

## BOOK REVIEWS

A. G. Rakhshtadt and V. N. Brostrem (editors)

METALWORKER'S HANDBOOK\*

Reviewed by I. I. Trusova

The second volume of this handbook contains valuable data for a broad group of civil engineers and technicians. The basic data are presented for engineering-technical personnel in many branches of industry.

Data are given on the mechanical and technological properties of various materials used in modern machine construction. Methods are given for mechanical and technological tests, determining the technological properties, chemical composition, basic properties, heat treatment or chemicothermal treatment conditions ensuring the necessary properties, TU specifications for materials and semifinished products, and areas of application (intended applications). The handbook contains data not only on ferrous, nonferrous, and refractory metals and alloys but also composite and nonmetallic materials.

However, several shortcomings should be noted:

1. There are no data on the interchangeability of structural and tool steels, alloys, and cast irons for special purposes. In plant practice the substitution of materials is a problem of major significance.
2. In the section on "Corrosion and methods of preventing corrosion" general data are given, but no specific methods of determining degrees of susceptibility to corrosion.
3. In the section on "Steels melted by special procedures" no specific practical recommendations are given, which does not respond to the purpose of the handbook.
4. No data are given on the ductile-brittle transition temperature, which is presently used as the basic indication of the operational reliability of machine parts.
5. There are several errors. For example, 38KhMYuA is listed on p. 130; it should be 38Kh2MYuA according to GOST 4543-71.

These shortcomings are mentioned in order to improve the handbook in later editions.

Finally, the practical value and convenience of the handbook should be emphasized once again.

Reviewed by V. D. Kal'ner

The authors and editors of this volume were presented with a complex problem - an essentially new handbook of machine construction materials - since in the long period of time following publication of the second edition there have been great changes not only in the variety of such well-known materials as structural and tool steels, copper-base alloys, and others, but also new materials and methods of treatment. It was impossible to incorporate all these changes in one volume without disrupting the basic arrangement of the Metalworker's Handbook.

It should be noted that the structural steels have been essentially reclassified into low-alloy steels with carbonitride hardening, steels with low hardenability for surface hardening with deep induction heating, alloy steels with a low concentration of expensive alloying elements, carburizing steels with low susceptibility to internal oxidation, and others. Among the tool steels there are new high-speed steels with a low tungsten content and also steels and alloys for machining heat resistant and titanium alloys. New compositions of die steels are given. Alloys of well-known nonferrous metals have been reclassified, especially aluminum alloys; data are given on many new alloys.

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Apart from the reclassification of materials, new types of materials developed in recent years are described. These are the new high-strength steels, the use of which in recent years has determined the development of many branches of industry. Heat-resistant steels and alloys, especially those based on nickel-chromium, are listed. They are of major importance for thermal power plants and also for reactor engineering. New heat-resistant alloys based on niobium, tungsten, and molybdenum are listed, along with methods of chemicothermal treatment to prevent oxidation in gas flows. A fairly complete list of titanium alloys is given, the use of which in industry has increased continuously. Also given are data on the principles of manufacturing composite materials, their composition, properties, etc. Their use in industry has made it possible to create structures that are new in principle and consume less metal.

Considerable attention has been given to methods of hardening alloys by means of heat treatment, chemicothermal treatment, and thermomechanical treatment, which increase the structural strength of machine parts. Data are given on the composition of heating media preventing oxidation and decarburization, new quenching media, and so on. Fairly detailed data are also given on new processes such as nitriding in glow discharge, liquid nitriding, carbonitriding, and so on.

Heat-treatment processes are described at a high scientific-technical level and at the same time specific data are given, which is very important for production personnel.

The handbook also contains other sections and is therefore of wide use to designers and technicians in factories and also in design bureaus and scientific-research institutes as well as students in technical schools.

Regretfully, the handbook has its shortcomings. It would be better to arrange the considerable data on the properties of alloys in the form of graphs and tables and also specific data on applications and selection of materials.

There are no data on P/M materials (except hard alloys).

The handbook contains insufficient data on technological tests. Frequently the results of machinability tests are not given, and the data on drawability are quite limited.

Although the importance of determining the structure of alloys is fairly well known, no data are given on methods of determining the grain size or the scale of carbide heterogeneity. At the same time, individual sections are not proportionately large even though they are important - the sections on refractory metals and composite materials.

Finally, it would be desirable that methods of preliminary heat treatment, induction hardening, and also the technology of manufacturing parts from several plastics be covered in more detail.

These inadequacies do not reduce the value of the second volume, which has been prepared by a large number of highly qualified specialists. The second volume is an undoubted success for Mashinostroenie Press.

The handbook contains numerous valuable data on various materials and their properties, treatment, and applications which will be useful in practice. There is no doubt that the handbook will be widely used by engineering-technical personnel in the machine construction industry.