Analysis of pipeline conditions

By Eugeny Stepanov & Roman Romanenko

Pipelines' major defects occur as the result of corrosive and mechanical damage, and can be difficult and costly to repair depending on their severity and location. That is why it is very important to inspect under- and above-ground field and main pipelines without opening the pipes.

Currently, the only efficient method for comprehensive inspection is *in-line inspection - ILI (smart pigging).* Modern in-line fault detectors with high resolution are able to scan the pipe surface with 2.5 x 2.5 mm resolution and can reliably penetrate 90° pipeline bends, making several hundred measurements per 100 kilometres of pipeline. The result is that the 80 to 90 per cent of defects are discovered. Thus, the accuracy of in-line inspection significantly surpasses the accuracy of any other existing inspection methods.

Moreover, in-line inspection requires preliminary internal pipe cleaning. On occasion, foreign objects (such as quilted jackets, buckets, etc.) can be found inside the pipes during inspection, which is evidence of negligence on the part of construction workers.

Our specialists have analyzed the "price of defect detection", comparing the cost of inspection using various methods, units of pipeline length and reliability of defect detection. The data proved that the "price of defect detection" by in-line inspection is 10 to100 times lower than other methods, and that in-line inspection has the best quality-price ratio.

Corrosion inspection by electric methods. Assessing the condition of gas pipelines is very important in decreasing the number of pipeline failures and working toward accident-free operation. Scheduling and performing efficient maintenance and taking preventive measures not only eliminate detected defects, but also prevent new ones from developing. Using electric methods to inspect adjacent and intersectional pipelines for corrosion is an important part of this prevention.

Underground pipeline is a very good conductor of electric current. In fact, it is a multi-electrode system of distributed micro- and macro-cells. In field conditions, pipelines intersect and converge, generating a majority of anode-cathode pairs.

When this electric current flows through damaged insulation, the pipelines can become thinner.

Complicated corrosive dependencies inside the pipeline network can result in a lack of efficiency or mismatched maintenance and preventive measures, and can sometimes even aggravate problems in adjacent lines. That is why repair work in one pipeline can often radically change the situation in adjacent ones.

To develop and implement efficient compensating measures, as many lines as possible should be simultaneously inspected. In reality, due to limited annual budgets, only random inspections are performed, which impedes the understanding of the system's interdependence.

It is recommended that the company set up a multi-year accident reduction program and make a schedule for its implementation. The main provisions of the program should include:

- Selecting economically efficient methods of inspection over inefficient methods;

- Scheduling maintenance, preventive and compensating measures following a comprehensive analysis of the interdependence of the pipeline system.