Scientific-research Institute " Geotechnologica Problems of Oil, Gas and Chemistry"

INTEGRATED APPROACH TO THE DIAGNOSTIC CONDITION OF PIPELINE SYSTEMS

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The process of world globalization has brought the problem of energy security to the forefront. The energy security represents a level of immunity of the government economies against outside threat. After "oil shocks" of the 70-ies of the last century the countries importing oil understand the term "energy security" as reliability of "delivery security" at a reasonable price. At the same time, the countries importing oil and whose economy entirely depends on the return on oil are concerned immediately about the stability of their markets.

The economic and social development of mankind depends on reliable, stable and adequate power supply. We can observe continuously increasing power consumption and especially vividly it manifests itself in dynamically developing regions of the world with great population.

Different sources of energy resources and routes of their transportation directly relate to geopolitical and geo-economical interests of European countries, as the European Union is the major consumer of hydrocarbon raw materials. Today, 60% of oil consumed by the European Union is exported from outside, 29% of which is imported from the post-Soviet countries, mainly from Russia, Azerbaijan and Kazakhstan.

In recent years dramatically increased the relevance of monitoring of gas pipeline and gas distribution systems. This is primarily due to the need to minimize the costs of reconstruction and repair of pipelines, which are one of the major expenditure items in their care. At the same time ensuring the reliability of the elements of these systems is essential.

On the operated pipeline systems, there are many sites with complicated geological conditions. This landslide, tectonically active areas, areas subject to flooding, etc

According to a statistics, more than half (80%) of all accidents pipelines falls on the intersection of tectonic active zones, with frequent recurrence of accidents at the same sites.

Typically, the real reasons for repeated breaches and destruction of gas pipelines are the factors that lead to a reduction of technological fatigue properties of steel pipe and reinforced concrete structures. By results of in research oil and gas pipelines, it was determined that approximately 70% of all defects are classified as "loss of metal, which includes cracks, cavities, etc.

With the advent of space geodesy system GLONASS, GPS, quickly solved the problem of obtaining information about the dynamics of moving parts in time, and hence the offset coordinate axis of the pipeline under the influence of tectonic movements of the crust.

Fig.1. Fragment of outer high-resolution images on the route proleganiya main oil pipeline Baku-Tbilisi-Ceyhan

With the aging pipeline systems ecological conditions in the man-made environment leads to increased corrosion, which significantly reduces the actual time of their life compared with the project, which is characteristic of wet soils with a sufficient content of sulfur compounds and areas with high water cut

For the purpose of planning preventive maintenance for the ICC compiled maps of the corrosion activity of the soil on the basis of space data (Fig. 2)

As a result, satellite image interpretation was found a few places with high humidity, which may further accumulate water.

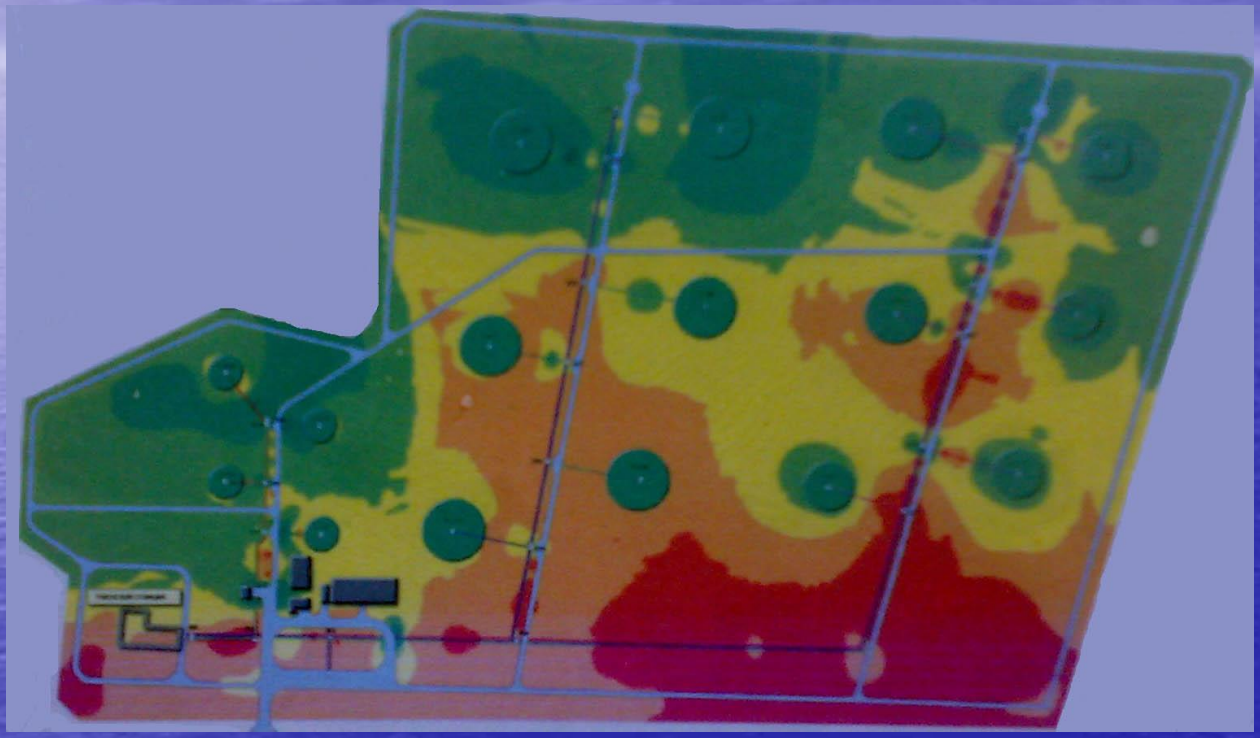


Fig.2. Schematic map of corrosion activity of soil constructed by interpolation of ground measurements with the use of space data

Actual and normative terms of service piping systems oil and gas industry

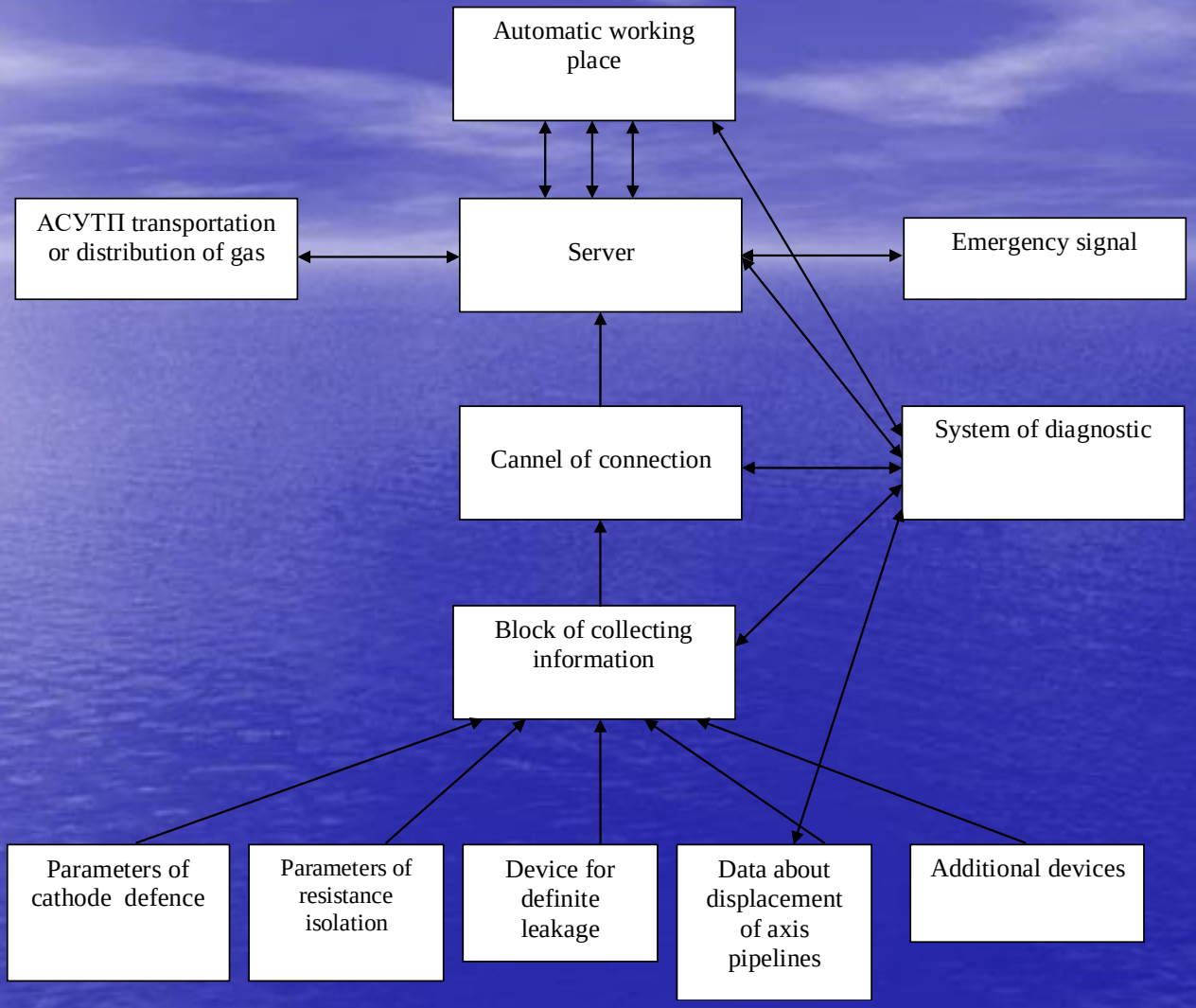
Pipelines	Time of exploitation, years		
	Real		standard
	Ural	West Siberian	
Gas pipelines	4-6	10-12	non setup
Oil pipelines non sulphur hydrogen	10-15	10-15	21
Oil pipelines with sulphur hydrogen	5-8	5-8	non setup
Pipelines of sew-age non sulphur hydrogen	5-7	6-8	21
Pipelines of sew-age with sulphur hydrogen	2-3	4-6	non setup

In general, the measured parameters determined during the monitoring can be divided into a number of indicators.

• Technical condition to which the thickness of the pipeline, the size of corrosion damage, the presence and characteristics of defects connections (welded, flanged, threaded), the quality of anti-corrosion coating (insulation), the state supports (for ground gas pipelines)

• Operating conditions, characterizing the external negative effects on the pipeline: the degree of aggressiveness of soils, the efficiency of cathodic protection, temperature drop, the rate of flow of groundwater, etc.

For effective monitoring and control of technical condition of steel pipelines and gas distribution systems perspective is the introduction of IMS, which can be easily integrated into automated process control systems (PCS) gas transmission and distribution. Outline of this RIS is shown in Figure 3.


Automatic working place
АСУТП transportation or distribution of gas
Server
Emergency signal
Cannel of connection
System of diagnostic
Block of collecting information
Parameters of cathode defence
Parameters of resistance isolation
Device for definite leakage
Data about displacement of axis pipelines
Additional devices

Thus, to ensure effective control of technical condition of pipeline systems must be the introduction of continuous monitoring. Currently, there is a necessary element base and experience in implementing information-measuring systems. A priority for the implementation of IMS include:

- Integration of process control energy transportation elements of technical inspection of pipelines;

- Economic evaluation of the introduction of IMS in the individual pipe sections