

Small Variable Geometry Crawler

Description: A robotic internal inspection device for 12”– 16” gas pipelines.

Status: Project completed, field proven and commercially available.

BENEFITS

The robotic video inspection device also known as “Small Variable Geometry Crawler (SVGC)” is a remotely operated tethered pipe crawler. SVGC is equipped with a high-resolution video camera for internal inspection of 12” - 16” diameter natural gas pipelines. It is designed to be installed using standard tap and drill equipment, thereby eliminating the natural gas venting to atmosphere during the inspection process (“no-blow” conditions). This improves overall job safety for the utility workers, customers and the general public (Figure 1).

SVGC 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 device can assist engineering and planning personnel with the information needed to make the best repair/replace decisions. SVGC 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.

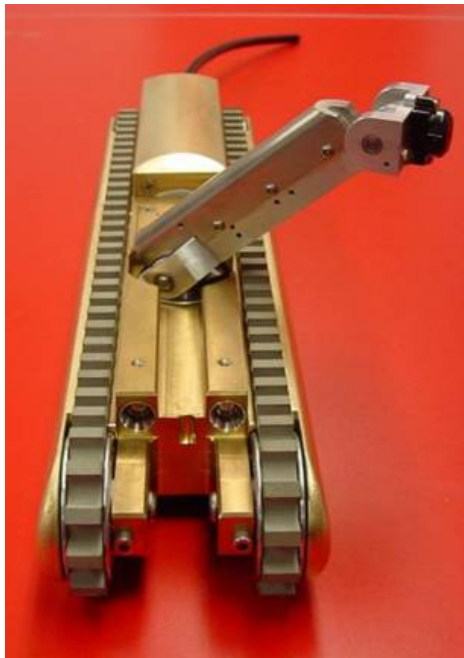


Figure 1: Small VGC

Most internal inspection cameras available on the market 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 and operating in pressurized natural gas pipelines, gas industry operators have not realized the full benefit of using high-resolution video inspection.

TECHNICAL APPROACH

NYSEARCH retained ULC Robotics Inc. to develop the Small Variable Geometry Crawler. Prior to this project, ULC successfully completed the larger version crawler application, known as Large VGC for pipelines 20” and larger. SVGC’s unique tractor tread design (Figure 2) allows it to travel up to 300 feet in each direction from a single entry point. It has the ability to navigate over pipeline debris, obstacles and can navigate through a limited number of pipe bends/offsets.

The inspection system has a specially designed entry and receiving system that has the ability to operate in natural gas pipelines operating at pressures up to 100 psig. An onboard state-of-the-art camera system is able to produce and archive detailed video images for internal



Figure 2: Small VGC in Operation

inspection of steel and cast iron pipelines. SVGC's unique design will allow it to enter and exit a pipe through a 3" taphole using standard drilling and tapping equipment (Figure 3). To assure safe operation during inspections, all work tasks are performed under no-blow conditions throughout the entire process.



Figure 3: Launch Tube Setup

This innovative robotic device with its unique tractor tread, steering capability and rotating camera allows SVGC to closely examine and locate pipe anomalies and defects. An onboard LED lighting system provides the lighting necessary to examine the pipe wall, welds, joints or abnormalities. The crawler system is remotely controlled via a tethered cable. The control system, typically located at or near the taphole entry point, is equipped with a series of joysticks and toggle switches that allow for navigation and camera positioning within the pipe. A high resolution monitor and a video recording system are integrated into the control unit (Figure 4).

PROGRAM STATUS

The SVGC system design including the crawler device, launching and control system has been completed and is commercially available as a service through ULC Robotics (www.ulcrobotics.com). To date, ULC Robotics has successfully inspected a variety of pipelines (cast iron and steel) for several natural gas companies.



Figure 4: Controls with Video Monitor

Highlights

- High resolution video inspection
- Operates pipelines 12"– 16" pipe
- Pressures up to 100 psi
- Uses standard hot-tap/drill equipment
- Travel distance 600 feet – both directions
- Navigate through bends & offsets
- Safe "no-blow" process (no gas venting)

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