WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 3, Issue 6, June, 2022

TECHNOLOGICAL PREPRODUCTION FEATURES OF THE PARTS MANUFACTURING AND MATERIAL SELECTION

Riskulov A. A.
DSc, Prof. of the Materials Science and Mechanical Engineering Department, Tashkent State Transport University

Tursunov N. K.
Ph.D., Head of the Department of Materials Science and Mechanical Engineering, Tashkent State Transport University, Tashkent, The Republic of Uzbekistan,

Alimukhamedov Sh. P.
Dr. Tech. Sciences, Professor of the Department of Materials Science and Mechanical Engineering, TashkentState Transport University, Tashkent, The Republic of Uzbekistan

Nurmetov Kh.I.
Senior Lecturer, of the Department of Materials Science and Mechanical Engineering, Tashkent State Transport University

Toirov O. T.
Ph.D. student of the Department of Materials Science and Mechanical Engineering, Tashkent State Transport University, Tashkent, The Republic of Uzbekistan

Urazbaev T. T.
Senior Lecturer, of the Department of Materials Science and Mechanical Engineering, Tashkent State Transport University,

Abstract
Production of technical articles starts from selection of materials which they will be produced of a scientifically grounded approach to solving this problem lies in application of methods and means of the system approach. The system approach is a direction in methodology of scientific cognition which is based on consideration of objects as systems consisting of a multiplicity of interconnected elements which form integrity, a unity.

Keywords: Production of technical articles, material selection, operability of articles, effectiveness, production process, manufacturing technology, equipment stock.

1. Introduction

The aim of the system approach to material selection is grounding of a selection strategy or forecasting results of selection of the most practicable materials. Complexity of this goal lies in the necessity of analysis of a large group of factors which determine relations between production and article consumers: nomenclature of materials, multiplicity of parameters of their structure and properties, levels of their hierarchy, saturation of connections between the levels, and interconnection between technological, economic, social, and other aspects. Selection of materials for manufacturing of technological articles starts from material nomenclature analysis. Its aim is to find out materials possessing the best combination of operating parameters. Further basing on technological properties of the selected materials variants of manufacturing technology of an article are considered depending on its construction, weight, dimensions, and the type of article surface processing etc. Materials of the optimal variant have to be accessible, to possess low cost, and to meet the criteria of economical effectiveness. This means that operability of articles produced of them has to correspond with social labour costs on realisation of their technological advantages taking into account the social effect of their use and the economic impact of production. Such a comparison is a serious problem due to narrow specialisation of sciences, particularly due to disconnection of technological and economic disciplines.

2. Methods

Article construction, materials used in it, and a technology of article obtainment are connected with the structure of production which turns out these articles. A technological basis for obtainment of articles which possess a set use value, i.e. usefulness, the property to meet a person's needs, social costs of production being the lowest. Social costs reflect a society development level and determine the effectiveness of elements of a production process: labour power and means and objects of labour i.e. materials. A scheme of material selection at the early preproduction stage is given in Figure 1.

An article manufacturing technology and equipment stock required to process materials into articles have to be determined during preproduction. Obtainment of an article which possesses a set use value, i.e. the possibility of an article to satisfy some human need, is the criterion of right selection of materials and technologies for their processing. A technology determines definite connections between a material and an article. Carrying out of each technological process leads to an increase in cost of materials being processed; therefore a study of ways for saving at the stage of

WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 3, Issue 6, June, 2022

technology designing determines effectiveness of future production to a significant extent.

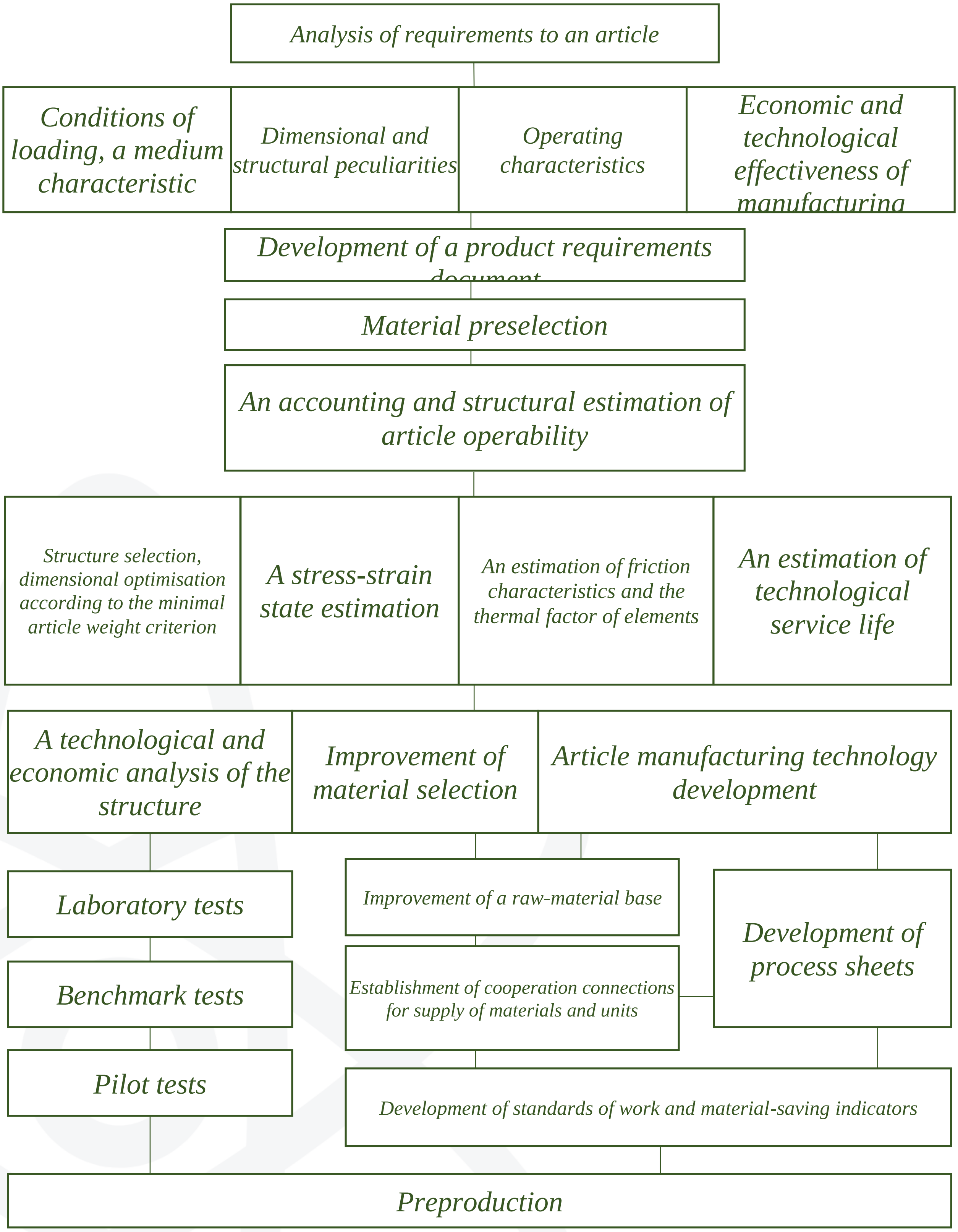

Figure 1. Scheme of material selection and requirements to a new material

Quality and material processing output are the main criteria for selection of an article obtainment technology. The latter factor has a substantial influence on article value formation and a decrease in material consumption standards. Consequently, the basics of resource-saving technologies are laid in cooperation of technologists and structural engineers.

Inter-industrial standardisation involving cooperation partners and technological and economic grounding of material consumption standards promotes a material loss decrease in the process of technological processing. This stage of preproduction ends with development of process sheets, documents which formalise the article manufacturing process and enlist the succession of technological operations, the materials being processed, production and technological equipment, technological modes of operations and the time necessary for them, and personnel qualification etc. Technological progress determines practicability of systematic adjustment of a material consumption structure through replacement of one material with another and also through relevant technological reengineering of production.

Material replacement in many cases follows a change in requirements to an article and determines a change in its cost. The aim of replacement may be to decrease the cost of an article on the whole or in part per a measurement unit of an article operating property. Such important tasks as a material deficiency decrease, coordination of a material consumption structure and a raw material base, and adjustment of production cooperation connections and article price etc. are solved through material replacement. As a rule, material replacement leads to a change in an article manufacturing technology and equipment stock. The natural results of technological measures are a material loss decrease during processing, a labour effectiveness increase, a change in personnel by grades, for example, a decrease in the number of specialists in one or another area.

A change in labour power structure inevitably results in a change of production relations and influences psychological climate in a production collective. Material replacement may promote an increase in the degree of mechanisation and automation of production and may serve as a regulator of movement of basic production assets. It is possible that material replacement may lead to a change in an article operation principle and, consequently, in its structure and may determine an increase in production output, a decrease in product material intensity, and improvement of operating properties of articles. Such technological and economic advantages of a new material compared to a replaced one prove that replacement is justified.

Still a material replacement strategy may be determined according to technological criteria for a definite article through defining priorities and quantitative indicators of the replacement influence on production and technological and economic parameters of an article.

The considered stages of the system approach to material selection show that technological grounding of material consumption structure has to be proved according to criteria of social practicability.

3. Results and Discussion

Stability of properties of materials in extreme operating conditions becomes more and more topical in relation to technology progress and exaggeration of working conditions for machines.

The way up of nuclear energetics since putting into operation the first ever atomic power station in the ex-USSR is marked by continuous improvement of atomic power station thermodynamic cycle parameters. This became possible thanks to appearance of new materials resistant to nuclear radiation and oxidising media at high temperatures. Cryogenic technology which provides obtainment and use of temperatures below –150°C solves many manufacturing problems related to gas liquefaction and distribution of gas mixtures, first of all air. It owes its achievements to a group of engineering materials which neither lose their mechanical characteristics nor become brittle with decreasing temperature. Thanks to cryogenic technology cryoelectronics appeared which deals with use of phenomena occurring in solid bodies at cryogenic temperatures (in presence of electric, magnetic, and electromagnetic fields) to build electronic devices. Upcoming is building of superconductive transformers, power transmission lines, and super-strong magnets required to hold plasma during a thermonuclear reaction etc.

Purity of materials is in most cases a prerequisite to stability of their properties. Therefore, material purity requirements have soared. Until recently pure materials met the definitions "commercially pure" (basic component level is 99.9% or "chemically pure" (99.99%). Now atomic energetics needs super-pure uranium and thorium (e.g. boron impurity in uranium may not exceed 10–5%). Material purity requirements in semiconductor technology are even higher: impurity standard in most materials is not more than 10–11%. Quantum electronics (working parts of lasers) and space technology (solar batteries, fuel etc.) became super-pure material consumers. Many super-pure materials revealed unexpected properties. Thus easily corroding iron and zinc successfully resist corrosion when purified; chromium, titanium, tungsten, molybdenum, and other refractory metals considered hard and brittle become compliant after high purification and may be rolled into foil. The issue of material property stability is solved in technology in several directions among which the following are the most important ones. Protection of materials against chemical interaction with the environment, aggressiveness of which increased much due to the rise of manufacturing activity of human, has become topical. Expenses on material wear effect liquidation in machines have become colossal. Knowledge of ageing laws for materials, i.e. change of their structure and properties through time, is necessary to take material property stabilisation actions and process item working ability forecast.

4. Conclusion

Comparison of the selected engineering and technological decisions is carried out through technological and economic analysis in the process of which correspondence of costs of article production to a level of its operating properties is estimated. The aim of such an analysis is to find out the best relation of article cost and its effectiveness and to create prerequisites for elimination of some cost constituents through it. In other words, one has to choose such solutions that cause carrying out of the basic function or a group of functions of an article with minimal expenditures of social labour involved. Such an approach allows directing not only at technological capabilities, but also at the criteria of social practicability of production as early as at the beginning stage of article engineering.

References

1. Riskulov, A. A., Yuldasheva, G. B., Kh, N., & Toirov, O. T. (2022). DERIVATION PROCESSES OF FLUORINE-CONTAINING WEAR INHIBITORS OF METAL-POLYMER SYSTEMS. Web of Scientist: International Scientific Research Journal, 3(5), 1652-1660.
2. Riskulov, A. A., Yuldasheva, G. B., & Toirov, O. T. (2022). FEATURES OF FLUOROCOMPOSITES OBTAINING FOR WEARING PARTS OF MACHINE-BUILDING PURPOSE. Web of Scientist: International Scientific Research Journal, 3(5), 1670-1679.
3. Abdurazakov, A. A., Riskulov, A. A., Yuldasheva, G. B., & Avliyokulov, J. S. (2015). Technology of high-strength wear resistant fluorcomposites for mechanical engineering. Europaische Fachhochschule, (10), 43-47.
4. Toirov, B. T., Jumaev, T. S., & Toirov, O. T. (2021). Obyektlarni tanib olishda python dasturidan foydalanishning afzalliklari. Scientific progress, 2(7), 165-168.
5. Nurmetov, K. I., & Riskulov, A. A. (2021). Some aspects of industrial polymer waste recycling system.

6. Akhmedov, D., Alimukhamedov, S., Tursunov, I., Narziev, S., & Riskaliev, D. (2021). Modeling the steering wheel influence by the driver on the vehicle's motion stability. In E3S Web of Conferences (Vol. 264, p. 05015). EDP Sciences.
7. Алимухамедов, Ш. П., Рахимов, Р. В., Инагамов, С. Г., Мамаев, Ш. И., & Кодиров, Н. С. (2022). Математическое моделирование передаточного механизма потележечной тормозной системы грузовых вагонов. Universum: технические науки, (2-3 (95)), 8-14.
8. Алимухамедов, Ш. П., & Гапиров, А. Д. (2018). Напряженно-деформированное состояние устройства для гашения динамических нагрузок в трансмиссии транспортных машин. Universum: технические науки, (12 (57)), 23-28.
9. Teleubaevich, U. T., Kayumjonovich, T. N., Pirmukhamedovich, A. S., & Muratovich, T. T. (2022). THERMODYNAMIC CALCULATION OF COMPLEX DEOXIDATION BY ALUMINUM AND SILICON OF MELTS OF STEEL 20GL FOR CAST PARTS OF ROLLING STOCK AUTOCOUPLE DEVICES. Web of Scientist: International Scientific Research Journal, 3(5), 1761-1771.
10. Тоиров, О. Т. У., Турсунов, Н. К., & Кучкоров, Л. А. У. (2022). Совершенствование технологии внепечной обработки стали с целью повышения ее механических свойств. Universum: технические науки, (4-2 (97)), 65-68.
11. Zhurakulovich, A. S., & Shavkatovna, V. D. (2021). Investigation of heat load parameters of friction pairs of vehicle braking systems. Web of Scientist: International Scientific Research Journal, 2(12), 483-488.
12. Кучкоров, Л. А., & Турсунов, Н. К. (2021). Исследование состава формовочных и стержневых смесей для повышения механических свойств. Scientific progress, 2(5), 350-356.
13. Азимов, Ш. И. М. М., & Валиева, Д. Ш. (2021). АНАЛИЗ ПРОЧНОСТНЫХ ХАРАКТЕРИСТИК ЗУБЧАТЫХ ПЕРЕДАЧ ПРИВОДА ПОДАЧИ РАБОЧЕГО ОРГАНА ШТРИПСОВОГО СТАНКА. Scientific progress, 2(2), 1470-1472.
14. Файзибаев, Ш. С., Соболева, И. Ю., Нигай, Р. П., Мамаев, Ш. И., & Абдирахманов, Ж. А. У. (2022). Исследование влияния пластических деформаций на поверхности упрочняемого бандажа. Universum: технические науки, (1-1 (94)), 106-110.
15. Shipilova, K., Radkevich, M., Tsoy, V., Shoergashova, S., Vildanova, L., & Gapirov, A. (2020, July). Land use by transport infrastructure in Tashkent City. In IOP Conference Series: Materials Science and Engineering (Vol. 883, No. 1, p. 012067). IOP Publishing.

16. Teleubaevich, U. T., Kayumjonovich, T. N., Pirmukhamedovich, A. S., & Muratovich, T. T. (2022). THERMODYNAMIC CALCULATION OF COMPLEX DEOXIDATION BY ALUMINUM AND SILICON OF MELTS OF STEEL 20GL FOR CAST PARTS OF ROLLING STOCK AUTOCOUPLE DEVICES. Web of Scientist: International Scientific Research Journal, 3(5), 1761-1771.
17. Kayumjonovich, T. N. (2022). DEVELOPMENT OF A METHOD FOR SELECTING THE COMPOSITIONS OF MOLDING SANDS FOR CRITICAL PARTS OF THE ROLLING STOCK. Web of Scientist: International Scientific Research Journal, 3(5), 1840-1847.
18. Ibadullayev, A., Teshabayeva, E., Kakharov, B., & Nigmatova, D. (2021). Composite elastomeric materials filled with modified mineral fillers. In E3S Web of Conferences (Vol. 264, p. 05006). EDP Sciences.
19. Ziyamuxamedova, U. A., Miradullaeva, G. B., Nafasov, J. H., & Azimov, S. J. (2022). RESEARCH OF RHEOLOGICAL PARAMETERS AND SELECTION OF COMPOSITIONS FOR APPLICATION ON WORKING SURFACES OF STRUCTURAL MATERIALS OF LARGE TECHNOLOGICAL EQUIPMENT. Web of Scientist: International Scientific Research Journal, 3(5), 1720-1727.
20. Alijonovna, Z. U. (2021, November). Research of Electrical Conductivity of Heterocomposite Materials for the Inner Surface of a Railway Tank. In International Conference On Multidisciplinary Research And Innovative Technologies (Vol. 2, pp. 174-178).
21. Urazbayev, T. T., Nafasov, J. H., & Azimov, S. J. (2022). Ti-Al SYSTEM COMPOUNDS TO CREATE A COMPOSITE TOOL MATERIAL. Web of Scientist: International Scientific Research Journal, 3(5), 1772-1782.
22. Файзибаев, Ш. С., Авдеева, А. Н., Мамаев, Ш. И., Турсунов, Ш. Э., & Нигматова, Д. И. (2022). АНАЛИЗ ЭКСПЛУАТАЦИОННОЙ НАДЕЖНОСТИ ТЯГОВЫХ ЭЛЕКТРИЧЕСКИХ ДВИГАТЕЛЕЙ ЛОКОМОТИВОВ ОА “УЗБЕКИСТОН ТЕМИР ЙУЛЛАРИ”. Universum: технические науки, (4-5 (97)), 30-35.
23. Файзибаев, Ш. С., Авдеева, А. Н., Мамаев, Ш. И., Турсунов, Ш. Э., & Нигматова, Д. И. (2022). МОДЕЛИРОВАНИЕ КРУТИЛЬНЫХ КОЛЕБАНИЙ КОЛЕСНО-МОТОРНОГО БЛОКА ТЕПЛОВОЗА UZTE16M. Universum: технические науки, (4-5 (97)), 24-29.
24. Tursunov, S. E., & Tursunov, N. Q. (2022). TRANSPORT MASHINASOZLIGIDA ISHLATILADIGAN INNOVATSION O ‘LCHASH ASBOBLARI. Academic research in educational sciences, 3(TSTU Conference 1), 120-123.

25. Мухаммадиева, Д. А., Валиева, Д. Ш., Тоиров, О. Т., & Эркабаев, Ф. И. (2022). ПОЛУЧЕНИЕ ПИГМЕНТА НА ОСНОВЕ ОСАДКОВ ЭЛЕКТРОХИМИЧЕСКОЙ ОЧИСТКИ ХРОМАТСОДЕРЖАЩИХ СТОКОВ. Scientific progress, 3(1), 254-262.
26. Азимов, Ё. Х., Рахимов, У. Т., Турсунов, Н. К., & Тоиров, О. Т. (2022). Исследование влияние катионов солей на реологический статус геллановой камеди до гелеобразования. Oriental renaissance: Innovative, educational, natural and social sciences, 2(Special Issue 4-2), 1010-1017.
27. Тен, Э. Б., & Тоиров, О. Т. (2021). Оптимизация литниковой системы для отливки. Литейное производство, (10), 17-19.