



# Flowserve Decoking System



*Experience In Motion*



## 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 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
- Profitability
- Productivity
- System reliability

### Continuing to innovate: Remote and automated operations

Improving personnel safety has always been the number one goal of delayed coker unit (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 Slim combination cutting tool with AutoShift™, along with significant advancements in associated equipment design, 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.

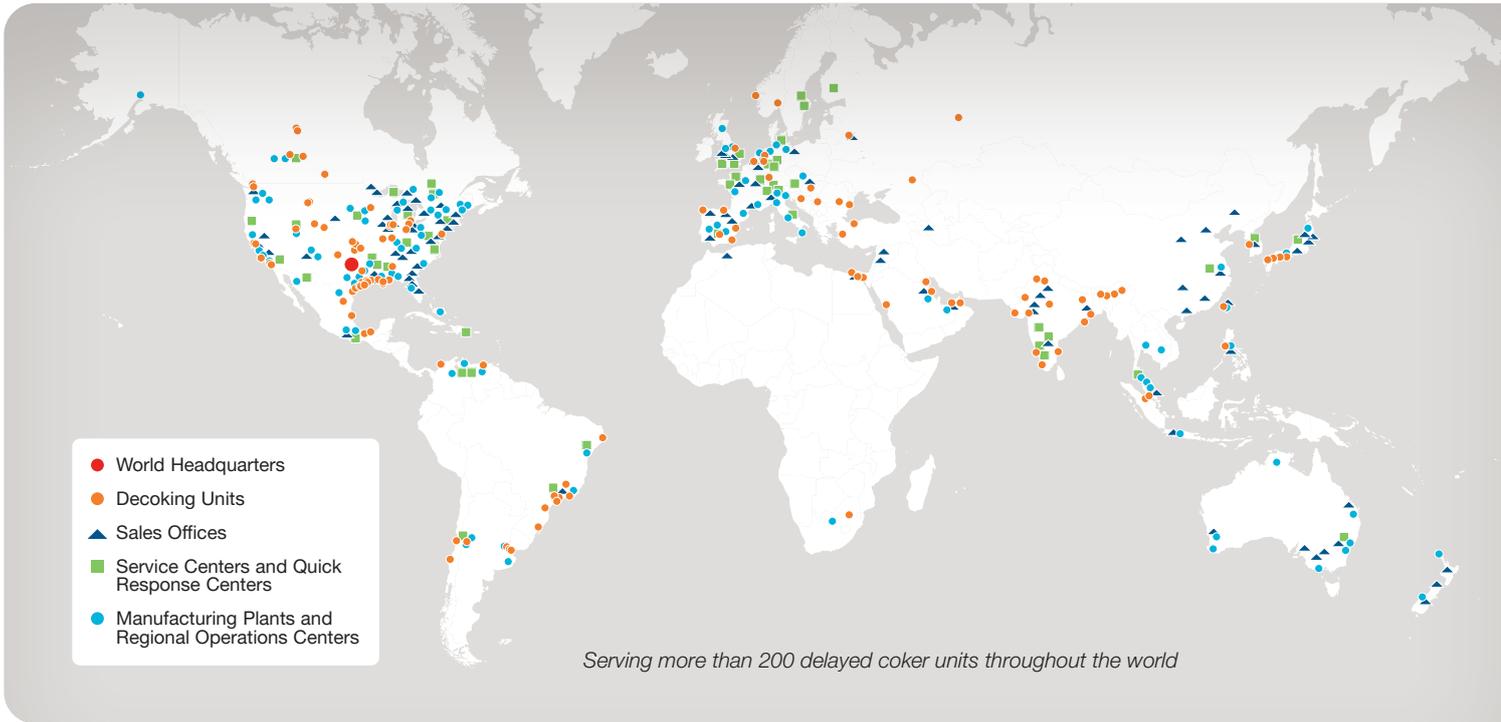
### Market-focused customer support

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 lifecycle. From inquiry to installation through start-up and expansion, Flowserve specialists work with customers to achieve their operational goals.

### 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.

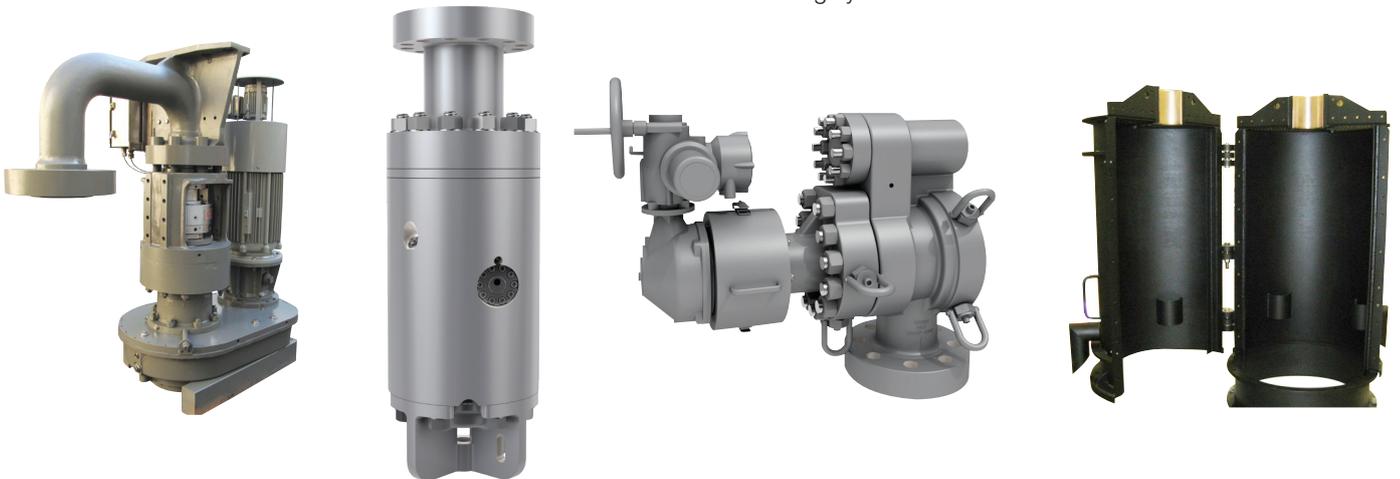
Since then, Flowserve has pioneered many significant advancements in decoking. Integrated systems consisting of decoking equipment, jet pump trains and control systems are matched to achieve the guaranteed decoking performance. Flowserve has transformed decoking into an increasingly safe, efficient and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



## Leading the way in new equipment and system upgrades

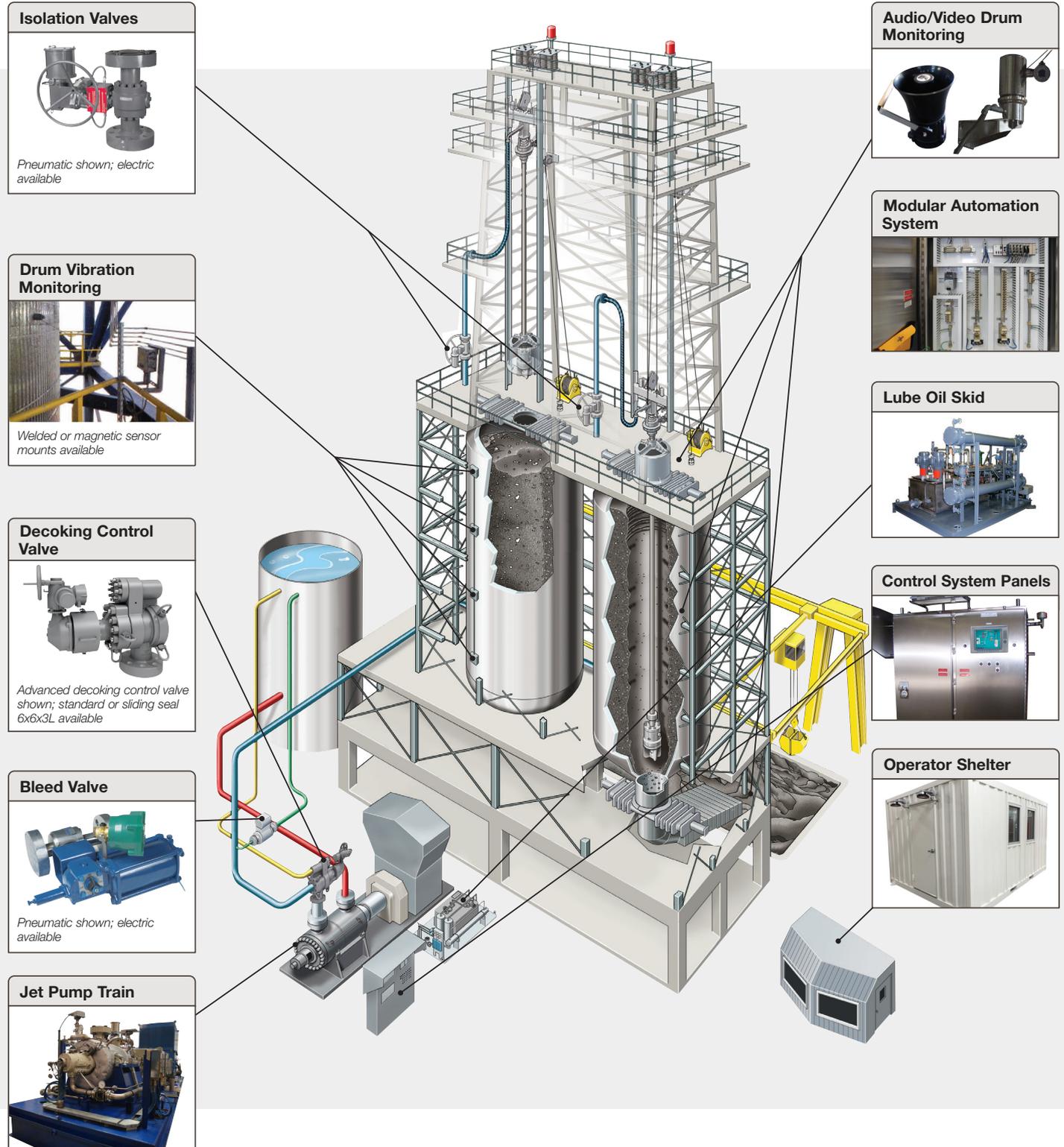
Whether new equipment or system upgrades, Flowserve continues to advance decoking technology. With its Combination cutting tool with AutoShift, the company revolutionized the way coke is removed from the coke drum. Capable of remotely changing its operating mode from bore to drill and back to bore, the AutoShift mechanism proved to be a significant advancement toward decoking automation along with the 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 200 delayed coker units around the world, Flowserve is the preferred supplier of hydraulic decoking systems.



# A complete decoking system

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



**Decocking 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**



Running-line tensiometer 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

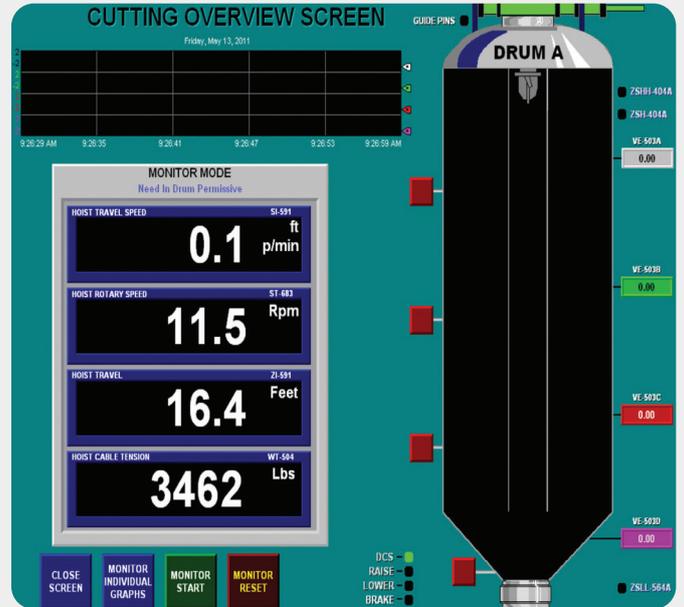
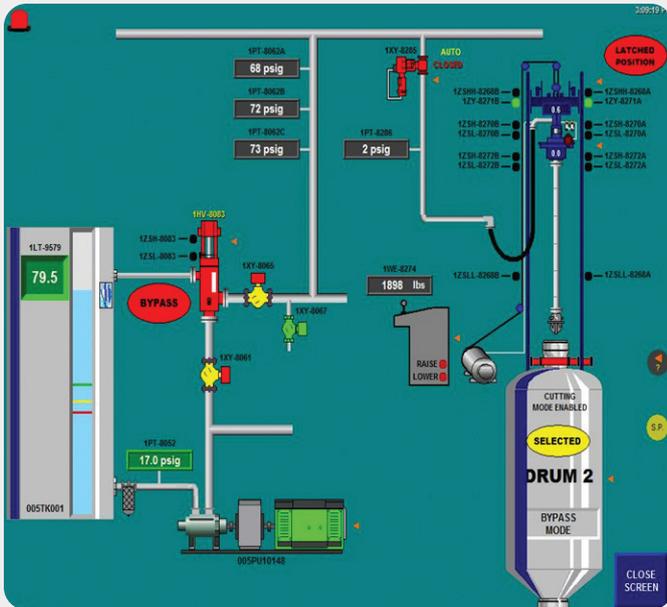
Advancements in remotely operated cutting tool design coupled with smart monitoring and control technology have made automated coke cutting achievable. Automation options range from pre-programmed cutting to full automation.

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

- Cutting tool remotely shifted through AutoShift mechanism technology, along with automated drum unheading equipment, tool enclosures, and electrically 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
- Capability to transform drum sensor data into audible signal to monitor cutting deck and/or chute condition





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

## Flowserve intelligent cutting control

Flowserve intelligent cutting control combines the reliability of 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 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 provide 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.



## Decoking system upgrades and services

### Complete upgrade solutions for the future

Whether converting to heavier coker feed stock to increase production or revamping systems to address safety, environmental and maintenance needs, Flowserve decoking specialists can help. They work closely with refinery personnel to identify equipment and system upgrades that maximize output and profitability while improving reliability and safety.

Flowserve offers numerous safety and performance upgrades — including all-new or significantly redesigned models — for vintage equipment of all types, regardless of OEM. These include:

- Cutting tool
- Jet pump
- Decoking control valve
- Control system
- Rotary joint

### Field services 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. And, with the support of Flowserve design and engineering groups, they can develop practical and reliable solutions to decoking problems.

### Unequaled product and system support

Boasting industry-leading technologies and specialists, Flowserve is well positioned to attend to its decoking customers' product and system support needs.

- Start-up and commissioning
- Local or on-site repair
- Plant evaluations (walk-throughs)
- Site-specific training
- Inventory optimization
- Turnaround planning
- Spare parts
- Auxiliary equipment
- Training
- Alliance agreements

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



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