

Video Inspection Systems for the Gas Industry

Technology Status assessment

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Introduction

This report summarizes the present state-of-the-art of inspection camera and related systems for the inspection of natural gas distribution system pipelines. The systems that are analyzed in this report are all “gas ready”, i.e. they meet the particular requirements (mostly safety related) for deployment into natural gas pipes. Both commercial products and experimental systems are presented. Many other systems exist in the market, mostly for the sewer industry. Such systems, while similar to those used in the gas industry, could be modified for use in gas pipelines if undergone design changes involving substantial time and effort. The experimental concepts/designs presented are at various stages of development, from pre-prototypes, to prototypes, to pre-commercial systems.

Commercially Available Systems

ARIES GasCam

Company: Aries

Product: GasCam

Web Address: www.ariesind.com

Contact: Dale Barber

Contact Phone Number: 800-234-7205



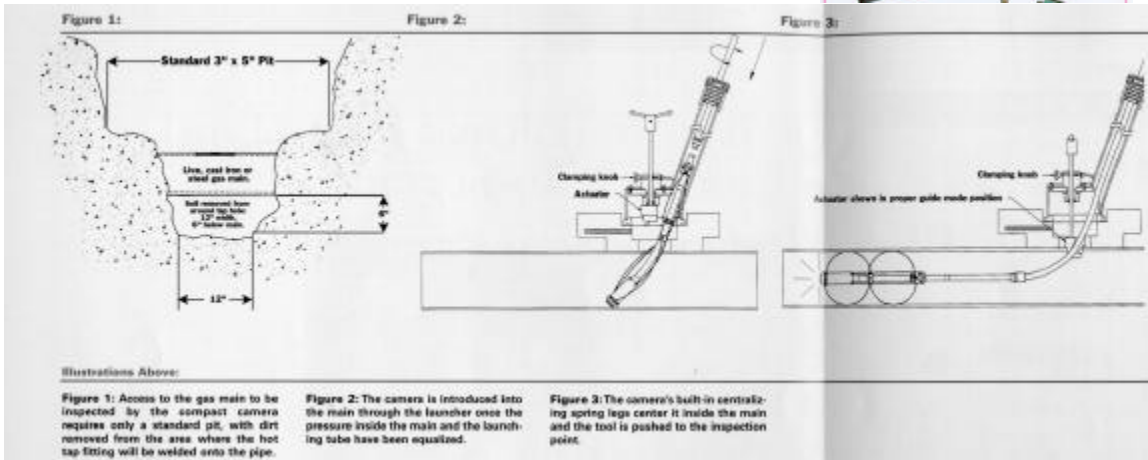
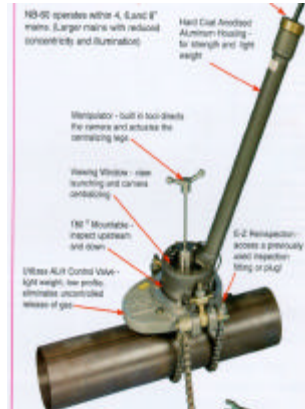
Camera System:

Aries' GasCam is one of the few commercially available inspection products that were designed for use in gas mains. It is also the only inspection system that is rated intrinsically safe. The camera is 1½" in diameter, allowing it to operate in pipes of inner diameter greater than that. However, the maximum recommended diameter for a camera using skids (a tractor system is available) is 12"; after this size, the lighting conditions are not strong enough to achieve a clear picture. The tethered camera can inspect about 240' from the point of entry in the pipe using the manufacturer provided push wire. Using skids available from the manufacturer, the camera can be centered inside the pipe. The camera itself is capable of operating in a wide variety of conditions. It is rated for temperatures well within working conditions (15°F–120°F), and pressures up to 150psi. In addition the product has been tested for shock tolerance and is rated up to 70g. The

video capture device is a 1/2" black and white CCD with a resolution of approximately 380,000 pixels, which is about the average of all the cameras researched. In addition the manufacturer provides a 8mm VCR for motion capture and a still frame printer is also available.

Launcher:

Among the GasCams' major features is its' ability to enter a live gas main with only a small taping hole (approximately 1 1/2" diameter) at pressures up to 60psi. The launching system that is available with the camera system is designed to minimize the amount of digging required around the entry point as shown below; 3'x5' above the pipe and 12"x12"x6" below the pipe.



Cost:

The approximate cost for the camera system and launcher described here is about \$65,000. The system should be operable by any technician with minimal training.

Other Capabilities:

- Digital line distance counter imprinted on video.
- Water extraction capability.

Everest VIT Rover

Company: Everest VIT
 Product: Rover
 Web Address: www.everestvit.com
 Contact: Joe Grosinski
 Contact Phone Number: 800-848-5665 x802



Camera System:

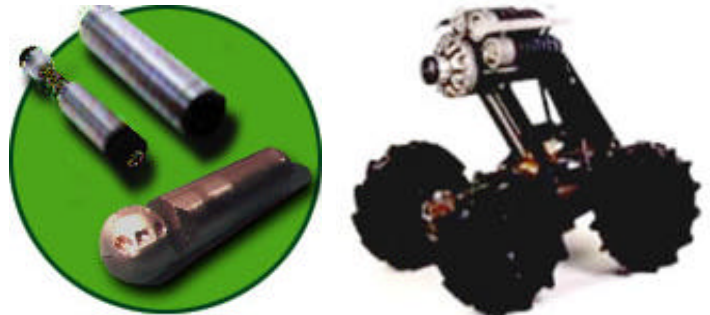
The Rovver series of products use a pushwire based locomotion system that is capable of investigating pipes from 2" to 36" in diameter with pan and tilt capabilities; the smallest camera available a diameter of 7/8" and a length of .9". The tethered camera system is also available with a tractor system that is capable of negotiating obstacles in pipes and covering distances in relatively short periods of time (speeds up to 40'/min). The tether, which contains the video and motion control feeds, is available in lengths of 330' to 590'. A variety of models are available (200, 400, 600, and 900 series) depending on the size of the pipe to be inspected. The camera is available as either a 1/3" black and white or color CCD device resolution of 380,000 pixels. The video feed can also be recorded via a digital VCR, which is available from the manufacturer.

Other Capabilities:

- Modular system available with a variety of tractors, camera heads and tractor accessories (lights and moving camera heads).
- Motorized cable reel available.

Pearpoint Flexiprobe ELS

Company: Pearpoint
Product: Flexiprobe ELS
Web Address: www.pearpoint.com
Contact: Tom Schmandt
Contact Phone Number: 760-343-7350 x231



Camera System:

Pearpoint's Flexiprobe is currently being used by several gas companies to inspect gas lines. It is rated as explosion proof and can investigate lines of diameters of 2" to 9". The maneuverability of the camera allows it to navigate 90° bends in pipes of a diameter of 3" or greater. The camera is actuated by a pushwire and can be centered in a pipe through the use of available skids and brushes. An available tractor system, which can be used in pipes of diameters of 6" to 24", is available with lighting systems providing up to 200 watts of forward light.

Other Capabilities:

- Digital line distance counter imprinted on video.
- Motorized cable reel available.

Systems Under Development

CISBOT

Company: ConEd – Enbridge
Product: Cisbot
Contact: terry Whitehead, Enbridge
Contact Phone Number: 416-496-7147



Camera System:

The Cisbot was designed to not only be able to inspect pipe systems but to also repair them on the spot. It is a tethered design, limited to 300' from point of entry and is limited to pipe sizes of diameters greater than 6". The camera is also not capable of navigating through elbows and tees, but is available with skids for centering. The system is useable at pressures up to 60 psi.

Launcher:

Camera is capable of live usage.

Other Capabilities:

- Repairing capabilities

Foster-Miller Pipemouse

Company: Foster Miller
Product: Pipemouse
Web Address: www.foster-miller.com
Contact: Al Fisk
Contact Phone Number: 781-684-4383



Camera System:

The Pipemouse is an untethered tractor based inspection system. Some of its best features are that it can navigate elbows and tees at ranges up to 5,000' from entry into the pipe at 10'/min. The Pipemouse is limited to pipe sizes of 3" to 6" diameter and can work in live conditions up to 60 psi.

Other Capabilities:

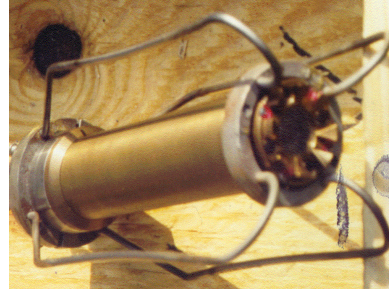
- Sensor capabilities

CBS Pipecam

Company: GBS
Product: PipeCam

Camera System:

The PipeCam is another tethered experimental design for an inspection system. It can investigate pipes of diameters 4" to 6" with its pushwire moving it up to 2,000' from point of entry. This system is not capable of navigating elbows and tees. The system is also design to work under live high-pressure conditions of up to 100 psi.



Launcher:

Camera is capable of live usage.

Other Capabilities:

- Leakage detection capability.

GTI-NASA-CMU GRISLEE

Company: Gas technology Institute
NASA
Carnegie Mellon University

Product: Grislee

Contact: GTI



Camera System:

The Grislee is another tethered experimental design for an inspection system. It can investigate pipes of a diameter of 4" with its pushwire moving it up to 2,000' from point of entry. This system is capable of navigating elbows and tees. The system is also design to work under live high-pressure conditions of up to 60 psi.

Launcher:

Camera is capable of live usage.

Other Capabilities:

- Leakage detection capability.
- Joint sealing capability.
- Sleeve installation

NYGAS-NASA-DOE-CMU EXPLORER

Company: New York Gas Group (NYGAS)

NASA

USDOE

Carnegie Mellon University

Product: Explorer

Contact: Daphne D’Zurko, NYGAS

Contact Phone Number: 212-354-4790, x214



Camera System:

Explorer is an untethered tractor based system, which can be used for inspecting pipes up to 5,000’ from the point of entry, in pipes of diameter 6” – 8”. This system is capable of navigating elbows and tees. The system is also design to work under live high-pressure conditions of up to 60 psi.

Launcher:

Camera is capable of live usage.