Metrologist – a profession of now and future days

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Abstract. The profession of metrologist will be in demand as long as there are measuring systems and processes in the world. ATMs, electricity meters, scales, radars, medical devices – all this is an integral part of our life today. And a metrologist, an expert in the measurement and control of all these systems, will always be needed. Moreover, all over the world, and in Russia in particular, there is a process of global automation of production. This suggests that many highly qualified specialists will no longer be in demand and metrologists, on the contrary, will become even more relevant. Preparation of metrologists should meet modern trends. In order to coordinate the requests of all market participants, the transition to professional standards is carried out. Young people will be able to choose a profession based on the use of professional standards, plan training and professional career; educational institutions will be able to form training programs that meet the needs of the market; and employers will be able to get competent specialists.

1. Introduction

In the modern world, it is impossible to ensure any production activity without metrology, metrologists are necessary for this process. Unfortunately, not many people know who a metrologist is, what he does and where he can work.

The profession of metrologist appeared at the end of the 19th century and is associated with the name of the famous Russian scientist D. I. Mendeleev. However, its origins can be found from ancient times. This profession is inextricably linked with the science of metrology. The name of both science and profession is based on two Greek words: «метрео» – measure and «логос» – teaching. The literal translation of these words means «the doctrine of measure». Thus, in the simplest sense, metrology is the science of measurement, and a metrologist is a specialist who performs measurements.

Measurement is one of the oldest forms of human activity. The first measurements, obviously, were measurements of time, distance, quantity of goods produced (mass, volume), etc. In general, the degree of development of measurements corresponded to the level of development of civilization. Even Galileo Galilei said: «We must measure everything that is measurable and make measurable what is not yet measurable».

In modern production, measurements play an increasingly important role, as with the growth of automation, production is freed from human participation and technological processes are controlled on the basis of measurement information. Therefore, measurements in the modern world largely determine the level of development of productive forces and scientific and technological progress.
2. Main part

Today, measurements permeate our entire lives, starting with school, store scales, apartment meters, speed measurement radars, or ATMs. And in any case, it is impossible to carry out measurements without special equipment—measuring instruments. The life and safety of people may depend on the accuracy of the operation of this equipment. Therefore, the accuracy of measuring instruments must be maintained and controlled. And this is another important area of activity for metrologists.

Due to the fact that each area of production is characterized by the use of its own measuring equipment, metrologists can find application in a variety of areas. The demand for these specialists in the labor market is quite high today. However, it was not always like this. Due to the crisis of 1990-2000, the profession of metrologist was not in demand among employers and was not very popular among young people. This explains the low rating of this specialty among applicants. According to the website vuzoteka.ru the specialty «Standardization and Metrology» takes only the 68th place in the ranking of specialties. Although the market demand for these specialists is quite high today [1].

Therefore, now there is a certain shortage of representatives of this specialty. So, at the beginning of 2021, on the official website of HeadHunter (the largest Russian Internet recruitment company, which ranks third in popularity among job search portals and employees in the world), there were about 800 vacancies of specialists in the field of metrology in various sectors of the economy (figure 1).

![Economic sectors related to the activities of specialists in the field of metrology.](image)

Specialists in the field of metrology are most often required in the production of industrial equipment, electronics and household appliances, as well as food; oil and gas; construction; IT-sphere. Metrologists
can also work in various regulatory organizations (Rostechnadzor, Rostest, etc.) and educational organizations. The salary of these specialists varies in a fairly wide range (from a minimum income of 30,000 rubles to a maximum of 150,000 rubles), depending on the sphere of the economy, the organization and the position held.

A metrologist must possess such qualities as attentiveness, patience, and accuracy in order to perform his work with great accuracy. By its nature, the specialty of a metrologist is at the intersection of intellectual work and the technical sphere. A metrologist should be well versed in the device of measuring devices for various purposes, which requires knowledge of the laws of physics and mathematics. In addition, metrologists should know the current standards and rules for setting up measuring devices. Therefore, the fundamental or theoretical training of metrologists is closely intertwined with the legislative – a set of state acts and regulatory documents that regulate the rules, requirements and norms that must be followed when performing measurements.

A reasonable question arises: where and how can I get the profession of a metrologist, what positions can I hold in an organization with this specialty. And here it should be noted that until the 1990s, no higher educational institution awarded the qualification of «engineer-metrologist». In this field, it was possible to obtain only secondary vocational education and the qualification «technician-metrologist» [1]. In 1987, the first educational standard of higher education was issued in this area.

The changes taking place in modern society require the improvement of the educational space that takes into account changes in state, social and personal needs and interests. Therefore, modern educational standards are undergoing significant changes and should be guided by the demands of the labor market.

Requirements for the quality and content of work of employees in a certain field of professional activity are currently described by multifunctional normative documents-professional standards [2-6]. In 2014, for the first time in Russia, a professional standard with the code 40.012 «Metrology Specialist» was developed and approved. In the future, this standard was revised and today the 2017 version is valid.

The professional standard «Specialist in Metrology» specifies the possible names of positions and professions of specialists in metrology and indicates the qualification levels associated with the level of education of the applicant. Skill levels determine the requirements for skills and knowledge, depending on the authority and responsibility of employees. In the Russian national qualification system, there are only nine qualification levels. Specialists in the field of metrology can get a qualification of 4, 5, 6 and 7 levels.

So, work in the position of a metrologist technician, corresponding to the 4th level of qualification, provides for:

- activity under the leadership with the manifestation of independence in solving practical problems that require an analysis of the situation and its changes;
- planning your own activities and / or the activities of a group of employees based on the tasks set;
- responsibility for the solution of the set tasks or the result of the activity of a group of employees.

Work in the position of a metrologist engineer, corresponding to the 5th level of qualification, provides for:

- independent activity to solve practical problems that require an independent analysis of the situation and its changes;
- participation in the management of the solution of the assigned tasks within the division;
- responsibility for the solution of the set tasks or the result of the activity of a group of employees or a division.

Work as the head of the Head of the metrology department, corresponding to the 6th level of qualification, provides for:
• independent activity, involving the definition of the tasks of their own work and / or subordinates to achieve the goal;
• ensuring the interaction of employees and related departments;
• responsibility for the result of the work performed at the level of the department or organization.

Work as the Chief metrologist, corresponding to the 7th level of qualification, provides for:

• definition of strategy, management of processes and activities, including innovation, with decision-making at the level of large organizations or departments;
• responsibility for the performance of large organizations or divisions.

3. Conclusions
Using professional standards, applicants can get an idea of a particular profession. To this end, the professional standard for each position divides the generalized labor function into labor actions that the employee will have to perform as part of their professional duties [7,8].

To perform these labor actions, the professional standard sets out the requirements for the necessary knowledge and skills of employees. These same requirements should only be transformed into requirements for learning outcomes in the higher education system. This approach allows you to coordinate the requests of all market participants (figure 2).

![Figure 2. Integration of the education and labor market.](image)

Thus, professional standards allow you to coordinate the requests of all market participants. The application of standards will allow young people to make a choice of profession, plan training and professional career. Educational institutions, using professional standards, will be able to create training programs that meet the needs of the market. And employers will get competent specialists.

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