
**OPINIONS OF UZBEK AND FOREIGN SCIENTISTS IN TEACHING THE
SCIENCE OF ELECTRIC MACHINES**

Jorayev Mirjalal Kahramonovich

Bukhara Institute of Engineering and Technology,

Assistant of the Department of "Electrical Mechanics and Technologies"

jorayev159@mail.ru

Annotation

In the article "Opinions of Uzbek and foreign scientists in the teaching of the science of electrical machines", the views of scientists in each subject are studied. In the teaching, there is talk about the comparative analysis of normative legal documents and advanced foreign experiences. It is our goal to organize lessons using the experiences of foreign countries to develop the learning process, to teach the reliable operation of electric machines.

Keywords: Constant current, Constant generator, Constant current motors, collector, law of electromagnetic induction.

Annotatsiya

"Elektr mashinalari fanini o'qitishda o'zbek va chet el olimlarining qarashlari" haqidagi maqolada har bir fan bo'yicha olimlarning qarashlari o'rganilgan. O'qitishda normativ-huquqiy hujjatlar va ilg'or xorijiy tajribalarning qiyosiy tahlili haqida gap boradi. Ta'lim jarayonini rivojlantirish uchun xorijiy davlatlar tajribalaridan foydalangan holda dars mashg'otlarini tashkil qilish, elektr mashinalariga nisbattan ishonli ishlashini o'rgatish maqsadimizdir

Kalit so'zlar: O'zgarmas tok, O'zgarmas generator, O'zgarmas tok motorlari, kollektor, elektromagnit induksiya qonuni.

Аннотация

В статье "Мнения узбекских и зарубежных ученых в преподавании науки об электрических машинах" изучаются взгляды ученых по каждому предмету. В преподавании идет речь о сравнительном анализе нормативно-правовых документов и передового зарубежного опыта. Нашей целью является организация уроков с использованием опыта зарубежных стран для развития учебного процесса, обучения надежной работе электрических машин.

Ключевые слова: постоянный ток, генератор постоянного тока, двигатели постоянного тока, коллектор, закон электромагнитной индукции.

Analysis of electric machines is a complex process, because heating, mechanical losses, deformation, motor mounting conditions, negative factors in the power supply, etc. cause abnormal operation of motors. Therefore, teaching the influence of these and similar factors to specialized students in technical higher education institutions is a complex pedagogical process. In addition to pedagogical skills, the pedagogue is required to have a high level of technical knowledge. A teacher must constantly enrich his technical knowledge by studying new modern literature and technologies. As a result of the analysis of electro-magnetic processes occurring in electric machines, transformers, standard design practice, good efficiency has been achieved through the proposed simulation method. This method, in turn, includes calculations of electromagnetic, thermal, ventilation, and mechanical movements, which are many physical and electrical properties. These calculations are performed iteratively during the design calculation phase, when the basic dimensions and loads are selected. [1] However, this literature does not fully analyze the factors affecting the electric machine. One of the trends in the practice of studying modern electric machine problems is to completely replace the full-scale experiment with numerical simulation, especially at the stage of conceptual development, it is noted that the simulation analysis of electric machines and the teaching of the analysis results to students have good results [2,3]. This trend plays an important role in solving this or that issue by asking relevant questions. For example, the principle of operation of an electric machine can be explained by taking into account the effect of electric conductivity on the distribution of the electric field using the variable electric field equation.

Having a set of tools for numerical simulation of electric and magnetic fields, stationary and non-stationary temperature fields, elastic stress and strain fields in the frequency and time domains when solving problems in electric machines (for example, see Figure 1 through the ANSYS program.), the ability to solve the electromagnetic field equations together with the connected electric circuit equations was taught. An important advantage of electrical engineering problems in solving multiphysics problems is the ability to develop steps for complex scenarios and solve them through two-way inter-task communication tools. [4-5]

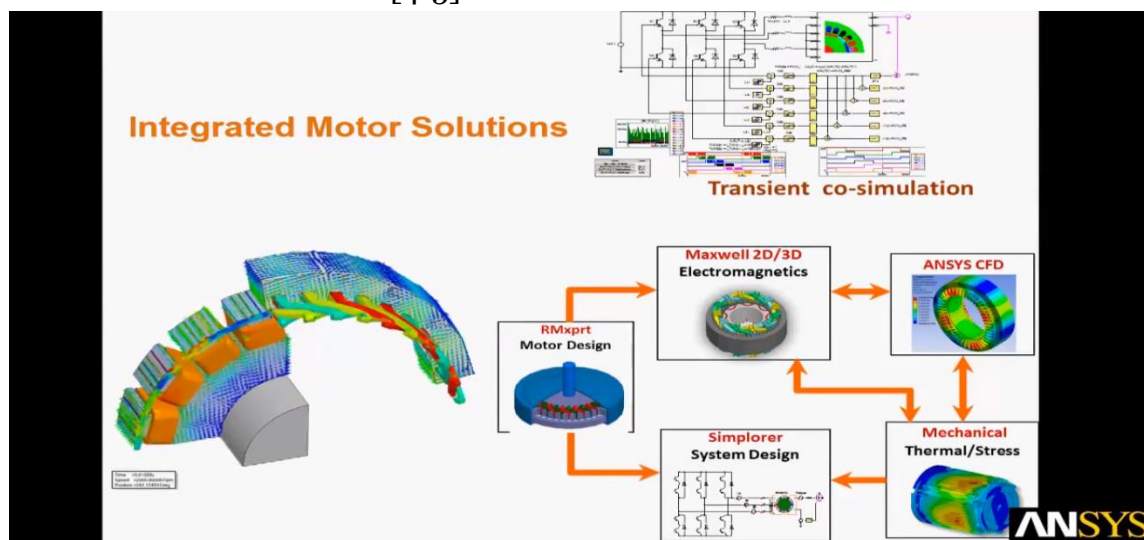


Figure 1. Simulation process of electric machine stator by ANSYS software.

Explaining the processes of electric machines to students through this program will help the teacher achieve his goal. Therefore, it is appropriate to use special software packages during the lesson.[5]

The study of electric machines is the main core for all personnel working in the energy sector. [6] This study guide presents the introduction to the field, that is, the main innovations and inventions from the emergence of laws in the field to the present time. The classification of electric machines, the main structural structure of electric machines and the laws that drive them are fully disclosed. The operation of electric machines as electromechanical converters, that is, the energy of the electromagnetic field is converted into mechanical energy in electric machines. The shape and structure of the electromagnetic field implementing this process has been revealed [6].

Electric machines and transformers are widely used in various industrial production enterprises, energy industry, transport (aviation, railway, automobile, subway, tram, trolleybus), agriculture and water management, construction and other fields.

The textbook is written for students of the "Electrical Engineering, Electrical Mechanics and Electrical Technologies" department of technical universities based on the program of the "Electrical Machines" science. stated. Their structure, principle of operation, main properties and characteristics are described from the point of view of practice. General information about the new generation of electric machines is also reflected in the relevant sections of the book. Since the principle of operation is based on the phenomenon of electromagnetic induction and the electromagnetic processes in them are similar to those of electric machines in many ways, transformers are also studied in the course "Electrical machines". Transferring the information presented in this textbook using innovative technologies has a positive effect on the process and quality of students' acquisition of technical knowledge. [7].

In the next 10 years, as a result of the development and application of EHM, the theory of electric machines is developing, and it is possible to include mathematical calculations of electric machines in the general course. Using mathematical calculations, the authors analyzed the given switching schemes of electric machines.

Theories of electric machines began with the conversion of energy into electromechanical motion and the equations of machines given. [8]. These equations and mathematical expressions help students to understand the physical and technical laws of electric machines during practical training.

The teaching of the science of "electrical machines" consists of lectures, experiments, practical exercises and independent work outside the classroom. The main theoretical concepts are given in the lecture classes, general laws are explained in interdisciplinarity, and methods of excitation of DC machines, which are necessary for practical and experimental exercises, are given.

➤ In the experimental sessions, the methods of electric machine excitation are checked in practice, and the understanding that experience is the basis of knowledge is formed.

➤ Theoretical knowledge is strengthened by solving problems related to the calculation of parameters of electric machines in practical training.

➤ Independent work outside the auditorium is organized in the sense of strengthening the knowledge acquired by students in classes, deepening it and forming creative thinking [9].

Learning certain knowledge and skills through the use of these types of lessons is the basis for a student to become a mature staff, and a teacher to become a skilled pedagogue.

Adabiyotlar ro'yxati

1. M.F. Horstemeyer Multiscale Modelling: A Review. – в книге Practical Aspects of Computational Chemistry: Methods, Concepts and Applications редактор(ы): Jerzy Leszczynski, Manoj Shukla. –Springer, 2009, стр. 87-137
2. P. Lethbridge Multiphysics Analysis. - The Industrial Physicist, № 4, 2004. с. 26-29
3. B. Jenkins Создание возможностей для компьютерного моделирования физических процессов и инженерного анализа. - CAD/CAM/CAE Observer #2 (54) / 2010 ч. 2 с 40-45
4. S.Zaynobbiddinov, M.Tulkinov, B.Kuchqarov. (2022). “Development of effective methods of teaching theoretical electrotechnics”. Web of Scientist: International Scientific Research Journal, 3(10), 431-437.
5. Marius Rosu, Ping Zhou, Dingsheng Lin, Dan Lonel, Mircea Popescu, Frede Blaabjerg, Vandana Rallabandi, David Staton, “Multiphysics simulation by design for electrical machines, power electronics, and drives”, 2018, p.306
6. B.X.Shaymatov, B.S.Abdullaeva, M.Q.Jo'raev, “Elektr mashinalari”, Buxoro: BMTI, 2022 y.-209 b.
7. J.S.Salimov, N.B.Pirmatov, “ElektrMashinalari” O'zbekiston Respublikasi Oliy va o'rta maxsus ta'lim vazirligi. - T.: o'zbekiston faylasuflari milliy jamiyati nashriyoti, 2011. - 408 b.
8. B.X.Shaymatov, I.I.Xafizov, M.B.Xolmurodov, T.A. Sattorov «Elektr mashinalari»fanidan darslik.Buxoro:BuxMTI, 2019 y.673 bet.
9. M. Q. Jo'rayev, F. J. Xudoynazarov “Elektr mashinalari” fani taraqqiyotining ustuvor yo'nalishlari Maqola. Academic Research in Educational Sciences VOLUME 2 | ISSUE 11 | 2021 ISSN: 2181-1385 Scientific Journal Impact Factor (SJIF) 2021: 5.723 Directory Indexing of International Research Journals-CiteFactor 2020-21: 0.89 DOI: 10.24412/2181-1385-2021-11-1184-1190
10. Shaymatov B.X. Xafizov I.I. Xolmurodov M.B.,Sattorov T.A., Darslik-“Elektr mashinalari” Buxoro.: “Sadridin Salim Buxoriy” Durdona nashriyoti, 2021.635.b
11. Jo'rayev M. Q. ”Oliy ta'lim muassasalarining elektr energetika yo'nalishi talabalariga elektr mashinalari fanini hozirgi kunda o'qitish tahlili”. Toshkent 2021 1–son 18 bet

12. Jo'rayev M. Q. "Elektr yuritmalari tezligini rostdash usullari" Ilmiy-nazariy va metodik jurnal Buxoro 2021, № 5 114 bet
13. Development of teaching methods in the field of "electrical machines" using new pedagogical technologies 1Jorayev M. K, 2Husenov D. R, 3Sharopov F.K. International Engineering Journal For Research & Development 584-586 p
14. Jo'rayev, M. Q., & Xudoy nazarov, F. J. (2021). "Elektr mashinalari" fani Taraqqiyotining ustuvor yo'nalishlari. Academic Research in Educational Sciences, 2(11), 1184-1190. doi:10.24412/2181-1385-2021-11-1184-1190 bet
15. Azizxujayeva N.N. Pedagogik texnologiyalar va pedagogik mahorat. T.: Chulpan.2013. – 200 bet.
16. Jurayev Mirjalol Kahramonovich SOFTWARE ANALYSIS OF ELECTRIC MACHINE SCIENCE ISSN: 2776-0960 Volume 3, Issue 1 Jan., 2022 143 | P a g
17. Jo'rayev M.Q. Dunyoda yadro energetikasi taraqqiyoti rivojlanishini amaliy ahamiyatining inavasion texnologiyalardagi bosqichlari. Maqola №12(79) soni (dekabr, 2020).
18. O'zbekiston Respublikasi Prezidentining 2017-yil 7-fevraldagi PF-4947-son "O'zbekiston Respublikasini yanada rivojlantirish bo'yicha harakatlar strategiyasi to'g'risida" gi Farmoni www.lex.uz
19. O'zbekiston Respublikasining 2020-yil 6-noyabr "O'zbekistonning yangi taraqqiyot davrida ta'lim-tarbiya va ilm-fan sohalarini rivojlantirish chora –tadbirlari to'g'risi" dagi PF-6108 farmonida www.lex.uz
20. Gafforov K.K., Hafizov Kh.I., Research of processes of implantation of ions in monocrystal gaas (001) on purpose increase in efficiency of solar elements, ELECTRONIC JOURNAL OF ACTUAL PROBLEMS OF MODERN SCIENCE, EDUCATION AND TRAINING 2019-I ISSN 2181-9750, P.51-58
21. Khafizov I.I., Khaitov B.B., The investigation of ions implantation processes into a single-crystal GaAs(001) in order to increase the efficiency of the solar cells, MODERN SCIENCE International scientific journal №02, 2017, Founder and publisher: "Strategic Studies Institute" LLC., Moscow, 2017, P.43-46.
22. Khafizov .Islom, Gafforov Komil, Muxammedov Shuxrat, Jurakulov Abdullo , Energy saving when using a variable frequency drive in pump installions, Journal of Critical Reviews. Vol 7, Issue 12, 2020. p 99-102
23. Islom Khafizov, Komil Gafforov, Bakhodir Oblokulov, Aziz Azimov, Elimination of energy losses in pumping installations by means variable frequency drive., International Engineering Journal For Research & Development.2020. Vol.5 Issue 3
24. Хафизов И.И., Шарипов Ш.Н., Худойназаров Ф.Ж., , Саноат корхоналарида зарарли газ ва чанглардан тозаловчи энергия самарадор электр филтрларнинг қўлланилиши, Buxoro davlat universiteti ilmiy axboroti 2020/2 (78) 28-37б