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FLOW CONTROL NEWS FROM ROTORK



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Access problem solved with RHS

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Keeping the World Flowing

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Welcome to Rotalk 44, the latest edition of flow control news from Rotork. As 2018 marks the beginning of the next decade of Rotork history, it also heralds a continuing focus on product and service excellence, bringing the Rotork Advantage to existing and new market areas.

Established throughout 60 years of flow control experience, the Rotork Advantage is a unique combination of engineering expertise and innovation. Drawing on and often creating the latest advances in flow control technologies, it enables the worldwide Rotork sales and service network to deliver reliable, safe and cost-effective solutions in any fluids handling environment. The following pages illustrate some examples of the Rotork Advantage in action around the world. I hope that you enjoy reading about them.



Tim Bessex
Group Sales & Marketing Director

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VALVE EFFICIENCY UPGRADES AT IRELAND'S CLEANEST POWER STATION

SSE plc's Great Island Power Station in Co. Wexford is a 464 MW combined cycle gas turbine (CCGT) plant which was first commissioned in 2014.

Acknowledged as one of Ireland's cleanest and most efficient natural gas power stations on the country's national grid, the plant generates enough energy to power the equivalent of half-a-million homes.

In 2016 the operators identified enhancements that could be made in the heat recovery steam generator (HRSG) plant to improve efficiency and long-term asset management. The improvements involved introducing Master/Martyr valve sets on the high, intermediate and low pressure turbine drain valves.

WHAT ARE MASTER/MARTYR VALVES?

Master/Martyr valves are two valves installed in series on the same pipeline. The Master valve sits upstream of the Martyr valve and is only operated when the Martyr valve is shut. This ensures that the Master valve never has to cope with any differential pressure when operating, giving it a greatly extended lifespan. The Martyr valve always opens and closes under pressure and will therefore require maintenance at some point. When this happens, the closed Master valve enables maintenance to be performed easily and with minimum interruption to routine operations. The actuators controlling these valves are equipped with interlocks to ensure that the valves only operate in the correct sequence.



TURNKEY PROJECT

The upgrade, involving the replacement of existing valves, installation of new valves, installation and commissioning of a total of 30 new actuators and integration with the existing control system, was programmed to take place during a three-week outage period. Rotork Site Services was awarded the turnkey contract to carry out all the work within this challenging timescale. Rotork Site Services' responsibilities encompassed:

- System design, product selection and procurement.
- Design of control system and integration with existing Mitsubishi programmable logic controller (PLC).
- Installation of power, control and instrumentation cabling and cable containment.
- Commissioning and site training.
- Project management.

Plant upgrades were performed in 30 areas comprising six continuous blowdown valves, six intermediate blowdown valves and 18 turbine drain valves. Valve adaption was designed and fabricated for the installation of 30 Rotork IQ non-intrusive intelligent electric valve actuators. These were specified with local plug-and-socket assemblies to facilitate removal and replacement if overhauls are required in future outages.

WHY ROTORK SITE SERVICES?

Padraig Dunleavy, Great Island CCGT Station Manager, explained: "We have worked closely with Rotork UK and Rotork Site Services for many years, utilising them at many of our plants in the UK including Fiddlers Ferry, Ferrybridge and Keadby. We are fully aware of their capabilities for meeting strict deadlines on major plant upgrades such as the one proposed for Great Island.

"Rotork were very professional and gave us full confidence for the timely outcome of the project, from the initial site survey

through project management, installation and system integration. This confidence is reinforced by the long history of reliability demonstrated by the Rotork actuators installed on SSE sites."

Rotork's double-sealed and non-intrusive actuators are designed to withstand hazardous and environmentally challenging operating conditions often encountered in the power generation industry. Secure, non-intrusive set-up and data transfer eliminates the need to remove electrical covers for commissioning once the actuator is site wired. This feature permanently protects internal components from the time the new actuator leaves the factory, enhancing the long-term reliability of the robust double-sealed enclosure design.

In addition, IQ intelligent actuation technology incorporates powerful data logging abilities, enabling operating data to be downloaded and diagnosed for the optimisation of plant performance, preventative maintenance and asset management.



ROTORK'S TRAINED AND QUALIFIED ENGINEERS ENSURE THAT THE EQUIPMENT IS CORRECTLY SET UP AND OPERATING WITHIN SPECIFIED PARAMETERS.

SUCCESSFUL COMPLETION

The project was successfully completed on time and to the satisfaction of the SSE engineers. Rotork is also offering a comprehensive Client Support Programme (CSP) to support over 100 Rotork products on the site and further enhance the reliability and availability of the actuation assets. The final word from Ian Elliott, Rotork UK Site Services Sales Manager: "We always knew that this would be a tight programme, but we submitted our full technical proposal within a few days of our initial site survey, which gave SSE the confidence to award the contract as a full turnkey project. Our project and engineering teams worked to exacting timescales and liaised seamlessly with site engineers, suppliers and Rotork production departments to ensure that completion within the timescale was achieved. A very pleasing outcome for all parties."



BLOWDOWN VALVE INSTALLATIONS WITH OLD ACTUATORS AT SSE GREAT ISLAND PRIOR TO THE UPGRADE.

PROJECT



LARGE PROJECT ORDERS DEMONSTRATE ROTORK'S EXTENSIVE FLOW CONTROL ABILITIES

The Freeport LNG project in Texas is a major undertaking that is transforming an import terminal into a natural gas liquefaction and liquefied natural gas export facility that will be the largest in the USA.

Rotork has supplied several hundred pneumatic actuators on the project for valves in sizes up to 1,730 mm (68"). The largest of these required the direct mounting of GP350 spring-return actuators measuring 5.8 metres in length and weighing 9 tonnes. The pneumatic actuators were manufactured in Lucca and shipped to Houston, where the packaged control panels were designed and manufactured using Rotork branded products. These included Soldo switch boxes, YTC and Fairchild boosters and Midland-ACS filter regulators and pilot valves.

Most of the applications are in aggressive and challenging environments which demanded corrosion resistant, proven and reliable product solutions that could be configured to suit diverse requirements including fire-proofing.

Specifications included on-board control panels for failsafe operation, partial stroke testing and closed-loop feedback systems.

The successful fulfilment of these challenges with all-Rotork products has been an illustration of Rotork's comprehensive scope of supply and the synergy between different Rotork divisions, offices and manufacturing plants around the world.

The Freeport LNG project is a joint venture between CB & I (Chicago Bridge & Iron Company), Zachry Group and Chiyoda International Corporation. Construction of liquefaction trains 1, 2 and 3 is well under way with commercial operation of the first train expected in 2018.

CONTROL EQUIPMENT FROM ROTORK INSTRUMENTS IS FITTED AT ROTORK'S HOUSTON CENTRE OF EXCELLENCE.



THE ROTORK AND PMC TEAM LINE UP IN THE HYDROSTATIC TEST FACILITY AT ROTORK SINGAPORE.

INNOVATIVE PRODUCTS AND IN-HOUSE HYDROSTATIC TESTING SECURE NEW CONTRACTS FOR ROTORK SINGAPORE

The introduction of an in-house hydrostatic test facility at Rotork Singapore is making an important contribution to winning new contracts.



THE IN-HOUSE HYDROSTATIC TEST FACILITY AT ROTORK SINGAPORE WITH ONE OF THE ACTUATED VALVE PACKAGES PREPARED FOR TESTING.

One of the first orders is from Singapore-based marine, oil and gas consultancy Praj Marine (PMC) for a project in Africa.

Rotork's ability to provide third-party witnessed hydrostatic testing, combined with the supply of specialised failsafe actuation solutions on short lead times, have enabled PMC to secure new contracts for onshore wellhead and gas projects.

Specialised actuation is required because there is no power source available for valve control on the wellhead production flow line, water injection and disposal installations. Rotork's successful and innovative solution comprises GH and RH hydraulic spring-return actuators operated by self-contained manually operated hydraulic power packs.

A hydraulic hand pump on the compact self-contained power pack is used to energise the actuator and compress the failsafe spring, holding the valve in the desired open or closed position until a failsafe signal is received, at which point the spring will immediately drive the valve to the safe position.

Failsafe operation of the self-contained hydraulic units can be triggered by electrical signals, high or low pressure pilots or fire sensors, enabling the reliable fulfilment of many ESD (Emergency Shutdown) and pressure related protection duties in the oil, gas, petrochemical and pipeline industries.

The order included mounting the actuators on 75 mm (3") and 150 mm (6") Class 1500 flanged ball valves.

INNOVATIVE GEARBOX PROVIDES VITAL SUBSEA MAINTENANCE FUNCTIONS

Rotork Gears has designed and manufactured an innovative gearbox to provide a key function in subsea valve intervention systems used for diver-less applications in the offshore oil and gas industry.

The Linear Subsea Model 1 (LS1) gearbox is currently installed in a Choke Insert Running Tool (CIRT) that is used for the maintenance of retrievable choke valves in shallow and deep water subsea locations. In this most demanding application, a CIRT is lowered onto the top of the valve and attached to the choke valve insert, which is then lifted out of the valve and brought to the surface inside the CIRT. A second CIRT containing the replacement valve insert is then lowered onto the valve and the insert is lowered into the valve.

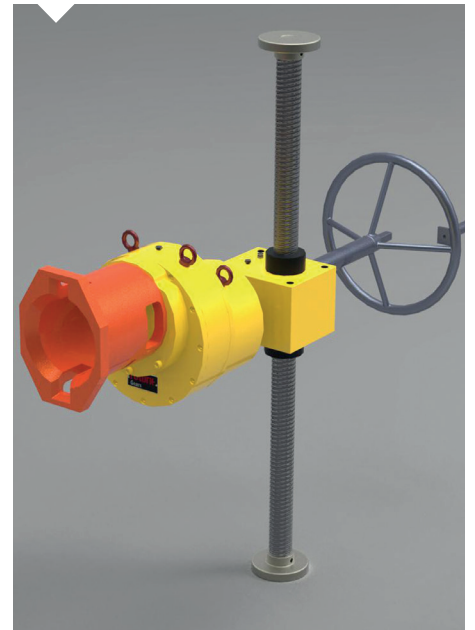
The key duty in this process is the lifting and lowering of the valve insert and this is the function performed by the LS1 gearbox. It is designed as

a linear screw jack system and can be operated either by a Remotely Operated Underwater Vehicle (ROV) or manually by a diver via a handwheel.

Reliability is vital for this function so the gearbox has been designed for subsea applications at any depth. With a pressure compensated design, it allows sea water to enter and avoid any pressure compensating problems.

In spite of its small dimensions, the LS1 gearbox has a maximum lifting capacity of five tonnes. The screw jack system can also be configured horizontally, providing increased flexibility to suit other subsea applications. The LS1 design allows an increase in the number of input turns when used with an ROV.

THE LS1 GEARBOX PROVIDES A KEY FUNCTION IN SUBSEA VALVE INTERVENTION SYSTEMS.



FAIRCHILD TRANSDUCER IMPROVES PERFORMANCE AND REDUCES COSTS

Fairchild, a Rotork Instruments brand, manufactures precision pneumatic and electro-pneumatic industrial control components. In a recent application, the introduction of Fairchild electro-pneumatic transducers has improved the performance of die casting machinery and reduced overall costs.

Suzhou Mingzhi Technology based in China manufactures low pressure die casting machinery that is designed to produce high quality, high volume metal components. The high quality of the components is dependent on accurate high flow, low pressure air pressure control, for which it was previously necessary to use four pressure transducers in each machine.

The switch to Fairchild has enabled a single Fairchild T9000 Series IP transducer to perform this duty with increased accuracy. Outlet air pressure is regulated in proportion to an analogue electrical input signal by a closed-loop integrated microprocessor control system. The highly accurate output pressure is maintained by an internal feedback sensor.

Designed for arduous and challenging industrial environments, Fairchild T9000 IP transducers are resistant to shock and vibration and can be installed in any orientation. Fairchild feed and bleed technology enables the T9000 Series to provide a complete range of

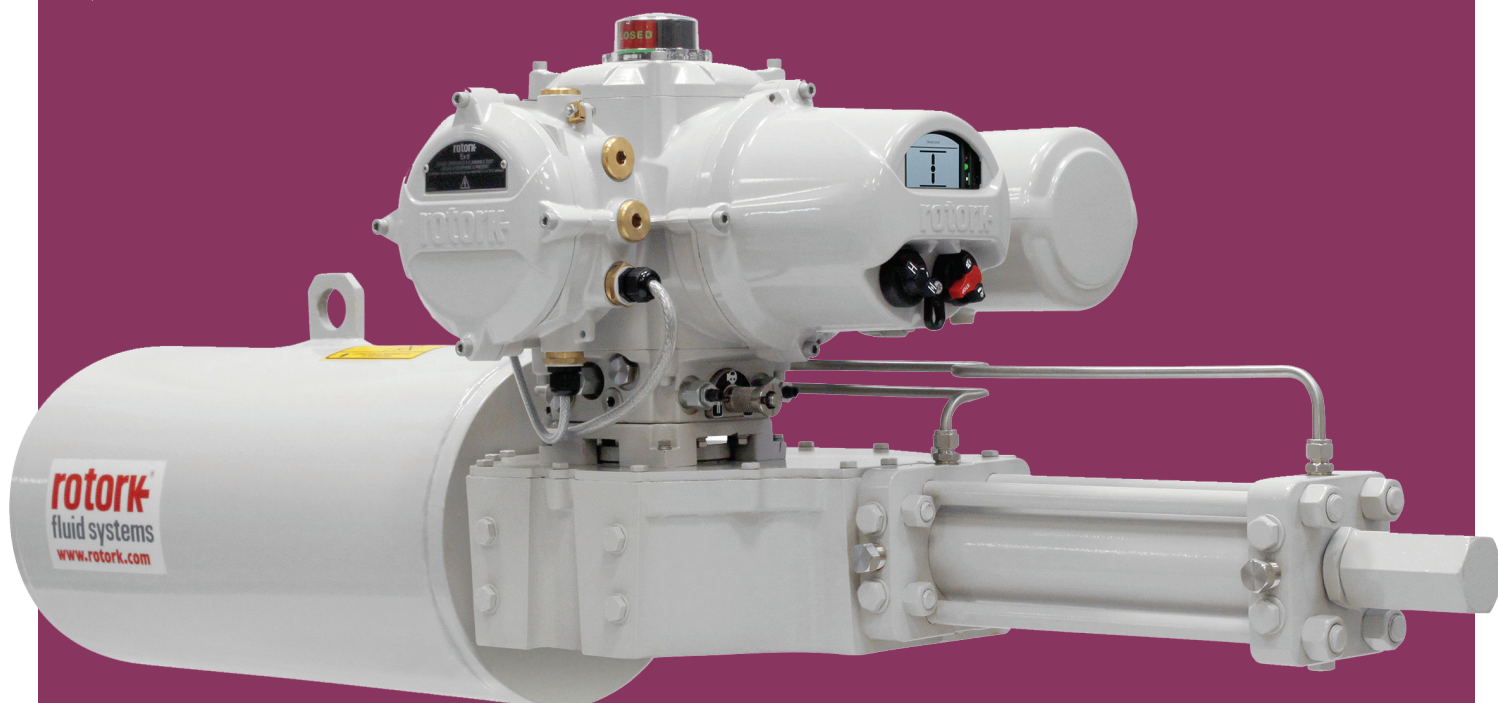


high performance transducers for many applications. In this case the high volume, low pressure performance has enabled a single unit to replace four units from another manufacturer, delivering cost savings as well as improved performance.

THE LATEST GENERATION ROTORK SKILMATIC SI3 ELECTRO-HYDRAULIC ACTUATORS HAVE BEEN SUPPLIED TO ONE OF INDIA'S LEADING STATE OWNED OIL COMPANIES FOR VITAL SAFETY-RELATED TANK FARM DUTIES.

ROTORK SKILMATIC SI3 ACTUATORS SPECIFIED FOR ROSOV VALVES IN TANK FARM EXPANSION

The latest generation of Rotork Skilmatic SI3 electro-hydraulic actuators have been supplied to one of India's leading state owned oil companies to operate 42" and 48" triple offset butterfly valves on vital safety-related tank farm duties.



The operator was constructing additional storage tank capacity and had to comply with the safety regulations laid down by the MB Lal Committee, requiring the installation of failsafe actuators for critical tank farm applications. These valves, known as Remote Operated Shut-off Valves (ROSOV), now provide tank overflow protection at the majority of storage facilities owned by the Indian oil industry.

The local engineering company appointed as the consultant for design and engineering was initially unclear about the specification of actuators for ROSOV, and was opting to go with a pneumatic failsafe solution.

The Rotork Skilmatic SI range of self-contained electro-hydraulic actuators, combining the simplicity of electrical operation with the precision of hydraulic control and the reliability of mechanical spring-return, has been widely adopted for ROSOV applications around the world. Rotork therefore worked very closely with the consultant and the end user, providing Skilmatic tank farm application details and reference lists, organising technical presentations and live product demos.

This resulted in the decision to adopt the electro-hydraulic solution in the specification for the project. Reliability

and safety were key factors for the application together with a requirement for a self-contained, fully integrated actuator with intelligent non-intrusive features and a handheld setting tool.

The latest generation SI3 actuator supplied on this contract has an enhanced specification and increased torque output range of 65 Nm to 500,000 Nm. The SI3 also offers a wide range of operating speeds, additional ESD options with single or dual inputs, and communication capabilities to suit many diverse applications.



INTELLIGENT ACTUATORS SUPPORT THE NEW ASHGABAT INTERNATIONAL AIRPORT

The new Ashgabat International Airport in Turkmenistan has been built in response to the rapidly growing demands of domestic and international passenger traffic.

The ultra-modern airport is supported by fuel supply facilities including a tank farm of 43 storage tanks with individual capacities up to 3,000 m³. Vital flow control throughout the tank farm is provided by Rotork IQ3 intelligent valve actuation technology, with a total of 120 electric IQ multi-turn and IQT part-turn actuators operating ball, butterfly and gate valves in the plant. All the actuators are ATEX certified explosion-proof to ExdIIBT4 and fitted with Profibus DP network interface cards.

Meeting important asset management requirements, the Rotork Profibus DP card provides comprehensive control and feedback data about the valve and actuator using DP-V0 cyclic communications. Extended actuator diagnostics and configuration is also

included in the DP-V1 acyclic data supported by this module, whilst Electronic Device Description (EDD) and Device Type Manager (DTM) files give access to critical valve and actuator performance parameters.

The terminal building, the design of which is inspired by the national symbols of Turkmenistan, can host 14 million domestic and international passengers annually to IATA Class A service standards.

The contract for the entire project, including additional infrastructure, administrative and technical support facilities, a hospital and a civil aviation school, was awarded to the Turkish Contractor Polimeks.

VITAL TANK FARM FLOW CONTROL AT THE ASHGABAT INTERNATIONAL AIRPORT IS PROVIDED BY ROTORK IQ3 INTELLIGENT VALVE ACTUATION TECHNOLOGY.



PROFIBUS ENABLED ACTUATORS SELECTED FOR BRAZILIAN WATER TREATMENT PLANT UPGRADE

The upgrade at the Rio Manso WTP at Brumadinho in the south east of Brazil involved building an additional filter plant, the replacement of obsolete actuators on existing plant and the introduction of a Profibus digital control network.



136

**MULTI-TURN NON-INTRUSIVE INTELLIGENT ELECTRIC ACTUATORS
INSTALLED IN THE LOWER LEVEL FILTER PLANT AREA.**

Profibus DP enabled Rotork IQ multi-turn non-intrusive intelligent electric valve actuators were installed during the upgrade and expansion of the water treatment plant. The majority of the 136 IQ electric actuators were installed to control the inlet, outlet and backwashing functions on the new and existing filters. The remainder

of the actuators are installed on the sludge collectors, sludge thickeners and secondary collectors from which the raw water is extracted for treatment.

The upgrade is the first P3 (Public Private Partnership) project to be performed by COPASA, a Brazilian company specialising in the design and implementation of

solutions for water supply, sewage and solid waste management. Rotork's Brazil office worked closely with COPASA, main contractor Odebrecht and valvemakers in Brazil and overseas during negotiations and technical discussions, which resulted in the Profibus DP enabled IQ being selected as the preferred actuator.

FILTER PLANT TURNS TO ROTORK

The City of Lafayette in Louisiana has selected Rotork IQ intelligent non-intrusive electric valve actuators for a major upgrade at its South Plant water treatment works.

More than 50 IQ multi-turn and IQT part-turn actuators will be installed on butterfly valves in the plant's filter gallery, replacing obsolete actuators from two other manufacturers. Installation on the in-situ valves and commissioning will be carried out by Rotork Site Services.

The actuators will perform isolating and modulating flow control duties for filtration and backwashing routines, for which the modulating actuators

**MORE THAN 50 IQ
MULTI-TURN AND IQT
PART-TURN ACTUATORS
WILL BE INSTALLED.**

are equipped with PID (Proportional Integral Derivative) controllers.

The decision to use Rotork IQ actuators was based on the fact that the existing actuators had been destroyed due to submersion and water ingress. The IQ double-sealed design, combined with non-intrusive setting and commissioning, provides a higher level of environmental protection.



**THE IQ DOUBLE-SEALED
DESIGN PROVIDES A HIGHER
LEVEL OF ENVIRONMENTAL
PROTECTION.**

ACCESS PROBLEM SOLVED WITH RHS

Recent rehabilitation at the drinking Water Treatment Plant #2 in Olathe, Kansas, USA, has included the installation of Rotork IQ3 intelligent electric valve actuators to replace electric actuators from another manufacturer.



In the gravity filter plant, 18 butterfly valves are situated in an area beneath a walkway which made it difficult to access and operate the old actuators. With the new Rotork actuators, the installation of Remote Hand Stations (RHS) has now eliminated this problem.

Providing an exact duplicate of the actuator switches, display window and control interface, the RHS are mounted on the walkway to enable the user to conveniently

and safely operate, interrogate and configure the actuators below.

Power for each RHS is supplied by the actuator, with which the unit shares all the benefits of the same O-ring sealed IP68 double-sealed environmental enclosure. Standard comms wiring suitable for the operating environment is all that is required between the actuator and the RHS, which can be installed at a distance of up to 100 metres (328 ft) from the valve.

THE ROTORK RHS MOUNTED ON THE WALKWAY ENABLE THE USER TO CONVENIENTLY AND SAFELY OPERATE, INTERROGATE AND CONFIGURE THE IQ3 ACTUATORS.

100 METRES

REMOTE HAND STATIONS (RHS) CAN BE INSTALLED AT A DISTANCE OF UP TO 100 METRES (328 FT) FROM THE VALVE.

Unlike alternative options offering only basic operation and indication, the RHS retains all of the actuator's functionality, presenting an identical window into the process, showing diagnostic data including the valve torque and usage profiles.

Using the Rotork handheld setting tool with its secure wireless Bluetooth® link, this information can be downloaded and transferred to a PC for analysis using Rotork Insight 2 diagnostic software to fulfil asset management requirements.

FLEXIBLE, MODULAR
ACTUATORS AUTOMATE

89 GATE VALVES

CK ACTUATORS PROVIDE RELIABLE AND ECONOMICAL AUTOMATION

The Guangdong Panyu Sewage Treatment Plant in China has installed Rotork CK Range electric valve actuators to provide reliable and economical plant automation encompassing isolating and modulating valve control.



CK CENTRONIK ACTUATORS
PROVIDE INTELLIGENT
VALVE CONTROL WITH
DATA LOGGING FOR
DIAGNOSTICS AND
ASSET MANAGEMENT.

The flexible, modular CK actuator design has enabled the plant to use a combination of CK Standard and CK Centronik actuators to automate 89 gate valves and sluices to control the flow throughout the wastewater treatment process.

CK Centronik actuators provide intelligent valve control with data logging for diagnostics and asset management. Rapid and secure commissioning and configuration is performed using selector switches on the Centronik housing or via a Bluetooth® setting tool, following user-friendly menu driven screens displayed on the actuator indication window. In

normal operation the window displays the valve position, valve status and alarms.

Standard features that are common to all CK actuators include IP68 double-sealed environmental protection, plug and socket connections for fast and efficient commissioning and maintenance, motor-independent handwheel operation, mechanical valve position indication and independent torque and position sensing for increased valve protection. Actuator gearboxes are oil lubricated for extended life and separable thrust or non-thrust bases enable actuators to be removed without disturbing the valve position.

TANK FARM UPGRADE BENEFITS FROM WIRELESS FLOW CONTROL

A major automation upgrade at a large petroleum tank farm in Mexico has taken advantage of simplified installation, reduced costs and increased functionality offered by wireless flow control. The valve actuation upgrade at the tank farm was performed by Rotork's Mexican office.

Almost 300 Rotork IQ3 intelligent electric valve actuators installed in the plant are connected to 16 Pakscan Master Stations via wireless monitoring and control networks. Wireless Pakscan is a development of Rotork's well established wired Pakscan system, designed specifically for valve actuators and the spacious environments associated with oil, gas and petroleum installations. Wireless

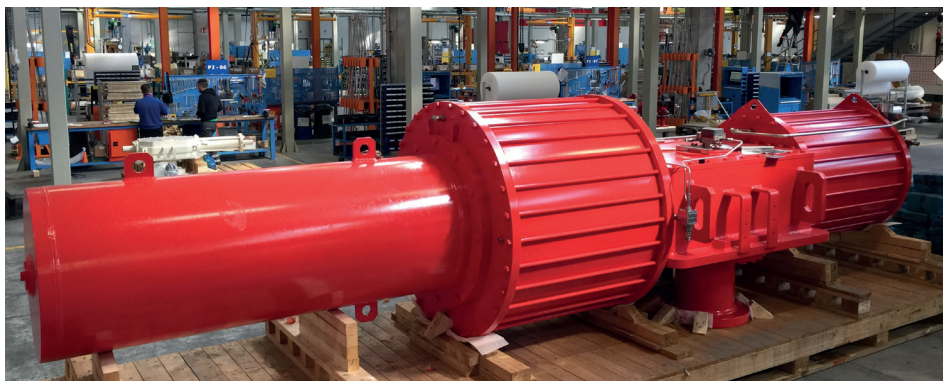
Pakscan eliminates virtually all the costs associated with the installation of network cabling, whilst enabling an increased level of information from the actuators to be communicated over the wireless network. The system also prevents potential automation and communication failures resulting from cabling problems.

Wireless Pakscan uses a secure and robust mesh network to control actuators throughout the plant and to gather important operating data for asset management and preventative maintenance. The three main components of the system are the wireless interface module fitted in the Pakscan Master Station, the wireless co-ordinator



module, which functions as the base station for each mesh network, and a wireless module installed in each actuator. The Master Station is connected to the plant's control system using an industry-standard Modbus protocol.

The Pakscan wireless network card gives the user access to all the standard control and monitoring features and data available from the wired Pakscan system, together with the diagnostic and asset management information stored as standard by Rotork IQ actuator datalogger and configuration files. Regular analysis of this information can make a valuable contribution to optimising plant efficiency and preventing unplanned interruptions.



OIL FIELD CONTRACT GENERATES INNOVATIVE SOLUTION

Rotork has received an order for 220 pneumatic actuators for the NASR Phase II Full Field Development Project in the UAE. The aim of the project is to increase the field's oil production capacity to 65,000 barrels per day (BPD) from the existing capacity of 22,000 BPD.

Awarded by Hyundai Heavy Industries, the order included spring-return pneumatic actuators to operate 30" and 36" Class 1500 ball valves, with the specification that the maximum actuator output torque

at a design pressure of 9.4 bar should not be in excess of 90% of the valves' maximum allowable stem torque (MAST).

Due to the huge force required to compress the spring, this requirement is beyond the performance limits of the standard range of Rotork GP pneumatic actuators. However, faced with this challenge, the Rotork Research & Development department successfully created an innovative and simple solution.

220
PNEUMATIC ACTUATORS
ORDERED FOR THE PROJECT.

Rotork engineers added a second pneumatic cylinder, mounted between the GP scotch yoke centre body and the spring-return cylinder. Both cylinders are pressurised in the same direction at the same time, so one delivers torque for valve movement, satisfying the valve MAST requirement, whilst the other independently applies the torque to compress the spring.

The resulting actuator is the largest GP350 actuator built to-date, with a total length of 8.5 metres and weighing 19 tonnes.



MULTIPLE ORDERS AT GRASSROOTS MIDDLE EAST REFINERY

Rotork fluid power valve actuators have been ordered for multiple applications at a new grassroots refinery under construction in the Middle East.



OVER 200

ROTORK GP AND CP PNEUMATIC ACTUATORS ARE BEING SUPPLIED.

ORDERS FOR ROTORK ACTUATORS INCLUDE 70 LP RANGE LINEAR PNEUMATIC ACTUATORS FOR THE OPERATION OF LARGE GATE VALVES.

With a capacity of up to 400,000 barrels a day, the refinery will process crude oils to manufacture petrol, ultra-low-sulphur diesel and fuel oil for export and to satisfy local demand.

One significant order involves the supply of 70 LP range linear pneumatic actuators for the operation of large gate valves. The order for these actuators includes the assembly and factory testing of local control panels with digital valve positioners.

Rotork LP actuators are individually sized for each application in double-acting or spring-return configurations. Carbon steel cylinders are electro-less nickel plated to provide minimum friction and maximum protection against corrosion. Careful attention to seal materials on pistons and piston rods further reduces friction and avoids stick-slip effect even after

prolonged periods without operation.

In other areas of the site, over 200 Rotork GP and CP range pneumatic actuators are being supplied for the operation of butterfly valves in desalination and wastewater treatment plants. These scotch yoke actuators are designed to provide part-turn movement for isolating or modulating duties. A rugged, compact and efficient modular design is common to both ranges, yielding high torques even at low pressures. The design concepts of the large GP actuators are applied to the CP range, bringing heavy-duty actuator qualities to small, quarter-turn actuators.

These orders also include the assembly and testing of local control panels, in this case including Bifold pneumatic instrumentation and Soldo switch boxes, both Rotork brands.

REFINERY ORDERS INCLUDE SIL CERTIFIED ELECTRIC ACTUATORS

Now under construction, Iraq's State Company of Oil Projects' (SCOP) Karbala Refinery will use state-of-the-art refining processes and automated control to maximise production of liquefied gas, petrol, gas oil, fuel oil, jet fuel and asphalt.



OPENING IN 2020

When it opens in 2020, the facility will have a refining capacity of 140,000 barrels of crude oil per day (bpd). Production will meet the latest international standards, serving the growing domestic demand for oil in Iraq and reducing the current level of refined product imports.

Rotork orders for the Karbala Refinery include large quantities of IQ3 non-intrusive intelligent electric valve actuators, designed specifically for automated flow control systems in hazardous environments. With their diagnostic and asset management abilities, the IQ3 actuators will facilitate the reliable, efficient and safe operation of the refinery. Comprehensive

operational data including valve torque profiles stored in actuator dataloggers can be downloaded and analysed to enable predictive maintenance and optimise plant performance.

For critical areas, actuator duties will include the provision of a Safety Integrity Level 2 (SIL2) Emergency Shutdown (ESD) function. Recognised around the world, the SIL system identifies the requirements for a Safety Instrumented System (SIS). In the flow control industry, Rotork is at the forefront of this technology, with IQ3 actuators certified for use in a SIS up to SIL level 2 for a single actuator or SIL level 3 for two actuators in a redundant system.

**ROTORK IQ3 ACTUATORS
ARE CERTIFIED FOR USE IN
A SAFETY INSTRUMENTED
SYSTEM UP TO SIL LEVEL 2
FOR A SINGLE ACTUATOR
OR SIL LEVEL 3 FOR
TWO ACTUATORS IN A
REDUNDANT SYSTEM.**

CHALLENGING SUBSEA APPLICATION SOLVED WITH CUSTOMISED GEARBOX

Rotork Gears has successfully completed an order for customised heavy-duty gearboxes to operate 450 mm (18") Class 600 subsea ball valves at a depth of 130 to 150 m (460 to 490 ft) in the Zawtika oil and gas field in the Bay of Bengal.

The Rotork WGS range of quarter-turn gearboxes are designed for heavy-duty subsea applications and constructed with carefully chosen materials to offer the highest level of reliability in very harsh environments.

The customer specified that the model WGS550 gearboxes should be built with a special vertical input structure with a total height of 750 mm, capable of sustaining 3,000 Nm of bending moment force and a vertical axial load of 3,000 N.

The design has been validated by Rotork Gears, using a Finite Element Model (FEM) software simulation that predicts how a model reacts to physical effects, followed by a Mechanical Advantage (MA) test on an in-house test rig to confirm the efficient performance of the design.

The gearboxes can operate the valve by using a Class 2 Remotely Operated Vehicle (ROV) or a removable handwheel used by a diver. To avoid damage to the valves the input torque is limited at 170 Nm. For

THE DESIGN HAS BEEN VALIDATED BY ROTORK GEARS USING A FINITE ELEMENT MODEL (FEM) SOFTWARE SIMULATION.

added security, special handwheels with calibrated Duplex stainless steel shear pins have been supplied and a highly visible operating data plate is attached next to the ROV bucket on each gearbox.

Completed valve and gearbox assemblies tests were performed in a hyperbaric chamber, simulating an external pressure of 27 bar (around 1.8 times the required pressure).



THE INNOVATIVE
CONFIGURATION PROVIDES
AN EXTREMELY COMPACT
AND RELIABLE ACTUATOR.

CUSTOMISED HYDRAULIC ACTUATORS FULFIL CRITICAL OFFSHORE SAFETY DUTIES

Rotork Fluid Systems' customised linear hydraulic spring-return valve actuators meet the critical safety-related specifications for an offshore gas field in the Middle East.

2.5 BILLION

THE PROJECT WILL
SUPPLY AN ADDITIONAL
2.5 BILLION STANDARD
CUBIC FEET PER DAY OF
CLEAN NATURAL GAS.

These actuators operate 220 mm (9") gate valves on skids requiring a High Integrity Pressure Protection System (HIPPS) certification manufactured for the Hasbah Offshore Facilities Increment II Project in the Arabian Gulf. Reliable failsafe operation of these HIPPS valves is essential to prevent potential damage by shutting off the source of high pressure before the design pressure of the process is exceeded.



The innovative configuration of hydraulic cylinders, quick exhaust valves, flow regulators and internally mounted discharge ports provides an extremely compact and reliable actuator solution with significant reductions in associated piping.

Standard design features include electro-nickel plated cylinder walls, providing minimum friction and maximum protection against corrosion, carbon steel

pistons with PTFE/rubber seals for reduced friction and stick-slip elimination even after prolonged periods of inactivity and totally enclosed carbon steel spring cartridges.

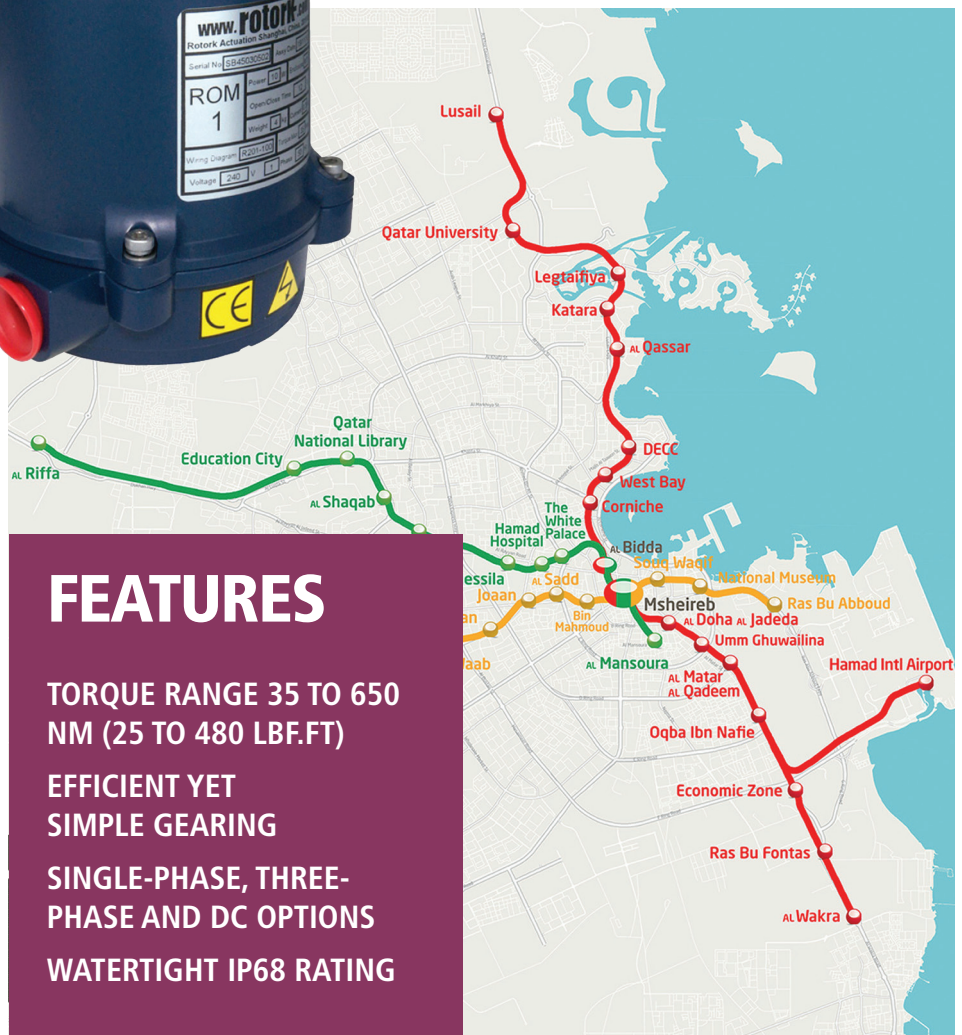
The Hasbah Offshore Facilities Increment II Project will supply an additional 2.5 billion standard cubic feet per day of clean natural gas to meet growing domestic energy demands in Saudi Arabia.

DOHA METRO VENTILATION CONTRACT

Rotork has won the contract to supply 2,500 ROM electric valve actuators for tunnel ventilation dampers on the new Doha Metro.

Rotork ROM actuators are robustly constructed to provide quiet and reliable operation for dampers and louvres, as well as all kinds of small ball and butterfly valves. Standard features of the compact design include an IP68 watertight enclosure, self-locking operation, local visual indication, manual override and suitability for a wide range of supply voltages.

Currently under construction, the Doha Metro is a rapid transit system in the capital city of Qatar that is scheduled to be operational by the end of 2019. It will have four lines running mainly underground with an approximate overall length of 300 km and 100 stations. Numerous dampers installed along the lines will provide important ventilation duties, including vital safety functions in the event of an underground fire.



FEATURES

TORQUE RANGE 35 TO 650
NM (25 TO 480 LBF.FT)

EFFICIENT YET
SIMPLE GEARING

SINGLE-PHASE, THREE-
PHASE AND DC OPTIONS

WATERTIGHT IP68 RATING

SUCCESSFUL FIRE TEST PERFORMANCE SECURES MAJOR ORDER

Following the successful completion of a severe fire test, more than 1,300 RC200 actuators have been ordered for tunnel ventilation damper control in the latest stage of the Thomson Mass Rapid Transit (MRT) line in Singapore.

The order from a local damper manufacturer is for RC200 high temperature pneumatic actuators for installation on the fully underground sixth section of the MRT line. In addition to ventilation, the dampers are designed to



ROTORK RC200
HIGH TEMPERATURE
PNEUMATIC ACTUATORS
OFFER A FAST OPERATING
CAPABILITY AND LONG
TERM RELIABILITY.

provide vital safety related duties in the event of a fire.

To verify compliance with the critical operating demands of the application, an RC200 actuator was subjected to stringent testing which involved heating to 250°C for two hours, followed immediately by a one cycle functional test. The test was witnessed by the customer, the contractor and the MRT end-user, the Land Transport Authority of Singapore. A separate test was carried out by a third-party organisation to

confirm the actuator's ability to perform one million cycles. The compact RC200 scotch yoke design performs in the high temperature environment without external fireproof coatings.

The actuators are fully supported by the Rotork Centre of Excellence in Singapore, where spare parts are stocked for maintenance purposes. A local stock of actuators is also available for potential future upgrades of dampers installed on previous phases of the MRT line.



IN BRIEF: ROTORK SITE SERVICES

At Rotork we understand the value of prompt and punctual customer site services. We aim to supply customers with superior flow control solutions by providing high quality, innovative products and superior service - on time, every time and everywhere.

Here is a brief summary of the services available from Rotork Site Services. Full details can be found at rotork.com.

FIELD SUPPORT

Rotork provides prompt customer field service response for all types and makes of actuator including those in hazardous environments such as nuclear and off-shore installations.

Our support can be planned in advance or in response to emergency situations.

- Site repairs and commissioning
- Upgrades
- Fault finding and maintenance
- Call-out with fully equipped service vehicles

PLANNED SHUTDOWN SUPPORT

Rotork provides actuator removal, service, repair, test, re-connection and re-commissioning on a wide range of electric, pneumatic and hydraulic actuators, including non-Rotork units.

Customers frequently use Rotork Site Services to remove, overhaul, reinstall and commission hundreds of actuators concurrently in our workshops during shutdown periods.

We can carry out upgrade projects simultaneously to ensure that customers make the most of their plant shutdown time and we excel at meeting tight shutdown schedules.

- Preventative maintenance
- On-site overhaul and testing
- OEM spares and support
- Project management and supervision

WORKSHOP OVERHAUL

Wherever our clients are in the world, Rotork is able to support them. We have workshops strategically

located with trained staff and full test and maintenance facilities. The overhaul, repair and upgrade activities carried out in our workshops are an integral part of the life-of-plant asset management support offered by Rotork Site Services.

On completion of work, every overhauled actuator is torque rig tested, and a test certificate is provided confirming that its performance is identical to the day that it was built.

We service and repair all major brands of actuators.

- Large OEM stock in all workshops
- Loan actuators available

VALVE AUTOMATION CENTRES

Rotork Valve Automation Centres provide a one-stop-shop for all your actuator upgrade and replacement requirements.

Services delivered encompass design, manufacture, supply and installation of all mechanical and electrical components to facilitate your plant upgrade.

- Actuator replacement
- New valve automation
- Control and automation
- System integration

CLIENT SUPPORT PROGRAMME (CSP)

The primary goal of our Client Support Programme (CSP) is to prevent the failure of equipment before it occurs. This includes equipment checks, replacement of worn components and partial or complete overhauls at specific periods.

Planned preventative maintenance is a better alternative to risking a potentially damaging breakdown of equipment and enables our clients to realise the full potential of their business by ensuring the maximum reliability and availability of the assets.

As part of the CSP, clients have 24/7 access to the Rotork Support Centres, with priority technical assistance, backed by comprehensive resources and dedicated systems. With over 400 directly employed engineers and more service technicians available via agents, we have the infrastructure required to effectively support clients' needs.

In addition, Rotork will help with site development when you need to expand, diversify or introduce a new process to the plant. Our engineers and technicians bring 60 years of application experience to help plan the way ahead.

- Select a level of service precisely tailored for you - gold, silver or bronze
- Improves production throughput
- Reduces the cost of maintenance year on year
- Allows customers to manage the challenge of 'Risk vs Budget' in maintenance operations
- Lifecycle management includes planned and predictive maintenance with a focus on equipment reliability and availability as well as asset management
- Generated reports detail cost savings and performance improvements