



# Hydraulic Decoking System Equipment



*Experience In Motion*

*Flowserve has pioneered many significant advancements in hydraulic decoking and has transformed it into an increasingly safe, efficient and automated process.*



## **The Decoking Experts**

*With over 100 years of decoking experience through its Worthington®, Pacific® and IDP® heritage brands, Flowserve is the undisputed global leader in hydraulic decoking systems. No other company has its depth or breadth of expertise and experience. This is why Flowserve decoking solutions permit customers to continuously improve key operational drivers:*

- *Safety*
- *Productivity*
- *Profitability*
- *System reliability*

### **A Heritage of Innovation and Leadership**

In 1938 Flowserve Worthington designed and manufactured equipment for Shell Oil's Wood River, Illinois (USA) refinery, the world's first hydraulic decoking installation. Flowserve supplied decoking tools, swivel joints, decoking control valves and high-pressure water jet pumps for that system. In 1940 Flowserve Pacific supplied the jet pumps for a hydraulic decoking system at Standard Oil's El Dorado, Indiana (USA) refinery.

Since then, Flowserve has pioneered many significant advancements in hydraulic decoking. Integrated systems consisting of decoking equipment, jet pump trains and control systems are matched to achieve the guaranteed decoking performance. Flowserve has transformed hydraulic decoking into an increasingly safe, efficient and automated process.

### **Continuing to Innovate: Remote and Automated Operation**

Improving personnel safety has always been the number one goal of DCU managers. Removing operators from the cutting deck would eliminate their exposure to inherent hydraulic decoking dangers, including:

- High-pressure water
- Hot spot steam eruptions
- Hydrogen sulfide (H<sub>2</sub>S) vapors
- Fire and mechanical hazards

The introduction of drum monitoring through vibration and the AutoShift tool, along with significant advancements in associated equipment design, now make remote operation possible. The addition of modern instrumentation, controls and software technology can achieve system automation for reduced cutting times with greater throughput, maximum reliability and lowest total cost of ownership.

### **Market Focused Customer Support**

Flowserve decoking specialists provide customer support to develop effective proposals and solutions directed toward market and customer preferences. They offer technical advice and assistance throughout each stage of the product life cycle. From inquiry to installation through start-up and expansion, Flowserve specialists work with customers to achieve their operational goals.

Serving more than 160 refineries throughout the world



### Leading the Way in New Equipment and System Upgrades

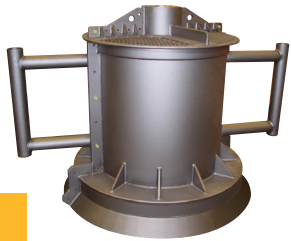
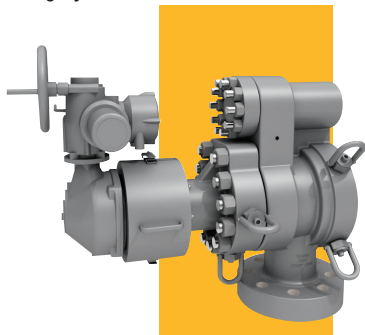
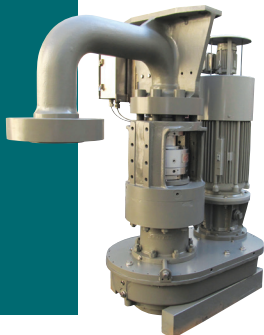
Whether new equipment or system upgrades, Flowserve continues to advance decoking technology. With its AutoShift™ decoking tool, the company revolutionized the way coke is removed from the coke drum. Capable of remotely changing its operating mode from bore to drill and back to bore, AutoShift proved to be a significant advancement toward decoking automation along with ultimate improvement in operator safety.

Flowserve also has made continuous and significant improvements in the performance and reliability of its integrated hydraulic decoking system. In addition to being the world leader in barrel pump technology, Flowserve continues to advance the development of decoking control valves, rotary joints, controls and ancillary equipment. This is why at more than 160 refineries around the world Flowserve is the preferred supplier of hydraulic decoking systems.


### A Complete Range of Decoking System Equipment

Whether for new equipment, system upgrades or replacement parts, Flowserve provides a complete proven decoking system:

- Cutting tools
- Threaded drill stems
- Drill stem guideplates
- Rotary joints
- Decoking hoses
- Crossheads
- Free-fall arrestors
- Pulley blocks, sheaves and wire ropes
- Proximity limit switches
- Latching mechanisms
- Tensiometers and instrumentation
- Winch systems, including console
- Isolation and bleed valves
- Decoking control valves
- Jet pump trains
- Lube oil skids
- Tools and accessories
- Control systems
- Drum cutting monitoring systems



**Isolation Valves**



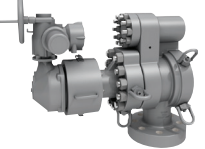
*Pneumatic shown; electric available*

**Drum Vibration Monitoring**

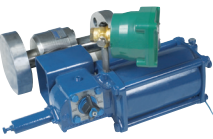


*Welded or magnetic sensor mounts available*

**Decoking Control Valve**

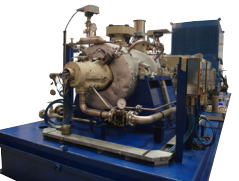
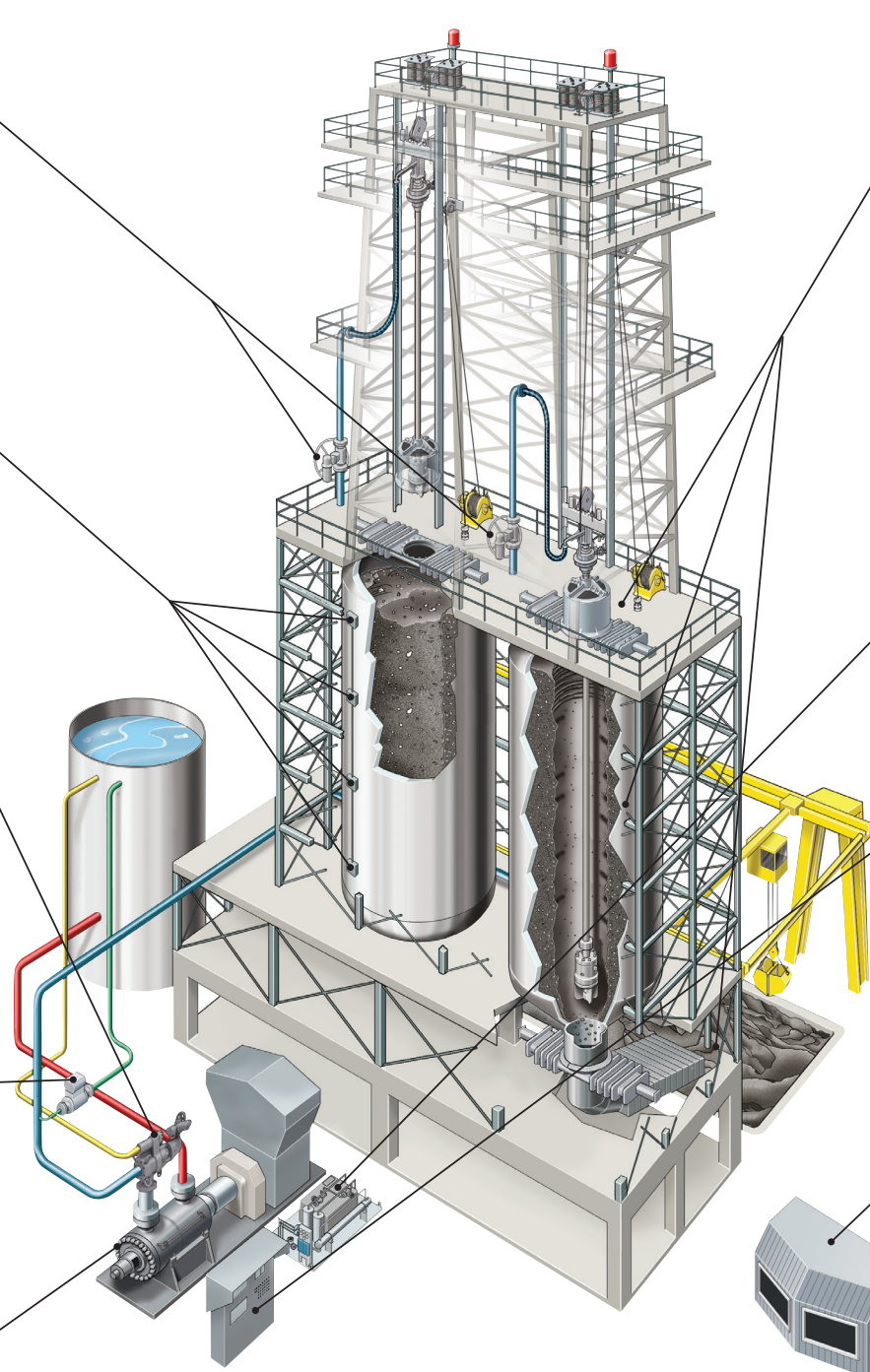


**Bleed Valve**



*Pneumatic shown; electric available*


**Jet Pump Train**

**Audio/Video Drum Monitoring**



**Modular Automation System**



**Lube Oil Skid**



**Control System Panels**



**Operator Shelter**



**Decoking Hose**




API 7K or 17J

**Latching Mechanism**



Electric shown; pneumatic available

**Pulley Blocks**



**Arrestor Springs**

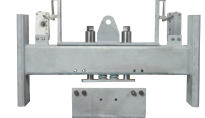


**Tool Enclosure and Guide Plate**




Vapor recovery or lifting configurations

**Cable-Gripping Crosshead**

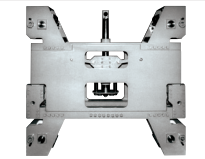


**Tensiometer**



Linerider also available

**Rail-Gripping Crosshead**




**Winch**



Electric shown; hydraulic or electric-over-air available

**Rotary Joint**



Electric shown; hydraulic or electric-over-air available

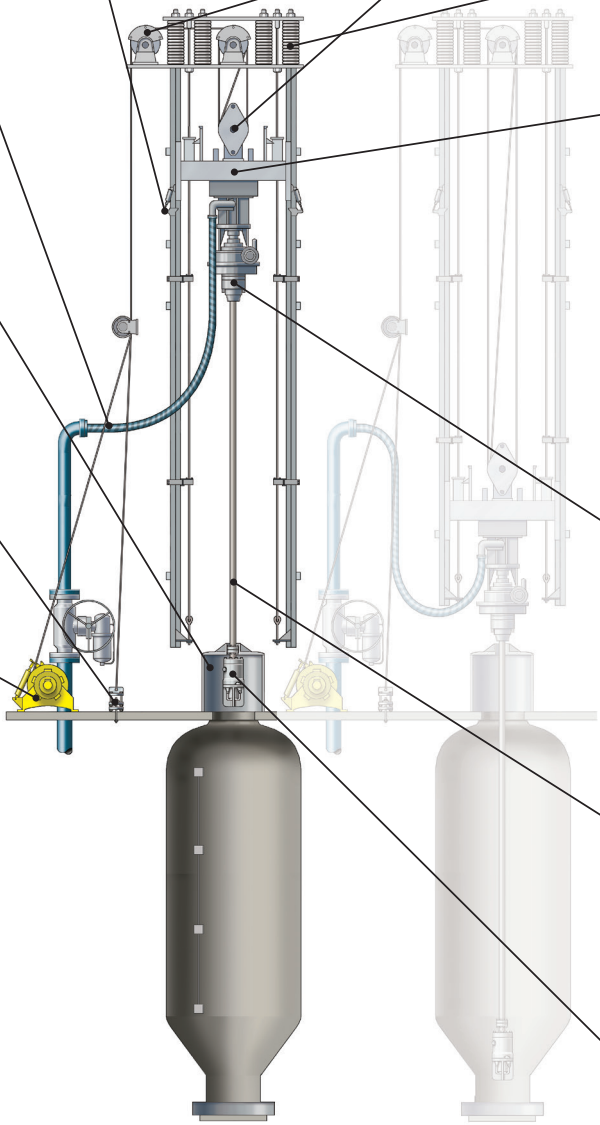
**Operator Console**



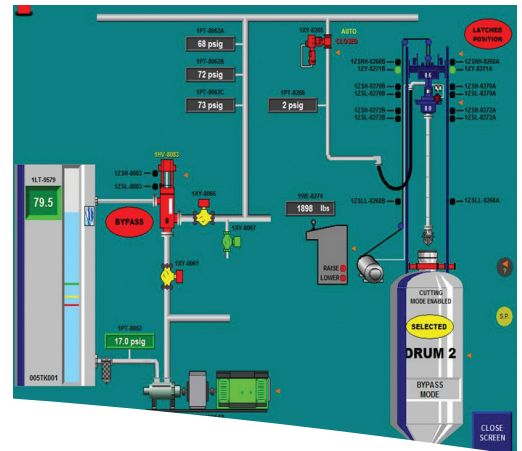
**Drill Stem Assembly**



**Cutting Tool**



## Removing Operating Personnel From the Cutting Deck



### Automated Decoking Systems

Advancements in remotely operated cutting tool design coupled with smart monitoring and control technology have made automated coke cutting achievable. Automation options range from pre-programmed cutting to full automation.

Fully automated systems feature cutting control with continuous feedback signals as to equipment and drum status. These systems include embedded intelligence to process signals for monitoring and control so operator interface is only required for sequence exceptions. Operator and plant safety are further enhanced by integrating an automated cutting system with PLC interlocks for fail-safe control of crucial equipment and operating parameters.

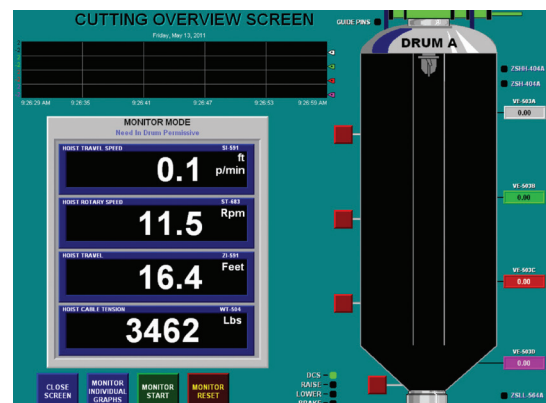
### Key System Elements

- AutoShift™ remotely shifted cutting tool with automated drum unheading equipment, self-aligning tool guide plates and hydraulically powered winches and rotary joints
- Flowserve intelligent coke drum vibration monitoring and coke cutting control completely integrated with the decoking control system
  - Coker drum display indicates:
    - Drum cleanliness
    - Cutting tool position
    - Control valve position
    - Diagnostic information
  - Coke cutting display indicates:
    - Crosshead latch/unlatch
    - Rotary joint and winch speed
    - Cutting pressure and dwell time
    - Wire rope tension
- Local “podium” control panel on the cutting deck for maintenance and emergency situations
- Video equipment enabling operator to view cutting deck and chute operations
- Acoustic devices to audibly monitor cutting deck and/or chute conditions

### Flowserve Intelligent Cutting Control

The Flowserve intelligent cutting control combines the reliability of the PLC-based controls with an intelligent algorithm that not only continuously monitors and records multiple process variables and equipment conditions, but also automatically makes adjustments to operating parameters to reliably control the equipment in the field. The goal is to optimize cutting time. In effect, this interactive system replaces the operator decision-making interface.

The intelligent control system is programmed to monitor the cleanliness of the drum to ensure a complete clean regardless of coke type through the process and provides a signal to the operator and DCS once the drum is ready to rehead. The system is flexible in the type of coke being produced by the DCU on any given crude slate and responds to mechanical issues within the system as well as the most common cutting problems, including slack cable coke bed collapses.



Critical process information is displayed in real time on the operator's control panel.

**Decoking  
Equipment,  
System Upgrades  
and Service**



*Flowserve engineers develop proposals that result in reduced operational costs, increased coker efficiency and improved system reliability.*

**Complete Upgrade Solutions for the Future**

Whether converting to heavier coker feed stock to reduce costs and increase production or revamping systems to address safety, environmental and maintenance needs, Flowserve works closely with refinery personnel to develop proposals for upgrading existing coking equipment. These proposals result in reduced operational costs, increased coker efficiency and improved system reliability.

Flowserve offers numerous safety and performance upgrades for vintage equipment of all types, including:

- Cutting tools
- Decoking valves
- Rotary joints
- Jet pumps
- Control systems

**Field Service and Technical Support**

Flowserve customer service technicians are on call 24 hours a day, seven days a week to respond to scheduled or unscheduled outages, construction, installation and start-up service needs. Technicians are specifically trained to evaluate and troubleshoot problems with decoking systems and equipment. Backed by Flowserve design and engineering groups, technicians have access to manufacturing drawings, bills of material and performance data so they can develop practical and reliable solutions to decoking problems.

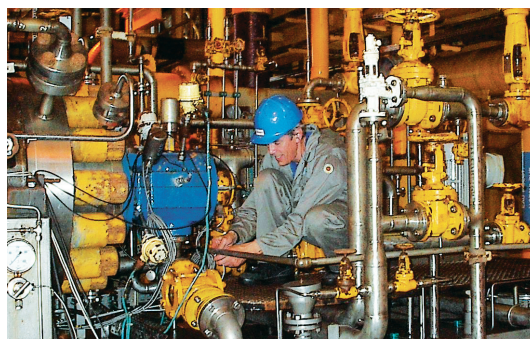
**Unequaled Product and System Support**

With the industry's most comprehensive portfolio of fluid motion and control products, including pumps, seals, valves and actuation, Flowserve is well positioned to attend to its decoking customers' product and support needs.

- Service
  - Start-up and commission
- Repair
  - Local repair center
  - On-site repair
- Technical support
  - Decoking specialists
  - Plant evaluations (walk-throughs)
  - Site-specific training
- Spare parts
- Auxiliary equipment
- Training
- Alliance agreements



In addition, Flowserve is an authorized repair center for the isolation, bleed and unheading valves.





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**PS-90-6k (E)** April 2018