PRODUCTION OF BEARING STEEL FROM STEEL SCRAP

Baymirzaev Akbarjon Rustamjan o‘g‘li

Andijan State Technical Institute, Andijan, Uzbekistan

akbarshoxashox@gmail.com

Abstract

This study investigates the production of bearing steel using selected steel scraps. The study included material selection, melting process, heat treatment and mechanical properties evaluation, and the results were performed under laboratory conditions. The results determine the optimal heat treatment temperature to achieve the required hardness.

Keywords: steel, bearing, waste, sorting, heat treatment, preparation.

1. Introduction

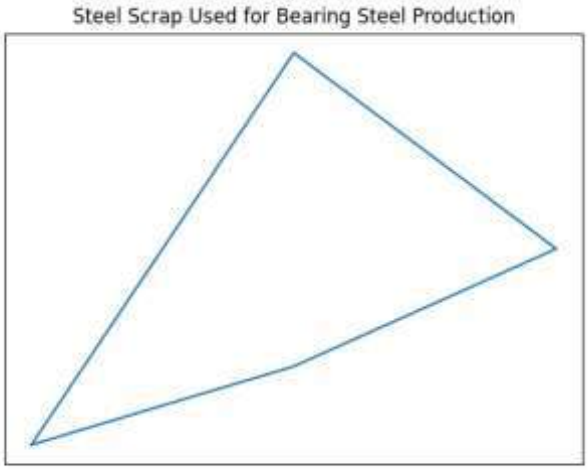
Bearing production requires high-carbon chromium steel with high hardness and wear resistance. The most suitable steel grade for bearings is AISI 52100 (100Cr6), containing approximately 1.0% C and 1.5% Cr. This grade provides high fatigue strength and dimensional stability after proper heat treatment.

Recycling steel scrap for bearing steel production reduces raw material cost and environmental impact.

2. Materials and Methods

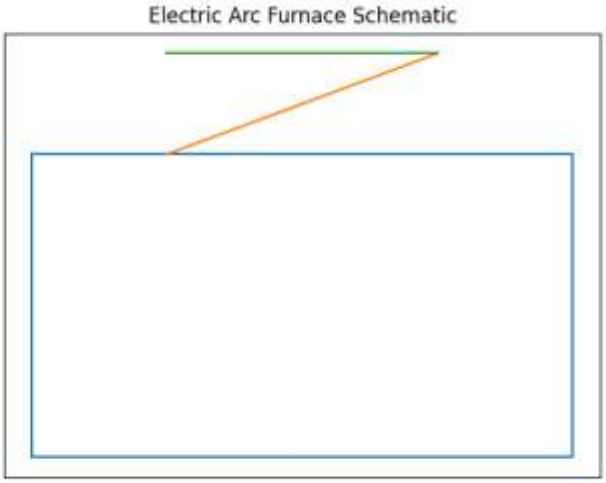
Selected waste types: high-carbon steel waste, alloy chromium steel waste and machining chips from bearing production. The waste was obtained by sorting using household and industrial waste. The intensive processing of industrial waste is one of the current requirements. Separating waste into ordinary branded and separate selection for bearing production also created a big problem, we have overcome this difficulty technically. Using a part of secondary steel waste as a basis for creating bearing rings, it serves to save steel reserves. Before melting, the waste is sorted magnetically and chemically and sent to the furnace. In casting furnaces, we heat it at a temperature of 1520-1539.

Figure 1. Shows steel scrap used in the study.



Melting was performed in an electric arc furnace (EAF).

Figure 2. Shows the electric arc furnace schematic.



Furnace characteristics:
- Capacity: 500 kg
- Power: 350 kW
- Maximum temperature: 1700°C
- Refractory lining: magnesite

3. Results

Sample	Austenitizing Temp (°C)	Hardness (HRC)

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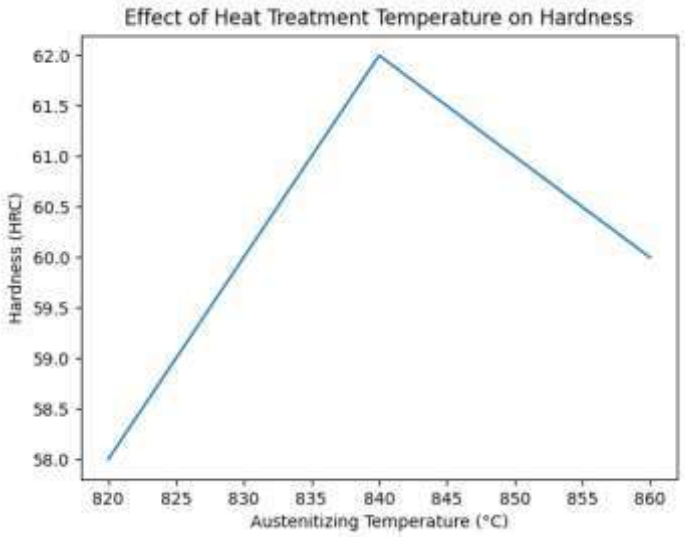
S1	820	58
S2	840	62
S3	860	60

Figure 3. Shows the influence of heat treatment temperature on hardness.



4. Discussion

The selection of parts is very important. High-carbon chromium parts should be given priority. Low-carbon structural steel parts should be removed. Oxidized and contaminated parts reduce chemical stability, that is, change the composition and adversely affect mechanical properties. Proper cleaning and slag control are necessary to adjust the amount of carbon and chromium.

Optimal hardness (62 HRC) was achieved at an austenitization temperature of 840 °C. We have repeatedly cast this mechanical property. We heat-treated the finished samples under various conditions and extracted them into the austenite phase at an optimal temperature of 840 °C. Knowing the results obtained and the temperature, we determined the hardness. The results fully corresponded to the standards. And we also gave recommendations for implementation in production.

5. Conclusion

The bearing steel produced from selected scrap metal met the hardness requirements. The recommended heat treatment regime was: austenitizing at

840°C, oil quenching, quenching at 180–200°C. The test work was carried out at the bearing plant and in the training laboratory. The results obtained were checked by special experts and I made recommendations based on the results obtained. I based the results on the frictional resistance and hardness indicators of such waste casting in sorting furnaces.

The technical characteristics and perfect operation of the heat treatment furnaces were monitored to monitor changes and defects in the austenite phase. The cooling processes also led to several experiments and the cooling temperature was also selected.

References

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