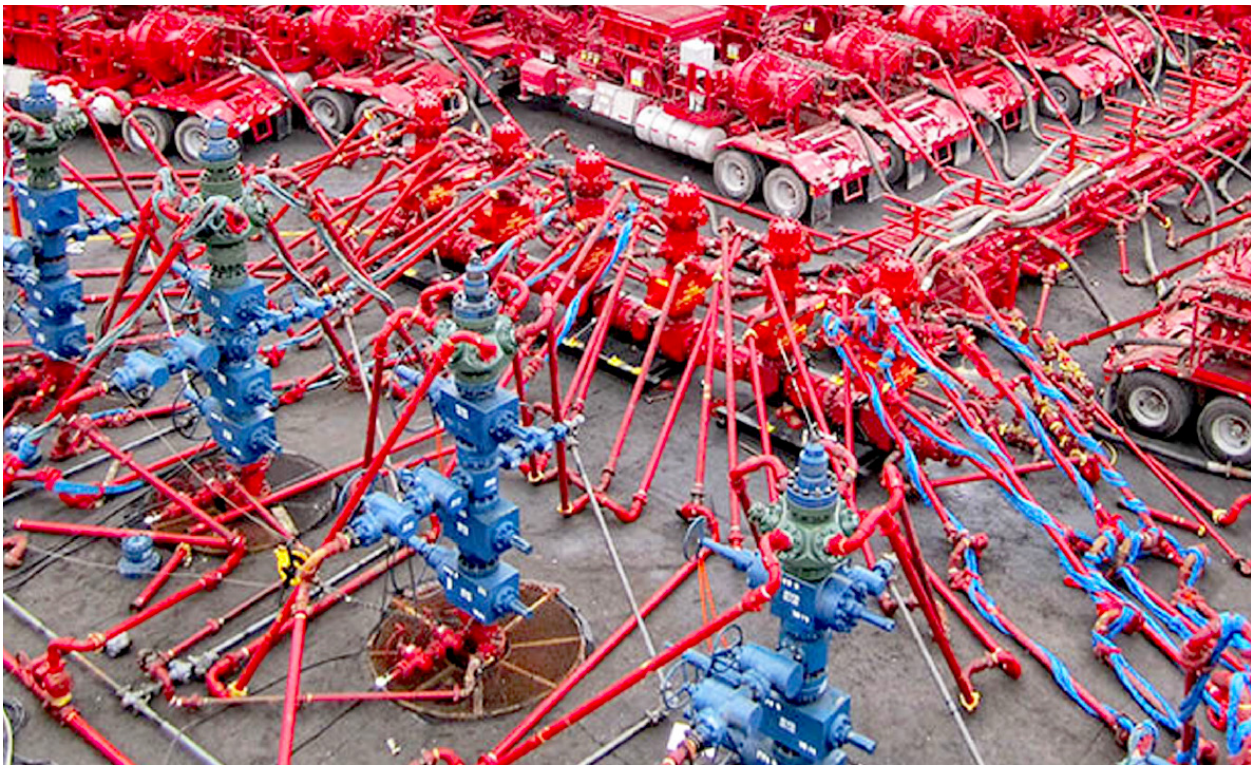
FRACLOCK


FHE

Current Frac Setup



Current frac spreads are dangerous, inefficient, costly, time-consuming, and overgrown.

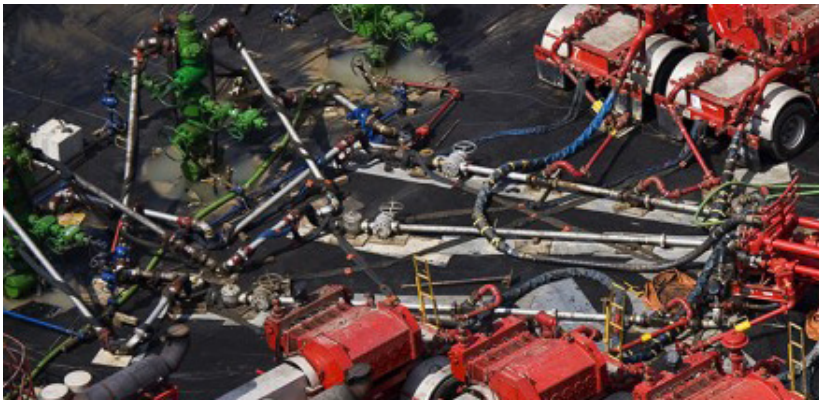
Inadequate safety equipment is required to protect personnel and equipment from frequent failures. Injuries often happen simply because of the amount of connections and equipment used.

On current fracking setups, every piece of iron needs to be tested every 3–6 months resulting in extended downtime. Inspections for all the excessive equipment adds up quickly.

The entire process takes days to get ready. The lease of zipper manifolds are costly and often not available when they're needed.

Current Fracking Situation

- Frequent injuries occur due to the amount of equipment on location.
- Additional safety equipment is necessary because of the high chance of equipment failure.
- All frac iron needs tested frequently which causes extended downtime.
- Crews must arrive at least 2 days before the job starts to begin set up.
- Zipper manifolds are often not available and can be costly to lease.



The FracLock System makes operations safer and reduces rig up, rig down, and production times while decreasing costs of operation.

FHE introduces the FracLock System, a combination of new technologies that makes well operations exponentially safer and more efficient with a lower cost of operations.

Advances Safety for Wellhead Operations by Removing All Personnel from Inside Danger Zones.

The FracLock technology clears all well site workers from dangerous areas during well operations. Crews will no longer have to enter risky areas to investigate leaks, secure hammer unions, or adjust whip stops. Keeping everyone out of harms way.

This system eliminates over 85% of frac iron at the wellhead. Without the clutter of equipment on-site, personnel have greater access to the wellhead with less potential injury from tripping, colliding with equipment and tools, or other accidents.

Reduces Set Up, Tear Down, and Operational Production Times to Increases Efficiency of All Well Service Crews

Operations can begin as soon as trucks begin to arrive. The FracLock System is an integrated system that drastically cuts time needed for setup and tear down. Well service companies are able to work simultaneously which multiplies the number of stages accomplished in a day.

Decreases Overall Cost of Ownership by Eliminating a Large Amount of Equipment Necessary to Safely Perform Well Site Operations.

Smaller crews are sufficient with this technologically advanced system, reducing man hours and monetary investment. Less equipment creates a safer environment and presents less possibilities of damage to adjacent equipment. This reduction cuts down on inspection expenses and often eliminates costly downtime.

FHE FracLock Is a Remotely Operated Universal Wellhead Connection for All Well Services.

The FracLock is central to the entire FracLock System and all wellhead operations. It remotely connects surface equipment to the wellhead.

Advanced Design Adds Levels of Safety to the Well Site

Construction is simple with a limited number of moving parts. The adapter drops into the FracLock. The reactive wedges mechanically initiate the connection. Once the adapter is seated, the lock ring is lowered into position to secure the connection.

The lock ring and reactive wedges are engineered to lock together once pressure on the well begins. This prevents the equipment from inadvertently opening during use and eliminates potential blow outs while operations are in progress.

In addition, the lock ring cannot be lowered unless a proper night cap or crossover is inserted. Once pressure is present, the lock ring cannot physically raise. All pressure must be released in order to unlock the FracLock.

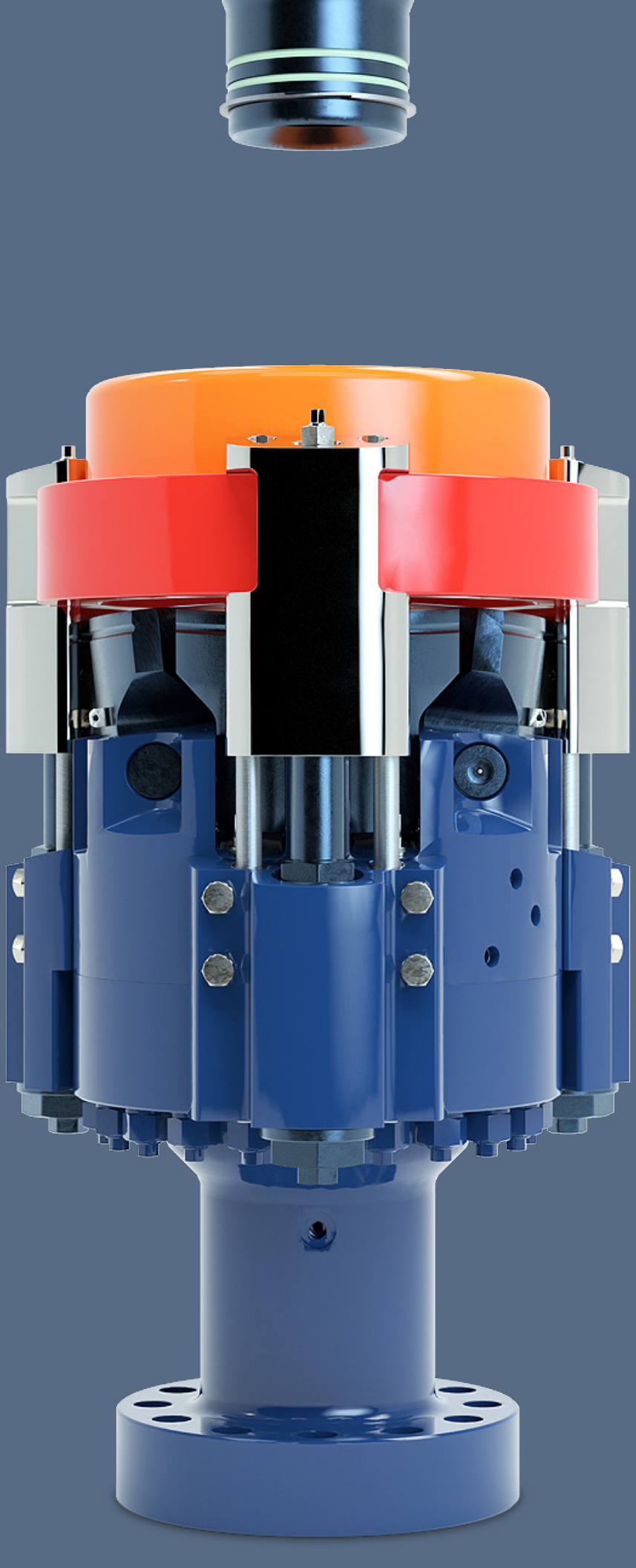
By Working Remotely, Operators Are a Safe Distance from the Wellhead

Remote operations are controlled hydraulically by the custom-designed FracLock Control Unit. Operators remain at a safe distance throughout the duration of the well work. The FracLock is equipped with sensors that relay to the control unit. The control unit visually indicates the locked and unlocked position of the FracLock.

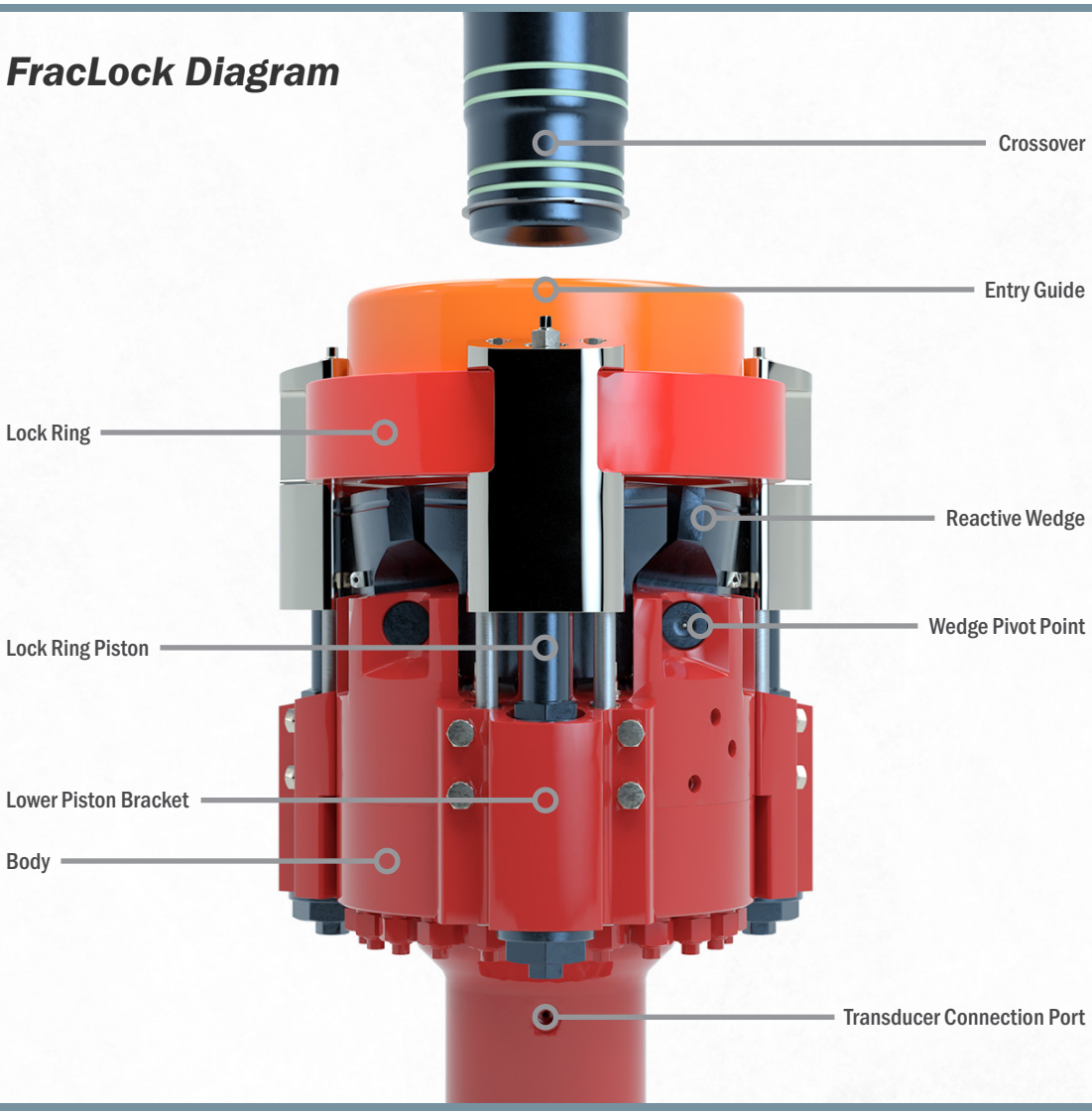
The lock ring cannot be lowered unless a proper night cap or crossover is inserted. Once pressure is present, the lock ring cannot physically raise. All pressure must be released in order to unlock the FracLock.

Quick Access to the Wellhead for All Well Services

The FracLock works with wireline operations, frac crews, and coiled tubing. It provides the universal connection for all well services which speeds up well work and increases the number of stages that can be completed in a day and over time.

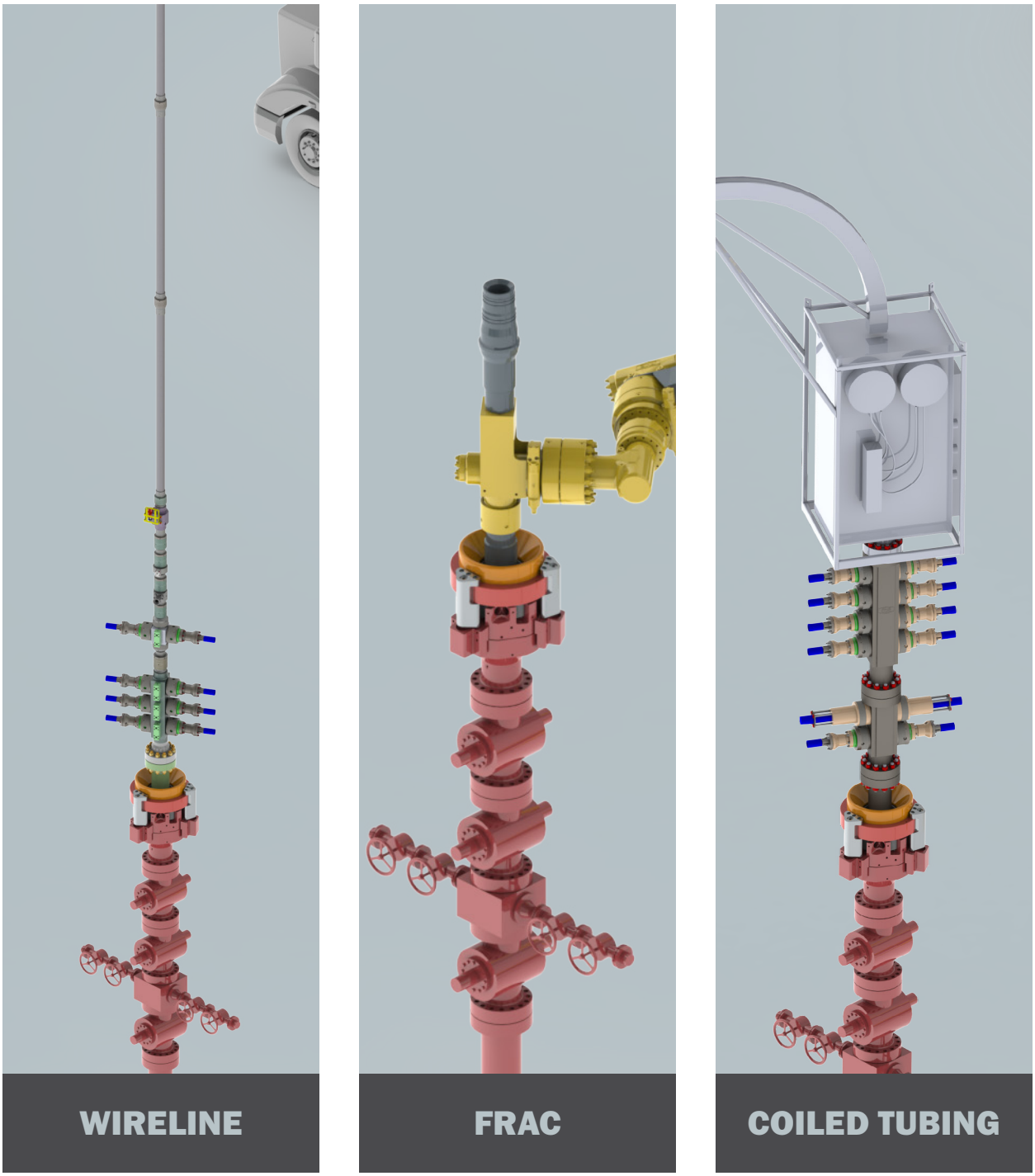


FracLock Diagram



FracLock Specifications

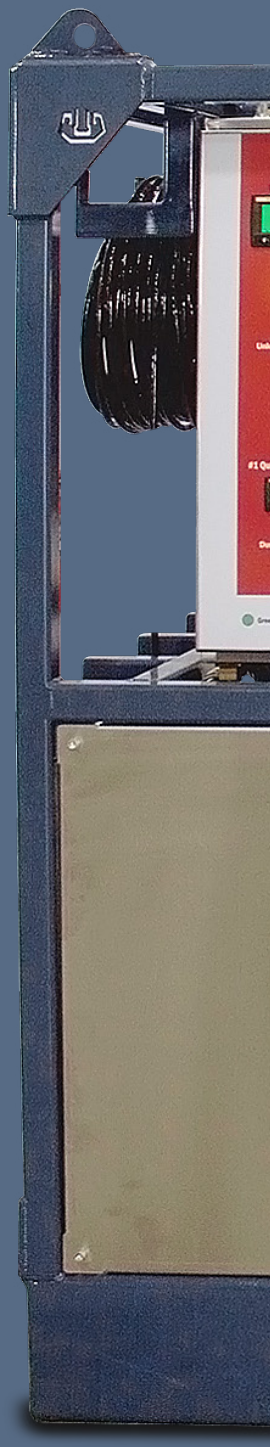
- Works remotely to protect personnel from injury by keeping them out of danger zones and harms way.
- Works with wireline, frac, and coiled tubing operations.
- Increases accessibility to the wellhead.
- 4 reactive wedges to initiate proper closure with nearly 360 degrees of contact.
- Hydraulically actuated lock ring completes and secures the connection.
- 7” Internal Diameter.
- 15K Working Pressure.
- Capable of 130 bpm Fluid Transfer.
- Quick test functionality.



FracLock Is a Universal Connection for All Well Operations

The FracLock offers accelerated efficiency gains since the wellhead connection works for all well services. Wireline operations, frac crews, and coiled tubing services can all access the wellhead to significantly improve performance.

Easy to operate control unit with safety light indicators, well pressure monitoring, and digital displays.



Visually Indicates to the Operator When FracLock is Locked or Unlocked

Safety indication lights are prominently displayed to ensure proper closure of each FracLock. Digital readouts quickly and accurately display to the operators the FracLock operating pressures.

Well Pressure Monitors Protects Against Unintentional Unlocking of the FracLock

The well pressure monitoring system monitors the pressure on the well and prevents operators from inadvertently releasing the FracLock when pressure is being registered.

Simplified Controls with Touch Screen

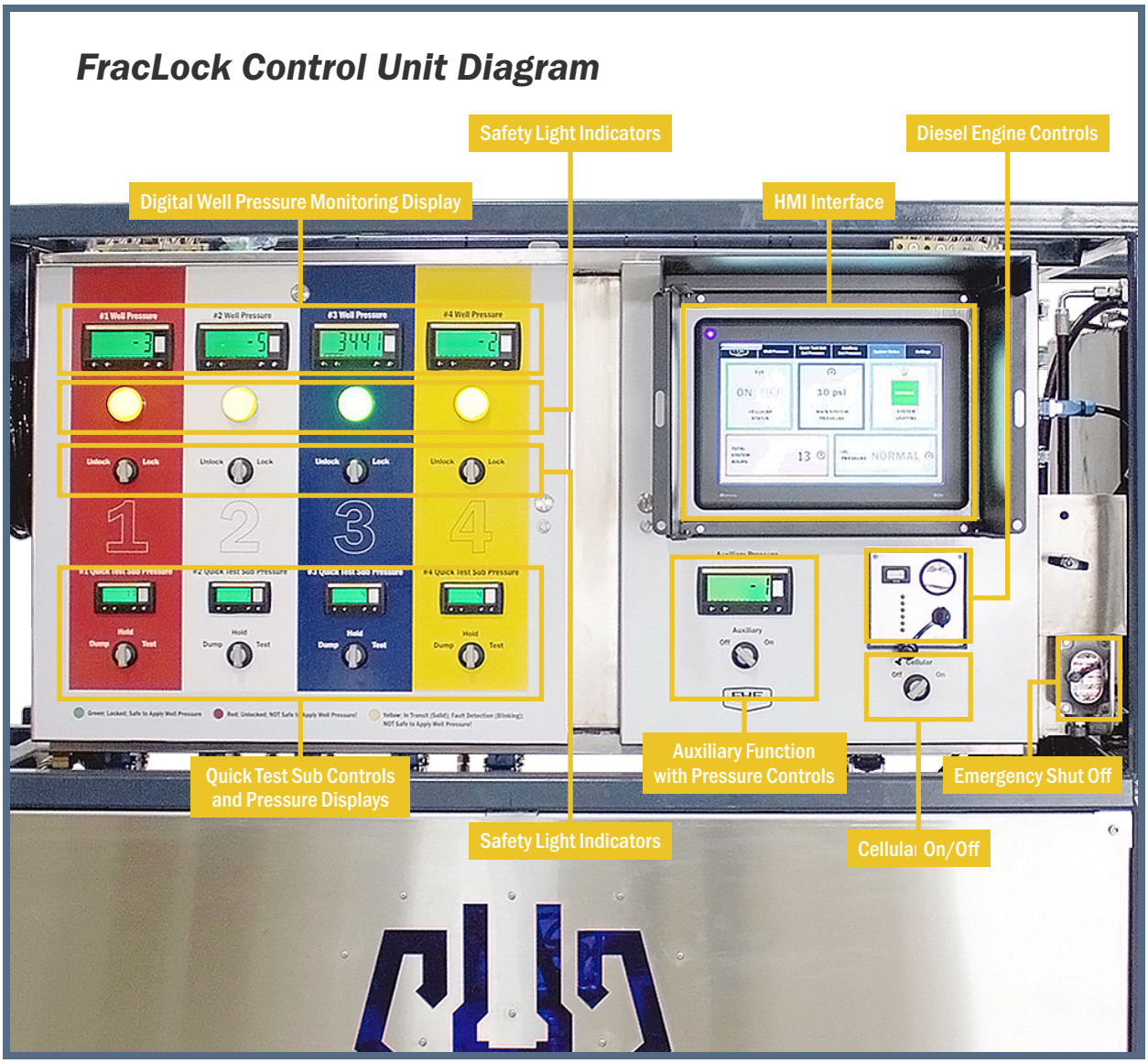
The FracLock Control Unit integrates an innovative touch screen featuring quick access to pressure setting controls, accurate pressure readings, and system diagnostics.

Data and Diagnostics Available Off Site with Secure Cellular Connection

The system is setup with secure access to real-time data that can be monitored and diagnosed off site. All data is continuously stored for future use.


#2 Well Pressure
#3 Well Pressure
#4 Well Pressure
Unlock
Lock
2
3
4
#2 Quick Test Sub Pressure
#3 Quick Test Sub Pressure
#4 Quick Test Sub Pressure
Hold
Dump
Test
10 psi
NORMAL
Auxiliary Pressure
Auxiliary
Off
On
Cellular
FHE
TM
FRACLOCK

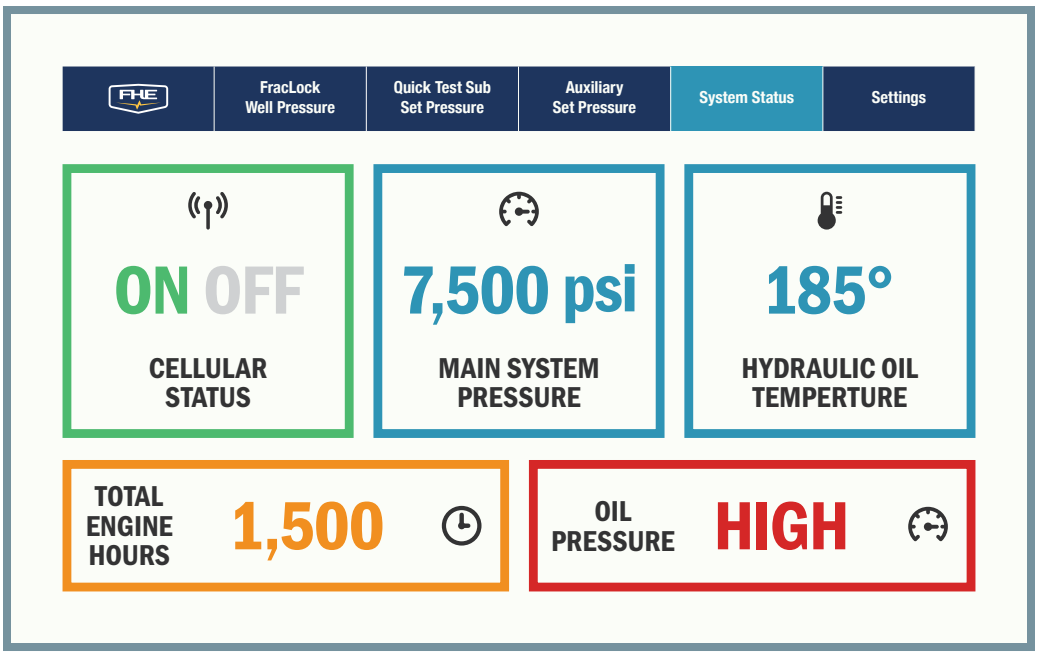
FracLock Control Unit Diagram



Control Unit Features

- Safety light Indicators inform operators when connection is locked or unlocked.
- Well pressure monitoring system prevent unlocking FracLock when pressure registers from the well.
- Touch screen monitor and reports system diagnostics and controls the system settings which can be accessed in real-time off site or downloaded from internal storage.
- Digital displays display accurate pressure and additional information to increases productivity and improve safety.

HMI Touch Screen Interface

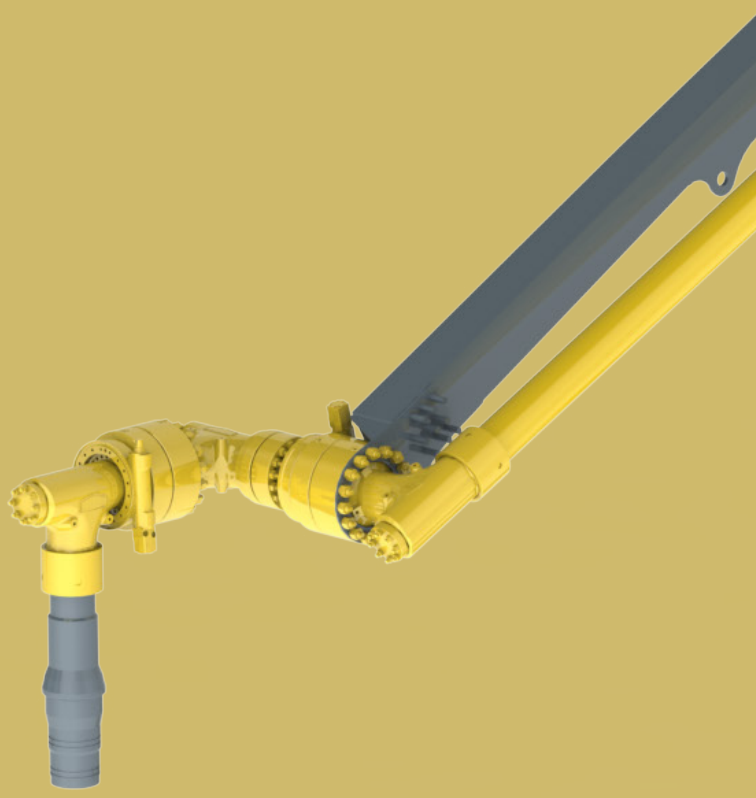


HMI Touch Screen Interface Access Critical Information During Well Operations

The HMI interface displays all 4 well pressures simultaneously. It allows operators to set desired pressures for quick test and auxiliary functions. The interface is intuitive and easy to use with large touch areas on each screen. The prominent main menu gives access to pertinent data for well work to remain safe.

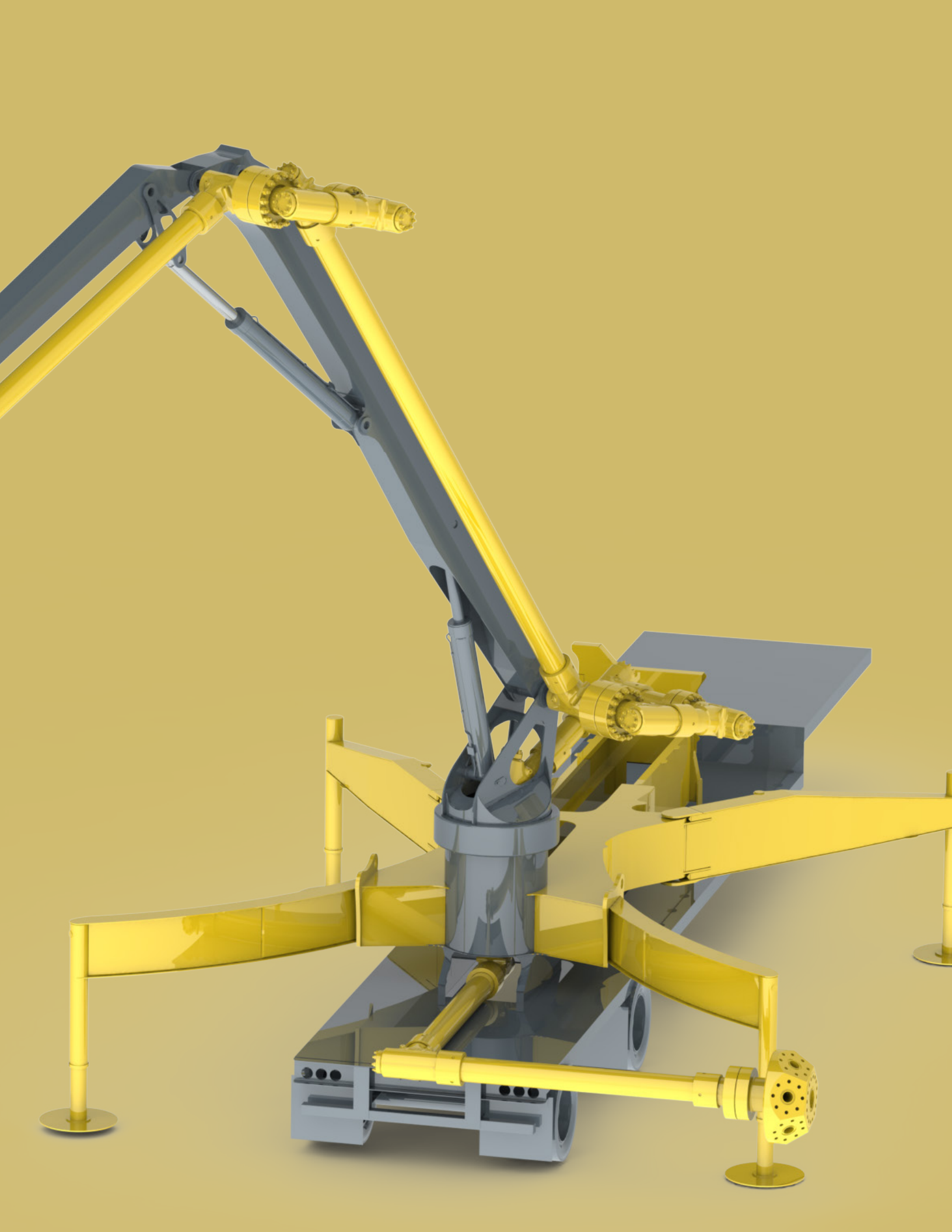
With a flexible range of motion, the articulated arm accurately locates the well fluid connection.

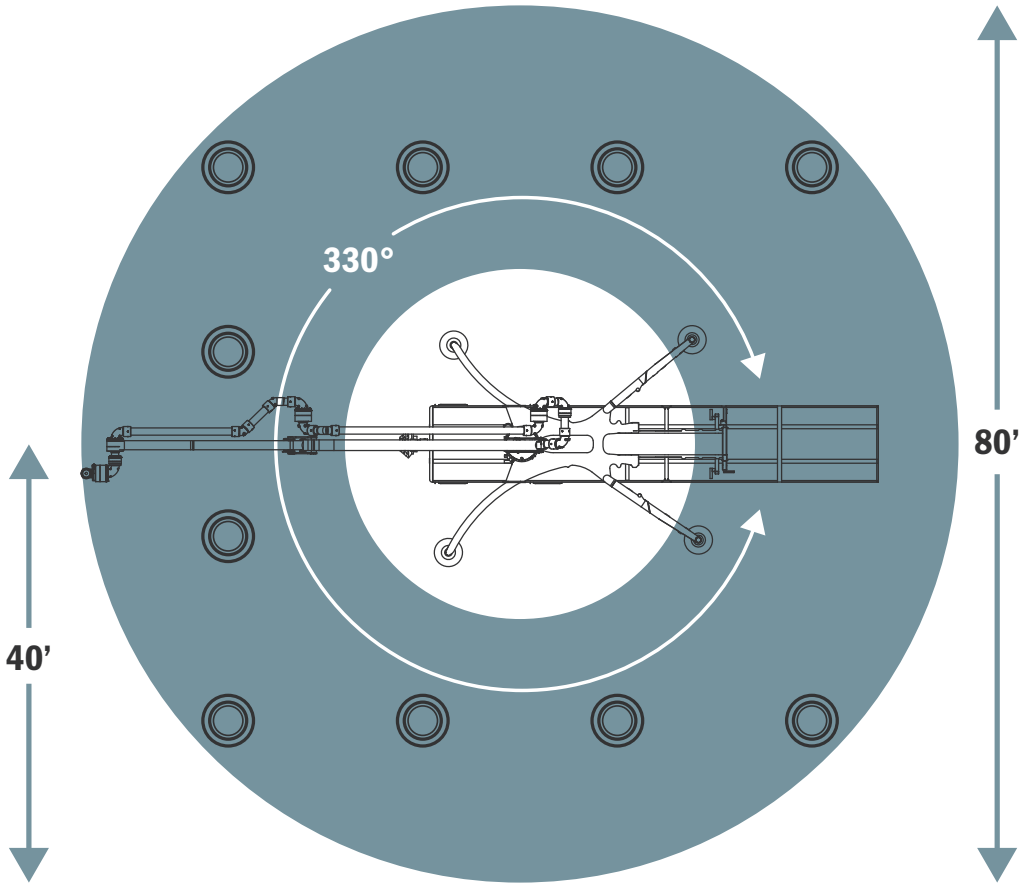
The FracLock articulated arm maneuvers the high pressure dynamic flow iron into position to connect with the FracLock. It has a tremendous range of motion which reaches over 40 feet out at a height of 25 feet from radial center. The articulated arm rotates 360 degrees. This range of motion allows operators to reach several wellheads from a central location to maximize operation up time and increase overall productivity.

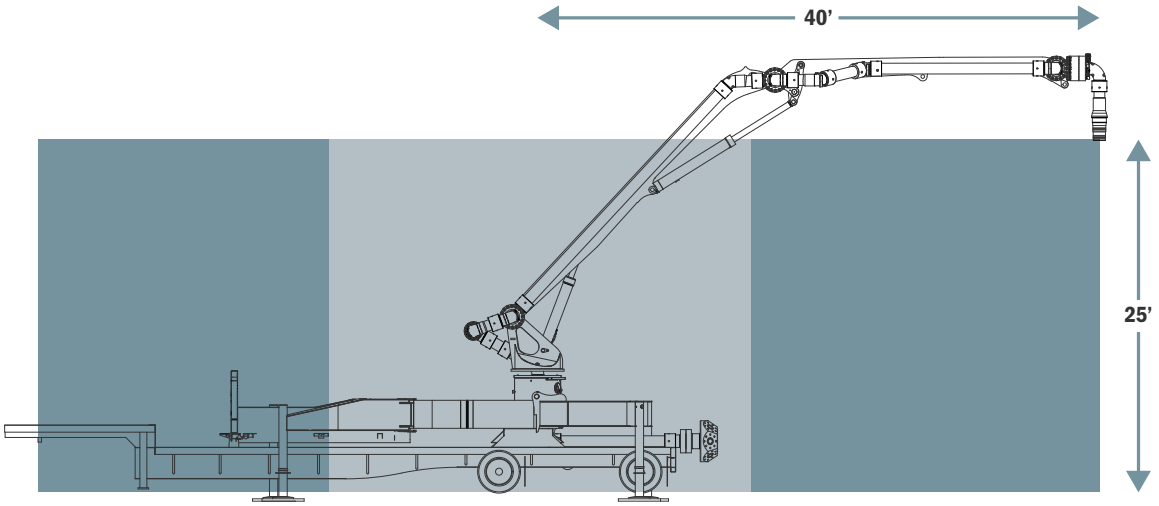


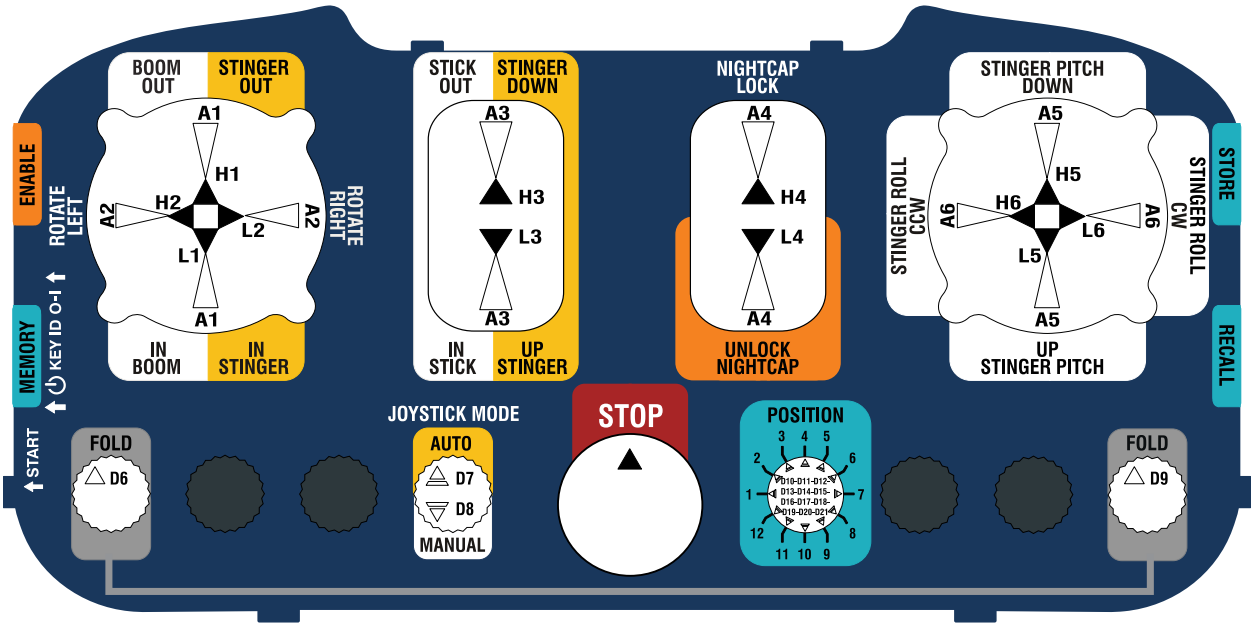
Articulated Arm Features:

- Eliminates overgrowth of frac iron and additional equipment.
- Limits exposure of employees to dangerous conditions.
- Rated for C1D1 use.
- 4 outriggers for maximum stability.
- Quickly moves between wells.
- Maximized reach with 5 points of rotation.
- Integrated system for rapid deployment.
- Powered by an on board, designated diesel engine.
- Mounted on 53 ft. step deck flatbed trailer with estimated weight of 88,000 lbs.




330°
80’
40’


40’
25’



12 programmable position recall which operators can return to set locations with ease.

Articulated Arm Controls

- Custom-designed remote control for simple operation.
- 12 programmable position recall.
- Preset height required for position recall.
- Remote controls allow operators to view targeted FracLock from various angles and an unobstructed view.
- Auto setting keeps crossover plumb to the wellhead.
- Manual setting allows complete control of all 5 axes.
- Back up controls located at the trailer.
- Fold function returns the articulated arm to transport ready position.

The radio control of the articulated arm features auto setting and 12 well location recall. The 12 programmable position recall lets them immediately navigate to a programmed position.

Auto setting makes operations allowing operators to easily maneuver the dynamic flow iron while keeping it aligned. With the manual setting, operators control all 5 axes of rotation.

Dynamic Flow Iron

7” dynamic flow iron maintains well pressure during operations and the has the ability to precisely position the crossover to the FracLock.

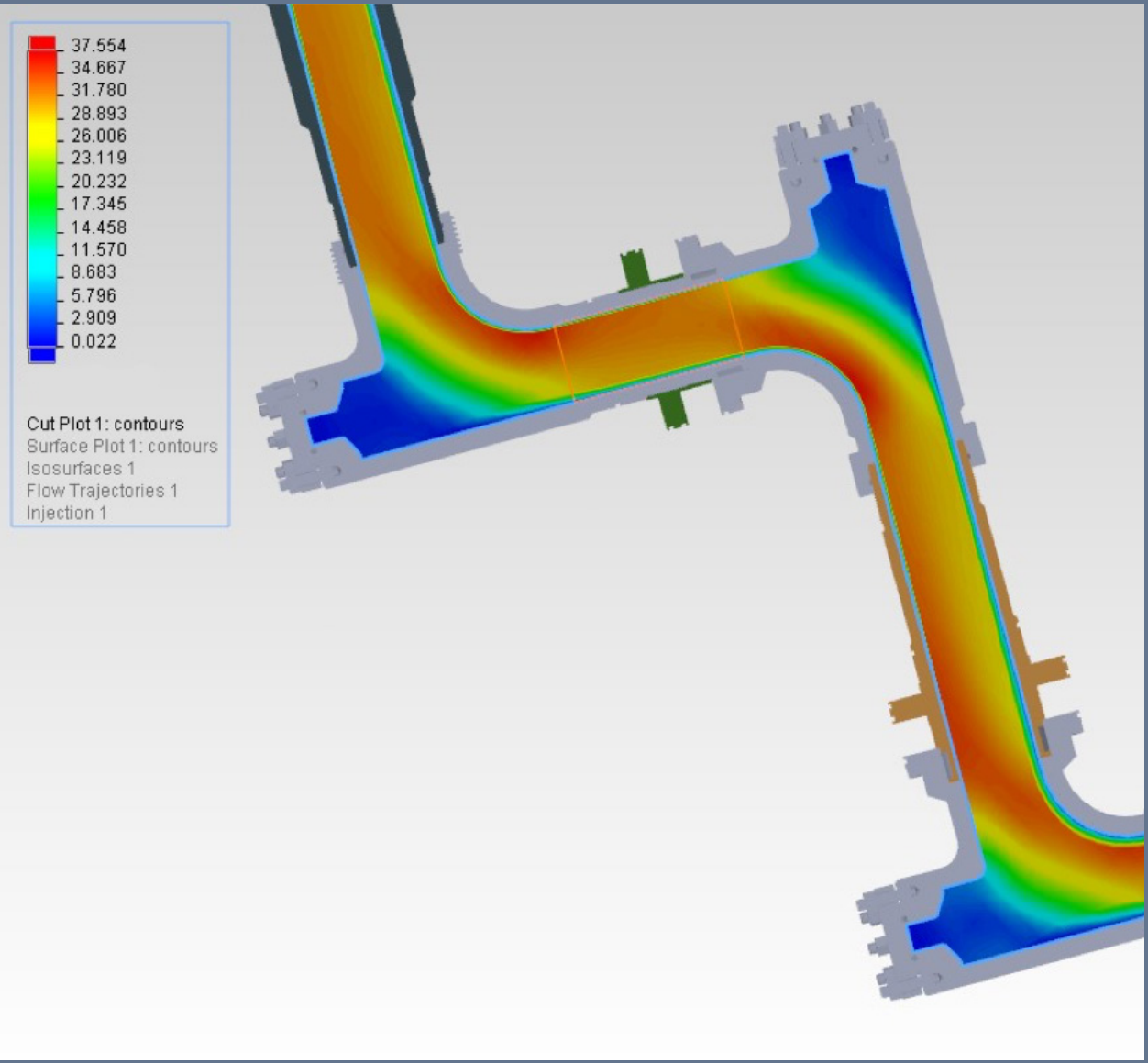
Dynamic flow iron attaches to the wellhead through the FracLock to allow high pressure fluids to be exchanged from the surface into the well. The dynamic flow iron is constructed with 5 axes of rotation to easily maneuver around the well site.

Designed to Safely Contain Well Fluids During Operations and to Efficiently Move Around the Location for Proper Placement of Equipment

The dynamic flow iron is constructed for high pressure operations through exhaustive analysis, simulations, and testing. It is fixed to the articulated arm with fasteners that allow necessary movement while keeping it completely restrained.

Engineered Flow Path Reduces Erosion and Extends Life of Equipment

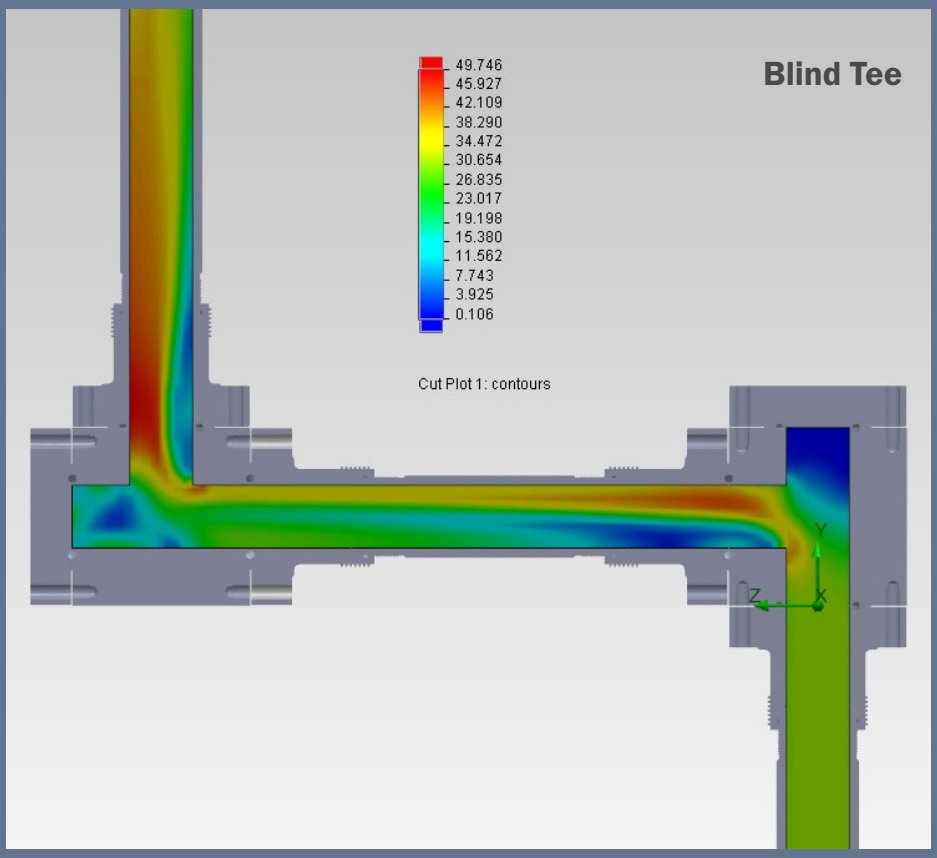
Elbows, swivels, and joints are optimized to reduce erosion which significantly extends the life of the construction material. After testing for 3,960 hours, erosion approached 20% while maintaining a safe wall thickness without predictive failure or washout.



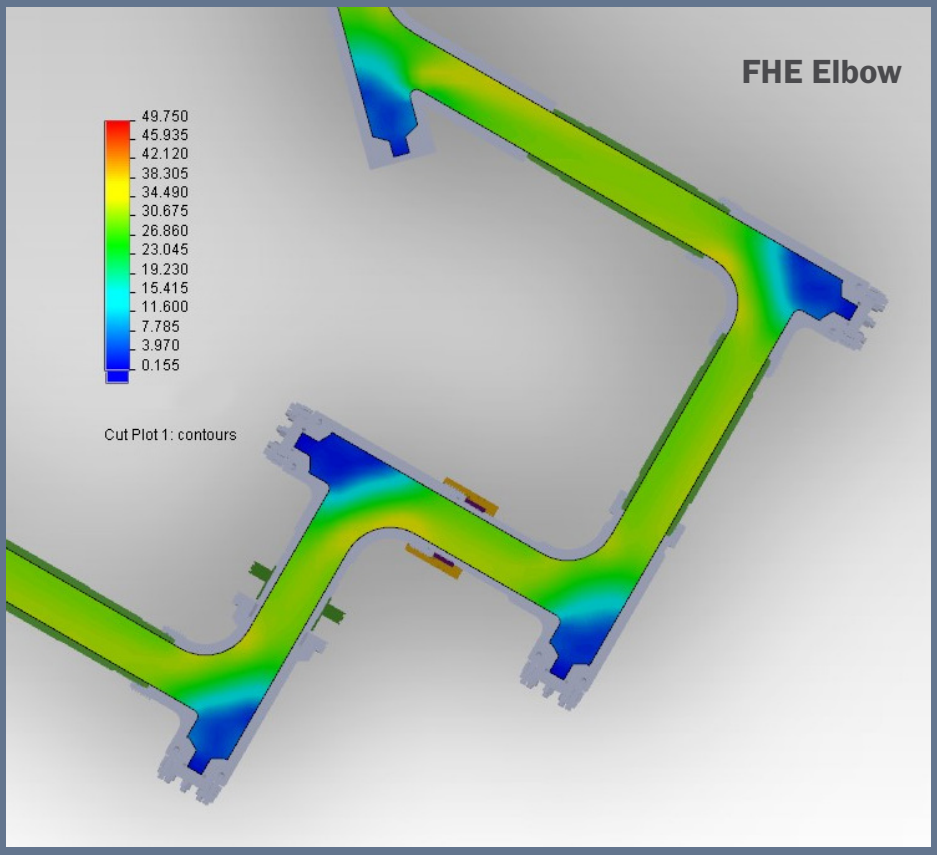
FHE dynamic flow iron optimizes media flow path to eliminate dangerous "dead spots" and drastically reduces erosion velocity which decrease erosion and adds significantly to the longevity of the flow iron. The internal diameter is 7" and can supply 130 barrels a minute.

		Blind Tee	FHE Elbow	Units
Simulation Output	Hours	1,800	3,960	Hours
	Erosion Velocity	50	38	
	Working Pressure	15,000	15,000	PSI
Simulation Input	Mesh	200	200	Mesh Filter Size
	Pressure	13,000	13,000	PSI
	BBL	130	130	Barrels Per Minute

Additional information available upon request.



Color charts equivalent.



Patented elbow and swivel designs minimize particle speed and protect dynamic flow iron from the abrasive nature of frac slurry by dampening the impact and absorbing the force of frac sand and additional materials.

Dynamic Flow Iron Life Estimates

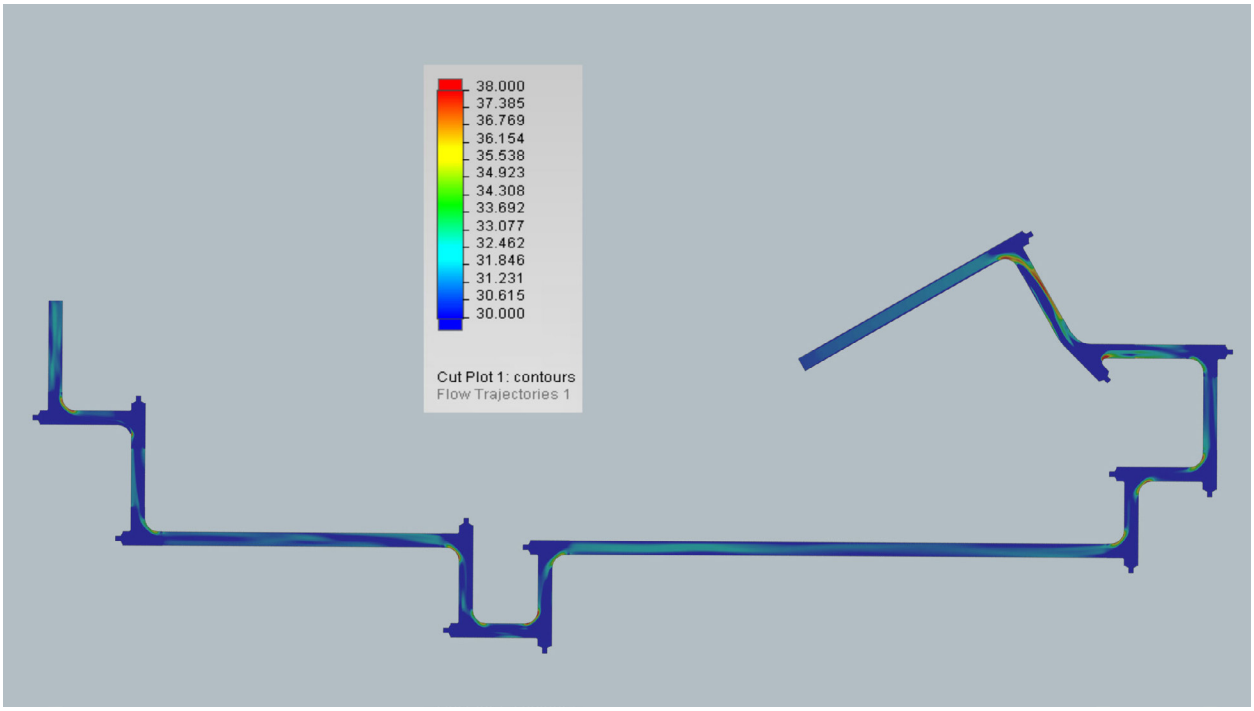
Flow Iron Life (hrs)					
40/70 Sand Mesh		Slurry Flow Rate (bmp)			
		80	100	120	140
Prop Con (ppg)	0.5				
	1.0				
	1.5				
	2.0				

Flow Iron Life (hrs)					
100 Sand Mesh		Slurry Flow Rate (bmp)			
		80	100	120	140
Prop Con (ppg)	0.5				
	1.0				
	1.5				
	2.0				

Flow Iron Life (hrs)					
200 Sand Mesh		Slurry Flow Rate (bmp)			
		80	100	120	140
Prop Con (ppg)	0.5				
	1.0				
	1.5				
	2.0				

Using Situational Data to Estimate Life of Dynanic Flow Iron

FHE can use job specific data to estimate the life expectancy of the dynamic flow iron with predictive anaylsis. This information helps accurately anticipate and schedule service intervals.



No. FHEFL060619

CERTIFICATE
OF COMPLETION

Nathanial Down

Successfully Completed FHE's
FracLock System Operations Course.

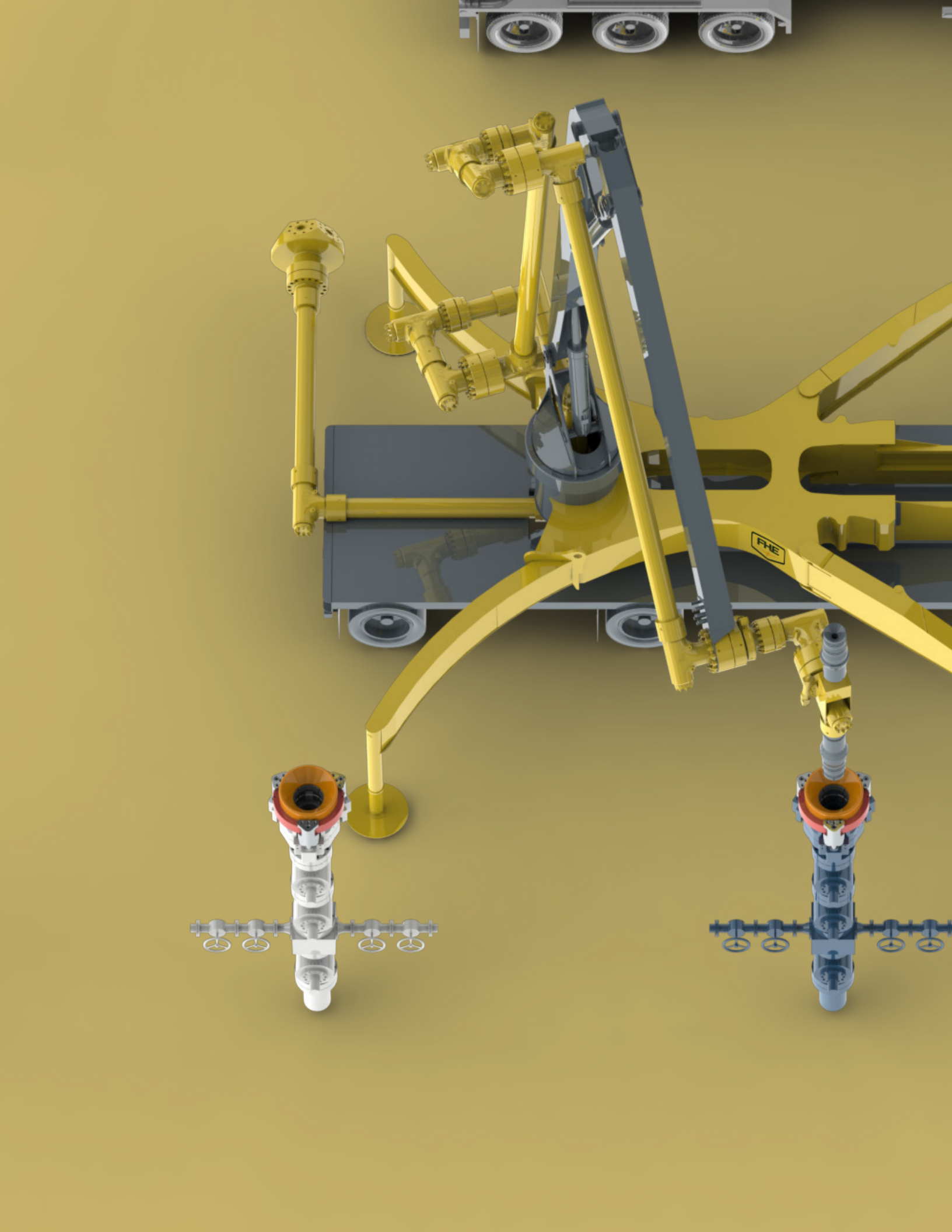
NAME	ISSUE DATE:
Nathanial Down	00 Month 2019
ID NUMBER	COMPANY/LOCATION
FHEFL060619	COMPANY/LOCATION

Steve Hutchinson
COURSE INSTRUCTOR

FRACLOCK

FracLock System Certified Training Course

FHE requires a comprehensive 40 hour training course on the FracLock System operations. Students participate in classroom instruction and benefit from hands-on experience. After successfully completing the course and examination, each will be awarded a certification of completion.



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