the manufacturing position *center line* where the measurement is carried out from *bottom* (bottom) *side frame.* The first stage is raising *side frame* to JIG then setting *side frame* to average or level 0. Size *center line* This position 1 pad is 154.5 mm measured from *bottom* (bottom). So position 2 is decisive *spot facing* on *motor bracket.* The stage in this process is to continue from stage 1. Size *spot facing* on the process *center line* it is 119 mm.

Visual Check of Welds

Visual tests are carried out to ensure that there are no welding defects and cracks produced during welding. If welding defects occur or there are cracks during checking, then *side frame* will be repaired again by re-welding or grinding to remove the welding defects. The following is picture 15 *side frame* which needs to be repaired.

Figure 15. *Side frame* which needs to be repaired

And here is image 16 *side frame* which has been repaired

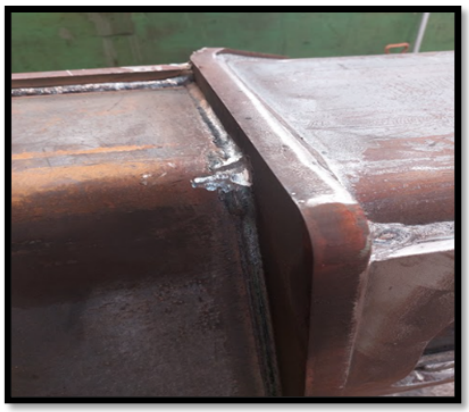


Figure 16. *Side frame* which has been repaired

Finished

At the end of the production process *side frame ZX – 200 5G* This will be sent to PT. HITACHI for further processing. The following is Figure 17 *side frame ZX – 200 5G* which has passed the visual weld inspection.

Figure 17. *Side frame* ZX – 200 5G

CONCLUSION

Based on the results of this practical work and scientific writing, the conclusions obtained are first, on the manufacturing process *Side Frame ZX- 200 5G* there are several processes. Starting from the process *tack welding* idler *bracket* which takes ± 18 minutes for right and left, *tack welding* motor *bracket,* And *tack welding* idler and motor *bracket* with *body / frame* middle. Then continue the process *full* las idler *bracket* with a weld thickness of 20mm and a width of 50mm and takes ± 17 minutes for each part, then the process *full* the engines *bracket* takes 25 minutes for the right and left parts for a weld thickness of 20 mm and a width of 50 mm for each part, then the process *full* the idler and motor *bracket* with *body / frame* middle. Then the manufacturing process continues *center line.* And ended by the process *quality control.* Second, the material used is SS 400 steel, which is a type of steel that is classified as low alloy steel because its alloy composition is less than 8% with a composition of carbon (C) of 0.17%, manganese (Mn) 1.4%, phosphorus (P) 0.045%, and sulfur (S) 0.045%. This steel has a weakness, namely that it often wears out. Usually this steel is applied in bridge construction, plates on ships, and also oil tanks. Where the surface hardness can reach 500 Brinnel (approximately 50 HRC) at a surface depth of 10 to 20 microns depending on the process parameters.

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