REMEDY TO LOCATE BURIED LDPE PIPE & MDPE GAS PIPES WITH FINAL CONCLUSIONS.

Author[1]: Zahid Fazal Mohammad Saleem Pinjari.

Author[2]: Hemantkumar Jagdish Swarnkar.

[1]Author Designation: Student, Name of the Department: Mechanical Engineering,
Institute Name: Gulabrao Devkar College of engineering, Jalgaon. Maharashtra, India.
[2]Author Designation: Guide, Name of the Department: Mechanical Engineering,
Institute Name: Gulabrao Devkar College of engineering, Jalgaon. Maharashtra, India.

ABSTRACT

PE pipes such as LDPE & MDPE are used in gas distribution industries, such as MGL. It is difficult to locate the pipe below earth surface when buried. Here in this project we focused on the detection of LDPE & MDPE which are buried in to the sub surface. Different process are shown in the project as Acoustic method, Ground penetrating radar, Electromagnetic conductivity (EM), Ultra-High Radio Frequencies, these all technics are complicated to locate PE pipes, for that purpose we give a different remedy using metal detector to locate buried pipes and the steps which we are including to detect the gas pipe. The research will be helpful to detect the buried gas pipes, result in saving life of people and we will be able to locate pipe even after 10 years and even also after losing of documents.

Keyword: - *Visual inspection, Acoustic devices, Electromagnetic (and radiofrequency) line locators, Infrared thermography, Sewer scanners and evaluation technology (SSET), Sonar and laser surveys, Wave analysis techniques.*

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1. Visual inspection

Traditional monitoring techniques for aboveground pipelines utilize image/video sensors to monitor the area around the pipelines. The image/video sensors have large sensing ranges if visibility is good. Any leakage or other abnormity status along the pipelines can be detected and localized by the image/video sensors. However, this technique cannot be used to monitor underground pipelines.

2. Acoustic devices

Small leakage from pipelines can generate high frequency oscillations in the pipe wall as the fluid escapes from the pipeline. The acoustic transducers are widely used to trace the vibration data to its source to detect and localize the leakage. Due to the limitation of the detection range, it is usually necessary to install a high density of acoustic sensors inside the pipeline to cover the whole pipeline network, which is impossible for underground pipelines due to the deployment and maintenance difficulties. Moreover, the acoustic sensors are insensitive to large leaks as they do not generate vibrations in the characteristic high frequencies. Therefore, the acoustic sensors are only suitable to accurately detect the small leakages on the underground pipelines near the checkpoints or pump stations.

3. Electromagnetic (and radiofrequency) line locators

The use of electromagnetic line locators, probably the most widely used method for the detection of buried utilities, can similarly be restricted by their inability to trace non-metallic objects. The technique does not locate metallic objects per se but requires a metallic medium to act as a conductor when introducing a signal into the utility line from an alternating current (AC) transmitter. The resulting magnetic field radiated by the buried utility is then detected by the antenna in the handheld receiver and interpreted to provide location and depth.

Signals introduced into a utility line can be either indirectly or directly induced. Introducing a signal indirectly consists of generating and transmitting a magnetic field from a transmitter above ground. Alternatively, a signal can be introduced directly using an induction clamp, a circular clamp which induces a signal only in the particular conductor that it is clamped around. The best possible tracing signals are those which are generated using the direct connect method. By 21 virtue of the closed current loop, there is very little chance of the resulting signals being distorted. This is the preferred method of tracing a utility when and where possible (Twohig,1998). In addition to the above-mentioned 'active' mode, electromagnetic line locators can also be used in 'passive' mode by locating a background signal typically induced from buried power cables.

Although the main weakness of this method is its inability to trace non-metallic objects, this can be overcome by using an 'in-pipe transmitter' sonde or a trace wire. When access can be gained to a pipeline a flexible insulated trace wire can be fed into the conduit. The transmitter is connected to the trace wire and the signal in the wire can be traced as before. The need to insert a trace wire into the pipeline could be, at least partially, overcome if all new non-metallic pipes incorporated tracer wires (Vickridge and Leontidis, 1997). Alternatively, an 'in-pipe transmitter' sonde can be used in the same manner. Although there are other weaknesses to this method, for example extraneous readings can be produced in very complex or congested situations due to the presence of nearby utilities possessing strong magnetic fields (Fedde and Patterson, 1988), a major benefit is the fact that the results are unaffected by the properties of the material surrounding the utility, including the position of the water table.

4. Infrared thermography

The basic principle behind infrared thermography concerns energy transfer theory, which states that energy flows from warmer to cooler areas. The insulating effect of different types of materials slows down the flow of energy by a different amount and thus can be used to locate subsurface objects such as voids, boulders and pipelines. The sun fulfils the necessity to have an energy source by warming the ground to be tested. Conversely, if the test is performed at night, the ground becomes the heat source and the sky acts as the heat sink (Wirahadikusumah et al., 1998). An infrared scanner, sensitive to short- or medium-wave infrared radiation, is used to measure variations in temperature, which in turn are converted into thermographic images in which objects are represented by their thermal rather than their optical values. As with GPR, utility location using infrared thermography is affected by the properties of the surrounding ground, and in particular moisture content.

Similarly ground cover and wind speed have been known to influence results. The greatest drawback however is its inability to measure depth.

5. Sewer scanner and evaluation technology (SSET)

The latest technological advances in optical survey techniques have been utilised in the SSET (Iseley et al., 1997; Wirahadikusumah et al., 1998; Gokhale et al., 1997). Optical scanner and gyroscope technology provide the engineer with the ability to see the total surface of the pipe interior along an entire length of pipe. Unlike conventional CCTV inspections, the SSET does not have to stop to allow closer inspection of the defect but instead the engineer carries out the assessment afterwards in the office. Consequently, it is possible to predict field production rates, as the time taken to inspect a length of pipe is independent of the number and severity of defects encountered. The scanned image is digitised providing a colourcoded 25 computer image in which defects are identified by a designated colour. A written description of the defect can be inserted at the appropriate location along the pipeline as an aid to assessment (based on inspector reports). Here lies its greatest weakness, namely the requirement for manual interpretation of results. Research, however, has been undertaken to automate the interpretation of the multi-sensory data using image processing and artificial neural networks to identify, classify and rate pipe defects (Chae and Abraham, 2001). Although other disadvantages have been reported – a full evaluation report (CEITEC, 2001) is available through the ASCE – removing the problems associated with subjectivity and inexperience from the interpretation of the image should result in an extremely powerful tool. More recent work by Inyer and Sinha (2005), Koo and Ariaratnam (2006) have advanced the use of automated defect detection systems for pipelines

6. Sonar and laser surveys

An alternative to optical surveys is to determine the internal profile of the pipe shape along the length being surveyed. In addition to pipe wall deflections, the corrosion loss and the volume of debris in the invert can also be measured from the displayed data output obtained from either sonar or laser surveys. The theory behind sonar surveys can be simply described as measuring the time taken for a burst of sound to travel from a source to a target and back again. From this information and the velocity of sound through the appropriate medium, the distance from the source to the target can be determined. The processed image can later be analysed, i.e. displayed on a monitor as a graphic colour image with each colour representing a different reflection (Vickridge and Leontidis, 1997). While a sonar survey can be operated in air or water, the major drawback in the case of sewer and water pipelines is that it cannot be operated in both air and water simultaneously. Consequently, only the part of the pipe above the water line, or conversely the part of the pipe below the waterline, can be assessed at any one time (Eiswirth et al., 2000). The theory behind laser surveys, also referred to as the lightline method, is summarised by Vickridge and Leontidis (1997) as the continuous generation of a line of light around the internal circumference of the pipe, therebyhighlighting and profiling the sewer shape at any point along the length being surveyed. In the case of sewer and water pipelines only the geometry of the pipe above the water line can be obtained. Consequently, laser surveys are frequently carried out at night during times of low flow in the case of sewers or by using a bypass arrangement such as that described by Hodgkinson (2000) to minimise disruption to customer supply in the case of water pipelines.

7. Wave analysis techniques

Ultrasound probes send a sound wave through a fluid medium, which is then detected by a number of sensors. As the acoustic wave penetrates the pipe wall, the wave is attenuated and/or reflected by any changes in the density of the material. By observing the returned signal many of the characteristics of the material can be determined. Inline inspection is performed using shear waves generated in the pipe by angular transmission of ultrasonic pulses through a liquid coupling medium. In order to detect axial cracks, the ultrasonic pulses are transmitted in the circumferential direction to obtain maximum acoustic response (Wolf, 2001). It also allows the determination of the defect position as well as the size of the defect. This technique can be used to detect defects on either the inside or the outside of the pipe, although it is necessary to perform proper cleaning to remove debris or wax prior to inspection. Willems and Barbian (1998), reporting on the use of an intelligent pig using the ultrasound technique in operating crude oil and gas pipelines, quoted good detection rates for different types of defects such as cracks, holes and corrosion. Impact Echo or Spectral Analysis of Surface Waves consists of a source of controlled impacts, such as falling weight or a large pneumatic hammer, and one or more geophones mounted against the wall of the pipeline (Makar and Chagnon, 1999). Low frequency surface waves are produced when the wall of the pipe is struck by the hammer or the weight. These waves are then detected by a number of geophones. The wave is split into different frequency components, which travel at different speeds and penetrate to different depths in the soil beyond the pipe. The results of these tests give information about the overall condition of the pipe. According to Makar and Chagnon (1999), this technique has been successfully applied in the analysis of damaged pre-stressed concrete pipes.

8. CONCLUSIONS

As the objective and goal of the project is to locate buried pipes using method to replace the tiles with a new types of tiles, helps to obtain the goals which reduces cost and time. Even if there is a maintenance cost, the project work according to the plan and there is high reduction of cost consumption and exact location finding ability.

By discussing with the project managers & operation and management team at every phase of the project, the goals are achieved, this project required lot of patience and coordination of all the employees in the company.

As the procedure is mentioned in above chapter, hence relating to that we can see that the change could do lots of things and could save money as well as time, and as mention in the objectives it conclude all the things, this idea has been shared with the operation & maintenance team of MGL, they are listened to these ideas and thought of working on it. A small model has been demonstrated on that which describes the whole idea.

Due to such technique, there will be less impact on environment also it will be helpful for the company. Also the unnecessary costs that are incurred in digging are also reduced. This is a best solution to find the buried pipes, if properly implemented in the future. It will have a positive impact on the company and speed up the work and reduce the accidents and can save many lives.

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