ON SOME NEW ISSUES RELATED TO THE RISKS OF INCORRECT DATING OF DOCUMENTS IN THE LEGAL PROCESS (MINI REVIEW)

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Abstract

When appointing an examination of the statute of limitations of a document, the courts traditionally take into account the expert's experience expressed in the years of expert activity, the timing and cost of the examination. However, any traditional approach tends to become obsolete. When assessing the quality of the choice of expert methods, one should first take into account the social damage that may arise as a result of receiving court decisions based on erroneous or unfair conclusions of an expert. And only secondarily evaluate the cost and timing of the examination.

Almost all such examinations in Russia are performed by gas chromatography. At the same time, there is already an awareness in the world that it is necessary to look for an alternative to this method. The number of refused expert opinions containing the wording "not possible" is close to 100%.

The reason for this is that, in addition to the limitations inherent in the chromatography method, an incorrect physicochemical model of the process, based more on everyday experience than on scientific knowledge, is proposed for data processing.

World science in this matter goes in two directions: attempts to improve chromatographic methods by means of complicated procedures of sample preparation, search for new components with long "evaporation" period, adaptation of sampling devices and extraction methods, etc, and develops new, non-chromatographic, physicochemical models of degradation of writing compositions.

The lag of domestic science has led to a sharp decline in the quality of methodological support for determining the age of documents and created the risk that a large number of legal disputes related to the examination of the age of a document will be resolved not in favor of the truth.

Meanwhile, the other extreme is unacceptable: a complete refusal to standardize forensic methods. Improves the quality of forensic methods, the development of a special system of standards or technical regulations is required. Alas, the norms of metrology, the courts are considered as secondary and insignificant, which contradicts world experience.

Keywords: statute of a document, dating of the document, limitations of a document

II. Introduction

When appointing an examination of the statute of limitations of a document, the courts traditionally take into account the expert's experience expressed in the years of expert activity, the timing and cost of the examination. However, any traditional approach tends to become obsolete.

When assessing the quality of the choice of expert methods, one should first take into account the social damage that may arise as a result of receiving court decisions based on erroneous or unfair conclusions of an expert. And only secondarily evaluate the cost and timing of the examination. The damage from expert errors can be many times greater than the procedural and

monetary savings.

This phenomenon can be very clearly seen in the example of the modern Russian state of methodological support for examinations of the age of documents. Forensic examination of the prescription of a document (more precisely, the totality of its individual details) is a type of forensic technical examination of a document, along with handwriting examination and examination of document materials.

II. Discussion

Determining the limitation of the manufacture of props is one of the most difficult forensic technical examinations of documents. In addition to complexity, it is also one of the most popular, since, from the point of view of an unscrupulous participant in the process, "correcting" the date of production of a document is the easiest way to obtain irrefutable evidence in the Court [1]. Almost all such examinations in Russia are performed by gas chromatography. At the same time, there is already an awareness in the world that it is necessary to look for an alternative to this method. The method has many limitations and problems associated with hypersensitivity to interfering assay factors. The main limitation is the "depth of analysis" within 1-2 years ago. This is certainly not enough, since for most of the analyzed details a much larger age is declared. This can be clearly seen from the publications of the Russian Federal Center for Forensic Expertise [1-3], in which Russian Federal Center for Forensic Expertise specialists are trying to make improvements to the methodology as they gain experience in its application. But the approach based on the adaptation of experience does not lead to an improvement in the method, and the number of refused expert opinions containing the wording "not possible" is close to 100%. The situation is slightly better on the world expert platforms, but even there, the percentage of "failures" is approaching 70% [4].

The reason for this is that, in addition to the limitations inherent in the chromatography method, an incorrect physicochemical model of the process, based more on everyday experience than on scientific knowledge, is proposed for data processing. At the everyday level, you can very easily and clearly imagine how "high-boiling" components of writing materials evaporate. And by controlling this dynamics, you can calculate the "age" of the props. More often than others, for this purpose they try to use the dynamics of changes in the concentration of glycerol and 2-phenoxyethanol. Further, at the level of the same everyday experience, it is tempting to use the publicly available EXCEL program and get a "satisfactory" approximation of the evaporation dynamics by a function of the form:

$$C=Ax^{-b} \quad (1)$$

where x is the age of the stroke; the values of coefficient A and exponent b are found as a result of the modeling procedure.

This simplistic approach contradicts some of the fundamentals of physical chemistry.

Table 1: *Some properties of individual analytes of writing materials [5, 6]*

Component	Boiling temperature (°C)	Equilibrium saturated vapor pressure at 20 °C (kPa)
2-phenoxyethanol	244	0,001
glycerol	290	0,0004 (50 °C)
water	100	0,31
ethanol	78	5,8

It can be seen from the table that both glycerol and 2-phenoxyethanol are not volatile liquids.

They have very high boiling points close to 300 °C and extremely low vapor pressures under normal conditions, which is easy to verify by comparing them with really volatile liquids: water and ethyl alcohol. Glycerol vapors begin to appear only when it is heated above 50 °C. At room temperature, glycerol does not evaporate. Consequently, the dynamics of the content of glycerol and 2-phenoxyethanol is not associated with their evaporation. Нужно искать иные причины, т.е. химические реакции, в результате которых компонент деградирует в составе материала письма. In this case, one should use the basic equation of chemical kinetics, the so-called "Arrhenius equation", similar to the models of foreign authors [7].

World science in this matter goes in two directions:

- attempts to improve chromatographic methods by means of complicated procedures of sample preparation, search for new components with long "evaporation" period, influence of paper sheet, adaptation of sampling devices and extraction methods, sample weight and desorption time, etc. [8-10].
- develops new, non-chromatographic, physicochemical models of degradation of writing compositions. As a rule, they are based on spectroscopy methods using modern mathematical methods for processing measurement results [11]. There is undoubtedly progress in this direction, but the final goal is still far away.

Unfortunately, domestic science has not been involved in the world process for a long time. Fundamental research in this area has not been conducted since the end of the last century (the accumulation of experience in the use of a single technique cannot be attributed to the scientific process). Periodic publications of the experience accumulated in the Russian Federal Center for Forensic Expertise do not affect the fundamental basis of the method. The overwhelming majority of experts have the illusion that there is and cannot be an alternative to gas chromatography in the version of the 80-90s of the twentieth century. Unfortunately, this turned out to be a favorable ground for the emergence of entire groups of non-state "pseudo-experts" who, knowing the weaknesses of chromatographic analysis, undertake to carry out any examinations of the prescription of a document by fitting to a predetermined result. Only in December-January 2023-2024, the Courts of St. Petersburg and the Leningrad Region considered 5 Cases containing "research by the Expert" Mr. I.N.P., where the chromatographic method "established" the age of documents dated 2005, 2012, 2013, 2017. Confidence in his impunity is based on the fact that there is no reference method of analysis. And such cases are not isolated.

The argumentation of reviewers pointing out to the Courts the obvious inconsistencies of such pseudo-expertises with the fundamental scientific basis of chromatography and physicochemical analysis, as a rule, does not find support in the Court. The argumentation of reviewers, as a rule, is based on fundamental arguments that are obscure to the Court, and unscrupulous experts - on personal experience and everyday ideas of the judges and lawyers. And argumentation, requiring fundamental special knowledge, is usually perceived as incomprehensible and alien to everyday perception.

Thus, the lag of domestic science has led to a sharp decline in the quality of methodological support for determining the age of documents and created the risk that a large number of legal disputes related to the examination of the age of a document will be resolved not in favor of the truth. In addition to material, economic and financial damage, which, in theory, can be calculated, there is significant social damage from the fact that a "gap" has appeared in the country's judicial system that allows the Courts to be misled in the interests of one of the parties. This undermines confidence in the judicial system as a whole. This trend has long worried the qualified expert community. Most often, the problem is proposed to be solved by creating professional departmental councils, and commissions consisting of trusted specialists who will weed out unscrupulous experts and monitor the scientific validity of expert research. However, this measure will not have the desired effect if the members of such councils do not have the necessary amount of fundamental knowledge, but will be guided only by personal experience of using a

limited number of methods. Therefore, structures authorized by the government of the Russian Federation, primarily the Academy of Sciences of the Russian Federation (Resolution of the Government of the Russian Federation of December 30, 2018 No. 1781 "On the implementation of scientific and scientific-methodological management of scientific and scientific-technical activities of scientific organizations and educational organizations of higher education, as well as examination of scientific and scientific-technical results obtained by these organizations, and on amendments to certain acts of the Government of the Russian Federation") and the Federal Agency for Technical Regulation and Metrology (Rosstandart) (Federal Law of June 26, 2008 No. 102 "On Ensuring the Uniformity of Measurements"). To assess the qualifications of an expert, it is also advisable to attract information from the database of the Russian Science Foundation eLIBRARY.RU (https://elibrary.ru/elibrary_about.asp), which gives a statistical assessment of the scientific qualifications of all specialists of the Russian Federation.

The scientific validity of expert methods is inseparable from the requirements of their reasonable standardization to the extent necessary to prevent improvisations of unscrupulous experts. The basics of national standardization are described in No. 184 "On Technical Regulation". National standards and all-Russian classifiers of technical, economic and social information, as well as control over the implementation of the Federal Law of June 26, 2008 No. 102 "On ensuring the uniformity of measurements" are under the jurisdiction of Rosstandart. Unfortunately, forensic activities are not included in the list of areas of activity subject to mandatory standardization.

E.R. Rossinskaya points out that: "The process of expert research includes both standardized components and components that determine the action of a forensic expert approximately, in general terms. The methodology always contains rules and recommendations on the key points that determine the research design. No method can provide for the entire content of a particular study. Therefore, creative components are usually present in every expert study" [12, p. 15-16]. This indisputable statement, however, gives rise to unscrupulous experts to "justify" the rejection of metrology requirements and create arbitrary self-invented methods, without caring about their scientific validity, which does not allow the introduction of standardization in the forensic field in full.

Meanwhile, the other extreme is unacceptable: a complete refusal to standardize forensic methods. o improve the quality of forensic methods, the development of a special system of standards or technical regulations is required. The technical regulations of expert research should include unifying requirements that ensure the general scientific and metrological reliability of research, as well as procedural requirements. Standardization and unification of forensic technical examination of documents should, first of all, relate to methods of preparing objects for research, storage, sampling and transportation, and, necessarily, metrological support. Alas, the norms of metrology, the courts are considered as secondary and insignificant, which contradicts world experience.

B Importance should be given to unification [13] - establishing the optimal number of standard operations, primarily of a procedural nature. All this work should be carried out taking into account the fact that when improving the quality of forensic technical examination of documents, society faces a contradictory but feasible task: standardization and unification while maintaining the freedom of the expert in the choice of methods and means of examination, according to Federal Law of May 31, 2001 No. 73 "On state forensic activity in the Russian Federation".

It should also be mentioned about the organoleptic group of methods, which, paradoxically, also play, in the future, an important role in improving the quality of forensic methods for determining the age of a document. This group of methods, by analogy, in relation to STED, can include "expert experience". This method cannot be completely excluded from consideration, although, as mentioned above, its absolutization, which is practiced by the judicial authorities, is

more harmful than beneficial to improving the quality of methods. The objectivity of the organoleptic method depends on the qualifications, experience and abilities of the persons conducting the examination. This should be added (in relation to expert activity) the level of cognitive abilities of the expert. This group of methods can be used in commodity science to determine the quality of products, the use of which is associated with emotional effects on the consumer. Moral satisfaction from the fact of establishing justice in a judicial dispute can also be attributed to emotional reactions.

Meanwhile, world science is actively engaged in the problem of quantitative registration, objectification and elimination of subjectivity of criteria for organoleptic "experience".

It should be taken into account that a scientific direction has already emerged in this area, replacing the organoleptic subjective perception of the properties of materials with an instrumental one. We are talking about a group of technologies from the "electronic nose and electronic tongue" family. Electronic language technology, consisting of non-selective sensors, is a quasi-organoleptic method for representing the composition of chemical mixtures. An electronic tongue (nose) is a package of sensors, preferably miniature ones, each of which cannot have high levels of sensitivity and selectivity for the components being measured, but the cumulative signal of such families of sensors carries additional information about the structure and properties of the system, which cannot be obtained using each sensor separately.

The sensor package data is processed digitally and visualized as clusters of values on the coordinate plane of the selected components. The aggregate signal forms a visualized image of the system. Such technologies are also called "multisensory" [14]. This concept, imitating the human organs of touch, was implemented in the development of the already mentioned analytical tools "electronic nose" and "electronic language" [15-17], which were introduced into use in 1995 as a result of joint Russian-Italian developments.

The electronic language proposed in 1995 is already positioned as a sensor used to analyze any solution consisting of a complex set of components using a package of non-specific chemical sensors and image recognition [18-20]. For this electronic language, a new method of mathematical processing of the cumulative signal of groups of sensors using chemometric analysis was used. The obtained result could be easily visualized in the form of a 2D or 3D graphical model in the selected coordinate system. That is, in this field there is a symbiosis of the visual image, digital model and verbal description of the composition of the system. This greatly simplifies a number of analytical and expert tasks, as the visual image often simplifies verbal descriptions. In addition, a set of digital and visual data allows you to simulate the next stage of the human nervous system: the processing of an array of information by the brain, which is performed by software of the highest level. And then move on to sending commands to actuators and devices.

Chemometrics is a synthetic discipline located at the intersection of chemistry and mathematics. It allows you to implement complex data processing algorithms, in particular, the results of multidimensional and multifactorial experiments. The following methods are widely known in chemometrics: ANN (artificial neural network), DASCO (discrete analysis with short covariance matrix), INLR (implicit nonlinear latent regression), PARAFAC (parallel factor analysis), PAT (process analytical testing), PCA (principal analysis components), PCR (principal component regression), PLS (projection to latent structure), etc.

The most commonly used method of mathematical processing of electronic signals of the electronic tongue and electronic nose is the chemometric method of the principal components of PCA.

In turn, with the development of chemometrics, manufacturers of measuring instruments began to actively create equipment capable of measuring in the form of multidimensional data sets, rather than individual digital files or values [21].

Chemometric methods are already being introduced into forensic practice abroad. For example, in a forensic environmental examination [22]. An attempt has been made to apply it to

the forensic technical examination of documents [23 – 25]. For this purpose dates of actual execution of document details are transformed into figures of spatial clusters on plane of coordinates of selected components of value matrices.

In the absence of such a presentation, specialists and experts would be faced with the difficult problem of verbally describing the results obtained for unprepared listeners. Demonstration of a visual picture of chemometric clusters, for example, during a court hearing, according to the plan, will help the judge understand the logic of the expert who made the conclusion based on the measurement results. Unfortunately, legal proceedings have not yet adapted this form of argumentation and prefer to rely on formalized verbal images and concepts, but we believe that we are talking about the near future, since scientific and technological progress will force the parties to the process to master this "language". We deliberately focused on this group of methods in such detail, since the use of a chemometric apparatus for the purpose of establishing the statute of limitations of a document in order to improve the quality of methods will actively develop in world science in the coming years in those areas of forensic examination where the main role, so far, is played by the experience and subjective opinion of the expert.

III. Conclusion

Summing up, it should be noted that the state of fundamental science in the field of dating documents in the Russian Federation is characterized by a set of problems. The necessary scientific research in this area is not carried out. In non-state expertise, there are entire groups of unscrupulous specialists who carry out conclusions by adjusting to a predetermined result. They argue their unreliable results with understandable at the household level, but not at all with scientific arguments. Legal proceedings are not yet ready for modern natural science and technical argumentation. Very often, the Court and the legal profession prefer to rely on concepts from the field of personal and everyday experience. An important task of improving the quality of forensic research is the mastery by the Judicial and Lawyer Corps of the language of fundamental scientific concepts and modern methods of mathematical processing of the results of expert research. Digital visualization of the results of expert research can provide significant assistance in this matter.

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