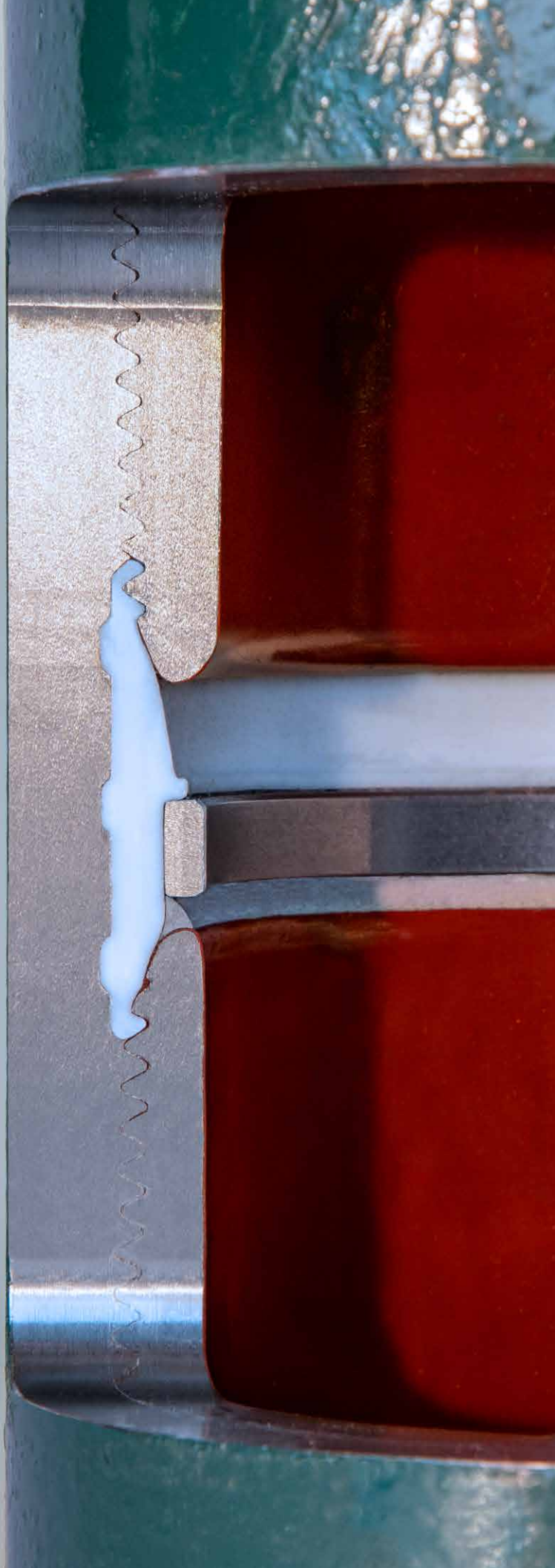
KC Connection

High performance modification to 8rd Connections



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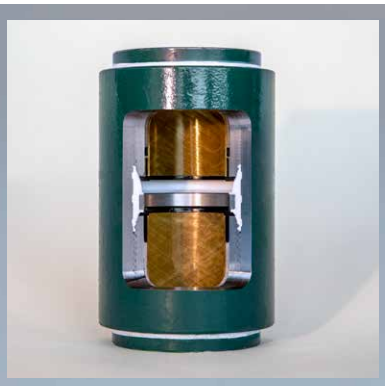
Tubular string requirements

continue to increase as well conditions become deeper and more hostile, making connection integrity crucial.

Tuboscope's KC Connection is a high-performance modification to 8rd connections for coated, lined or bare pipe in fluid and gas service wells. Available worldwide, this system targets issues such as connection damage such as corrosion, and loss of containment due to pressure leaks.

KC/Internally Coated Pipe *(IPC)* with CRA Ring



KC/Fiberglass Lined *(FGL)* with CRA Ring

Available Connections

- KC/IPC *(Internally Coated Pipe)*
- KC/FGL *(Fiber Glass Lined)*
- KC/NCNL *(Non-Coated, Non-Lined)*

PTFE for Liquid and Gas Service

Resilient Polymer for Fluid Service

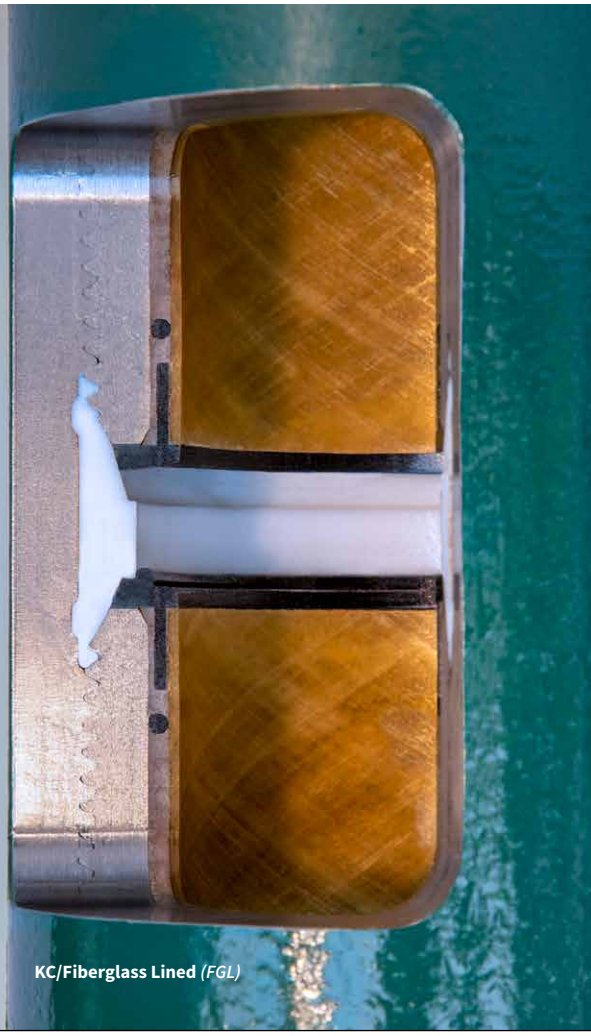
- Temperature 400°F
- Enhances pressure containment
- Creates more laminar flow

Primary Application

- Water injection producers, Water disposals, CO_2 injection

Benefits

- Can be used in production and injection environments with high levels of CO_2 and H_2S
- For use with API threads on fiber glass lined, internally plastic coated, or bare pipe
- Enhances corrosion control and pressure containment
- Can be pulled and run multiple times
- Holiday-free J area
- Increases connection life
- Protects connection from erosion
- Facilitates swabbing



KC/Fiberglass Lined *(FGL)*

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Image is representative only

The Coldwater Ranch Unit C #12W is one of several water injectors for an enhanced oil recovery project in the Marmaton Formation located in Sherman County, Texas. The well was inactive due to a failed tubing/casing integrity test and a tubing leak was suspected. The well was equipped with 175 joints of 2 ⅞", 6.5 lb/ft, N-80, EUE 8rd tubing, internally coated with TK™-70 that had been in service since February 1994. The tubing was pulled & sent to Tuboscope for inspection. All of the collars were removed before the tubing was inspected. The tube was in excellent condition and inspected out to white band, but all of the pins had suffered severe corrosion damage. Instead of buying a new string of tubing, a decision was made to reuse the used tubing by re-threading all of the ends, internally coat the complete string with TK™-70XT and install KC/IPC modified collars with Teflon seals. The tubing string was re-installed in the well and it passed the tubing/casing integrity test.

Cost Comparison

Cost of a new string of tubing	$32,930	**Cost Savings**	**$17,619**
Cost to re-thread & install new collars	$15,311		

KC-Connection — Center Torque Ring (CTR)

KC/CTR

The KC/CTR EUE Connection improves connection integrity of workstring tubing by converting the pin ends into Torque shoulders. The CTR ensures a solid connection and exceeds API connection specification limits, allowing for rotation work such as milling packers, jamming and power swivel work to be performed.

Benefits

- Improved workstring tubing performance
- Extended working life
- Reduced maintenance and re-cut costs

KC Connection Technical Field Support

Tuboscope provides a specialty trained technician on-site during running and handling of KC Connection. This service includes inspection of the pipe before installation, ensures adherence to standard operating procedures and proper makeup of the connection while running the pipe.

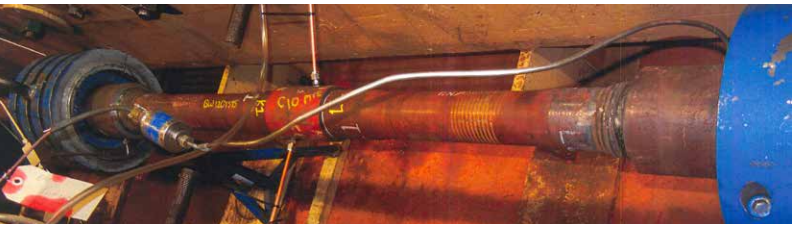
To evaluate and advise decisions on used casing and tubing, technicians can also be on-site during pulling or re-installation.

Technicians are properly trained on handling coated and lined tubulars to minimize chance of damaging tubular goods while on location and during installation.

All technicians are fully trained on all required rig safety and certifications.

Upon completion of the installation, a detailed well report will be recorded for documentation if future workover is required.

- Quality control
- Comprehensive/24-hour service
- Optimize time and efficiency
- Integrity/performance
- Reduce downtime and rig charges
- Evaluate on-site problems
- Technicians provide field support to assist with the proper implementation of all recommended procedures.



Testing

Tuboscope contracted third party testing of the KC Connection to determine pressure capabilities of the PTFE seal and temperatures limitations to ensure viability in oil and gas applications.

- 24 hr Thermal Soak
- Stress Engineering Modified ISO Series B Test
  - Axial Frame Load
  - Pressure
  - Leak Data
  - Rocker Testing *(TK™-805 & TK™-Liner)* multiple make-and-break tests
- Fluid Flow Simulation/Flow Efficiency Testing

Case Histories

KC Connection has been used successfully in a wide range of downhole environments reducing the need for workovers and extending the life of the tubing.

Heidelberg Field, East Mississippi
January 2007–Present

Connection Size & Type	Well Conditions
51 Wells with 2 7/8" KC/IPC Connections **7 Wells** with 3 ½" KC/IPC Connections	The completion tubing strings were run in various wells, water and/or CO_2 injectors using KC/IPC connections on new internally plastic coated pipe, J-55, EUE, 8rd threads. The well conditions consist of the following; bottom hole temperatures of 140–180°F, depths of 4,800–5, 400 ft., and pressures of 1,600–1,950 PSI on the CO_2 gas wells and 1,100–1,250 PSI on the salt water injection wells. Internal water/Helium testing was done on the first 5 wells installed with KC/IPC connections, with no leaks found. It was then decided that gas testing was no longer needed, thus saving the company an expense.

Eucutta Field, East Mississippi
June 2008–Present

Connection Size & Type	Well Conditions
22 Wells with 2 3/8" and 2 7/8" KC/FGL Connections	The completion tubing strings were run in CO_2 injectors using KC/FGL connections on fiberglass lined, new and used, J-55, EUE, 8rd pipe. The well conditions consist of the following; bottom hole temperatures of 125–150°F, depths of 2,500 ft., and pressures of 1,600–1,950 injection pressure. The Eucutta Field uses the external water/nitrogen test method to test the connection while tripping pipe into all wells. No leaks have been found.

Brookhaven & McComb Area, West Mississippi
February 2009–Present

Connection Size & Type	Well Conditions
17 Wells with 2 3/8" KC/NC-NL Connections **1 Well** with 2 3/8" KC/IPC Connections	The completion tubing strings were run into CO_2 injectors using KC/NC-NL connections on bare, not coated, not lined, used, J-55, EUE, 8rd pipe. The well conditions consist of the following; bottom hole temperatures of 260–325°F, depths of 10,200–10,800 ft., and pressures of 3,800 PSI. These operational areas use the internal gas test method with Helium on all wells. No leaks have been found while running pipe in or out of these wells.

Baker, Montana
November 2012–Present

Connection Size & Type	Well Conditions
82 Wells With 2 3/8" and 2 7/8" KC/IPC Connections	The completion tubing strings were ran in various wells, water and/or CO_2 injectors using KC/IPC connections on new internally plastic coated pipe. L-80, EUE, 8rd threads. The well conditions consist of the following bottom hole temperatures of 140–180°F, depths of 4800–8500 ft, and pressures of 1,600–2100 psi. Wells had no leaks at time of installation and have been pulled and re-ran on several occasions.

Wickett, TX
August 2010–Present

Connection Size & Type	Well Conditions
~800 Wells With 2 3/8" and 2 7/8" KC/FGL Connections	The completion tubing strings were ran in various wells, water and/or CO_2 injectors using KC/FGL connections on new fiberglass lined pipe. J-55, EUE, 8rd threads. The well conditions consist of the following bottom hole temperatures of 150–190°F, depths of 2500–3500 ft, and pressures of 800–1200 psi. Wells had no leaks at time of installation and have been pulled and re-ran on multiple occasions.

Oklahoma, Mississippi Lime
December 2011–Present

Connection Size & Type	Well Conditions
105 Wells With 4 ½", 5 ½", and 7" KC/IPC Connections	The completion casing strings were ran in Salt Water Disposal wells using KC/IPC connections on new internally coated plastic casing. The wells are at a depths ranging from 5200–6600 ft. The PTFE ring has protected the J area of the connection from corrosion, extending the life of the casing.

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