



rotork[®]

Keeping the World Flowing
for Future Generations

Application Focus:
Delayed Coking

The Delayed Coking Process

Delayed cokers are used to process the heavy residuum oil (known as the “bottoms” because it is removed from the bottom of the vacuum distillation tower) into higher value transportation fuels. Continuous operation with minimal downtime is an important design consideration to ensure a safe, efficient and profitable process.

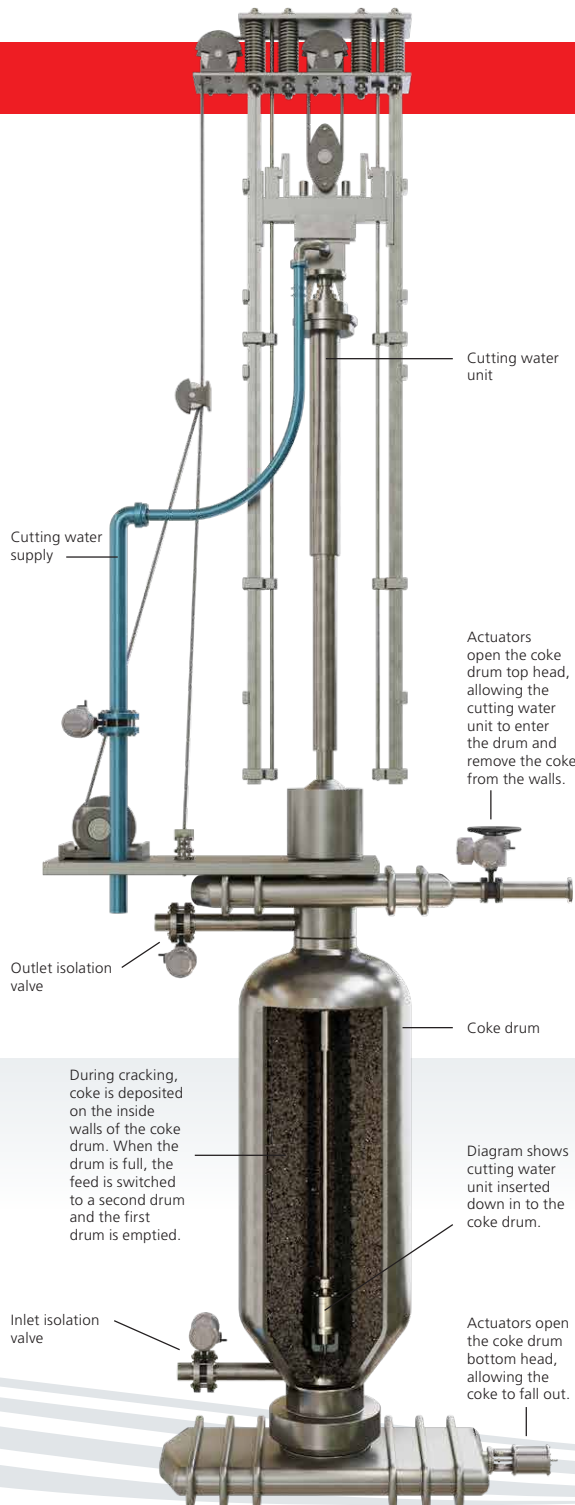
The residue feed is introduced into the fractionator after being heated in the heat exchangers along with the coker gas oil products. The low-value bottoms from the fractionator (including the heavy ends of the vacuum residue feed with recycled heavy coker gas oil) are mixed with steam and sent to the tubular heater in the furnace to be heated to approximately 475 °C at a pressure of 10-30 psi. Steam is added to prevent coking in the heater tubes. The heated feed is introduced from the bottom of one of the coke drums.

The coking takes place in one of the insulated coke drums at a time and continues until the drum fills up taking approximately 16–18 hours. After the first drum is full of the solidified coke, the hot mixture from the furnace is

switched to the second drum. While the second drum is filling, the filled first drum is steamed out to reduce the hydrocarbon content of the petroleum coke, and then quenched with water to cool it. The top and bottom heads of the full coke drum are removed, and the solid petroleum coke is then cut from the coke drum with a high pressure water (135 bar) nozzle, where it falls into a pit, pad, or sluiceway for reclamation to storage.

The coking cycle is controlled so that the vacuum residue is continuously fed to the unit 24 hours a day and the fluid products are recovered continuously, while coke is removed periodically. The hot products from the coker drums are fed back into the fractionator where the lighter gases are separated into naphtha, light gas oil and heavy gas oil.

In this document we identify the two main challenges where modern, reliable flow control equipment provides solutions for delayed coking plant managers.



Rotork produce flow control solutions for reliable delayed coking operations

Products designed with safety, integrity and industry leading lifespans

Vibration resistant, explosionproof and suitable for use in high temperatures

Rotork reliability reduces maintenance, improves efficiency and increases productivity

Safety Isolation

Challenge

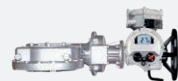
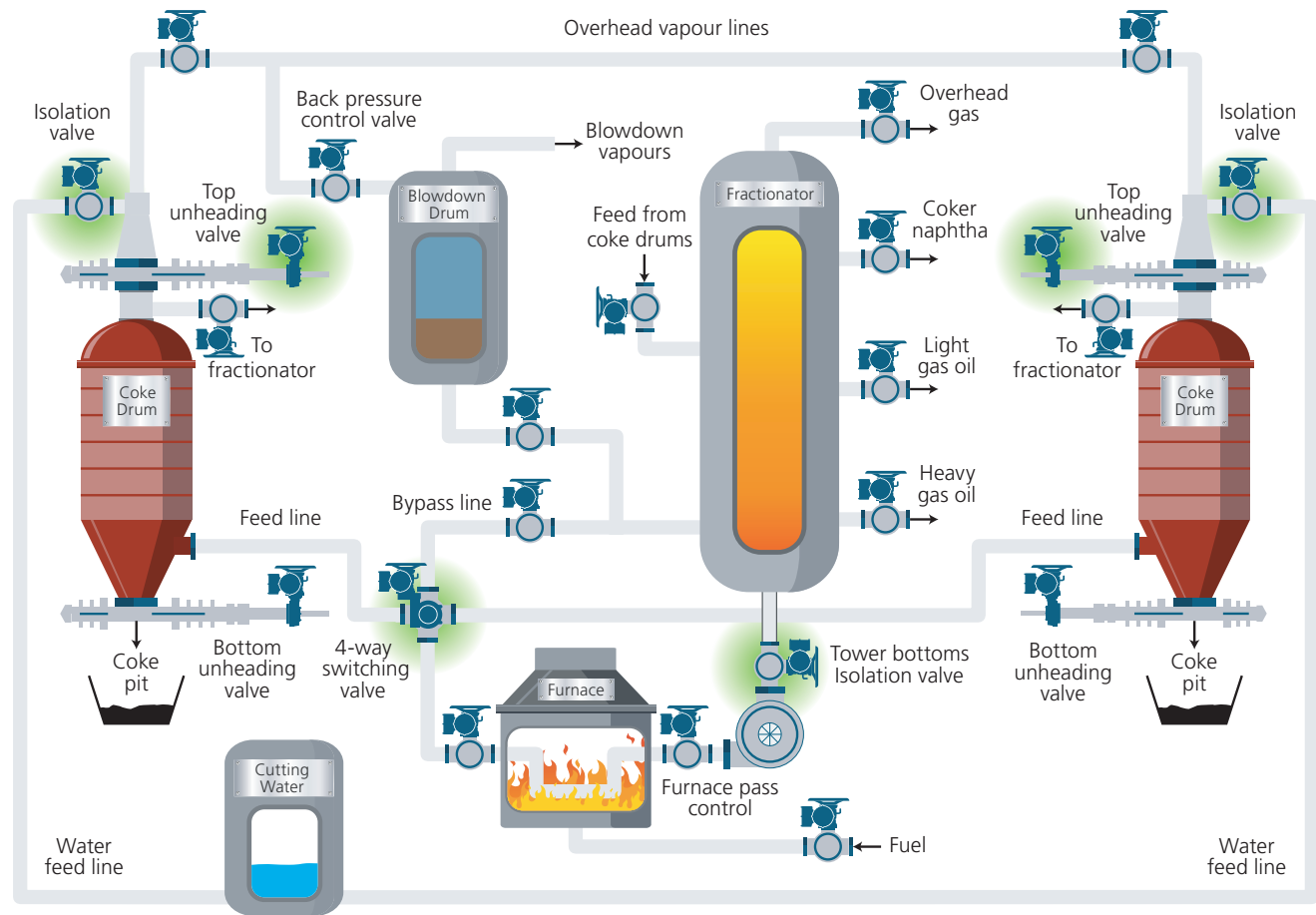
Safety is one of the biggest challenges in delayed coker applications because of the high pressure and temperatures required. During the switching procedure, it is imperative that the closing and opening of the isolation valves is carried out in a reliable and accurate manner.

Solution

To mitigate any potential issues, the actuators controlling the valve's position must have reliable feedback and the essential ability to operate when required. They must remain interlocked into position when performing isolation duties. Confidence in this switching/isolation procedure allows operators to perform the hydraulic de-coking operation with maximum safety and efficiency. Actuators that are compatible with safety systems such as Safety Integrity Systems (SIS – IEC61508) are suitable for this type of operation.

Rotork IQ electric actuators with IW gearboxes are suited for Emergency Shutdown (ESD) applications. They provide ESD function with partial stroke capability to ensure operability. The intelligent IQ actuator has advanced diagnostics and is SIL certified for increased safety.

Rotork produce various electric and pneumatic actuators suitable for the service conditions and process demands found in a delayed coking system. Flow control solutions for isolation valves are dependant on plant specifications.



IQ actuator with IW gearbox



IQT actuator



IQ actuator with IB gearbox



CP actuator



LH actuator

Reliability and Performance Monitoring

Challenge

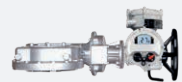
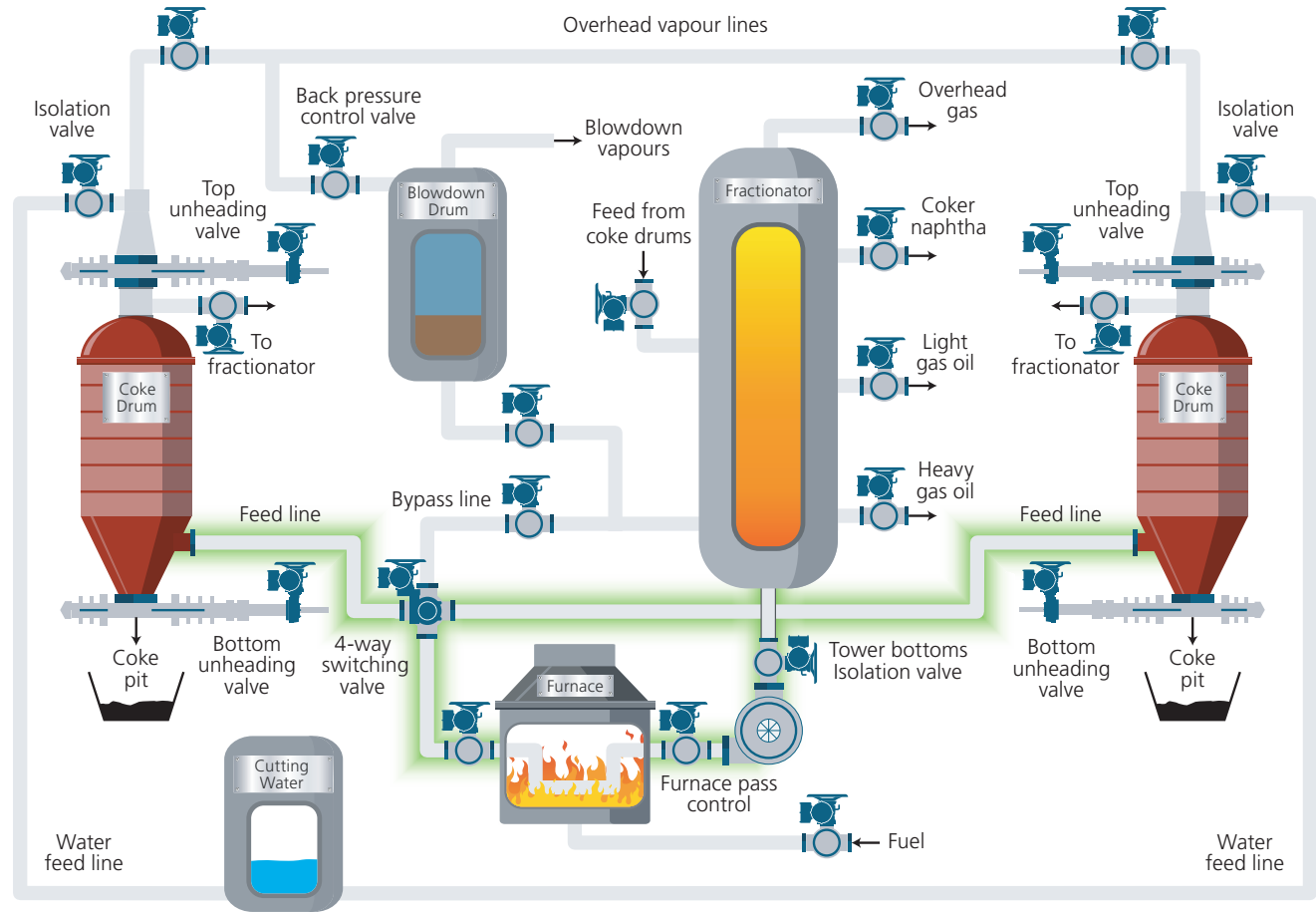
Ensuring that the process runs 24 hours a day without unplanned downtime. The ability to monitor valve performance is key. The nature of the delayed coker process relies on a constant feed to the coker drums from the fractionator and that after switching, the coke can be removed ready for the next batch.

Solution

Reliability and a way to monitor valve performance is key to ensuring reliability. Data loggers can provide precise operational and diagnostic data to ensure reliability and prevent unplanned shut down.

Rotork IQ electric actuators with inbuilt data loggers continually monitor valve performance and torque requirements. The IQ can provide diagnostic data to ensure reliability and prevent unplanned shutdowns.

Our range of heavy-duty electric and pneumatic actuators is suitable for the service demands of a delayed coking plant. Specifying flow control solutions for precision, coordinated valve operation and control system integration is dependant on plant specifications.



IQ actuator with IW gearbox



IQT actuator



IQ actuator with IB gearbox

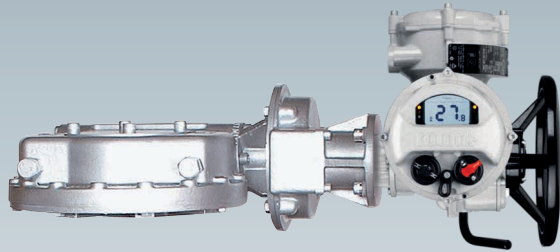


CP actuator



LH actuator

IQ Range Multi-Turn and Part-Turn Electric Actuators Combined with IW Gearbox



Four way diverter, isolation and tower safety

Reliability and Performance

- High speed and accurate operation (IQH)
- Robust and reliable isolation duty
- Datalogger monitoring of valve performance, preventing unwanted shutdowns
- Interlocking capability to prevent unwanted operation
- SIL capability to EN61508
- Can be configured for different types of valves

IQ Range Multi-Turn and Part-Turn Electric Actuators Combined with IB Gearbox

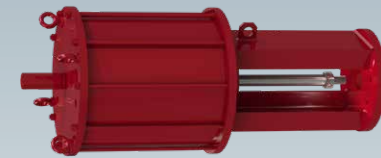


Top and bottom unheading

Reliability and Performance

- High speed and accurate operation (IQH)
- Robust and reliable isolation duty
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- Interlocking capability to prevent unwanted operation
- SIL capability to EN61508
- Can be configured for different types of valves

LH Range Linear Actuators



Top and bottom unheading

Safety and ESD Shutdown Capabilities

- Provide fail-safe actuation for emergency shut down (ESD) applications
- Fast shut-down response protects your investments
- Designed to meet today's control and safety needs
- Designed for operation in high temperature environments and arduous conditions
- Double-sealing design reduces affects of humidity, improves reliability and reduces downtime

IQT Range Intelligent Part-Turn Electric Actuators



Overhead vapour back pressure control

Reliability and Performance

- Robust and reliable isolation duty
- Datalogger monitoring of valve performance, preventing unwanted shutdowns
- Interlocking capability to prevent unwanted operation
- SIL capability to EN61508
- Can be configured for different types of valves

CP Range Scotch Yoke Pneumatic Actuators



Overhead vapour isolation

Compact and Robust

- Reliable double-acting and spring-return operation, fail close/fail open
- Compact size with high torque output
- Fast and easy on-site assembly
- High quality manufacturing
- We can provide package solutions to save you time and reduce maintenance by combining actuator, limit switch, solenoid valve and filter regulators

Service and Aftermarket Solutions



All plant operations

Lifetime Management

A complete solution to the risks associated with the life cycle of your equipment

Intelligent Asset Management

Advanced analytics to improve reliability and availability of key assets

Spares

Comprehensive OEM spares available worldwide

Life Cycle Management

Controlled strategies for managing the risks of ageing equipment

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A full listing of our worldwide sales and service network is available on our website

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PUB000-255-00
Issue 05/21

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