

CHEMMOTOLOGY AND CHEMICAL TECHNOLOGY

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Sergii Boichenko**PHENOMENOLOGICAL CONCEPT OF CHEMMOTOLOGY**

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Abstract

Aim: of the article is consideration of goals and objectives of Chemmotology science. The paper presents a modern interpretation of science, its role in the development of technology and society. **Methods,** which were used for preparing the work include system analysis, systemology, formalization, hypothetic and abstract-logical methods. **Results:** It is shown that with the development of the range of modern fuel and lubricants, the development and promotion of alternative fuels, consideration of Chemmotology problems is impossible without systematic approach. In addition to the theoretical part of Chemmotology science, it is an integral component of the application, and whose task is to ensure energy and environmental security of the country's economy, rational use of traditional and alternative fuels and lubricants in the operation of a modern and advanced equipment. **Discussion:** The article focuses on the fact that in recent years one of the most important issues is the ecological constituent of Chemmotology, which is aimed on maximally possible minimization of the negative impact of fuel lubricants and technical liquids on ecosystems. Also processes of regeneration, restoration of quality, disposal and recycling of fuel and lubricants become highly relevant. In conclusion, this work shows that the fundamentality of Chemmotology science is the manifestation of systematic methodological characteristics in solving modern engineering problems in technical development and the development of energy sources for motor vehicles.

Keywords: chemmotology; exploitation; fuels & lubricants; quality; system approach; technics.

1. Introduction

Rational use of fuel and lubricants, energy efficiency and environmental safety are among the most important problems of our time. Their solution largely determines the sustainable development of the world economy and the preservation of human comfortable conditions.

Science that became responsible for ensuring integrity in dealing with a variety of tasks connected to these problems, is Chemmotology [1–3].

2. Analysis of the research and publications

Encyclopedic concept of science defines it as a sphere of human activity, the function of which is the development and theoretical systematization of objective knowledge of reality [4, 5]. The direct goals of the science are description, explanation and prediction of the processes and phenomena of reality, which are the subject of its study on the basis

of public law, i.e. the theoretical reflection of reality. Chemmotology possesses all these features [5–7].

The modern definition of Chemmotology is interpreted as following: *This is the science about the technological processes, properties, quality and methodology for the rational use of fuels, oils, lubricants and technical liquids in the operation of machinery* [8, 9]. It is necessary to consider both conventional and alternative fuels and lubricants.

Knowledge of technology involves not only knowledge of the design, kinematic, dynamic, temperature characteristics, but also the physical and chemical properties of construction materials needed for the analysis and prediction of physico-chemical processes during the application of a specific fuels and lubricants [2, 6, 10–12].

For example, the aircraft is a huge amount of metallic and composite parts, which are flying at a speed of 900 km/h (0.85 from the speed of sound, it

is a typical speed of the Boeing 787 Dreamliner) at an altitude of 10 km. A couple of million parts are manufactured and assembled into one product and aircraft flies, providing comfort for passengers and profit for owners (Fig. 1).

Providing reliable and economical joint flight of these details, linking the most different requirements (load capacity, fuel consumption, flight range, noise during takeoff and landing, the requirements for the length of the takeoff and landing, the need for easy maintenance on the ground, the lack of icing, the safety of people on board and so on) is possible only with the help of system engineering approach, taking into account the requirements of a variety of specialists, representing a variety of professional and community groups [13, 14].

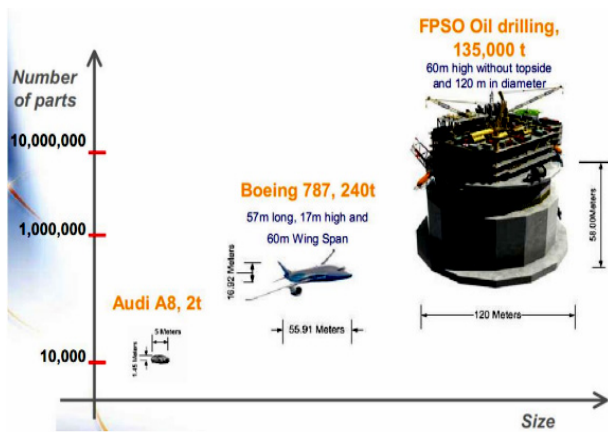


Fig. 1. Number of details and weight of some engineering constructions

Generalized utility function of fuels and lubricants as socially useful products (as opposed to a generalized function of vehicles) can not be described by the appropriate design documentation and drawings [8, 16]. Exactly this fundamental difference between the fuels and lubricants from mechanical engineering products objectively led to the emergence Chemmotology [2–5].

3. Main material

As we know from the classical scientific papers on Chemmotology [6, 12, 14–18], there is a universal four-tier Chemmotology system in any kind of machinery and equipment, which use fuel, lubricants and technical liquids (Fig. 2). This system takes into account the relationship between the quality of the fuels and lubricants, the reliability of equipment and the conditions of its operation [12, 15]. It can also be seen in Fig. 3 that shows an improved Chemmotology system.

Initially Chemmotology science is characterized by systematicity. Chemmotology, as well as system technology and system engineering, has such methodological tools in science and technology, which covers the design, development, testing and operation of complex systems. A certain extent it is an applied embodiment of systems theory in which the term "system" is used in a special way, referring to the way of thinking to explain coherent links between elements of the system, synergy and emergence. Here, the "system" expresses not only the essence, but also related to the nature of the object, emphasizes the class properties interesting point of view from here diversity of definitions and a huge number of possible ways the system decomposition and release of subsystems [18, 19].

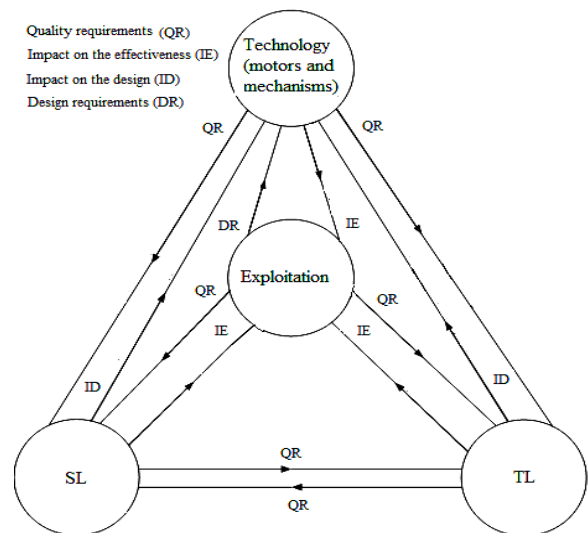


Fig. 2. Improved four-tier Chemmotology system

These thoughts can be seen in Fig. 3. It illustrates the integrated interdisciplinarity of Chemmotology, science system itself, its hierarchy, Chemmotology coherent connections, structure, nature, synergy and emergence [19–21]. It is clearly shown how the interaction of elements and coherent processes on the example of an aircraft engine result in synergistic and emergent effects: ecological compatibility, efficiency, reliability and durability of the equipment.

Currently, consideration of problems of Chemmotology beyond a systematic approach to knowledge is not possible. This is qualitatively higher than just a substantive way of knowing. (Synergies is summarizing effect of the interaction of two or more factors, characterized by the fact that their effect is much greater than the effect of each individual component in the form of a simple sum).

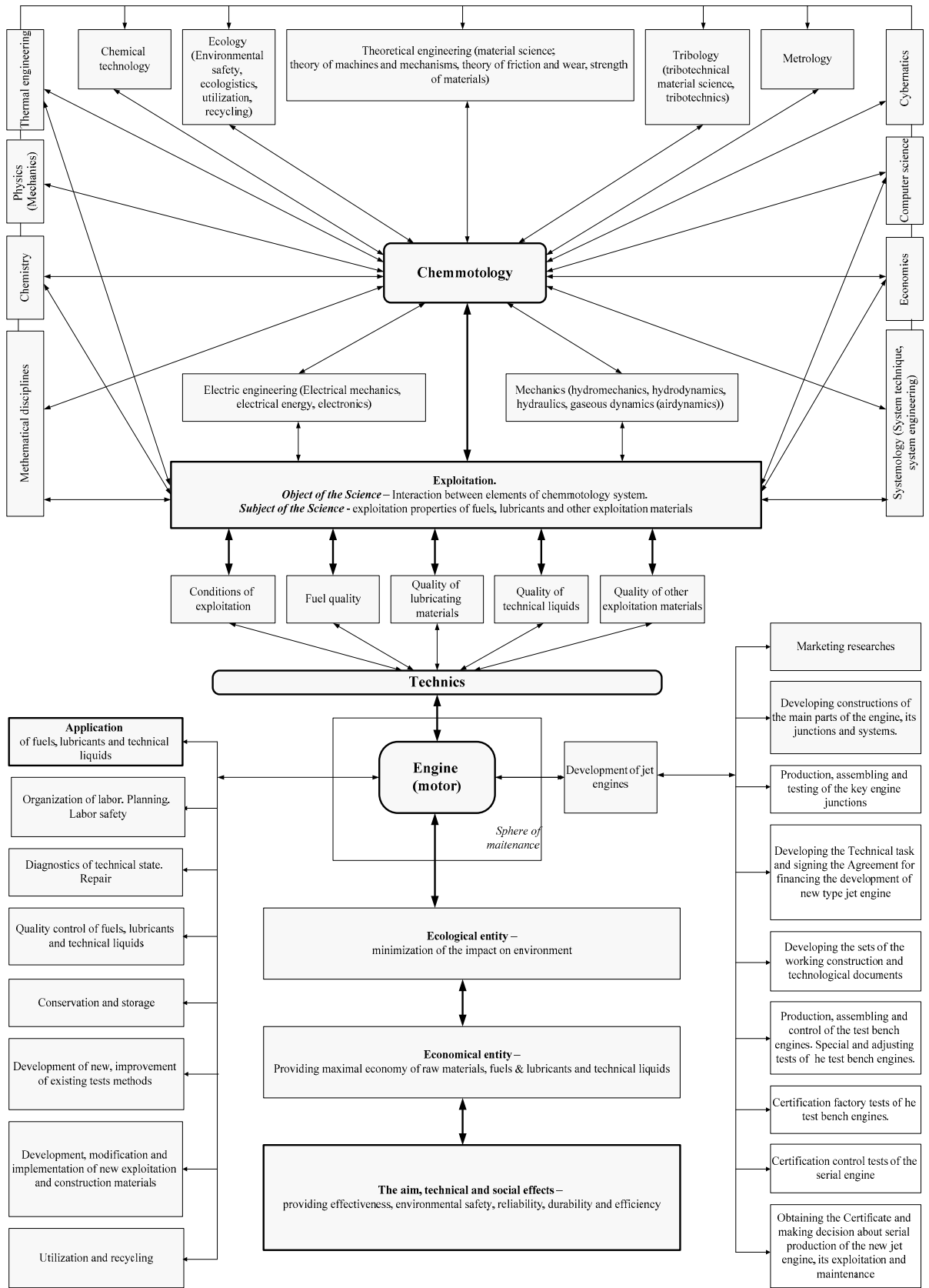


Fig. 3. The phenomenological scheme (model) of Chemmotology

"Emergence is quality, property of the system, which is not inherent in its elements separately, but instead rises by combining these elements into a single, integrated system."

From a philosophical point of view, we can easily state that Chemmotology science makes the consolidating function of system, integration of communication scholars and practitioners of engineering, chemical, oil-refining and petrochemical sectors of the economy, together with operators technique for solving evolution problems of scientific and technological progress. For example, refiners produce gasoline, diesel and other fuel, for further use in engines [22]. Knowing fuels, lubricants and technical liquids is to have a clear understanding of the relationship of indicators characterizing the quality of a physico-chemical and energy processes that occur during their use in specific conditions, and the relationship with their chemical and group composition.

The lack of such an analysis and forecasting makes it impossible to achieve the objective, technical and social effects. This is another clear evidence of synergy effects in the operation of Chemmotology system [22–24]. Quality control of fuels, lubricants and technical liquids plays a special role in Chimotology on the way from their producer to consumer [25]. As we can see from Fig. 3 quality of exploitation materials is included into the parameter of the system itself. Practice has proved that the use of fuels, lubricants and technical liquids with the overestimated indicators of quality (quality level) leads to excess of costs in their production, and with reduced to cost escalation in mechanical engineering and operation of equipment.

As it is known consider any scientific problem is impossible without a coherent ideological system. Worldview, which selects a particular civilization, defines the whole character of the activities of society and its impact on the environment. On this basis, the *environmental essence* of Chemmotology is as far as possible to minimize the negative impact of fuels, lubricants and technical liquids on ecosystems [24–26].

The importance of tasks solved by the Chemmotology is shown by its role as an applied science: ensuring energy and environmental safety of the country's economy, rational use of traditional

and alternative fuels, lubricants and technical liquids in the operation of a modern and advanced equipment [27].

Deterioration of fuels, lubricants and technical liquids quality is also typical for operation of technique in a result of evaporation, oxidation products accumulation, precipitation and leaching of some additives, mixing fuels, lubricants and technical liquids of different brands et al. (Fig. 3). Here become actual processes of regeneration, restoring quality, utilization and recycling [28, 29].

Classics of systematic approach indicates that the solution of any problem is characterized by the following elements:

- 1) Someone (or some group) should be put into the front of the problem, i.e. requires the existence of decision-making;
- 2) The purpose, desire of decision-making aimed at solving a problem situation that is its purpose and the basis for formulation of the problem and to achieve this goal
- 3) Decision-making should have a choice among alternative actions that lead to achieving the goal.

These arguments allow us to assert that Chemmotology system "engine-fuel-lubricants-technical liquid" is a management task, in which apply prescriptive and descriptive methods. Here we can trace Chemmotology coherence with cybernetics (which depicted connections in the upper part of Fig 3). At each stage of engine creation (the right side of Fig. 3), operation and application of SCL it's also demonstrates the need for decision-making (the left side of Fig. 3), which eventually is embodied in the synergetic result: to ensure efficient, ecological, reliable and economical operation of equipment.

4. Conclusion

Consequently, the fundamentality of Chemmotology science is the manifestation of the system of methodological characteristics for solving modern engineering problems, improving of technology and development of energy sources for motor vehicles simultaneously. Applying Chemmotology and acting its knowledge is possible to achieve significant results of scientific and technical progress in the technique. The concept of Chemmotology is the systematic integration of knowledge of engineering, chemical, oil-refining and petrochemical spheres of scientific and practical activities to achieve synergistic results in ensuring reliability, safety, durability and efficiency of equipment.

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Мета цієї статті полягає у розгляді цілей та завдань науки хімотології. У роботі представлено сучасне трактування науки, її роль для розвитку техніки і суспільства в цілому. **Методи**, що використовувалися при підготовці даної роботи включають системний аналіз, системологію, формалізацію, гіпотетичні та абстрактно-логічні методи. **Результати:** Показано, що з розвитком асортименту сучасних паливо-мастильних матеріалів, розробкою і популяризацією альтернативних палив, розгляд проблем хімотології є неможливим без системного підходу. Крім теоретичної складової науки хімотології, невід'ємною є і прикладна складова, завданням якої є забезпечення енергетичної та екологічної безпеки економіки країни, раціональне застосування традиційних і альтернативних паливо-мастильних матеріалів при експлуатації сучасної і перспективної техніки. **Обговорення:** У статті акцентується увага на тому, що в останні роки однією з найважливіших є екологічна сутність хімотології, яка полягає у максимально можливій мінімізації негативного впливу паливно-мастильних матеріалів і технічних рідин на екосистеми. Крім того стають актуальними процеси регенерації, відновлення якості, утилізації і рециклінгу паливо-мастильних матеріалів. На закінчення даної роботи показано, що фундаментальність науки хімотології полягає в прояві системних методологічних властивостей під час вирішення сучасних інженерних задач вдосконалення техніки і розвитку джерел енергії для двигунів транспортних засобів.

Ключові слова: експлуатація; паливно-мастильні матеріали; системний підхід; техніка; хімотологія; якість.

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Целью данной статьи является рассмотрение целей и задач науки химмотологии. В работе представлено современное трактование науки, ее роль для развития техники и общества в целом. **Методы**, которые использовались при подготовке данной работы включают системный анализ, системологию, формализацию, гипотетические и абстрактно-логические методы. **Результаты:** показано, что с развитием ассортимента современных топливо-смазочных материалов, разработкой и популяризацией альтернативных топлив, рассмотрение проблем химмотологии невозможно вне системного подхода. Помимо теоретической составляющей науки химмотологии, неотъемлимой является и прикладная составляющая, задачей которой является обеспечение энергетической и экологической безопасности экономики страны, рациональное применение традиционных и альтернативных топливо-смазочных материалов при эксплуатации современной и перспективной техники. **Обсуждение:** в статье акцентируется внимание на том, что в последние годы одной из важнейших является экологическая сущность химмотологии, которая состоит в максимально возможной минимизации негативного влияния топливо-смазочных материалов и технических жидкостей на экосистемы. Кроме того становятся актуальными процессы регенерации, восстановления качества, утилизации и рециклинга топливо-смазочных материалов. В заключение данной работы показано, что фундаментальность науки химмотологии состоит в проявлении системных методологических свойств при решении современных инженерных задач совершенствования техники и развития источников энергии для двигателей транспортных средств.

Ключевые слова: качество; системный подход; техника; топливо-смазочные материалы; химмотология; эксплуатация.

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