

Large Variable Geometry Crawler

Description: A robotic internal inspection device for 20”– 48” gas pipelines.

Status: Project completed, field proven and commercially available

BENEFITS

The robotic video inspection device also known as “Large Variable Geometry Crawler (LVGC)” is a remotely operated tethered pipe crawler. LVGC is equipped with a high-resolution video camera for internal inspection of 20” - 48” diameter natural gas pipelines. It is designed to be installed using standard tap and drill equipment, thereby eliminating the need to vent natural gas into the atmosphere during the inspection process (“no-blow” conditions). This improves overall job safety for utility workers, customers and the general public.

LVGC allows gas companies to react quickly to emergency and maintenance issues and can assist pipeline operators in locating cracks, damaged pipe, unknown branches, service tees, valves, fittings and water intrusion. The data provided by the crawler can assist engineering and planning personnel with the information needed to make the best repair/replace decisions. LVGC will also be able to make pre-rehabilitation surveys possible by identifying problems within pipelines by assessing cleanliness, areas of corrosion and other pipeline defects.

BACKGROUND

For more than thirty years, video inspection has provided data to pipeline operators to evaluate and assess system integrity. These video inspection tools, originally developed as an aid for sewer system maintenance, played a key role in the development of a variety of “no-dig” and trenchless applications for rehabilitating pipelines. As natural gas pipelines age, there is an ever growing need to repair or replace pipelines to maintain and assure the integrity of the system.

To assist in this process, camera systems were developed to access pipe segments to locate and determine the best corrective action. Most internal inspection cameras available were limited and did not provide the accuracy and high resolution imaging needed to properly inspect large diameter pipelines (12” and greater). Due to the complexity and cost of accessing pipelines, gas industry operators have not realized the full potential of using high-resolution video inspection.

NYSEARCH retained ULC Robotics to develop the Variable Geometry Crawler. ULC Robotics has an excellent track record in designing, building and providing commercially proven products for the Gas Industry. ULC was charged with developing a robotic tool capable of high-resolution video inspection (Figure 1) for large diameter gas mains under pressure by using a “no blow” process (no gas venting).

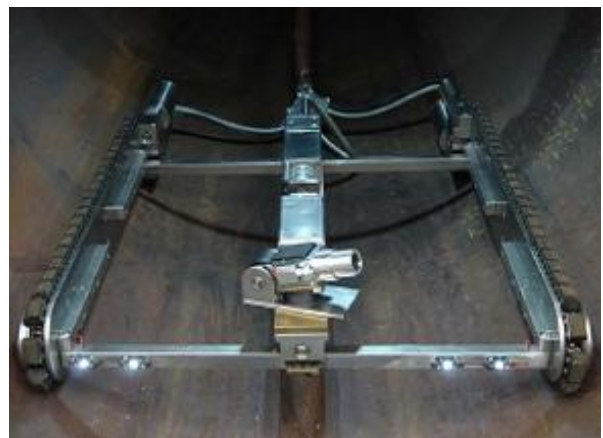


Figure 1: Deployed Crawler in 20” Pipe

TECHNICAL APPROACH

The specially designed inspection device and entry system will have the ability to operate in pipelines at pressures up to 100 psig. An onboard state-of-the-art camera system with

LED lighting is able to produce consistent and detailed video images.

The robotic crawler's unique design will allow it to enter a pipe through a 4" taphole using standard drilling and tapping equipment (Figure 2). LVGC will provide visual imaging, suitable for detailed assessment and inspection of the interior of large diameter cast iron and steel pipelines. To assure safe operation during VGC inspections, all work tasks are performed under "no-blow" conditions.



Figure 2: Launch System

LVGC's telescoping tractor tread design allows it to travel up to (500) feet in each direction from a single entry point. It has the ability to navigate over large obstacles and through a limited number of pipe bends and offsets. This innovative robotic device with its unique tractor



Figure 3: Entry & Retrieval via 4" Taphole

tread and scissor-jack design allows the crawler to contract during pipeline entry (Figure 3) and expand, once in the pipe, for camera positioning

and navigation. LVGC is controlled remotely and connected to the inspection tool via a specially designed cable connected to the control system located at or near the entry point. The control unit is equipped with a series of joysticks/toggle switches for navigation, a high resolution monitor and a video recording system to archive inspection data. When in the pipe, LVGC with its steering capability and rotating camera allows the operator to closely examine and locate pipe anomalies and defects. The onboard LED lighting system provides the lighting necessary to examine the pipe wall, welds, joints and/or pipeline abnormalities (Figure 4).

PROGRAM STATUS

ULC Robotics (www.ulcrobotics.com) is ready to provide pipeline inspections to anyone requiring internal inspection service. The commercially available system includes the crawler device, launching system and control unit with monitor. Currently, LVGC is qualified for 100 psig operation and ULC has completed several inspection projects for distribution companies. To further assure safe operation, an emergency extraction system was developed that allows for removal of the crawler in the event a system problem occurs.



Figure 4: Pan-Tilt Camera & LED Lights

Highlights

- High resolution video inspection
- Operates pipelines 20"– 48" pipe
- Pressures up to 100 psi
- Uses standard hot-tap/drill equipment
- Travel distance 1,000 feet – both directions
- Navigate through bends & offsets
- Safe "no-blow" process (no gas venting)

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