I. Construction Innovation Forum • NOVA Award Nomination

Instructions

Step 1 Enter a Descriptive Name for the Process/Method/Technique you are nominating on line A of this page.

Step 2 Complete this page,
"I. Construction Innovation Forum • NOVA Award Nomination"

a. Be sure to provide original signatures in Section B and E on this page. Your nomination cannot be reviewed without them.
b. If you need additional space for names and addresses you may attach additional pages for names and address information. You may attach extra pages only for sheet I.

Step 3 "II - Innovation Description" — attach one (one only) 8-1/2˝ X 11˝ page that gives a succinct written description of the innovation. Put the name of the innovation at top of page. Tell us what you think is innovative about this. You should include:

- What the innovation is
- Why it is innovative
- What it changed or replaced
- Where and when it originated, has been used, and is expected to be used in the future
- If the nomination is for an innovative project, specifically identify its innovation.

Please type, with 1˝ margins, 10 characters per inch, 6 lines per inch.

Step 4 "III - Innovation Illustration" — attach one (one only) 8 1/2˝ X 11˝ page that contains one or more photographs, drawings, tables, graphs, clauses, etc., that visually describe the innovation. Do not submit more than one page of visuals. The jurors will see only one sheet for review. Put the name of the innovation at top of page.

Other You must submit 12 (twelve) sets of sheets I, II and III (a total of 36 pages).

Nominations are due September 15 mailed or delivered to:
The Construction Innovation Forum, 1000 Campus Drive, Suite 100, Ann Arbor, MI, USA 48104-6792, Phone: 313-995-1855, Fax: 313-995-5002

A. Name of Innovation: DEVELOPMENT OF PIPEBURSTING BUSINESS FOR SEWERS IN USA

B. Person(s) and /or Organization(s) Primarily Responsible for the Innovation (Those to whom the NOVA Award should be presented.)

Name:	SYD PARKES	JIM HOPWOOD	
Title:	COMMERCIAL MANAGER	ENGINEERING CONSULTANT	
Affiliation:	BRITISH SAS plc	BRITISH SAS plc	
Address:	100 THAMES VALLEY PARK DRIVE READING, BERKS, UK, RG6 1PT	7105 BUSINESS PARK DRIVE HOUSTON, TX 77041	
Phone:	(0) 118 929 3412	713 849 6322	
Signature:			

(Signature(s) indicate acceptance of the nomination and consent to have CIF research and make presentations on the innovation for the purpose of jurying and publicizing awards.)

C. Other Primary Sources of Information on the Innovation: (in addition to the persons nominated above.)

Name:			
Title:			
Affiliation:			
Address:			
Phone:			

D. Independent Reference(s) familiar with the use of the Innovation

Name:	ED STEPHENSON		
Title:			
Affiliation:	PAYTON/STEPHENSON INC		
Address:	5115 MARYLAND WAY BRENTWOOD, TN 37027		
Phone:	615 377 7677		

E. Person(s) making nomination:

Name:	JIM HOPWOOD		
Title:	ENGINEERING CONSULTANT		
Affiliation:	BRITISH SAS plc		
Address:	7105 BUSINESS PARK DRIVE HOUSTON, TX 77041		
Phone:	713 849 6322		
Signature:			

(Signature(s) indicate familiarity with the the innovation and signify that information contained in the nomination is correct to the best of one's knowledge.)

Development of Pipebursting Business for Sewers in USA

Pipebursting is rapidly becoming one of the leading "No Dig" technologies in the USA for the replacement of old and undersized sewers. British Gas plc, pipebursting patent owner, is licensing operators and equipment suppliers throughout the US on a non-exclusive basis. Projects are carried out by licensed operators.

Pipebursting was developed by British Gas in the UK for the replacement of old cast iron gas mains. Now the advantages of pipebursting are proving attractive to municipalities and utilities in the USA. Pipebursting has only been widely used by US sewer authorities for the past 2 years. Now that the benefits of "No Dig" technology have become accepted, authorities are anxious to reduce costs and to avoid significant disruption to customers, traffic and the environment. Pipebursting is the only method by which fracturable pipes can be replaced by pipe of a larger size without using boring or open cut methods; pipes of the same size can also be installed.

The principle of pipebursting is straightforward and this has enabled operators in the USA to be quickly trained. During operation a pipebursting machine is pulled through the old pipe breaking it into pieces while a new plastic pipe is pulled in behind the machine (normally butt-fused polyethylene or "PE"). If significant upsizing is required a bigger machine is used to break the old pipe and expand the bore to that of the new PE pipe diameter. Lengths of up to 900ft can be replaced at one time for pipes 3" - 36" dia, upsizing one or two pipe sizes. Excavations are only required at each end and at service/lateral connections.

A campaign was initiated by British Gas in the USA in early 1994 to promote the advantages of the system to cities, utilities and contractors. The City of Houston, TX, recognised the benefits of pipebursting and had initiated a major sewer rehabilitation programme. As a result, the number of licensed operators and equipment suppliers grew rapidly. Now cities across the US are recognising the benefits of pipebursting. Many sewers are old and undersized for the demands of modern urban expansion. The ability of pipebursting to instal larger leak free plastic sewers, on the same line as the old system, without producing deep open cut trenches has proved a significant benefit. Costs of excavation and reinstatement are significantly reduced, typically by some 30%. Also, engineers are finding that pipebursting is an environmentally friendly technique with many projects being completed more quickly than with open cut methods, resulting in much less disruption in busy city streets.

In 1990/91 there was only 15,000ft of pipebursting carried out in N America. Following the growing interest in "No Dig" technology, the lengths replaced by pipebursting have mushroomed to 180,000ft in 1994 and to 300,000ft in 1995. These lengths represent large cost savings to cities and significantly reduced disruption to the environment and population of the USA. The number of licensed contractors and suppliers has risen from 2 at the start of 1994, to 15 in early 1995 and over 60 in 1996. Gas and water utilities are now recognising the major benefits of pipebursting and trials are in hand across the USA.

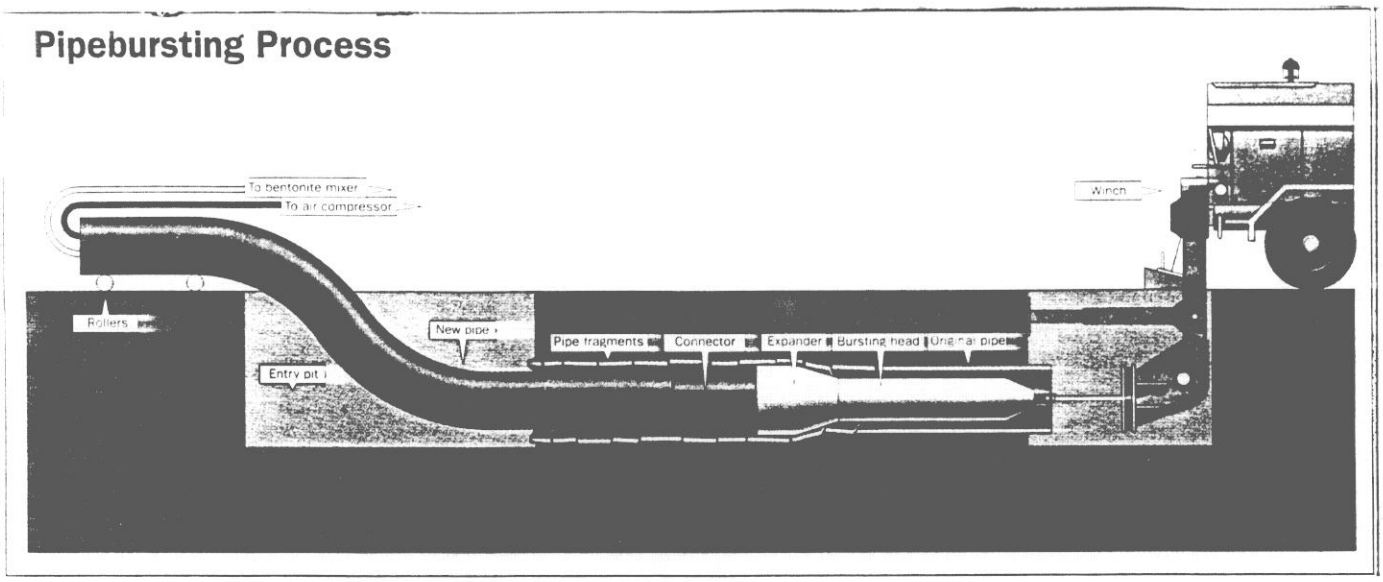


Fig. 1A: Method of Pipebursting using Pneumatic Machine

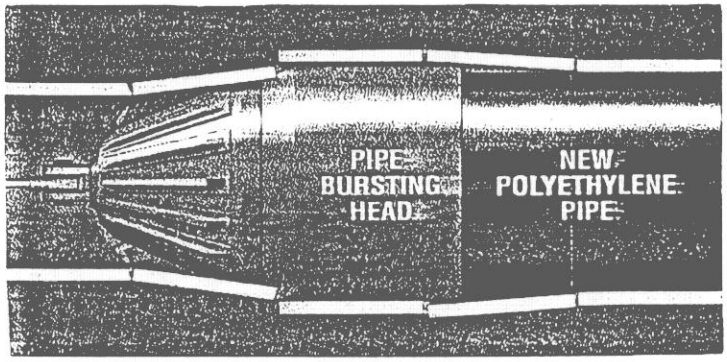
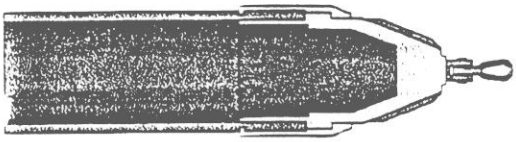
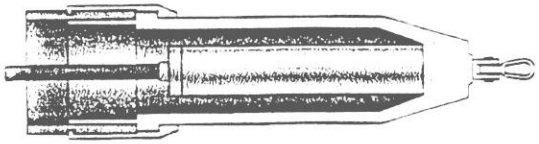


Fig. 1B: Method of Pipebursting (detail)



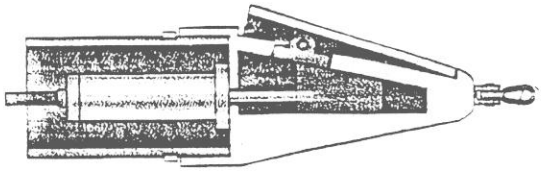
STATIC HEAD

Static heads have no moving internal parts. The head is simply pulled through the old pipe by a heavy-duty pulling device.



PNEUMATIC HEAD

Pneumatic heads use pulsating air pressure to drive them forward and burst the old pipe. A small pulling device guides the head.



HYDRAULIC HEAD

Designed for cast iron pipe, the Hydraulic Head expands as it is pulled through, bursting both the old pipe and heavy joints.

Fig. 2: Types of Pipebursting Head

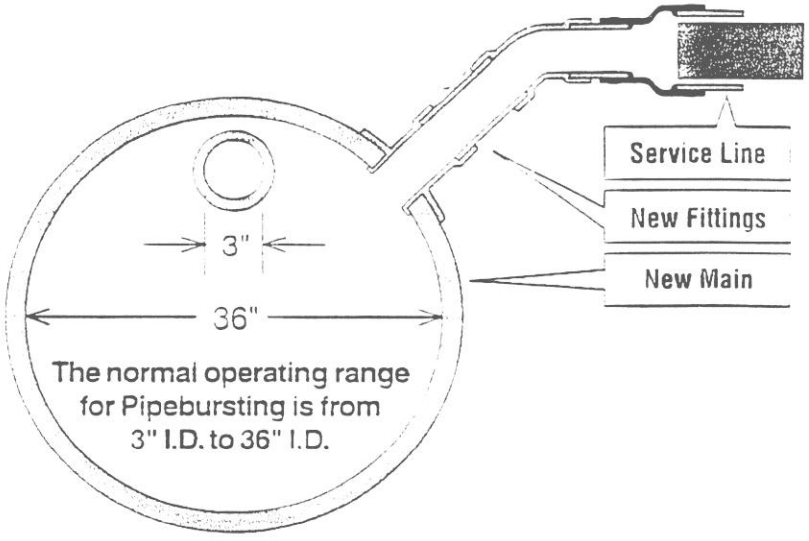


Fig.3: Method of Making Connection



AWARD MANAGER'S SUMMARY
Nomination 9709

DEVELOPMENT OF PIPEBURSTING BUSINESS FOR SEWERS IN USA

The Innovation

Pipebursting is a patented technology for the replacement of old and undersized pipes for sewers, gas lines, and water mains. A pipebursting machine, or mole, is guided through an existing fracturable pipe and breaks the pipe into small pieces. A new, plastic pipe is pulled behind the pipebursting machine to replace the original pipe. This pipe is usually butt-fused polyethylene (PE).

The holder of the pipebursting patents is British Gas, plc who is licensing operators and equipment suppliers throughout the US on a non-exclusive basis. Individual projects are carried out by licensed operators using machines manufactured under the British Gas patents.

Background

Pipebursting was developed by British Gas in the UK for the replacement of old cast iron gas mains. The pipebursting concept appears to have occurred prior to 1980. The US patents show a patent issued in the UK on December 2, 1980. The US patent for the **method** (4,738,565) indicates Roy Streatfield, Francis D. Wilson, and Roger England as inventors. The patent for the **apparatus** (4,720,211) indicates only Streatfield and Wilson as inventors. Mr. Wilson is Director of Engineering for British Gas and Mr. Streatfield worked with D.J. Ryan and Sons. The Ryan company is a utility contractor in the UK. They helped develop the pipebursting tools. D.J. Ryan shares patents with British Gas. (See Exhibit 1)

The use of pneumatic tools for pipebursting applications was developed in a joint effort between British Gas Co. and Tracto-Technic, a European company. T.T. International is a British company that markets these tools under the GRUNDOCRACK name throughout the UK. TT Technologies, the counterpart company in the US, is the largest producer of the tools in America. The GRUNDOCRACK machines are the only pneumatic machines that can be used for pipebursting under British Gas/D J Ryan patents.

Pipebursting technology was brought to the USA in 1988 and a company in the Northeast was given an exclusive license to the patent. The technology was then extended to replacement projects for water and sewer lines.

Early in 1994, British Gas began to promote the advantages of the system to cities, utility companies, and contractors in the US for use in sewer line applications, and began to license US companies to use the technology on a non-exclusive basis. As a result of this promotion, the number of licensed operators and equipment suppliers grew rapidly until now 58 US contractors and 10 Canadian companies are licensed to use the system. (Exhibit 2)

The method has become popular in the southern states, especially in Texas and Louisiana where some cities will specify the use of the method. In other states, the method is almost unknown.

Application

Many urban utilities are old and undersized for the demands of modern expansion, so the ability of pipebursting as a "No-Dig" technology to install larger, leak free plastic pipes on the same alignment as now exists without producing deep, open cut trenches becomes a significant option when pipe replacement is being considered. The benefits from using "No-Dig" technologies for utility construction are being accepted by many municipal authorities anxious to reduce costs, shorten construction time, and avoid significant disruptions to traffic, customers, and the environment. Pipebursting is the only "No-Dig" technology by which fracturable pipes can be replaced by a pipe of equal or larger size without using boring or open cut methods. The term "fracturable" applies to host pipe materials such as cast iron, clay, non-reinforced concrete, transite, and some plastics. In some cases the host pipe may need to be split before being fractured.

A pipebursting project must have access to the host pipe at each end of the length to be burst. Existing manholes typically provide for this access, but if manholes are not available, then open excavations must be prepared. Open excavations are also required at service or lateral connections. Pipebursting lengths will vary depending upon pipe sizes and soil conditions. Maximum lengths of replacement can approach 900 feet at one time for pipes 3"-36" dia., with upsizing equal to one or two pipe sizes. Commonly, the pipe sizes are 16" and smaller.

New plastic pipe sections are fused together to make a continuous pipe equal in length to the distance between access points. The new pipe is then attached to the rear of the pipebursting mole in preparation for installation. A winch is installed at the target access point and a cable is threaded through the host pipe back to the entrance point where the cable is attached to the front of the pipebursting mole. The mole is positioned at the entrance of the host pipe and is connected to an air compressor.

During operation, the air activates a piston in the mole in a manner that is similar to a jack hammer. As the piston is driven forward, it expands the front of the mole and breaks the host pipe. The cable, kept taught by the winch, steers the mole and provides

the reactive force for the piston. The mole thus moves forward through the host pipe and tows the new pipe into place. The winch does not really pull the mole, but does need to overcome the frictional forces developed by the new pipe.

Pipebursting machines are made in a number of different sizes and expansion capabilities which allow for the installation of new pipe equal to the old pipe diameter or to accommodate new pipe of larger size than the old. The amount of upsizing is usually in the order of one or two standard pipe sizes, although larger expansions may be made. (Exhibit 3)

Notes on Nominated Persons

Mr. Syd Parkes, Commercial Manager of British Gas, plc., is the person in charge of the development of the pipebursting technology in North America.

Mr. Jim Hopwood, Engineering Consultant for British Gas, plc., is the resident contact for British Gas in the US. He is in charge of all licensees for pipebursting methods and equipment in the US. He is located in Houston, Texas.

Award Manager's Comments

The pipebursting technology appears to be a tightly controlled technology developed in the UK more than 18 years ago and extensively used the UK and in Europe. It was introduced to the US in 1988 but was not actively encouraged until 1994. It is one of a number of "No-Dig" technologies, and with the growth of these technologies, it also prospered.

SELECTED INTERVIEW SUMMARIES
Nomination 9709

James Hopwood, Engineering Consultant
British Gas, plc.
Houston, Texas
Phone interview by RB Harris 10/29/96

Mr. Hopwood says that the development of the pipebursting system started with British Gas in England and was designed to replace gas mains. It was brought to the USA in 1988 and a company in the Northeast was given an exclusive license to the patent. The system was then extended to water and sewer lines and in 1994 they licensed parties on a non-exclusive basis. There are now 58 USA contractors licensed to use the system and 10 Canadian licenses.

Mr. Hopwood will send me some more information and some additional names.

James Hopwood, Engineering Consultant
British Gas, plc.
Houston, Texas
Phone Interview by RB Harris 12/09/96

Harris called Hopwood to ask further about origins of the pipebursting technology. Hopwood said that the patents on the method are owned by British Gas and that they started to push the system in the USA in 1994.

TRACTO-TECHNIK has some of the tool patents. TT Technologies are the largest licensee for tools in the US.

Hopwood says that D.J. Ryan is a contractor in the UK who helped develop the tools.

Hopwood thinks that the origination of the system came from an engineer in the north of England. Hopwood will send me a copy of the patents that will show the names of the inventors.

Ramon Menzell, President
SOS Services Group, Inc.
Brighton, Michigan
Phone Interview by RB Harris, 11/26/96

Mr. Ramon Menzell is President of SOS Services Group, Inc. of Brighton, Michigan. They are licensees of the Pipebursting System and have done quite a lot of work, mostly in Michigan, but also in Ohio and Indiana. Occasionally, they have worked outside this area.

Mr. Menzell knows Mr. Hopwood. Menzell was in England and Germany in 1987 to look at the technology. SOS uses the technology primarily for sanitary sewers and drains. Mostly they use it for sewer renovation projects. They have broken pipes of clay, concrete, cast iron, reinforced concrete, and even some plastic pipe that had been used as a prior repair. He related a case where they tried to burst a short section of corrugated metal pipe used in a previous repair. The system didn't work and they had to dig it out.

Asked about the range of difficulty, he said that it varies widely depending upon the soil. There is a big difference between wet clay and sand, for instance. It also depends upon the soil friction and the depth at which the pipe is located. You need to understand the soils.

Pipe Bursting has the ability to upsize, that is to install a larger pipe than the existing one. The amount of upsizing depends upon the site conditions. He knew of a project in Colorado that went from 24" to 30" or 36". He has done jobs that have gone from 8" to 14". This ability is one of the main advantages that he sees in Pipebursting. Mr. Menzell added that they have pulled 886 feet of pipe in one run between manholes.

Asked about standards and procedures, he said that the amount of documentation is growing, but every project depends on its own conditions and the ability of the contractor.

Menzell says that there are about four different equipment manufacturers in the USA. Each has slightly different pieces of equipment that can be acquired. He says that the most experienced manufacturer is T.T. Technologies who make the GRUNDOCRACK equipment. He recommends that I talk to Chris Breader, President of T.T. Technologies of Aroura, IL. Phone 1-800-533-2078. If Breader cant be reached, try Larry Gross of the same company.

Larry Gross, Product Manager
T.T. Technologies
Aurora, Illinois
Phone Interview by RB Harris, 11/27/96

Larry Gross is Pipe bursting Product Manager for T.T. Technologies, 2020 East New York St., Aurora, IL 60504. T.T. Technologies manufactures piercing tools for soil applications. These are mostly for small diameter bores for many different

purposes. They also manufacture directional drilling equipment. In short, they make equipment for trenchless technologies.

Mr. Gross knows Mr. Hopwood as well as Mr. Menzell. He says that British Gas holds the patents to the **process** of pipe bursting. They license users of the process, but not the makers of the equipment. Pipes can be burst in different ways, but the patent seems to be far reaching. T.T. Technologies has an agreement (a license) with British Gas (through Hopwood) to notify them of the sale of the equipment. They must report to British Gas and pay a small royalty to them for the equipment. The contractor pays a royalty that is dependent upon the size of the pipe and the footage installed.

T.T. Technologies uses pneumatic hammers. These may have expandable heads if needed. Gross says that the particular equipment is not regulated. "It doesn't matter how you do it as long as the pipe is broken and a new pipe is installed, it would fall under the British Gas patent." There may be places in the world where pipe bursting might be going on without British Gas being aware of it.

Their equipment will do installations from 4" to 30" in diameter, but they are considering a project with 36" diameter pipe. Commonly, the pipe sizes are 16" and smaller. The method is popular in the south, Texas and Louisiana especially, where some cities will specify the use of the method. In other locations, the method is almost unknown. For example, Mr. Gross recently worked with a contractor in Montreal where pipebursting was a first.

Mr. Gross has some engineering data, job stories and so forth that he will send to me. He would like a written address and the reason for my call sent to him by FAX. His FAX number is 815-426-9810.

Syd Parkes, Commercial Manager
British Gas plc.
Reading, Berks, UK
Phone Interview by RB Harris 12/12/96

Mr. Syd Parkes is Commercial Manager for British Gas plc. He said that he has charge of all the pipebursting licensing in North America.

The US Patents show names Roy Streatfield and Francis D. Wilson. Mr. Wilson is Director of Engineering for British Gas. Mr. Streatfield worked with D.J. Ryan and Sons. Ryan is an equipment company in the UK and are joint patentees with British Gas.

TRACTO-TECHNIC is an equipment company in Germany. They are parents of TT Technologies in the US. (Aurora, IL)

On one patent the names of Malcolm Wayman and Goeffrey I. Mood appear. Parkes says that Wayman worked for British Gas in research and development, but that he no longer works for the company. Mood no longer works for British Gas. Their machine is an hydraulic machine instead of being pneumatic.

Parkes says that they thought that the NOVA Award was for only North America and they prepared their nomination on that understanding. I assured him that it was open to all from any country.

Parkes says that the pipebursting process has been used in the UK for over a decade. The UK patents were granted from about 1986 through 1988. The system has been used in the UK mostly for bursting cast iron water mains, whereas in the US it has been applied to sewers. They expect it to be used for water mains in the US in the future. At present there are about 10 licensees in Germany, 2 in France, and 2 in Japan.

British Gas holds all the patents on the pipebursting method. There may be some groups making equipment, but when they have been encountered, the other company usually becomes a licensee.