IJIAET International Journal of Innovative Analyses and Emerging Technology

| e-ISSN: 2792-4025 | http://openaccessjournals.eu | Volume: 2 Issue: 11

Development of Technology for Obtaining Quality Casting Products from Carbon Steel Alloys

Bektemirov Abdujalal Dusmuhammad ugli
PhD student, Andijan Machine-Building Isntitute

Turakhodjayev Nadir Dzhakhongirovich
Tfd, prof, Tashkent State Technical University

Erkinjonov Abdulkhamid Bakhtiyarjon ugli
Assistant, Andijan Machine-Building Isntitute

Ilkhomboyev Ulugbek Kakhramon ugli
Student, Andijan Machine-Building Isntitute

Abstract: This article provides information on the technology of obtaining high-quality castings from 65G carbon steel and its various international analogues, as well as the mechanical and casting properties of 65GL steel alloys, as well as information on research results and recommendations for improving the technology of obtaining high-quality castings from carbon steel.

Keywords: Carbon steels, steel 65 G, steel 65 G L, steel wheel, model, opoka, NiCr, polystyrene.

Introduction

In the internal transportation of large loads in machine-building plants, freight carriers moving on iron rails and their steel wheels, as well as other parts that are resistant to corrosion and have a long service life, are very important for increasing the internal capabilities of machine-building plants. Heavy-duty steel wheels and similar workpieces requiring high corrosion resistance are usually obtained from the following carbon steel grades by casting and pressure forming [1].

In the CIS countries, according to ISO 2590-2006, ISO 2879-2006 standards, 65G is its substitute

- ✓ U8A, 70G, 60S2A, 9XS, 50XFA, 60S2, 55S2 brands.
- ✓ US brands 1066, 1566, G15660,
- ✓ 66Mn4, Ck67 brands in Germany,
- ✓ 080A67 in the UK,
- ✓ 65Mn in China and 65G in Bulgaria and Poland are the international analogues of 65G steel. Obtaining high-quality cast products from these types of carbon steel serves as a solution to many problems in current production plants.

Research methods

In the internal transportation of large loads in machine-building, mining and metallurgical plants of our country, freight carriers moving on iron rails and their steel wheels, as well as other corrosion-resistant, long-lasting parts, are very important for increasing the internal capabilities of machine-

building plants. Steel wheels according to ISO 2590-2006 65G carbon steel (0.62-0.71 % C) is being prepared by working under pressure. Until now, various problems have been encountered in obtaining steel wheels by casting method, and the solution to this problem improves economic efficiency by several percent by saving energy and resources in production. According to the ISO 2590-2006 and ISO 2879-2006 standards, the chemical composition of 65G steel is presented in Table 1 as a percentage of elements [2].

Table 1. Chemical composition of 65G carbon steel

Brand	Elements, %						
65 G	S	Si	Mn	P	S	Cr	Cu
	0.62-0.7 1	0.17-0.37	0.9-1.2	0.035	0.035	≤0.25	≤0.2

Liquefied carbon steel alloy is cast using molds of the required shape based on existing technologies. Figure 1 shows a simplified technological scheme of the quality casting technology of 65G carbon steel alloy. As a result of research carried out at the foundry mechanical plant of Ozmetkombinat, steel samples of the 65GL special brand, competitive with 65G steel in terms of mechanical properties, were taken, and the chemical composition of the samples was determined using a modern SPEKTORLAB-10M device (Table 2).

Table 2. Chemical composition of 65GL special grade steel samples obtained as a result of research

№	Elements, %							
	S	Si	Mr	P	S	Ni	Cr	Cu
N-1	0.68	1.4	0.9	0.035	0.035	0.25	0.24	0.2
N-2	0.70	0.9	0.8	0.033	0.030	0.25	0.24	0.2
N-3	0.69	1.2	1.0	0.035	0.034	0.25	0.24	0.2

According to the technological properties of the 65G and 65GL carbon steel alloy samples, the alloy has low flowability and low impact strength. According to the mechanical properties of the 65G and 65GL carbon steel alloy samples, the hardness of the alloy before and after heat treatment is shown in Table 3

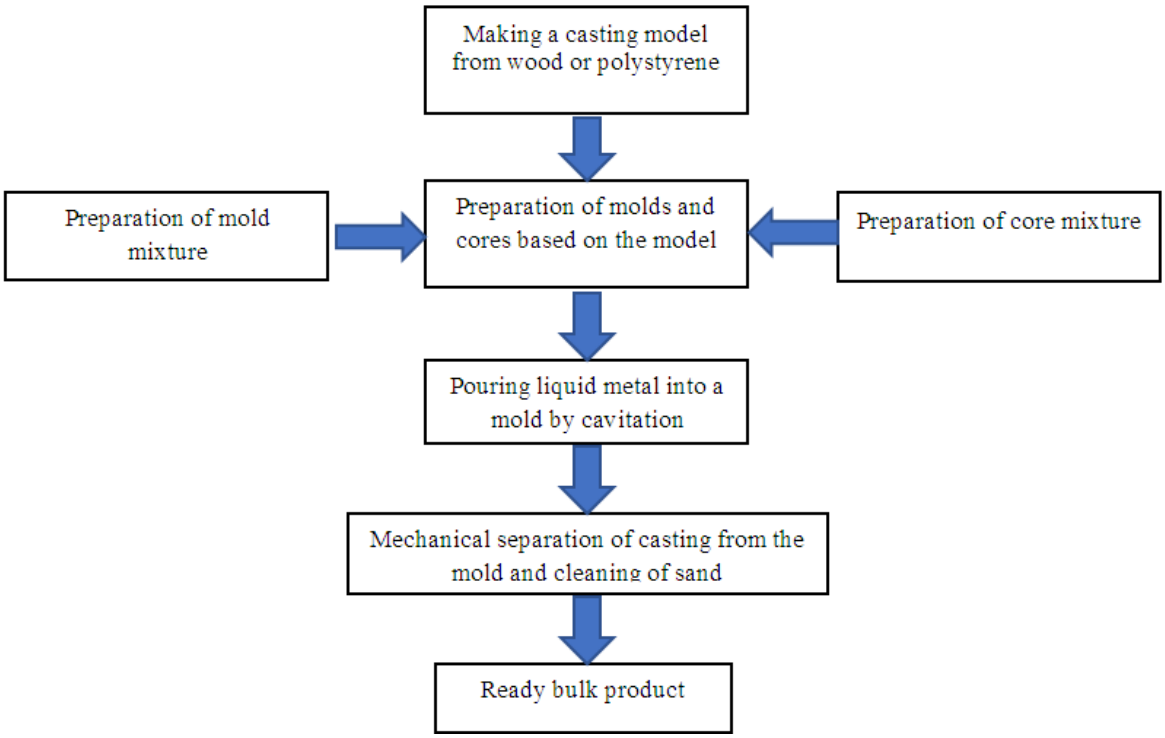
Table 3. Hardness test results of 65G and 65GL carbon steel alloy samples

Brand / Sample	Hardness measuring device	Hardness according to HB
65 G	GUNT WP-300	HB 10 -1 = 241 MPa
Sample - 1		HB 10 -1 = 244 MPa
Sample - 2		HB 10 -1 = 242 MPa
Sample - 3		HB 10 -1 = 241 MPa

In the proposed new technology for obtaining bulk products in sand-clay molds, the processes of adjusting the chemical composition of the alloy, preparing the casting model, and preparing half molds have been improved.

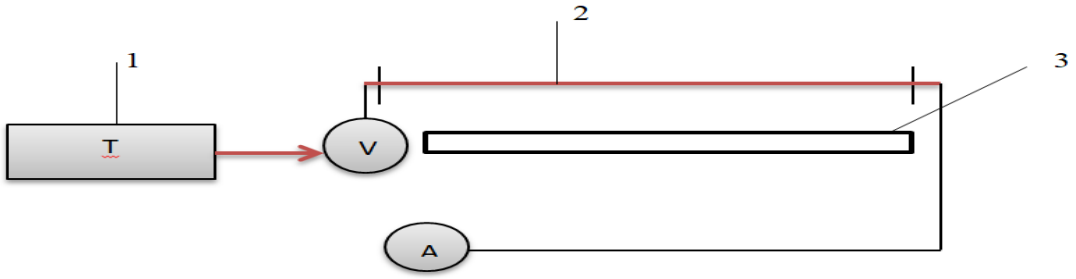
IJIAET International Journal of Innovative Analyses and Emerging Technology
| e-ISSN: 2792-4025 | http://openaccessjournals.eu | Volume: 2 Issue: 11

Figure 1. Technological scheme of ingot production from carbon steel alloy 65G and 65GL [3]



For the preparation of the model, polystyrene was cut to the desired size and cut on a nichrome (NiCr) wire. Nichrome manufacturing processes take 1.5 times less time than tungsten (W). A voltage of 20 V and a current of 5 A were transmitted through a transformer to a nichrome wire with a length of 1000 mm and a diameter of 2 mm. Polystyrene was precisely cut with the resulting temperature on the surface of the nichrome wire. A drawing of a nichrome wire polystyrene cutting device is presented in Figure 2 [4-5].

Figure 2

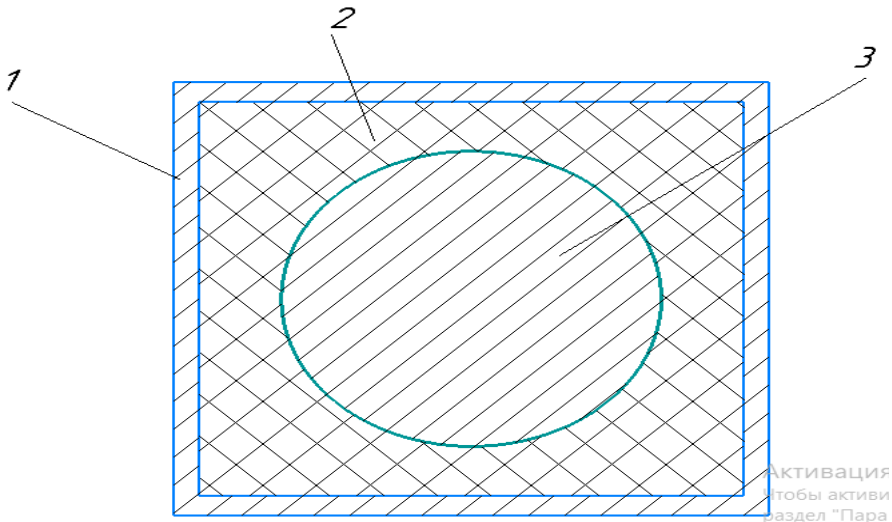


1.Transistor 2. Nichrome wire working part 3. Polystyrene cutting work table.

A sand-clay mold was prepared according to the shape of the casting, which had a positive effect on the gas release and heat transfer properties of the mold. Castings obtained in these molds were found to be suitable for the intended purpose, free of gas pores. This was achieved by placing special barriers in the inner corners of the mold before compacting the sand into the molds used to make the half molds. The location of the mold in Opoka is shown in the diagram in Figure 3 [6-7].

IJIAET International Journal of Innovative Analyses and Emerging Technology
| e-ISSN: 2792-4025 | http://openaccessjournals.eu | Volume: 2 Issue: 11

Figure 3



Opoka sand is the traditional location of the clay mold

1- metal mold, 2- mold material (quartz sand) 3- mold cavity

In order to obtain high-quality cast products from carbon steel alloys 65G and 65GL, a change was made to the casting process, that is, after removing the models from the sand mold, the upper and lower parts of the mold were washed with an aerated chamotte suspension, and then it was ignited. formed a thin wall in the cavity of the mold. This thin wall protected the mold walls from the high temperature of the liquid steel and also ensured a high quality surface of the resulting casting [8-9].

Conclusion

Based on the results of the research, the following conclusions were reached.

- A new technology for obtaining high-quality cast products from 65G and 65GL carbon steel alloys was developed.
- An increase in production capacity was achieved based on energy and resource efficient technology.
- The chemical composition of the alloy was adjusted and 65GL carbon steel alloy samples were taken.
- Using nichrome wire instead of tungsten in model preparation saved energy several times.
- Silica (SiO_2), which is the basis of mold sand, was saved by adjusting the position of the mold in Opoka.

References

1. D.K. Garba , A.U. Alhojib, O.F. Agboolaa “65 Mn po‘latini ishlab chiqarishda asos material sifatida qo‘llash” Kaduna. P.M.B. 2019, Nigeriya
2. A. Nicholas Grundy[1)], Steve Münch[2)], Stephan Feldhaus[2)], Johan Bratberg[1)] “Yuqori uglerodli po‘latni uzluksiz quyish va tez sovutishda mikro va makro strukturalarning ta’siri” [1)] Thermo-Calc Software AB, Solna, Sweden [2)]Zurich, Switzerland.
3. Vigneshraj C T, Udayakumar S “Quymakorlikdagi so‘ngi rivojlangan va innovatsion texnologiyalar” [1, 2]R.M.K Engineering College, Chennai, India.

4. Bektemirov A.D., Turaxodjayev N.Dj. “Quyma mahsulotlarning yonuvchi modellarini tayorlashda nixrom (NiCr) simidan foydalanish” “Ilm-fan, madaniyat, texnika va texnologiyalarning zamonaviy yutuqlari hamda ularning iqtisodiyotga tadbiqi mavzusidagi ilmiy amaliy anjuman” 25-27 may 2022 yil AndMI.
5. Furkat Odilov, Alisher Fatkhullaev. “Improving The Technology Of Continuous Casting Of Steel Castings” The American journal of engineering and Technology (tajet) Sjif-5.705 Doi-10.37547 /tajet volume 3 issue 04, 2021 Issn 2689-0984. –p. 108-117.
6. S.A.Rasulov., N.Dj.Turaxodjayev. “Metallurgiyada quyish texnologiyasi” O‘quv darslik. Toshkent. 2006 y.
7. V.A.Mirboboyev “Konstruksion materiallar texnologiyasi” Toshkent-O‘zbekiston 2004.
8. Truxov A.P., Mogilev I.S. “Литейние сплавы и плавка” Moskva, Akadema, 2004.
9. Truxov A.P “Технологи литейного производствоб технологи литейни формы” Moskva, Akadema, 2005.