CHAPTER 6

MANUAL INSTRUCTION

This manual instruction explains the component unit, the list of specifications and the operating procedure of spin casting machine.

6.1. Component Unit of Spin Casting Machine

Figure 6.1. Spin Casting Machine (View 1)
Figure 6.2. Spin Casting Machine (View 2)

Components Unit of Spin Casting Machine:

1. **Funnel Presser**
   Entrance of molten metal and press Cover Plate

2. **Handle**
   Open Top Enclosure

3. **Left Latch**
   Lock Top Enclosure to top part of the machine, give pressure on Cover Plate

4. **Thermocouple MCB**
   Cut short circuit current happens in Thermocouple

5. **Electrical Motor MCB**
   Produce rotation force
6. **Thermocouple Switch**  
   Flow electric current to Thermocouple

7. **Electrical Motor Switch**  
   Flow electric current to Electrical Motor

8. **Thermocouple**  
   Manage stability temperature of Heating Element

9. **Voltage Regulator Socket**  
   Connect current in/out from Voltage Regulator

10. **Spin Casting Machine Plug**  
    Connect current in/out from Spin Casting Machine

11. **Voltage Regulator Plug**  
    Connect current in/out from Voltage Regulator

12. **Top Enclosure**  
    Top cover of Spin Casting Machine

13. **Cover Plate**  
    Prevent upward movement of silicone rubber

14. **Side Plate**  
    Keep silicone rubber mold from shifting movement

15. **Head Casting**  
    Housing for silicone rubber mold

16. **Right Latch**  
    Lock Top Enclosure top part of the machine, give pressure on Cover Plate

17. **Spin Casting Machine Socket**  
    Connect current in/out from spin casting machine

18. **Electrical Motor Plug**  
    Connect current in/out from Electrical motor

19. **Voltage Regulator**  
    Manage voltage in order to change speed
6.2. The List of Specification of Spin Casting Machine

Table 6.1. Specification of Spin Casting Machine

<table>
<thead>
<tr>
<th>PHYSICAL SPECIFICATION</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension</td>
<td>500mm x 600mm x 862mm</td>
</tr>
<tr>
<td>Weight</td>
<td>80 kg</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>1400 RPM</td>
</tr>
<tr>
<td>Operating speed</td>
<td>460 RPM</td>
</tr>
<tr>
<td>Maximum dimension of silicone rubber mold</td>
<td>Ø300mm x 40mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POWER SUPPLY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>220V AC, 50/60Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>373 Watt</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRICE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spin Casting Machine</td>
<td>Rp. 10,000,000</td>
</tr>
</tbody>
</table>

6.3. The Operating Procedure of Spin Casting Machine

**STEP 1: Prepare Tools and Material**
1. Molten metal
2. Silicone Rubber Mold
3. Ladle

**STEP 2: Unlock Left Latch**

Figure 6.3. Unlock Left Latch
STEP 3: Unlock right Latch

Figure 6.4. Unlock Right Latch

STEP 3: Open Top Enclosure by lifting Handle

Figure 6.5. Open Top Enclosure

STEP 3: Remove Cover Plate

Figure 6.6. Remove Cover Plate
STEP 4: Load Silicone Rubber Mold

Figure 6.7. Load Silicone Rubber Mold

STEP 5: Put Cover Plate back to close Head Casting

Figure 6.8. Close Head Casting Using Cover Plate

STEP 6: Close Top Enclosure

Figure 6.9. Close Top Enclosure
STEP 7: Lock Right and Left Latch

![Figure 6.10. Lock Right and Left Latch](image)

STEP 8: Put Electrical Motor Plug to Voltage Regulator Socket

![Figure 6.11. Put Electrical Motor Plug to Voltage Regulator Socket](image)
STEP 9: Put Voltage Regulator Plug to Spin Casting Machine Socket

Figure 6.12. Put Voltage Regulator Plug to Spin Casting Machine Socket

STEP 10: Put Spin Casting Machine Plug to the socket

Figure 6.13. Put Spin Casting Machine Plug to the socket
STEP 11: Switch “ON” Thermocouple MCB and Electrical Motor MCB

Figure 6.14. Switch “ON” Thermocouple MCB and Electrical Motor MCB

STEP 12: Set the temperature of Thermocouple

Figure 6.15. Set the temperature of Thermocouple
STEP 13: Switch “ON” the Thermocouple Switch and wait until reaching the temperature set

Figure 6.16. Switch “ON” the Thermocouple Switch

STEP 14: Switch “ON” the Electrical Motor Switch

Figure 6.17. Switch “ON” the Electrical Motor Switch
STEP 15: Rotate clockwise the Voltage Regulator to maximum voltage and wait until sound “click” from Electrical Motor to set the expected voltage

STEP 16: Rotate counter-clockwise to set the expected voltage
STEP 17: Pour molten metal to the Funnel Presser and wait for spinning process about 1 minute

Figure 6.20. Pour molten metal to the Funnel Presser

STEP 18: Turn “OFF” the Voltage Regulator

Figure 6.21. Turn “OFF” the Voltage Regulator
STEP 20: Switch “OFF” Thermocouple MCB and Electrical Motor MCB

Figure 6.22. Set “OFF” Thermocouple MCB and Electrical Motor MCB

STEP 21: Switch “OFF” the Electrical Motor Switch

Figure 6.23. Switch “OFF” the Electrical Motor Switch
STEP 22: Switch "OFF" the Thermocouple Switch

Figure 6.24. Switch "OFF" the Thermocouple Switch

STEP 23: Unlock Left Latch

Figure 6.25. Unlock Left Latch

STEP 24: Unlock right Latch

Figure 6.26. Unlock Right Latch
STEP 25: Open Top Enclosure by lifting Handle

Figure 6.27. Open Top Enclosure

STEP 26: Remove Cover Plate

Figure 6.28. Remove Cover Plate

STEP 27: Remove Side Plate

Figure 6.29. Remove Side Plate
STEP 28: Open silicone rubber mold to obtain casting result

Figure 6.30. Result of Spin Casting Process
CHAPTER 7

CONCLUSION AND SUGGESTION

7.1. Conclusion

Based on analysis and discussion on chapter 5, the conclusions are:

1. The improvement specification of the new spin casting machine compares to the current one is available on Table 7.1 while the constructions are available on Appendix 1.

Table 7.1. The Specification of Spin Casting Machine

<table>
<thead>
<tr>
<th>COMPARISON</th>
<th>The Current Spin Casting Machine</th>
<th>The New Spin Casting Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICAL SPECIFICATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimension</td>
<td>500mm x 600 x 920mm</td>
<td>500mm x 600mm x 862mm</td>
</tr>
<tr>
<td>Weight</td>
<td>50 kg</td>
<td>80 kg</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>1400 RPM</td>
<td>1400 RPM</td>
</tr>
<tr>
<td>Operating speed</td>
<td>780 RPM</td>
<td>460 RPM</td>
</tr>
<tr>
<td>Maximum dimension of silicone rubber mold</td>
<td>Ø250mmx50mm</td>
<td>Ø300mmx40mm</td>
</tr>
<tr>
<td>POWER SUPPLY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td>220V AC, 50/60Hz</td>
<td>220V AC, 50/60Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>186.5 Watt</td>
<td>373 Watt</td>
</tr>
<tr>
<td>PRICE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spin Casting Machine</td>
<td>Rp. 2,000,000</td>
<td>Rp. 10,000,000</td>
</tr>
</tbody>
</table>
2. The visualization result of spin casting process compares to the master is shown on Table 7.2.

<table>
<thead>
<tr>
<th></th>
<th>Master</th>
<th>Spin Casting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Side</td>
<td>![Master Image]</td>
<td>![Spin Casting Image]</td>
</tr>
<tr>
<td>Back Side</td>
<td>![Master Image]</td>
<td>![Spin Casting Image]</td>
</tr>
</tbody>
</table>

Note: The casting product was visually the same as master model and there were no defects anymore.

3.a) The production time for UAJY keychain:
- 8 pieces requires 12 minutes 9 seconds
• 500 pieces requires 3 working days
• 600 pieces requires 2 working days
• 700 pieces requires 3 working days
• 800 pieces requires 3 working days
• 900 pieces requires 3 working days
• 1000 pieces requires 4 working days
• 2500 pieces requires 8 working days
• 5000 pieces requires 16 working days
• 10000 pieces requires 32 working days

3.b) The spin casting machine cost is IDR 3,529.6/hour

7.2. Suggestion

The redesigned spin casting machine has two major weaknesses: longer setup time and incomplete casting product as the cause of head casting design modification. Hence, for future research it is suggested to conduct a head casting design to solve non-flatness silicone rubber mold and eliminate the current weaknesses.
REFERENCES

Cross, Nigel., 2008, Engineering Design Method 4th Revised Edition, John Wiley and Son, USA

Garmany, John., Walker, Jeff., Clark, Terry., 2005, Logical Database Design Principles, CRC Press, USA


Hegbom, Thor, 1997, Integrating Electrical Heating Elements In Appliance Design, CRC Press, USA


Nayatani, Y., Eiga, T., Futami, R., Miyagawa, H., 1984, The Seven New QC Tools Practical Applications of Managers, Japan: 3A Corporation

Omachonu, Vincent K., Ross, Joel RE., Swift, JA., 2004, Principle of Total Quality, CRC Press, USA

Sabdariva, Victorinus Deras., 2008, Perancangan Mesin Spinning Casting Untuk Pembuatan Symbolic Shorthand Souvenir Berbahan Baku Pewter, Skripsi
Simonovic, Alexander M., Tupar, Slobodan N., Pekovic, Ognjen M., 2008, *Stress Distribution as a Cause of Industrial Steel Chimney Root Section Failure*, Faculty of Mechanical Engineering, Belgrade


