

Innovative flow control technology supports Australia's programme for clean LNG

Rotork flow control products have been selected for applications throughout the giant Queensland coal seam gas-to-LNG (Liquefied Natural Gas) projects in Australia. To date, Rotork's international sales network has received orders for more than 5000 valve actuators, embracing electric, electro-hydraulic, pneumatic and gas-over-oil technologies.

The three projects – Queensland Curtis LNG, Santos GLNG and Australia Pacific LNG - are developing coal seam gas in Queensland's Surat and Bowen Basins. Hundreds of kilometres of pipelines will link the natural gas production wells on the Queensland mainland with a world-class LNG production plant under construction on Curtis Island, which will initially produce more than twenty seven million tonnes of LNG for export each year. These coal seam gas projects are centred on a clean and efficient energy source with half the carbon dioxide emissions of coal.

By Mark S. Clark

For the upstream mainland wellheads, HART enabled Rotork CVA modulating electric actuators have been ordered for process valve control at an eventual total of 2000 widely distributed sites. In addition to the natural gas, CVA actuators will also control the flow on the extraction process for coal seam water. This resource will be treated for use by agricultural and industrial customers as well as supplementing domestic water supplies. Among other advantages, innovative CVA electric actuation removes the expense of installing and maintaining instrument air supplies at these remote sites, where the pressure of the gas itself is too low to provide a viable source for actuator operation. CVAs are also preferred because electric actuation eliminates the release of any environmentally harmful gas into the atmosphere during valve operations. Nearly 1000 Rotork Skilmatic SI and EH range electro-hydraulic actuators have

been ordered for control valves, shutdown valves, wellhead skids and metering skids. These self-contained actuators combine the simplicity and convenience of electrical operation with the modulating precision of hydraulic actuation and the reliability of mechanical failsafe motion. Designed to SIL3 standards for use in safety critical applications, Skilmatic actuators

are also programmable for partial stroke testing, enabling valves to be tested without interrupting routine processes. The orders for Rotork electric actuators are completed with IQ actuators for various isolating valve automation duties. All the Rotork electric actuator ranges feature advanced and user-friendly non-intrusive programming and commissioning



Fig 1: Installation in progress on a typical wellhead and separator skid on the Queensland mainland.



Fig 2: Rotork CVA and Skilmatic actuators installed on a typical Queensland Gas wellhead skid. On the left, a CVA actuator, model CVQ1200, operates a 3 inch (DN80) ball valve to control the gas flow and pressure. Behind the CVA, a Skilmatic Model SI-Q51 electro-hydraulic actuator operates a 2 inch (DN50) safety shut-down ball valve on the water extraction line. The Skilmatic Model SI-Q60 on the right is controlling a 4 inch (DN100) safety shutdown ball valve on the gas line.

technologies, combined with integral data logging, diagnostics and asset management capabilities.

The balance of Rotork orders on this giant project involves fluid power actuators for the pipeline and the LNG plants on Curtis Island. The majority of these are CP and GP range pneumatic actuators operating butterfly valves on LNG production lines. The actuators are customised with control packages to meet specific operating duties, including SIL2 and SIL3 applications. The remainder are GO range gas-over-oil actuators, most of which are for the large mainline pipeline shutdown valves. GO actuators are designed to use the pressure of the pipeline gas as the motive power source. Integral control functions facilitate a wide range of duties, usually safety related and including line break, low pressure close, high differential inhibit and ESD.

Rotork's international sales network has made an important contribution to this success, with orders received at Rotork offices in Australia, China, Singapore, Italy and the USA. As well as providing a simplified contractual route for the different products, the Rotork global organisation has the ability to co-ordinate manufacture

at various production centres and secure on-time deliveries to customers across the world. In Australia, Rotork has moved to larger premises in order to fully support the Queensland projects.

Innovative valve actuation

Rotork CVA electric actuators deliver continuous, repeatable modulating control with a programmable fail to position option. Resolution, repeatability and hysteresis performance is quoted at less than 0.1% of full scale, offering suitability for the most demanding control valve applications. Earlier electric actuators used for process control application were generally unable to meet the dynamic positioning performance achieved by the CVA, which uses a patented dual position sensor to achieve an accuracy of $\pm 0.1\%$ without overshoot whilst operating at maximum speed. This compares more than favourably with pneumatic operation, whilst other design features offer additional advantages.

The CVA actuator is mechanically non-back driveable up to rated output and inherently stiffer than pneumatic counterparts, meaning that process forces fed back through the valve

do not disturb the operating point, ensuring repeatable process control. The advanced electronic control of the drive also means that the force required to change the valve position can be smoothly and instantaneously controlled, thereby eliminating overshoot and fundamentally improving the accuracy of valve positioning. The output torque or thrust of the actuator is measured and corresponds directly to the force required to operate the valve, rather than being masked by the operation of any spring return mechanism. Electric operation also eliminates the interdependence present within pneumatic systems. Internal super-capacitors contain enough stand-by energy to drive the valve to any programmable position upon power loss. The electronic controller enables this position to be remotely set to any point of valve travel, significantly improving the flexibility.

Being a high efficiency electric actuator, the CVA uses little energy when it moves, whilst the energy losses associated with pneumatic actuation, calculated to amount to up to half of the input energy, are also eliminated. Venting to the atmosphere clearly is no longer a consideration, whilst the low power requirement for CVA



Fig 3: Rotork IQ3 intelligent electric valve actuator with non-intrusive bi-directional hand held setting tool for setting up, commissioning, monitoring, adjustment and downloading of data logger records for diagnostics and asset management. Rotork IQ, CVA and Skilmatic electric actuator designs share versions of this technology.



Fig 4: Rotork GO actuators are built on a modular basis and incorporate integral control functions for a wide range of duties which are usually safety related.

actuation enables solar sourced renewable power supplies to be introduced.

Complementing the CVA's control valve capabilities, Rotork Skilmatic SI and EH range electro-hydraulic actuators - comprising integrated control module, hydraulic manifold and a power unit consisting of a motor, hydraulic pump and reservoir - have been specifically designed for use in critical fail safe applications.

For isolating and regulating valve duties the features of Rotork IQ actuator technologies are widely recognised. The use of solid-state electronics as an alternative to switch mechanisms and counter limiting devices, combined with programmable micro-processor based control and instrumentation functionality, offer many benefits.

All three of these Rotork electric actuator ranges utilise non-intrusive Bluetooth® wireless technology for swift and user-friendly setting up, commissioning, monitoring and adjustment. Integral electronic control packages monitor a wide range of parameters which can be accessed to provide extensive diagnostics to facilitate

maintenance and long term asset management using dedicated Rotork software.

A hand held setting tool with a secure, bi-directional link is used to perform all switch setting and commissioning functions. The same instrument is used to download operating information from the actuator's data logger. The inclusion of a data logger enables an event-by-event history of valve activity to be generated, including torque profiles produced during each opening and closing. These can be compared with the valve torque signature profile logged during the commissioning process to identify the

trend of valve operating wear or isolate tight spots and other problems. Analysis of this data improves asset management through fault diagnostics and preventative maintenance.

Rotork GO range gas-over-oil actuators incorporate integral control functions designed for a wide range of duties which are usually safety related. Standard gas control systems are complemented with optional equipment for a wide range of functions whilst the multi-function manifold has the facility for a high-flow hand pump, pressure relief and a locking handle for safe commissioning.

The gas is delivered to oil tanks that convert the gas into hydraulic pressure and this pressurised hydraulic oil is used to drive Rotork scotch-yoke quarter-turn or linear valve actuators. Using pressurised oil as the driving force provides powerful and smooth actuator control and isolates the cylinder from the pipeline gas. This prevents contaminants from entering the hydraulic cylinder, eliminating corrosion and seal deterioration and extending actuator life.

Rotork GO actuators are IP66M/67M third party certified and approved for environmental protection, together with CE and ATEX hazardous area certification. The standard working operating pressure range is 10 to 105 barg, enabling a quarter-turn operating torque of up to 600,000 Nm and linear thrust of 5,000,000 N to suit pipeline valves of virtually all sizes and description.

About the author

Mr. Mark S. Clark is a PR and marketing consultant who has been working in the valve and actuation industries since the 1970s. During this time he has been closely involved with a number of leading international company names involved with isolating and control valves, valve actuators, filter systems, flow metering and instrumentation. He is a regular contributor to Valve World and other professional journals.

