
COMPARATIVE CHARACTERISTICS OF TECHNICAL AND MEDICAL DIAGNOSTICS

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ABSTRACT:

Diagnostics in maintenance, or technical diagnostics is a scientific discipline which deals with theory, methods and means of maintenance of technical systems and their elements and a set of joined mechanisms. The task of diagnostics is revealing and preventing of a break-down, by which we make the machines and the equipment more reliable and available on a demand. Beside this primary task, technical diagnostics allows a prompt acquiring of long-term data.

Medical diagnostics represents a possibility of a disease detecting on the basis of anamnesis (medical history), recognizable clinical picture, laboratory analyses and radiology methods. Finding out about a disease on time is a predominant condition for an adequate treatment to the complete healing.

KEYWORDS:

Diagnostics, technical, medical.

1. INTRODUCTION. TECHNICAL DIAGNOSTICS

Methods in diagnostics are used in order to determine a condition of a technical system. A system check-up (diagnostics) can often be done without having the system dismantled by using adequate tools and utensils. If that could not be done, we should try with dismantling of machinery and equipment, and a thorough measuring and checking of the essential elements must be done. The possibility to detect the machinery break-down accurately and to detect the conditions which would indicate certain maintaining methods application are utterly important from the aspect of speed and quality of the machinery and equipment maintenance.

For determining the real system condition using a technical diagnostics method, it is necessary to know what and how to check, and which diagnostics methods to use and how to get a conclusion about a technical system condition as well.

The special diagnostics parameters are usually measured during the process of exploitation and in the periods of a stoppage as well. Thus, diagnostics can be done continually and periodically (from time to time), manually or automatically. There are some concrete parameters which should be observed continually

(monitoring) for the whole time of a technical system operation. Some other diagnostic parameters should be observed periodically.

Technical diagnostics can be:

- Permanent (continuous), where the tools for diagnostics are integrated in the machine. They control the main system condition during the exploitation according to the chosen diagnostics data.
- Periodical diagnostics is applied after the certain period of machine operation or after the certain tasks have been completed. During the process of diagnostics, there are many pieces of different information which is to determine the location, the type and the possible machinery break-down cause. The system data analysis of the type and frequency of a break-down is used in order to create a basis for the equipment manufacturer and the user to decide about what he should do and how to react.

Determining a technical system condition (diagnostics) means doing a set of technological operations whose aim is to help bring an important decision about the accuracy, repair and regeneration or removal of the elements, structures or sets of joined mechanisms, which are the main part of the system.

2. METHODS IN TECHNICAL DIAGNOSTICS

The diagnostics of elements in mechanical engineering is done according to a certain schedule. In the first place, wear and other malfunctions are tested, since that is the most common reason for removing of elements. The most complex process is to detect certain hidden damage small cracks, inner holes etc.)

These problems are very difficult to solve only on the terms of technical measurement. That is why we use indirect methods of diagnostics and machinery operation evaluating. That is just an important addition to the method of technical measurement. Indirect methods of the technical system condition determination refer to the use of the latest and the most contemporary tools and utensils which can allow highly accurate and fast checking and without having the machine dismantled or stopped. The indirect methods to evaluate a technical system condition give a comparative technical characteristic.

Many different diagnostics methods have been used nowadays (figure1).

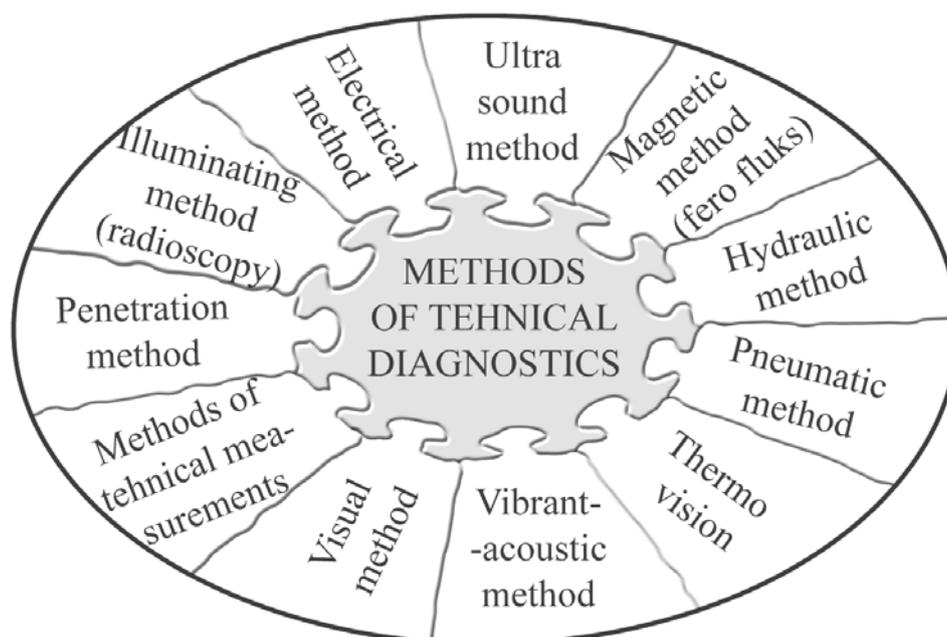


FIGURE 1. The most frequently used methods of technical diagnostics

3. THE COMPARISON WITH THE DIAGNOSTICS METHOD IN MEDICINE

The most important characteristics of the mentioned methods of technical diagnostics and the comparison with the matching methods in medicine we have tried to present in the table (table 1).

TABLE 1. Comparative methods characteristics in technical science and medicine

Method	Technical diagnostics		Diagnostics in medicine	
	Operations	Purpose	Matching method	Purpose
hydraulic method	<ul style="list-style-type: none"> Leakage detecting, Measuring the pressure of a liquid. 	Determining of a certain damage (cracks and holes) in the elements like engine head, pipes of collectors etc.	Blood pressure measuring.	Determining of certain damage on inner organs, kidneys diseases, changes in blood vessels (cancer).
pneumatic method	<ul style="list-style-type: none"> Bathtub soaking, Soapsuds polishing (with larger elements). 	Determining of a certain damage (cracks and holes) on heating systems, pneumatics, boilers, etc.	Air injection into abdomen, ribs, brain holes.	Air injection into abdomen artificially during laparoscopic operations. In earlier time, air used to be injected into lungs order to separate lungs involucres from the bones.
vibrant -acoustic method	<ul style="list-style-type: none"> Direct- sound measurement, Analogous – mechanical vibrations changing into electric signals. 	Determining of the operation of the engine and machinery, function of revolving elements, composition regularity check.	Qualitative and quantitative hearing check (ORL).	Using a sound fork (256-512 Hz) we determine the type and the intensity of the hearing damage (conductive or perceptive). Air and bone conductivity (regular one has 12 frequencies).
thermo vision	<ul style="list-style-type: none"> Temperature distribution scheme. 	Identification of the surface elements with prohibited heating.	Principle of the body temperature	Term graphical camera measures any temperature change with brain cancer, bleedings, post-trauma (changed tissue shown).
visual method	<ul style="list-style-type: none"> Visual observation, Kerosene testing, Endoscope. 	Evaluation of the surface condition, holes, damages, curves investigating as well as pitting of cogs and cog-wheels and inner machinery system functioning.	Inspection, endoscope, dermatological check-up.	General condition of a patient evaluation, color of the skin, , changes on slime tissues, outer anomalies, digestive system evaluation.

magnetic method (fero fluxs)	<ul style="list-style-type: none"> wet method (with kerosene alloy), dry method (magnetic powder), polar, circular or combined magnetisms. 	Evaluation of the surface and under-surface condition, cracks, holes, non-metal parts of ferromagnetic materials.	MRI ¹ – Proton orientation in a magnetic field of the organs	The most advanced diagnostics method of spinal cord check-up, with injuries in sport and other organs changes.
illuminating method (radioscopy)	<ul style="list-style-type: none"> radiographics (x-rays), gamagraphics (γ-rays), ionization method. 	Determining of deeper cracks and inner holes, lunkers and non-metal parts, quality check of welds.	Classical radiography (x-rays)	Complete check of lungs, abdomen, bone system, urology system. Comparative shots, evaluation of immovability of a diaphragm.
penetration method	<ul style="list-style-type: none"> Penetration. 	Determining of a position and size of the surface cracks.	Luminescence. Cold light illuminating.	On non-covered photographic plate, (film), α and β particles cause luminescence and damage the film.
ultra sound method	<ul style="list-style-type: none"> sound shadow method, impulsive echo method. 	Determining of deeper cracks and holes, quality check of weld. Measurement of wall thickness, which are not available on both sides.	Acoustic shadow method and Doppler	Determining of changes on inner organs, blood vessels, soft tissues.
electrical method	<ul style="list-style-type: none"> whirlpool currents, magnetic characteristics change, electro conductivity changes, measurement. 	Determining of cracks and holes, i non-metal parts and elements (longer poles)	Electro conductivity measurements, and resistance	Registering of a heart operating, brain operating, registering neuron-muscular conductivity EKG ² , EEG ³ , EMG ⁴ .
methods of technical measurements	<ul style="list-style-type: none"> direct, indirect, combination comparative, differential. 	Determining of the regularity of a shape, type of wear, needed mechanical characteristics deviation.	Direct, indirect, comparative measurement method	Determining of the size, weight, pressure, lab analysis, changes check on RTG ⁵ film, ultra-sound check-up, intra-uterus check, comparison with regular or previous analyses.

¹ MRI – magnetic resonance . Materials are investigated on protons level (not orbital layer like in x-rays), parameters are special concentration of atoms of hydrogen (its protons) in a water solvent of body structures and its return to the first position.

² EKG - electrocardiogram – measures frequency and quality of the work of the heart.

³ EEG - elektroencefalogram - measures brain waves work intensity.

⁴ EMG - elektromiografija - measures activity of groups of muscles on electrical stimulus

⁵ RTG – radiographic - x-ray pictures taking.

4. CONCLUSION

The safe and correct exploitation of the repaired technical systems can be obtained only by accurate and thorough diagnostics in mechanical elements and machines, and measures which are taken according to the conclusions after the diagnostics has been done.

Almost the same conclusion goes for medical science; The application of the adequate method of treatment is based on the quality and precise evaluation of the whole organism condition.

Technical sciences advance has been reflected on more contemporary and complex laboratory and x-ray machines construction with their high technological value, thus giving more possibilities for further diagnostics and similar procedures in medicine.

The subject is rather interesting, since only correctly and thoroughly diagnostics in mechanical elements can allow reliable and accurate exploitation of repaired technical systems.

The same conclusion can be applied in medical studies: the application of the adequate treating methods in curing diseases is based on quality and precise diagnostics of a living organism and special organs.

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