



Furmanite IPSCO Specialist Hot Tapping and Line Stopping techniques

cost effective pipeline modification
and repair without the need for
shutdown



FURMANITE[™]
MAXIMISING ASSET UPTIME

Hot Tapping

Hot Tapping is a specialist technique employed by Furmanite IPSCO for making a connection to piping or vessels while the system is operating under pressure. Our vast experience in pipeline intervention techniques, our trained and skilled work force, considerable inventory and our global reach makes us the prime technical resource for pipeline modification and repair under high pressure, large diameter or subsea. Industries where our expertise has been successfully deployed include oil exploration and production (both topside and subsea), refineries and petrochemical plants, gas, power generation and utilities such as water and waste, in fact any industry where continuous process is paramount.

Furmanite IPSCO's range of specialist engineering services and patented technologies, together with project planning capability and on-site management ensure that uptime is maximised and assets keep earning.

Hot Tapping is a procedure using an under-pressure drilling machine to cut a hole in an operating pipeline to facilitate a new branch connection from the original pipe or vessel. The process is undertaken with no loss, leakage or interruption to flow.

Furmanite IPSCO manufactures and operates a complete range of equipment to carry out hot taps from 1/2" (ND 13 mm) to 72" (ND 1800 mm) at pressure ratings up to 1480 psi (102 bar) and temperatures up to 370°C (700°F).

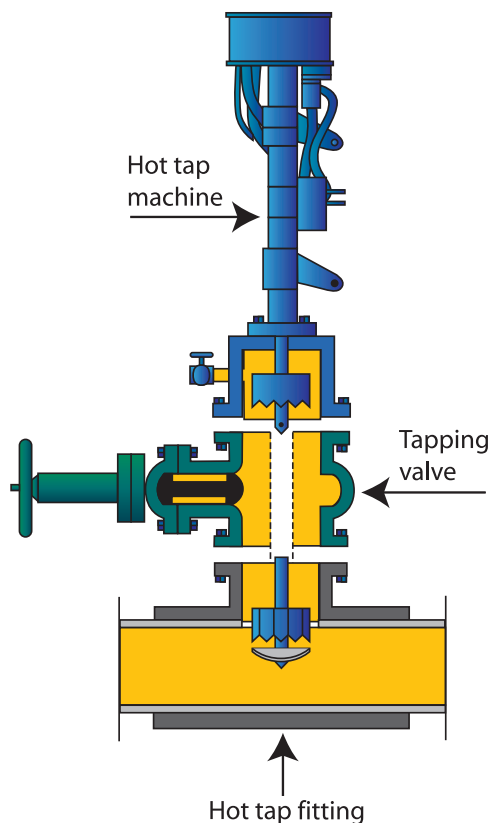
Typical hot tap procedure involves a fitting designed to contain system pressure, a valve to control the new connection and a hot tap drilling machine.



8" (200mm) hot tap line stop operation and 2" (50mm) equalisation tap

Basic procedure

- Install fitting and valve on existing pipeline
- Install hot tap machine
- Perform hot tap through the open valve (special device retains the 'coupon' removed during the operation)
- Cutter assembly retracted
- Hot tap valve closed
- Hot tap machine removed to allow connection to new pipe



36" hot tap cutter, coupon and pilot drill



Removal of coupon



36" coupon showing bracing support

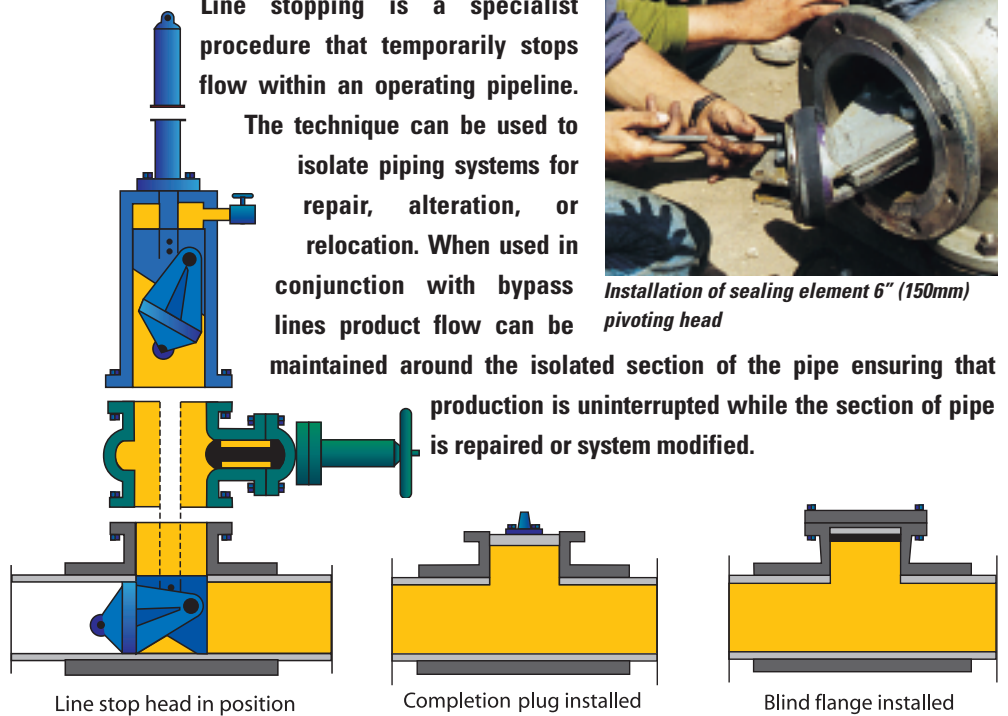
Basic procedure

- Install line stop fitting and hot tap pipe (see basic Hot Tap procedure)
- Line stop equipment is installed on the temporary tapping valve and the valve is opened
- Line stop head enters the pipeline through the hot tap connection
- Temporary seal is achieved and pipeline flow is stopped
- Repair, alteration or relocation is performed
- Line stop head is removed from the pipe via the hot tap connection
- Temporary valve is closed and the line stop equipment is removed
- Completion plug is installed on the tapping machine
- Tapping machine is installed on the temporary tapping valve
- Valve is opened, completion plug is installed in the branch of the line stop fitting and locked in position
- Line stop equipment and temporary tapping valve are removed from the line stop fitting
- Blind flange is installed on the line stop fitting

Line Stopping

Line stopping is a specialist procedure that temporarily stops flow within an operating pipeline.

The technique can be used to isolate piping systems for repair, alteration, or relocation. When used in conjunction with bypass lines product flow can be maintained around the isolated section of the pipe ensuring that production is uninterrupted while the section of pipe is repaired or system modified.



Installation of sealing element 6" (150mm) pivoting head

Line stopping can require dedicated equipment to reflect the pipe size, pressure rating and temperature of the media within the pipe. Furmanite IPSCO is able to address many challenges using its extensive inventory, engineering expertise and years of experience in pipeline intervention.

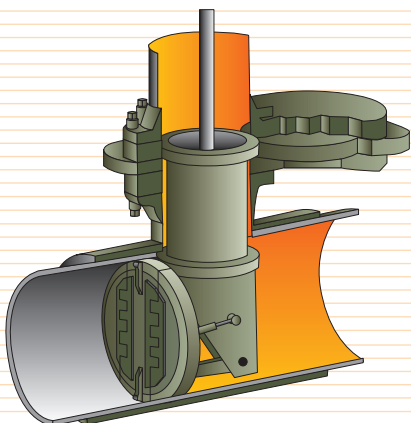
Folding head system

The folding head line stop system, which utilises a reduced branch fitting, is another cost-effective method of line stopping. This system is used in water/wastewater, transmission, oil, gas and petrochemical industries. Sizes range from 8" (ND 200mm) to 72" (ND 1800 mm) with pressures up to 145 psi (10 bar). Larger sizes upon request.

The prime advantage being that the equipment is lighter, more readily transported to site and reduced workspace is required around the pipe.



48" (1200mm) folding head for crude oil line stop



Folding head system

Sequence of 36" (ND 900mm) folding head installed in steel cylinder reinforced concrete test pipe

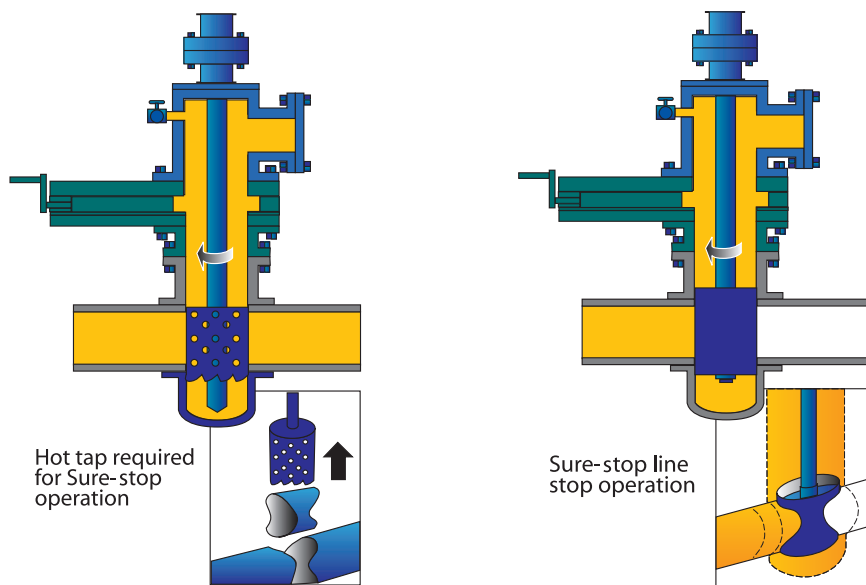
Line Stopping cont'd

Sure-stop system

Furmanite IPSCO's Sure-stop sealing is a well proven cylinder-wedge stopper method used by many customers for its positive mechanical seal. Traditionally limited from 4" (ND 100 mm) to 12" (ND 300 mm) pipe, this method is now available for larger diameter pipes, from 14" (ND 350 mm) to 46" (ND 1150 mm).

The positive mechanical seal provides two distinct advantages:

- Sealing on the machine edge eliminates potential problems related to erosion/corrosion, internal pipe build-up or out-of-roundness
- The mechanically wedged seal allows new sections of pipe to be pressure tested between stoppers.

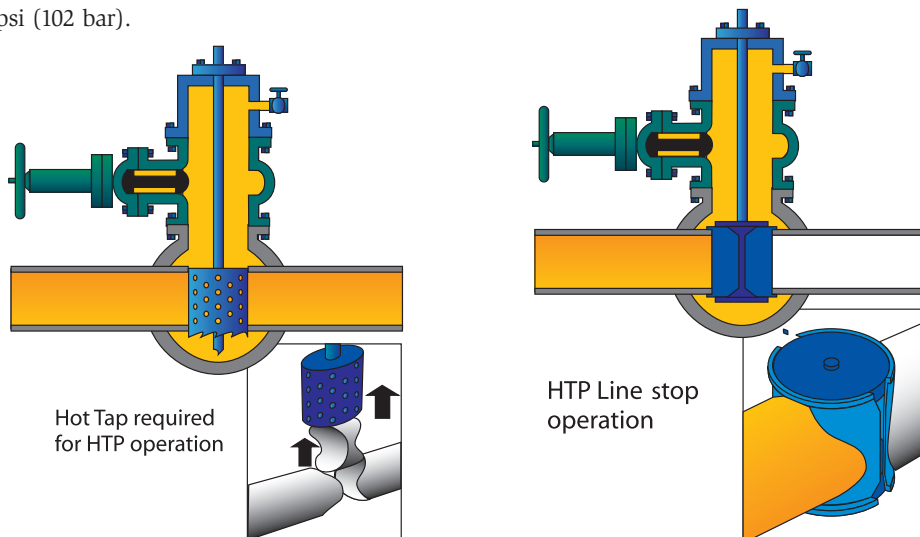


HTP stop

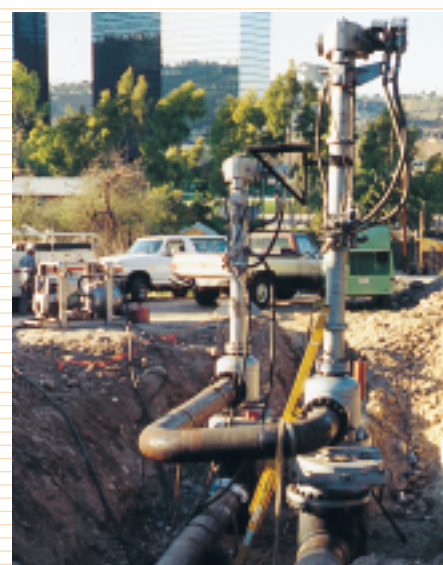
Positive sealing for high temperature and pressure pipe systems

The HTP stop provides a metal-to-metal seal at the pipe face, eliminating problems from erosion/corrosion, internal pipe build-up or out-of-roundness, creating a 'block and bleed' system allowing modifications or valve replacement to be undertaken downstream. As the sealing surface is metal-to-metal, the line stop can be left on the line longer than elastomer seals would allow.

HTP stops are effective at temperatures up to 370°C (700°F) and pressure ratings up to 1480 psi (102 bar).



20" (500mm) Sure-stop bottom-out fitting with completion plug installed



Double 20" (500mm) Sure-stop on natural gas line with 14" (350mm) bypass



Sure-stop line stop head



8" (200mm) HTP line stop on steam condensate line



14" (350mm) line stop with bypass



Spherical Tee line stop fitting with side outlet for permanent relocation



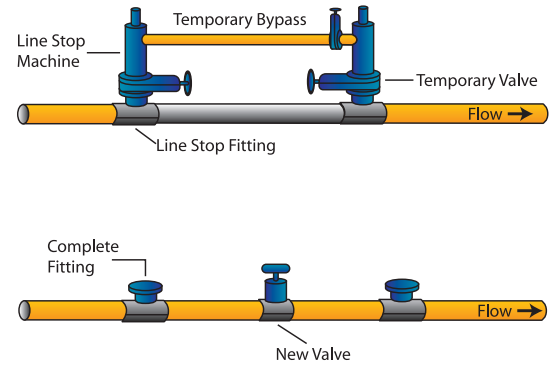
Line stop, equalisation and bypass fittings for multiple line relocations

Typical Line Stop applications

Double-stop and bypass for valve insertion

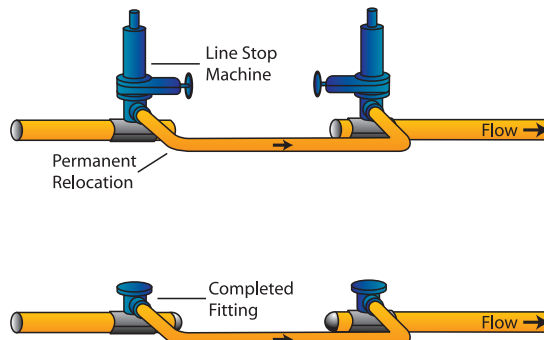
Utilising two fittings, the system flow is maintained through a bypass from one line stop machine to another.

Once the line is isolated, drained and cut, the new valve is installed, the temporary bypass disassembled, the line stop machines removed and the blind flanges are installed.



Double-stop and bypass for permanent relocation using 3-way tees

This method of relocation uses a long branch nozzle with outlet or 3-way fitting and shows how two fittings may be used instead of four. Permanent valves are not used and flow can be maintained while the plugging operation is on-going.



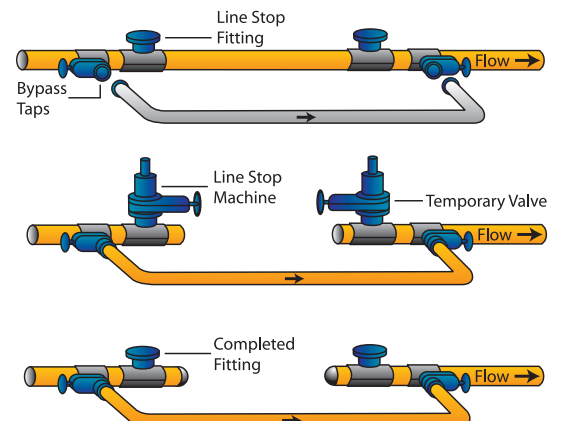
The old section is plugged and end caps installed for permanent isolation, the plugging machine removed and blind flanges installed.

Double-stop and bypass for permanent relocation

A typical pressure layout using two hot tap fittings with valves and two line stop fittings for the installation of a new section of pipe.

The Line stop machines are in place and the flow is stopped in the original line. The section of original pipe is removed.

The relocation is complete and the line stop machines are replaced with blind flanges.



Offshore and subsea applications

Furmanite IPSCO's global expertise is geared to serve the offshore sector's specific operational requirements both topside and subsea.

Furmanite IPSCO understands that maintaining production and minimising disruption is critical to the profitability of the operation. Furmanite IPSCO's hot tapping and line stopping techniques are geared to share in this ethos.

Subsea applications bring new and unique challenges due to the need for diver intervention and pressure variations at depth. Furmanite IPSCO is able to perform hot taps and line stops subsea at depths up to 1,000 ft, including single line stops through to double line stops with bypass on high-pressure natural gas and crude lines.

It is within this environment that Furmanite IPSCO has carried out its largest double hot tap connection on a 36" high-pressure gas line at 500 ft. Other projects have included a double 20" line stop with 12" bypass on HP gas line at 700ft, multiple subsea hot taps and line stops off the coast of Egypt, as well as multiple hot taps to float a submerged fuel storage cell at 650 ft.

Summary

Furmanite IPSCO has considerable experience around the globe working to tight timescales, mobilisation/demobilisation schedules, restricted space and potentially hazardous environments. Our current capability includes;

- Subsea hot taps up to 36" Class 900
- Subsea line stops up to 36"

Our global reach includes

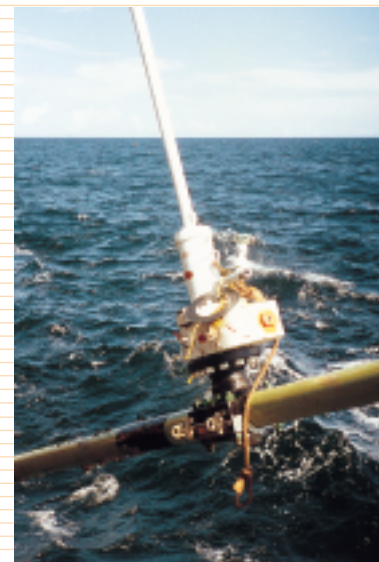
- North Sea
- Gulf of Mexico
- Arabian Gulf
- Red Sea
- Gulf of Guinea (West Africa)



24" x 12" mechanical hot tap fitting, ANSI 600 for subsea application



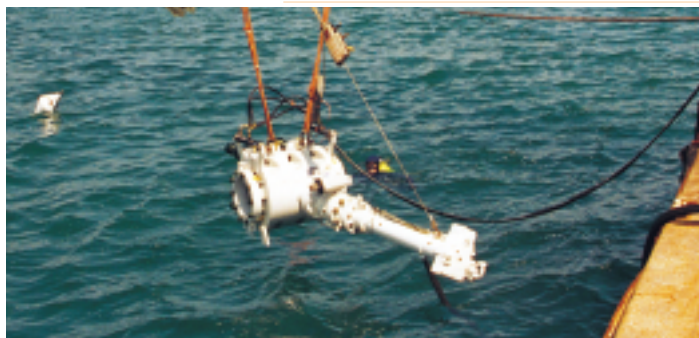
914XL hot tap machine is lowered in to North Sea for 16" hot tap



6" (150mm) line stop being evacuated and raised to the surface



914XL hot tap machine with hot tap fitting



Mechanical hot tap tee with hot tap machine fitted is lowered into Gulf of Mexico



48" (1200mm) line stop fitting with completion plug installed on crude line

Fittings

Furmanite IPSCO manufactures split tees, shaped nozzles and close-sure line stop fittings in a variety of sizes and combinations for hot/wet tapping and line stopping. Fittings are available for size-on-size or reduced branch applications from 2" (ND 50 mm) to 60" (ND 1500 mm). Custom designed fittings are available on request. Our fittings are designed and manufactured in accordance with ANSI standards. Customer specific requirements can be considered upon request.

Equipment

Furmanite IPSCO also manufactures a complete line of hot tapping equipment from 1/2" (ND13 mm) to 72" (ND 1800 mm) and line stopping equipment from 4" (ND 100 mm) to 72" (ND 1800 mm) with maximum rating to 1480 psi (102 bar) at 100°F (38°C) 700 psi (48 bar) at 700°F (370°C). We manufacture a complete line of line stopping equipment which includes actuators, pivoting heads, sandwich type valves, sealing elements, cutters, pilot drills and other related items. Individual equipment specification sheets and equipment packages are available to meet your specific requirements and can be prepared on request.

Engineering, manufacturing and quality management

Furmanite IPSCO has an extensive engineering and manufacturing capability both in the UK and the US and is able to supply dedicated equipment such as hot tapping machines and ancillary equipment for customer use, ranging from drilling and plugging machines, split sleeve self-sealing clamps and contingency supplies. All customer requirements are reviewed and validated to ensure that design codes, manufacturing tolerances and safety considerations are met and that the ISO9001 Quality Management System is maintained.



Three-way line stop tee for use on flare lines



Spherical three-way tee outlet from side or bottom



Mechanical line stop fitting with blind flange



Sure Stop tee with bottom outlet prepped for welding



Tapping machine with capabilities from 13mm to 300 mm



Purge equalisation fittings (screw lock nipples)



Split tee



Close-Sure completion flange

Optimise your assets by eliminating unscheduled downtime

Furmanite helps companies across all industries worldwide achieve maximum process efficiency and effective asset management - adding value not cost - bringing a breadth of experience plus a raft of products and services, using the latest materials, techniques and technologies, and engineering dedicated solutions where required. All are designed to increase process efficiency, extend production runs, minimise scheduled downtime, and avoid unscheduled shutdowns.

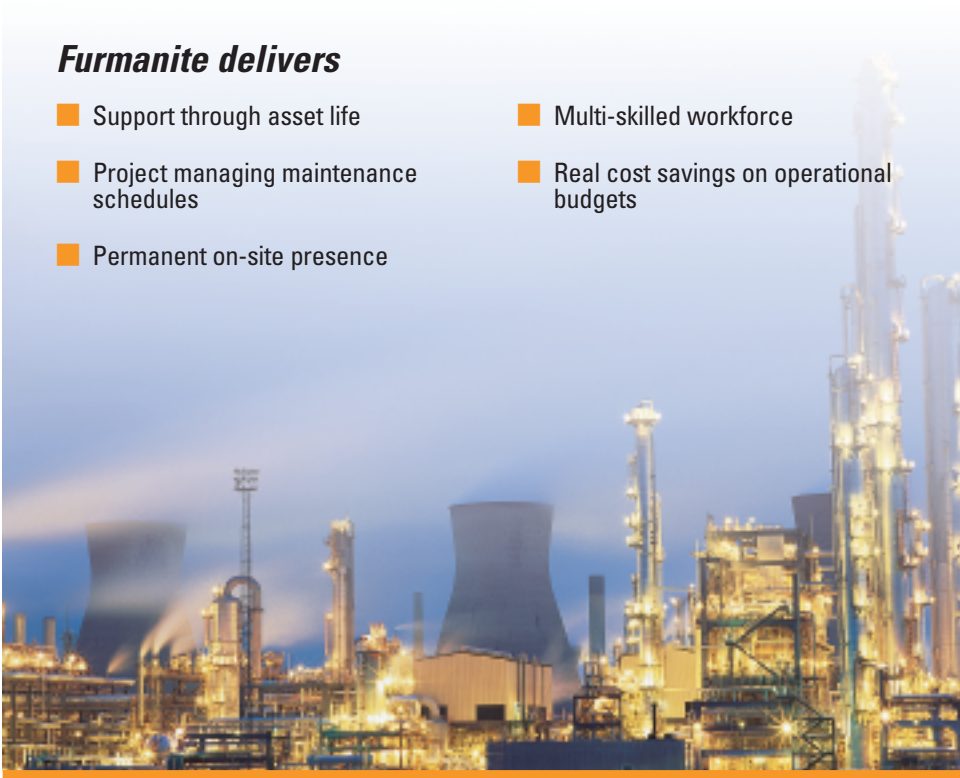
From working alongside an in-house maintenance team, or project-managing all maintenance or specialist requirements, through to providing a full-time Furmanite technician or team on-site, Furmanite will work with its customers to meet their requirements.

For over 75 years, Furmanite has been the name behind innovative leak-sealing techniques, providing major players in the oil and gas, power generation, mining and petrochemical industries with an unrivalled level of expertise. On-call 24/7 for emergency repairs and planned shutdown support.

Today, Furmanite is the world's preferred engineering partner, delivering on-line, on-site engineering services and advanced patented technologies, saving companies \$millions on their bottom line by maximising asset uptime.

Furmanite delivers

- Support through asset life
- Project managing maintenance schedules
- Permanent on-site presence
- Multi-skilled workforce
- Real cost savings on operational budgets



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FURMANITETM
MAXIMISING ASSET UPTIME

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Furmanite's skills and support services include;

- CONTROLLED BOLTING (PSIM)
- ON-LINE LEAK SEALING
- TRANSFORMER LEAK SEALING
- FURMASEAL
 - SELF SEALING REPAIR CLAMPS
 - PIPE END CONNECTORS
- PIPELINE INTERVENTION
 - HOT TAPPING
 - LINE PLUGGING
 - PIPE FREEZING
 - GROUTED TEES
- VALVE REPAIR
- TREVITEST ON-LINE VALVE TESTING
- ON-SITE MACHINING
- METAL DISINTEGRATION
- SILK SPECIALIST MACHINES
- HEAT EXCHANGER MANUFACTURE AND REPAIR
- TANK ROOF REPAIRS
- SMART SHIM CONDUCTOR ANALYSIS AND CHOCKING
- COMPOSITES REPAIRS AND STRUCTURAL STRENGTHENING
- PASSIVE FIRE PROTECTION
- ENVIRONMENTAL/SAFETY PRODUCTS

