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History of the development of the Department of Technosphere and Environmental Safety and its contribution to improving occupational safety in railway transport

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ABSTRACT Objective: The purpose of this paper is to trace the formation and development of the Department of Technosphere and Environmental Safety over 75 years of its existence and assess the contribution of its staff to the development of the science of occupational safety, environmental protection, and the training of occupational health and safety specialists for Russian enterprises. Materials and methods: Archival documents of PGUPS and activity reports of the Department were reviewed. Findings: For the first time, this paper presents the stages of the Department's formation, from an associate professorship in safety engineering and fire safety equipment to a department with highly qualified personnel, material resources and technologies for solving challenging scientific problems and high-quality training of students. Practical significance: Based on the study of archival materials, memoirs of the Department's long-timer members, and reports, the stages of the Department formation were reconstructed. The collected materials allow for preserving the memory of the employees who made the greatest contribution to the development of the Department, its scientific activity and scholarly works. The contribution of the Department to the training of qualified university graduates is assessed.

KEYWORDS: technosphere safety; occupational safety specialist; environmental engineering

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Обзорная статья

История развития кафедры «Техносферная и экологическая безопасность» и ее вклад в повышение безопасности труда на железнодорожном транспорте

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АННОТАЦИЯ Цель статьи — проследить становление и развитие кафедры «Техносферная и экологическая безопасность» на протяжении 75 лет ее существования, оценить вклад коллектива кафедры в развитие науки о безопасности труда, защите окружающей среды, в подготовку специалистов по охране труда для предприятий России. Рассмотрены архивные документы ПГУПС, отчеты кафедры о проделанной работе.

Впервые представлены этапы становления кафедры от доцентуры техники безопасности и противопожарной техники до кафедры, обладающей высококвалифицированными кадрами, материальной базой и технологиями для решения серьезных научных задач и качественного обучения студентов. На основе изучения архивных материалов, воспоминаний ветеранов кафедры, отчетов восстановлены этапы становления кафедры. Собранные материалы позволяют сохранить память о сотрудниках, внесших наибольший вклад в ее развитие, о разработках и научных трудах кафедры. Оценен вклад в дело подготовки квалифицированных выпускников университета.

КЛЮЧЕВЫЕ СЛОВА: техносферная безопасность; специалист по охране труда; инженерная защита окружающей среды

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INTRODUCTION

In the post-WWII period, as the Soviet Union was recovering from the ruins, building new railways and reconstructing old ones, the country's higher education institutions for transport faced the challenge of training engineers who would not only master the art of building and operating railways, but also know how to do it in a safe way.

In January 1949, the Fire Safety Equipment associate professorship[1] was reorganized into the Safety Engineering and Fire Safety Equipment associate professorship[2]. In June of that year, Order No. 63/R for the Leningrad Order of Lenin Institute of Railway Engineers[3] issued in pursuance with Order No. 479 of the Ministry of Higher Education of the USSR dated April 26, 1949 reorganized the Safety Engineering and Fire Safety Equipment associate professorship into a similarly named department. Associate Professor Alexey E. Lemmergidt was appointed the head of the Department. Within a short period of time, by the start of classes in September 1949, the Department was staffed with full-time faculty members. During the 1949/50 academic year, the department was equipped with laboratory stands for the main sections of the course. The Safety Engineering and Fire Safety Equipment course was delivered in accordance with programmes approved by the Ministry of Higher Education and compulsoripy completed with an examination. The same order mandated that the Department should be involved in the graduation project process and work of state examination committees and that a graduation project not endorsed by a consultant in Safety Engineering and Fire Safety Equipment would not be eligible for defence.

EARLY DAYS OF THE SAFETY ENGINEERING DEPARTMENT

In the early 1950, Pyotr N. Bolkhovitinov, Candidate of Technical Sciences and Associate Professor, became the head of the Department. The name of the Department was changed to Safety Engineering[4, 5].

In 1953–1966, the Department was headed by Lidiya A. Khokhlova (Neustroyeva), Candidate of Technical Sciences and Associate Professor (*Fig. 1*).

Major organizational and methodological work was carried out under her leadership[6, 7, 8] to put together lecture courses, improve training aids and facilities, recruit and train skilled teaching and research personnel. In

[1] An associate professorship was a transitional entity between instructors in Safety Engineering and Fire Safety Equipment scattered across different departments and a single entity, a department.
[2] Order No. 11/k dated January 29, 1949 for the Leningrad Order of Lenin Institute of Railway Engineers.
[3] Order No. 63/k dated July 04, 1949 for the Leningrad Order of Lenin Institute of Railway Engineers.
[4] Order No. 5/al dated January 03, 1950 "On teaching" for the Leningrad Order of Lenin Institute of Railway Engineers.
[5] Order No. 408/al dated December 20, 1952 "On teaching" for the Leningrad Order of Lenin Institute of Railway Engineers.
[6] Order of the Leningrad Order of Lenin Institute of Railway Engineers named after Academician V.N. Obraztsov No. 10/al dated January 15, 1953 "On teaching".
[7] Order of the Leningrad Order of Lenin Institute of Railway Engineers named after Academician V.N. Obraztsov No. 379/al dated December 22, 1955 "On teaching".
[8] Order of the Leningrad Order of Lenin Institute of Railway Engineers named after Academician V.N. Obraztsov No. 359/al dated February 23, 1956 "On teaching".

Lidiya A. Khokhlova | Georgy E. Skorodumov | Evgeny V. Bobin

Fig. 1. Department heads in 1953–1977

1960, a fundamental research laboratory for industrial noise control in railway transport was established[9]. The main focus of the laboratory was research to identify equipment and technological processes with noise levels exceeding sanitary standards and providing assistance to transport enterprises in developing new low-noise designs for machinery and mechanisms. Engineer Evgeny V. Bobin was appointed the head of the laboratory.

In 1964, the Department established a research laboratory for transport aesthetics headed by engineer E.S. Kadukov in accordance with the plan for comprehensive scientific experimental research in engineering aesthetics for the improvement of working conditions and productivity which was developed in cooperation with October Railways[10].

Order No. 175/k dated December 03, 1965 changed the Department's name to Occupational Health and Safety and the course Fundamentals of Safety and Fire Safety was renamed Occupational Health and Safety[11].

In 1966–1976, the Department was headed by Georgy E. Skorodumov, Candidate of Technical Sciences[12, 13].

Under his leadership, the educational laboratories were modernized, a specialized educational laboratory for occupational health and safety was established, and the Department's scientific base was substantially enhanced. In 1967, a monograph *Noise and Vibration Control in Railway Transport* by Evgeny V. Bobin was published [1]. The same year, the first textbook for university students, *Occupational Health and Safety in Railway Transport*, was published with the contribution of Department members, first of all Associate Professor V.V. Granqvist [2].

In 1976–1977, the Department was headed by Candidate of Technical Sciences Evgeny V. Bobin[13, 14].

DEVELOPMENT OF THE OCCUPATIONAL HEALTH, SAFETY AND ENVIRONMENTAL PROTECTION DEPARTMENT

In 1977–1992, the Department rapidly developed under the guidance of Nikolai N. Maslov, Doctor of

[9] Order of the Leningrad Order of Lenin Institute of Railway Engineers named after Academician V.N. Obraztsov No. 174/k dated November 23, 1960.
[10] Order of the Leningrad Order of Lenin Institute of Railway Engineers named after Academician V.N. Obraztsov No. 212/k dated December 30, 1964.
[11] Order of the Leningrad Order of Lenin Institute of Railway Engineers named after Academician V.N. Obraztsov No. 175/k dated December 03, 1965.
[12] Order of the Leningrad Order of Lenin Institute of Railway Engineers named after Academician V.N. Obraztsov No. 267/al dated June 16, 1966.
[13] Order of the Leningrad Order of Lenin Institute of Railway Engineers named after Academician V.N. Obraztsov No. 131/al dated March 22, 1976.
[14] Order of the Leningrad Order of Lenin Institute of Railway Engineers named after Academician V.N. Obraztsov No. 466/al dated October 17, 1977.

Fig. 2. Nikolai N. Maslov

Technical Sciences, Professor, and Honoured Inventor of the USSR[14, 15] (*Fig. 2*).

Under his leadership, the Department expanded the scope of its research interests. The list of research areas of the Department included environmental protection, resulting in changing its name to Occupational Health, Safety and Environmental Protection.

During this period, the Department's educational laboratory was provided with new technical teaching aids, rooms for business simulation games on occupational health, safety and environmental protection were set up, and publishing activities picked up momentum. The Department maintained contacts with 150 organizations across the country, such as higher education institutions, research and design institutes, design bureaus, and factories. The Department's teachers and researchers (*Fig. 3*) collaborated with all railway universities in the Soviet Union. As part of their R&D activities, they worked with enterprises from Murmansk to Vladivostok, and almost with all of the Soviet Union Republics, in particular, the Baltic Republics and Ukraine. For example, they worked with the Darnytsky Wagon Factory, the Ukrainian Soviet Socialist Republic, on issues related to industrial aesthetics and workplace ergonomics, analyzing and evaluating working conditions, and developing measures to improve them. A machine for cleaning diesel locomotive units and parts during major repairs developed by the Department was introduced at the Daugavpils Locomotive Repair Plant in the Latvian Soviet Socialist Republic. The tunnel dust control processes designed by the

Fig. 3. Team of the Occupational Health, Safety and Environmental Protection Department in the 1970s

[15] Order of the Leningrad Order of Lenin Institute of Railway Engineers named after Academician V.N. Obraztsov No. 88/al dated February 22, 1978.

Fig. 4. President of Russian Railways OJSC Vladimir Yakunin hands out an industry award to Gennady K. Zaltsman (right)

Department were introduced in metro systems of the Soviet Union.

A monograph by the head of the Department's Industry Research Laboratory, Candidate of Technical Sciences N.I. Ivanov *Noise Control on Track and Construction Machinery* was published in 1979 [3]. A monograph by Candidate of Technical Sciences N.A. Bobrovnikov *Environmental Protection from Dust in Transport* was published in 1984 [4]. A book by Professor Nikolai N. Maslov and Professor Viktor A. Elsukov *Occupational Health and Safety in Metro Systems* was published in 1985 [5]. The first textbook for students of railway universities, *Environmental Protection in Railway Transport*, written by Professor Nikolai N. Maslov in collaboration with Yu.I. Korobov came out [6].

In 1993–2006, the Department was headed by Professor Gennady K. Zaltsman[16] (*Fig. 4*).

In 1995, a unified research laboratory was established under his leadership, bringing together all occupational health and safety research efforts of the Department. A number of research works were commissioned directly by Russia's Ministry of Railways. 1996 saw the establishment of an expert information centre for collective and personal protective equipment for railway workers. Since 2002, the Department has been training students in Safety of Technological Processes and Operations.

In January 2004, as the Department launched a new specialty and the University established the Engineering Ecology Department, the Department's name was changed from Occupational Health, Safety and Environmental Protection to Occupational Health and Industrial Safety[17].

A NEW STAGE IN THE WORK OF THE DEPARTMENT OF OCCUPATIONAL HEALTH AND INDUSTRIAL SAFETY – TECHNOSPHERE AND ENVIRONMENTAL SAFETY

Since 2006, the Department has been headed by Tamila S. Titova, Doctor of Technical Sciences, Professor, and Honoured Science Worker of the Russian Federation (*Fig. 5*).

Fig. 5. Tamila S. Titova

In November 2006, a decision of the Academic Board renamed the Department to Technosphere and Environmental Safety[18], giving impetus to a large-scale process of renaming departments that train safety professionals in higher education institutions across Russia.

On November 21–23, 2007, the Department organized and held the I International Science-to-Practice Conference "Technosphere and Environmental Safety in Transport". The plenary session and roundtables that took place in the Constantine Palace in Strelna attracted the attention of not only professors of transport universities that train HSE specialists, but also representatives of executive authorities and supervisory agencies for labour and rail transport. The relevance of the issues raised at the Conference and the interest of its participants in discussing them showed the need for

[16] Order of St. Petersburg State Transport University No. 768/ok dated March 23, 1993 "On teaching staff".
[17] Order of St. Petersburg State Transport University of the Ministry of Railways of the Russian Federation No. 3/dd dated January 16, 2004 "On renaming the Occupational Health, Safety and Environmental Protection Department".
[18] Order of St. Petersburg State Transport University (GOU VPO PGUPS) No. 18/od dated November 30, 2006 "On renaming the Occupational Health and Industrial Safety Department".

Fig. 6. Department team (2008)

regular meetings in this format. Since 2008, the Conference has been held every two years and thus become a customary event. The second conference, which has been since then known as "TABTRANS", revealed the essence of the concept of "technosphere safety" and it was subsequently taken into account when new health and safety training standards were developed. Thus, the Department is one of the early pioneers in a new area of human life and health protection, which in 2009 was shaped as a separate scientific discipline with an approved professional training programme, bringing together all possible areas of training in occupational safety.

In November 2008, the Department team increased through a merger with the Ecology Department[19] (*Fig. 6*), and its scope of work expanded, too. The research laboratories were transformed into a testing centre for Environmental Safety and Occupational Health and Safety.

In 2011, the Ministry of Education and Science of Russia changed the list of specialties and fields of study for admission and training of higher education students. At that point, the Department had to discontinue admission and training of specialist students and launched a bachelor degree programme in Technosphere Safety, specialty 20.03.01 (with the major in Safety of Technological Processes and Operations) and a master degree programme in Technosphere Safety, specialty 20.04.01 (Hazardous Technological Processes and Operations).

PUBLISHING ACTIVITIES OF DEPARTMENT MEMBERS

Among a large number of textbooks, teaching guides, and research papers prepared by employees of the Department, worth mentioning are thr publications widely used for training both by the Technosphere and Environmental Safety Department at PGUPS and by many other departments of Russian universities training safety engineers. These are the study guide *Industrial Safety* prepared by the Department's team and published in 2010 under the editorship of Tamila

[19] Order of St. Petersburg State Transport University (GOU VPO PGUPS) No. 6/od dated November 28, 2008 "On reorganizing the Engineering Ecology Department and the Technosphere and Environmental Safety Department".

Fig. 7. Study guide Occupational Health and Safety in Rail Transport

S. Titova (reprinted in 2016) [7, 8], and the study guide *Occupational Health and Safety in Rail Transport* published in 2017 [9] (*Fig. 7*).

DEPARTMENT NOWADAYS

The skills of the graduates in the master degree programme, the high reputation of the Department among employers, and multiple requests from prospective students and employers enabled the first admission of students to the master degree programme in Environmental Engineering in 2022.

The hallmark of the Department is that it contributes to training of each and every student of the University. The Health and Safety discipline is in the curricula of all specialties and areas of training. Moreover, its content substantially varies for mechanics, builders, traffic engineers, and economists. Besides, the Ecology course is available for many specialties. Every year, the Department trains about 4,000 students of all modes of attendance.

Fig. 8. Department team (2014)

Fig. 9. Department team (2024)

By the celebration of its 75th anniversary, the Department boasts a close-knit team which includes three professors (Doctors of Sciences), nine associate professors (Candidates of Sciences), two senior lecturers, and one assistant (*Fig. 8*, *9*).

CONCLUSION

2007 saw the first graduation of specialists in Occupational Health and Safety. Since then, the Department has trained over 350 specialists and bachelors and more than 50 masters for industry, transport and other sectors. Graduates from the Department are successful on the labour market. You can meet them anywhere in Russia, from Kaliningrad to the Far East. The majority of them are employed by railway member companies of Russian Railways OJSC, Gazprom, the St. Petersburg Metro, Severstal Steel Mill in Cherepovets, and other companies in Russia. Many graduates work in supervisory agencies and expert organizations.

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