Contribution of the GPS in the Exploration of the Pipeline State by the Use of the Intelligent Pig

Mohamed Choura
Researcher, University of Sciences of Sfax, Geotechnical Laboratory, BP 802, Sfax, 3018,Tunisia

Crude oil produced from wells is treated in a separation unit then stored in tanks from which it is sent to the terminal via pipeline. This part of facility is vital for the economy and environment; it should be inspected regularly within a framework preventive program.

The pipeline must be protected externally and internally:

Externally by the cathodic protection;

Internally by the chemical injection.

Despite the protective means, corrosion occurs all the time in different points.

If we do not comply with the preventive maintenance program, a catastrophe may occur. So, to avoid this situation, the use of the Intelligent Pig, mainly after using the pipe for 10 years, is a prime necessity in order to get an accurate state of the line enabling the management team to take the right decisions before being under the necessity of a total shutdown of the production site and having to face environmental matters such as depollution, penalties, authorities.

Although pipelines are considered as the safest means of bulk transportation for hydrocarbons when compared with others (rail, road, barge), some failures do occur resulting in spillages (pollution).

The principal causes of failure are: mechanical failure, operational error, corrosion, natural hazard and third party activity.

Pipeline Inspection and Monitoring Methods:

Prevention of external corrosion starts with the design and installation of the appropriate pipeline coating and cathodic protection system.

If there is a risk of internal Corrosion, this can be combated by some appropriate operational methods, e.g. regular pigging of the pipe-line by sending spheres or pigs through the line to prevent the settling of water at low points along the route, and/or in certain cases the use of some appropriate corrosion inhibitors.

The occurrence of internal/external corrosion may be determined by means of special corrosion inspection tools sent through the pipeline with the medium acting as a propelling agent.

We start talking about the "Intelligent Pig" as a special corrosion inspection tool.

Tool description:

- Target: It is built to detect each loss of material (internal and/or external), to locate accurately the position and the degree of it using the GPS's capabilities.
- Principle: The tool is equipped with 16 Magnets powered by a set of batteries. Over-magnetisation induces a Magnetic Flux within the pipe walls between the poles. An anomaly leads to a magnetic dispersion.

Each anomaly is well located (X, Y, Z, ?°), and stored, after the end of survey, a complete data treatment allows the engineer to get an accurate and clear general idea about the pipe state.