Keyhole Technology Newsletter

A newsletter for Keyhole Technology Research Collaboration Project participants and manufacturers

Keyhole Technology Collaboration Project

March 2003

Volume 1, Issue 3

Inside this issue:

Priority Matrix Gap Analysis Results

New tooling development for the following areas:

- Main Leak Repair—Steel & PE
- Service Leak Repair—Steel & PE
- New Service Connection—PE
- Service Replacement/ Insertion
- Service Abandonment, Steel & PE—medium and high pressure

UGI Utilities and Keyhole Technology

UGI Utilities, Inc. is a natural gas and electric utility headquartered in Reading, Pennsylvania. UGI's Gas Division serves 277,000 customers in 14 counties. Its service area includes Allentown, Bethlehem, Easton, Harrisburg, Lancaster, Lebanon, Reading and Hazleton, Pennsylvania.

UGI currently uses keyhole technology to execute low pressure service cutoffs, service renews, new business service installations, anaerobic and encapsulation repairs of bell joints and corrosion work through an 18-inch cored hole.

UGI is working towards performing additional processes through keyholes, including medium pressure service cutoffs, main line valve repairs, and plastic main work in conjunction with replacement projects. UGI is close to performing both encapsulation and anaerobic repairs through a 10-inch cored hole. Using a smaller core size allows UGI to avoid certain state highway regulations.

Since July, 2002, UGI has replaced over 300 cores in the ground with no failures. In addition, they participated in the design of a no-mix flowable, quick setting, non-shrinking backfill and core reinsertion grout. UGI also helped design a special no-mix flowable fill product that is used for filling and plugging leak investigation bar holes.

The mission statement for core boring that UGI follows encompasses four ideals:

- Minimization of pavement intrusion
- Reduction of impact on traffic flow
- Effective and efficient pavement restoration
- Preservation of structural integrity of the pavement

This spring, UGI plans to increase their core bore crews from two to five crews.UGI will use a variety of core rigs including Utilicor, Simco and possibly Vermeer.

If you would like to learn more about the keyhole activities at UGI, please contact:

William Krupa
Restoration & Special Project Supervisor
UGI Utilities, Inc.
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Lehigh Valley, PA 18002-5148
Phone: 610-807-3159

UGI keyhole repair

Air Lances: Soil Disturbance Technology

INTRODUCTION

Air lances are vital equipment for soil excavation. They must aid vacuum excavation by breaking up soil while at the same time not damaging pipes and other items that may lay beneath the soil.

Soils vary in texture from coarse to fine. Some of the different types of soil include:

- Sand: coarse particles (30-50 microns in diameter)
- Sandy loam: farm soil
- Loam: Contains fibrous products such as roots
- Clay: small non-porous particles (1.5 microns in diameter)

When it comes to excavation, each soil type presents its own challenge. The finer the particles of soil, the more difficult it is to penetrate this soil. Air lances use pressure to break up the soil.

This page features three different air lances for soil excavation. There are many others, such as the Utilivac Air Lance (see www.utiliscope.com).

SOIL PICK by MBW

SOIL PICK by MBW

The MBW Soil Pick features a converging-diverging supersonic air nozzle used to accelerate the compressed air stream to 1,475 miles per hour. The increased density of the compressed air helps to break up the soil. The MBW nozzle has been designed and developed during the past 13 years to achieve maximum performance based on customer needs. MBW engineers utilize the latest technology in 3D computer modeling to design and manufacture the complex nozzle shape.

Unique features of the Soil Pick include a non-sparking nozzle and a non-conducting barrel so that with excavation around buried utilities, there is no risk of damage.

For more information, contact Andrew Multerer at 262-644-5234 or andym@mbw.com. Website: www.mbw.com

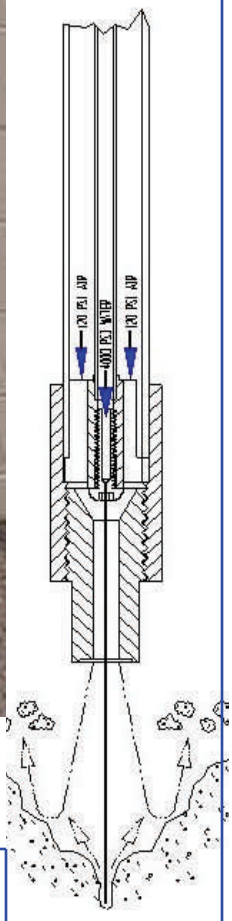
AIR-SPADE by Concept Engineering

AIR-SPADE® by Concept Engineering

Concept Engineering Group (CEG) is devoted to the development and use of air excavation. The CEG AIR-SPADE® air lance is used by numerous gas companies for keyhole work as a stand-alone tool and as part of their vacuum excavation equipment. The AIR-SPADE® has a unique patented supersonic nozzle that focuses the air "like a laser" creating a very effective digging tool.

CEG has a standard package for utility applications, which consists of an AIR-SPADE® Series 2000 hand tool with an angled adapter, lightweight hose, extension, and a storage case. The adapter allows the user to excavate in any direction (eg. underneath pipes) while holding the tool in a convenient way. The lightweight hose takes the weight of the heavy compressor hose off of the tool and extensions adjust the length of the tool. A choice of nozzles is available to fit any compressor.

For more information, contact Andy Jarabak at 888-557-2339 or visit: www.air-spade.com.



WET AIR LANCE by Omega Tools

WET AIR LANCE by Omega Tools

The Wet Air Lance by Omega Tools combines the advantages of using an air knife with the advantages of using a water knife, while avoiding disadvantages of using either one of these alone.

The Wet Air Lance uses compressed air with short bursts of high pressure water to break up non-porous soil that would be difficult to break up with an air knife alone. The water injection volume is small so that the soil remains dry enough to use for backfill, unlike using a water knife where soil is turned to mud and new backfill must be transported to the excavation site.

The compressed air and high pressure water on the wet air knife can be used simultaneously and also independently.

For more information, contact Frank Russo at 570-897-6138 or visit www.omega-servac.com.

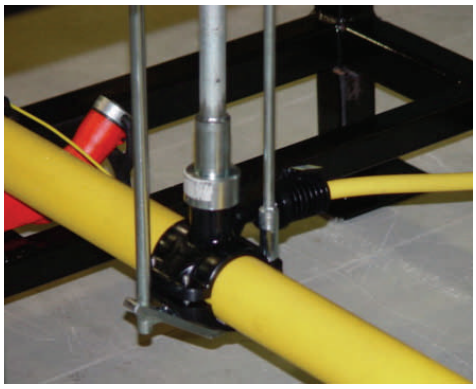
R.W. Lyall Keyhole Demo at GTI

Jeff Lyall and Mark Huetinck of R.W. Lyall & Company visited GTI on January 21st to demonstrate two new keyhole processes: service installation of Lycofit® mechanical tapping tees, and tracer wire connection.

The **Lycofit® mechanical tapping tees** are installed through the use of 4 long-armed tools as well as a ring tool. The steel ring tool sits on the ground surface over the keyhole to protect the cored opening. Other long-armed tools inserted into the keyhole can be affixed to the ring tool with clamps, freeing up the crews' hands. The long-armed tools are lightweight and easy to maneuver and position in the keyhole.

- The tapping tee bottom saddle (including bolts) is affixed to the cradle of a tool that is lowered into the keyhole and positioned underneath the pipe.
- The service line is installed on the tapping tee outlet.
- A combination test/tapping tee tool is used to install the tapping tee top saddle.
- A socket extension tool is used to lower and place nuts on top of the bolts. Each nut is pre-coated with a 3M mastic tape to ensure that it doesn't fall out of the tool and into the keyhole.
- The test/tapping tee tool is used to conduct a pressure test on the saddle before the line is tapped with this tool.
- Once the line is tapped, a threaded tee cap is installed with a cap tool.
- The process concludes with a final pressure test.

The **tracer wire** is attached to a plastic connector coated with silicon that is fitted onto a long-armed tool. The tool is inserted into the keyhole and the connector is attached to the main tracer wire, splicing the two wires together.



Installation of a tapping tee

Tracer wire connection

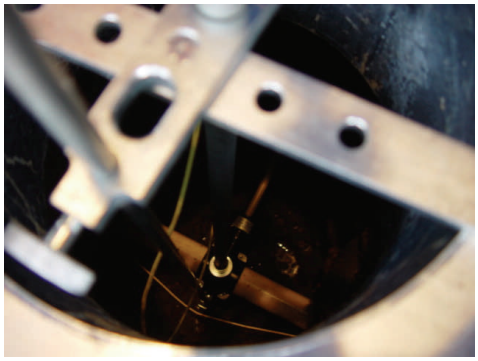
NW Natural Rolls Out Keyhole Process

On March 11th, Northwest Natural debuted their new keyhole process for service installation and tracer wire connection at a demonstration given at their Salem, Oregon office. Through a 12-inch diameter hole, a service line and tracer wire was hooked up to a PE main from above ground. Using directional drilling, the service line was dragged underground to the main. NW Natural estimates that use of these new procedures will save between $1,000 and $1,400 per installation. This is due in large part to a much smaller surface excavation. In addition, these new processes will allow NW Natural to install services in many cities and counties with five-year trenching moratoriums on roads recently paved. The new keyhole processes are considered an exception to the moratorium.

The new processes needed new tooling which was developed by NW Natural and RW Lyall & Company. The new tooling and procedures were demonstrated at GTI in January (see article above).

The next step for NW Natural? They plan to start working on a keyhole process to install new service lines to steel mains.

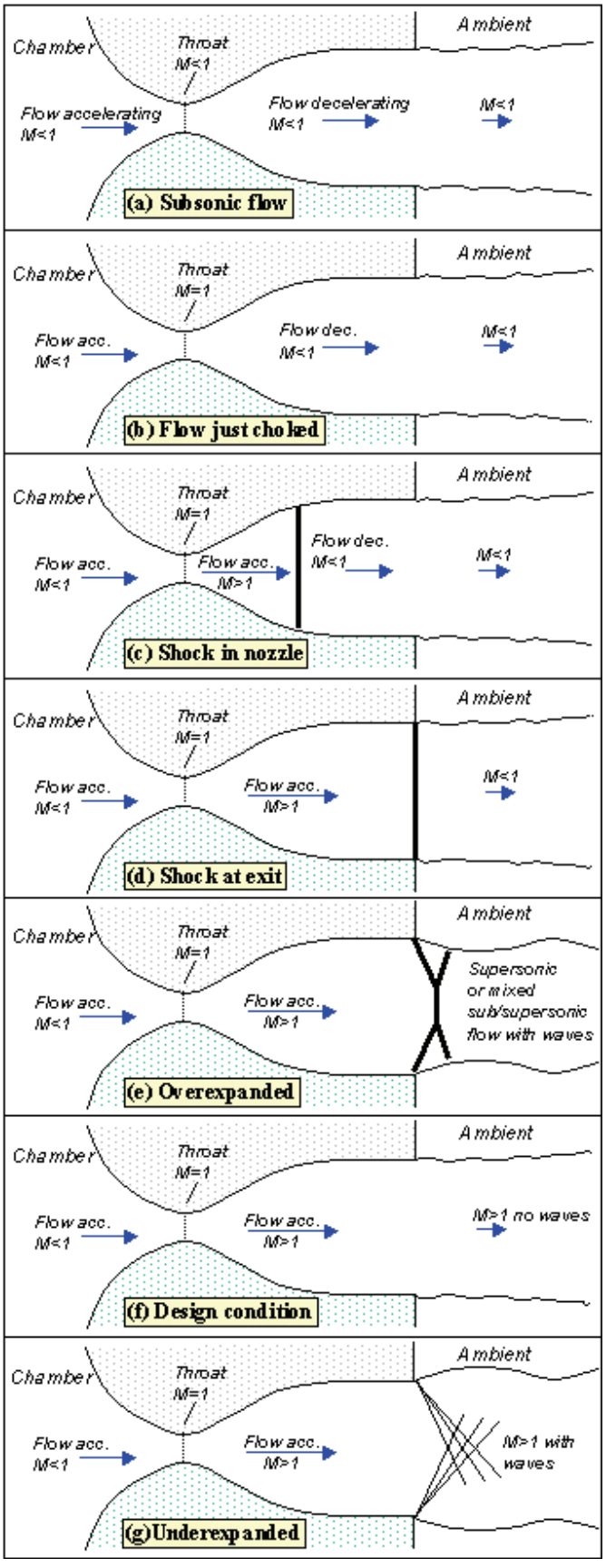
The Northwest Natural service area includes more than 500,000 customers in Oregon and Vancouver, Washington.



New service installation

Tracer wire connection

Converging-Diverging Nozzles



The diagram pictured here steps through different airflow scenarios in a converging-diverging (cd) nozzle. Some air lances feature this type of nozzle. A cd nozzle affects the airflow through the air lance by changing its velocity. Converging-diverging nozzles have the potential to change subsonic airflow to supersonic airflow given certain conditions of inlet pressure, outlet pressure and airflow velocity. In a cd nozzle, air flows from an area of greater diameter to an area of smaller diameter and back to an area of greater diameter. The area of smallest diameter is called the "throat" of the nozzle. At the throat, airflow can reach Mach 1 (choked flow) but cannot exceed it. At any other point in the nozzle, it is possible for airflow to exceed Mach 1. When this happens, the flow is termed "supersonic." Supersonic air flow is sometimes terminated by a shock wave.

Thanks to Dr. William Devenport, Aerospace & Ocean Engineering, Virginia Tech, for permission to use the cd nozzle diagram at left.

Website: www.engapplets.vt.edu/fluids/Cdnozzle/cdinfo.html

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Contact List Updates

There is an additional contact name at SouthWest Gas for the keyhole technology project. Jerry is responsible for keyhole related activities at SouthWest Gas.

Jerry Schmitz Phone: (702) 365-2204
Email: jerry.schmitz@swgas.com

Have a question? Register for the Q&A Board on the Keyhole website !

Q&A: Please register for the new **Question and Answer Board** on the keyhole website at www.gtiservices.org. Participants can post questions on keyhole related issues and read about issues other utilities face.

If someone in your organization would like to obtain a copy of the keyhole newsletter, please contact Jim Otzko at 847-768-0523 or send an email to james.otzko@gastechnology.org