

THE SPECIAL ASPECTS OF IN-LINE INSPECTION FOR GAS PIPELINE

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Nowadays pipeline transportation is the most economic mode of transportation of oil, gas and petroleum products. Its smooth and safe operation has the paramount importance for all vital sectors of the economy. Transportation of oil, gas and petroleum products through pipelines of large diameters over long distances led to increasing demands of pipeline system reliability, development of the system which prevents accidents and leaks, the system of environmental protection.

The main method of diagnosing the technical condition of long-distance pipelines is internal diagnostics.

The main aims of in-line inspection of pipelines are the detection of defects in the metal pipe, weld defects, defect geometry of the pipeline type, recognition of defects and determination of their size and position on the pipeline, status monitoring, external protective coating.

In most cases ultrasound and magnetic pigs are used for in-line inspection of pipelines and oil-products pipelines. Ultrasonic pigs, due to their higher accuracy and lower cost, have more advantages than magnetic ones have.

A serious drawback of the method of ultrasonic inspection is that they need fluid or gel for a contact which makes it impractical for diagnosing gas pipeline.

The purpose of this work is to analyze and to search methods following to use ultrasound pigs for gas pipelines.

To achieve this purpose, we set the range of the following tasks:

1. To make a literature review to identify the specific use of ultrasound diagnosis
2. Search for diagnostic devices that are directly or indirectly could solve these problems.

After analyzing the literature the following features of the use of ultrasound diagnosis were identified.

1. Presence of fluid for contact.
2. It is almost impossible to make reliable inspection of welds.
3. Deposits on the inner surface of the tube influence on the result of researching.
4. There is no possibility to detect the state of the insulation coating.

We turn to the second aim - the search of devices that can solve these problems. After analyzing data on the advantages and disadvantages of ultrasound and magnetic pigs we made a conclusion that for solving the problem of identifying the maximum number of defects it is necessary to use the pigs that were built using new advanced methods of examination.

1. The company "BritishGasCorporation" proposed the following technology of using ultrasonic pigs of the third generation for the control of gas pipelines. Piezoelectric transducers of the pig are located into special chambers. This chamber is in the form of a wheel, which touches the pipe wall. This wheel is also filled with a liquid which is capable of installing acoustic communication. This technology is one of the easiest ways of ultrasound pipeline diagnostics.

Nevertheless, it has been found that in gas pipelines with high pressure the seal, which is used in the wheels to prevent fluid leaks, cannot withstand high pressures. Furthermore it causes the formation of gas bubbles in the liquid medium what makes the quality of diagnosis worse. So the design of the wheel needs to be strong enough to withstand the pressure. And it causes not only increasing the weight of the pig, but also reducing the ability of ultrasound passage.

2. The company "Dacon" (Thailand) proposed the following technology of using ultrasonic pigs to control gas pipelines. The pig is placed into the trap station. Then the pipeline is filled with water.

The system comprises a horizontally disposed sensor. This sensor is located in the pig which sends an ultrasonic wave forward. Where this wave meets the mirror standing at an angle of 45 degrees. This mirror sends the wave perpendicular to the pipe wall. Then the sound wave goes back. Also the pig is equipped with two bladders.

3. The company ROSEN Group proposes the following pigs. These pigs are based on the use of electromagnetic - acoustic excitation and receiving ultrasonic vibrations. The operating principle of the EMA is the transformation of electromagnetic waves in elastic acoustic. Due to the technology of EMA the same electronic components are basically used like in traditional ultrasonic devices. The difference is that the piezoelectric element is used instead of the coil and there is a device for the excitation of the polarizing magnetic field. These pigs provide all the advantages of ultrasonic flaw detection, and at the same time have additional advantages, such as:

- The possibility of diagnosing pipeline without coupling fluid;
- Insensitivity to the surface state;
- Special peculiarities for finding stress corrosion cracking;
- An ability to detect the state of the insulation coating.

The main disadvantages of these pigs are:

- EMA converters require high power;
- The need for specific electronic equipment which is not widely available;
- The cost of these pigs is higher than the cost of conventional ultrasound and magnetic pigs.

Here are some conclusions:

1. The pigs of the "British Gas Corporation are simpler but there is a possibility that the diagnostic results can be failed because of leakage of special chambers in the pipeline. If we use advanced high strength materials for chambers, it will reduce the weight and improve the design quality of diagnostics.

2. The pigs of the "Dacon" are less expensive than the others, but the cost and time spent for all manufacturing operations make them unprofitable.

3. Nowadays the pigs, which use electromagnetic acoustic transducers, are the most progressive in the field of in-line inspection of gas pipelines. The results of practice research show that the use of these pigs provide a more detailed and qualitative research. And their using reduces the risk of accidents. Analyzing the price we can honestly say that these pigs are the most expensive on the market. These pigs are not sensitive to the flaws on the surface which means that they can lead inspection of the pipeline without using the cleaning device.

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PHENOL ALKYLATION BY α -OLEFINS ON PURPOSE TO RECEIVE RAW MATERIALS FOR PRODUCTION OF MULTIPURPOSE ALKYLPHENOL ADDITIVES TO OILS

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The article describes mechanisms of phenol alkylation by α -olefins and some modern and the most effective catalysts which are used for phenol alkylation on purpose to receive raw materials for production of multipurpose alkylphenol additives to oils

Usually in industry alkylphenols are received by phenols alkylation process on catalysts of acid type. As alkylation agents olefins are used most often, alcohols and alkyl halids are used less often. Preference is given to olefins, as they are available and cheap, also the mechanism of alcohols alkylation passes through the stage of the relevant alkenes formation and does not have any advantages in production organization and simplicity of receiving products.

Phenol and its homologs are easily alkylated by olefins in their liquid and gas phases in the presence of catalysts. The catalysts are usually mineral or organic acids, metal halogenides, cation-exchange resins, aluminosilicates and other compounds of acid nature.