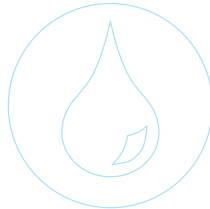
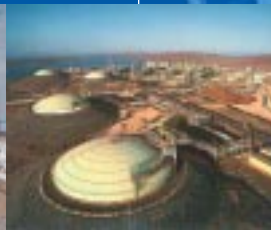
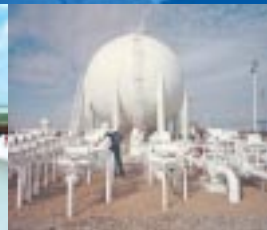
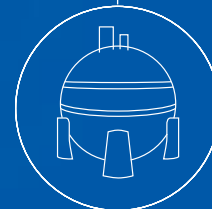
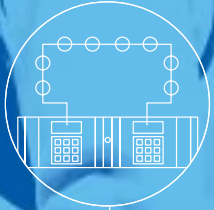


rotork®

understanding
our customers
in key industries



sales manual





understanding our customers



This manual is designed to help you understand our customers, and respond to their needs

The more we understand their needs, the more actuators we will sell

So let's follow these principles...

We should learn about each major sector where we sell actuators...

- What are their overall business needs?
- What are the challenges they face?
- How can they resolve them?
- How can Rotork help?

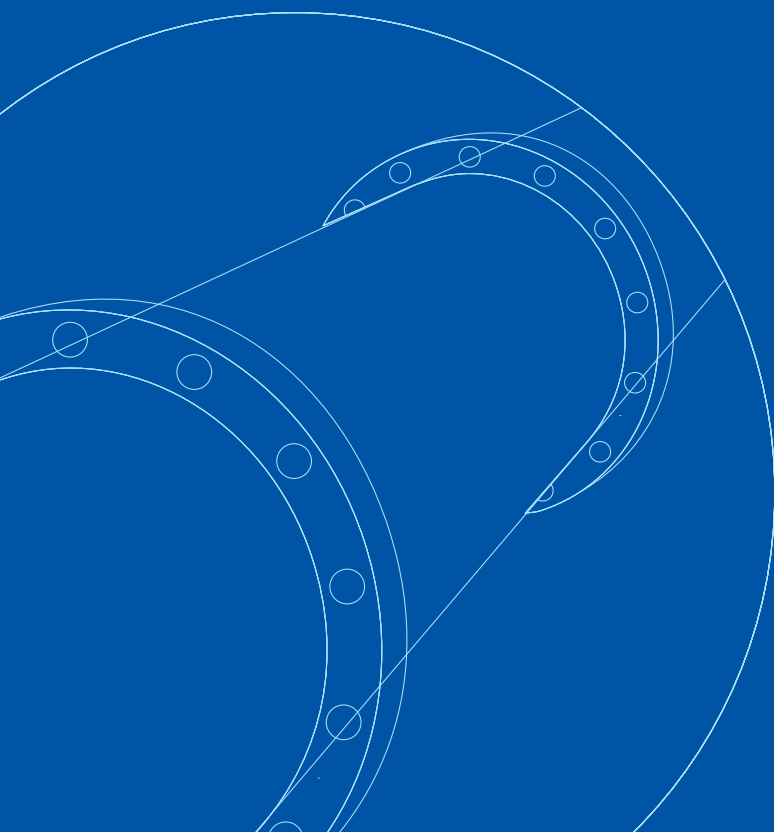
We should understand the structure of each type of operation and plant

- What is happening in each area?
- Where are actuators needed?
- What features are required?
- Which Rotork models should we sell?

We should be more like partners and consultants, helping our customers achieve their objectives
And less like product sales people and suppliers

We should help our customers run an efficient operation, realising that this is more important to them than actuators or valves

We should continue to learn together, so that this manual becomes simply the starting point for our knowledge





here are our priorities

- Learn about the industries we supply
(USE THIS MANUAL TO HELP YOU)
- Visit plants/sites/contractors
- Understand how their operations are run
- Determine existing level of plant automation
- Find out what projects are coming out
- Influence actuator specifications
- Learn the path to market -
who buys the actuators?
- Sell Rotork actuators
- Sell asset management
- Look for repeat business

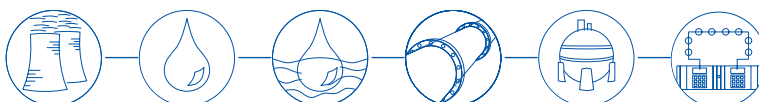
how to use this manual

- When you want to understand the motivations of a customer, read the relevant section of the manual.
- Understand their real needs and challenges
- Think about every part of their operation, and consider all the areas where you may be able to sell actuators (and not just some of them)
- Decide on your objectives
- **Asset Management is important for every type of customer**



index

Power Stations	1-4	LNG	17-24
Water and Waste Water	5-8	BUS Systems	25-30
Oil and Gas Facilities	9-12	Asset Management	31-32
Oil and Gas Pipelines and Storage	13-16		





Power Stations

Power Plants need lots of actuators

Average number of actuators in a power plant is 1 per megawatt.

A typical power station has four times 300 megawatts units = 1200 actuators

The world market for refurbishment of power stations is \$4.35 billion per year (source: IEA)

what are the general
BUSINESS NEEDS
of power station managers?

1 Reduce costs

2 Improve control of
process (incl. Two Shifting)

3 Operate plant safely

4 Increase efficiency

5 Reduce emissions

so what general
OBJECTIVES
do they have?

Reduce manpower
Reduce fuel usage
Prevent breakdowns

Operate an automated
plant management system

Operate an automated
plant management system

Reduce losses and
inefficient processes

Better control of
combustion process

Better cleaning of waste material

and what are the general
MEANS
of achieving these objectives?

Automation of manual valves
More reliable equipment
Tighter control of combustion process
Planned maintenance in outage period

Digital control systems
Communication between system and all equipment

Warning systems
Reliable equipment

More modulation
Accurate feedback and controls
Increase in speed of reaction to change
Reduction of heat loss

Secondary burn
Better modulation
Nitrous Oxide and Sulphur Oxide removal
Cleaning of waste gases

The reduction of emissions

How can Rotork help?

UN Press Release

The need to reduce emissions

Under the Kyoto Protocol, industrialized countries are to reduce their combined emissions of six major greenhouse gases during the five-year period 2008-2012 to below 1990 levels.

The European Union, for example, is to cut its combined emissions by eight percent, while Japan should reduce emissions by six percent. For many countries, achieving the Kyoto targets will be a major challenge that will require new policies and new approaches.

Retrofit Flue Gas
Desulphurisation

To remove
Sulphur Oxide
(that causes acid rain)

Retrofit of Lo Nox burners
Retrofit of Separated Over
Fire Air (SOFA)
or Boosted Over Fire Air
(BOFA)

To remove
Nitrous Oxide
(that causes global
warming)

“ We’re under a lot of pressure, and there’s a constant drive for efficiency in every part of the plant ”

Power Station Manager



Rotork Actuators are designed for Power Stations

Dirty, dusty environments

Our actuators are completely protected and enclosed, and being non-intrusive do not need to be opened

Heat resistant

Our actuators work well on valves and dampers handling media at high temperatures

Unpleasant dangerous areas

Our equipment is operated and monitored remotely, so no routine maintenance access is needed

Efficient installation

Our actuators are designed to be easy to commission and install

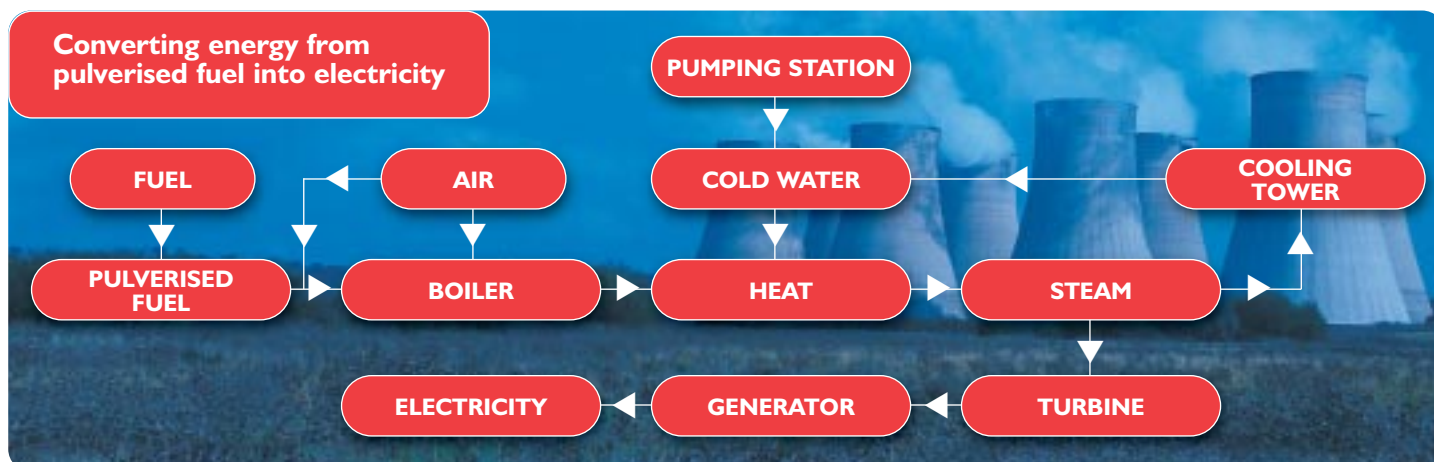
Restricted spaces and inaccessible areas

Our equipment is low-maintenance, self-contained, and compact, so it's ideal for small and hard-to-reach spaces



Rotork can offer the best solution for every application

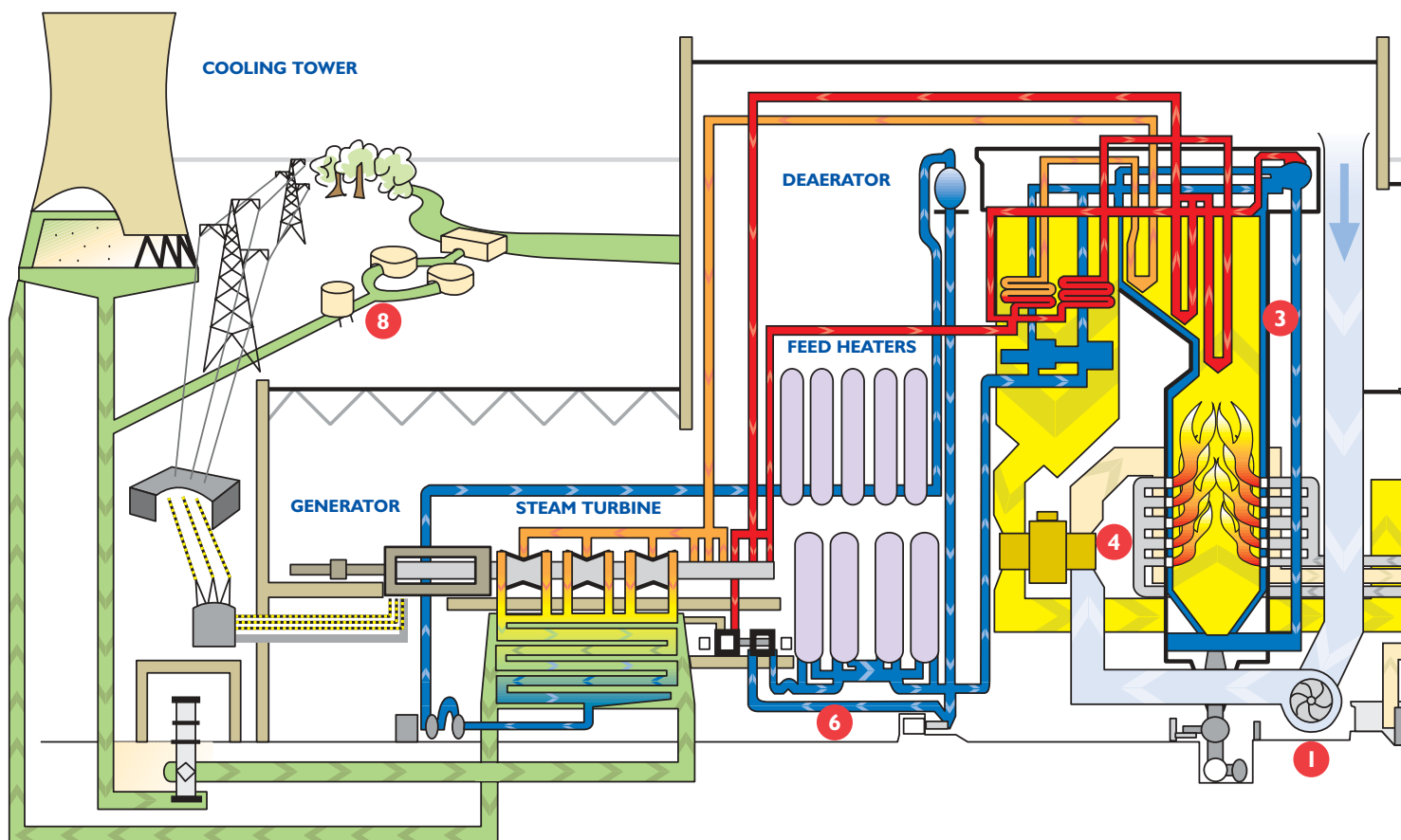
Application	Rotork Product Range	Benefits
VALVES DAMPERS	IQ / IQM / IQT / IQTM 	1/4 turn, multi-turn or linear On/Off or Modulating (1200 starts/hour) High specification Double sealed Non-intrusive
VALVES DAMPERS	AWT 	1/4 turn or multi-turn Lower specification Syncroset or Syncropak Double sealed
DAMPERS FANS BURNERS SMALL LINEAR VALVES	Jordan 	1/4 turn or linear Continuous modulating duty High accuracy (0.1%) High temperature (225 deg F) Optional remote mounted electronics
CONTROL VALVES DAMPERS ESD VALVES	Skilmatic 	1/4 turn or linear Continuous modulating duty High accuracy (0.25%) Failsafe Non-intrusive





Power Stations

typical coal fired
power station _____



Actuators are required in these areas

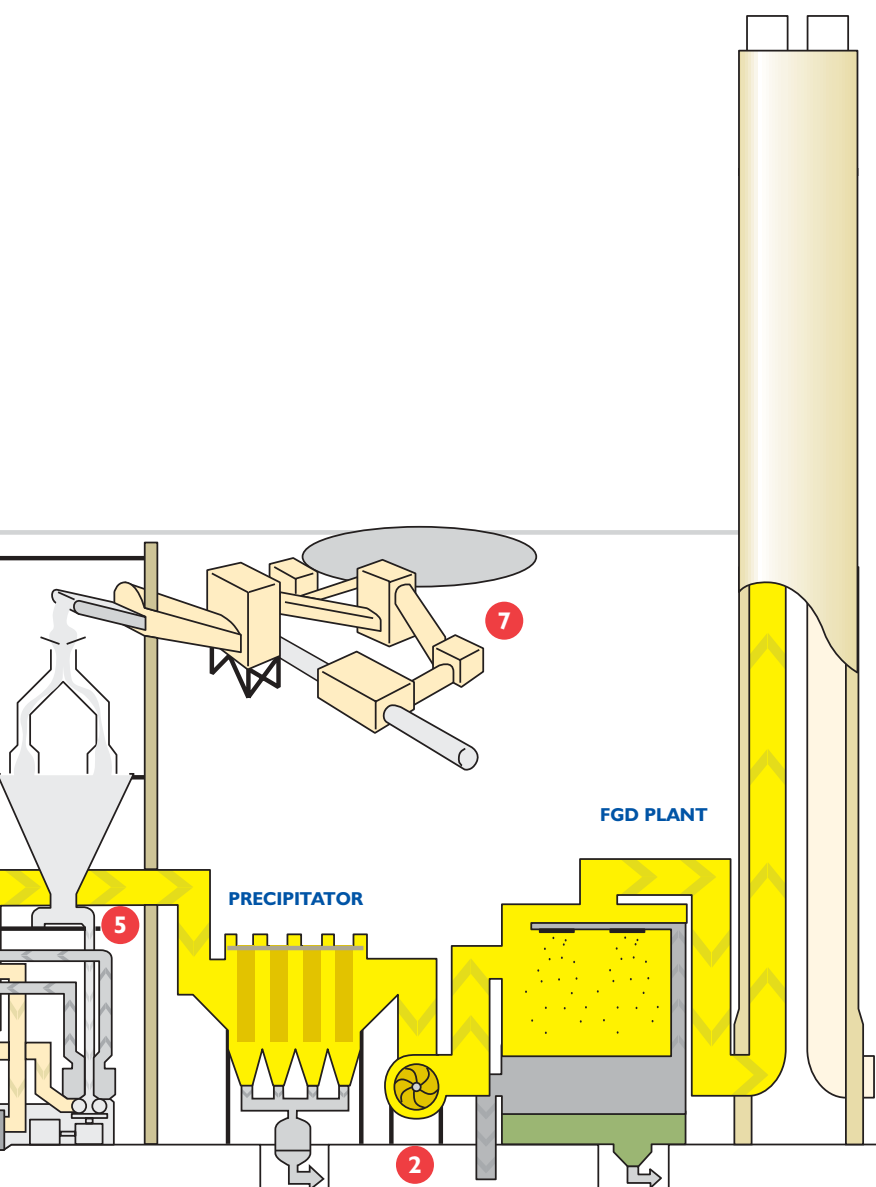
Fans	Actuator
1 Forced Draft (FD) Fan	SM6000
2 Induced Draft (ID) Fan	SM6000
Inlet vanes	SM6000
Outlet Dampers	IQT / IQ / AWT
Isolation Dampers	IQT / IQ / AWT
Primary Air (PA) Fan	SM6000

Firebox	Actuator
3 Secondary Air Dampers	LA2000 / SM6000
Overfire Air Dampers	LA2000 / IQT
Tertiary Air Dampers	LA2000 / IQT
4 Boosted Overfire Air Dampers	LA2000 / IQT
Burner or Corner Tilts	LA2000 / SM6000
Burners	LA2000
Registers	LA2000

Coal Mill	Actuator
5 Tempering Air Dampers	SM6000
Mill Adjustments	IQ
Coal Valve	IQ
Boiler Feedwater	Actuator
6 Feedwater Controls Valves	IQ / AWT / AQT
De-aerator Valve	IQ / AWT / AQT

“ We’re under a lot of pressure, and there’s a constant drive for efficiency in every part of the plant ”

Power Station Manager



River Water

This is added to the feedwater to make up for losses from the Steam/Power Generation Process

Feedwater

Boiler feedwater is recovered from the condenser and re-circulated through the system, primarily through extraction pumps and feed heaters to the de-aerator. This is then pumped into the economiser and furnace walls to generate steam within the boiler drum.

Saturated Steam

Feedwater that has had its pressure reduced to form heating steam in the feedwater heaters

Superheated Steam

Steam from the boiler drum goes through primary and secondary plate superheaters to produce superheated steam at a very high temperature and pressure to drive the first stage turbine. The High Pressure exhaust steam is returned to the boiler.

Reheated Steam

The High Pressure return steam passes through the reheater elements within the boiler and this reheated steam drives the second stage turbine (Intermediate Pressure). This then exhausts into the three stages of Low Pressure turbine and then to the condenser where it is cooled and becomes feedwater.

Exhaust Gases

Gases created and exhausted as a result of the combustion process

Limestone Slurry

The exhaust gases are passed through Limestone Slurry to remove the Oxides of Sulphur, thus reducing emissions, also known as Flue Gas Desulphurisation (FGD)

Gypsum Slurry

The by product of passing the exhaust gases through the limestone slurry. Gypsum Slurry is used in various building materials including breeze blocks and insulation boards

Coal Handling

7	Gates / Diverters	LA2000 / IQ / AWT
	Conveyor Speed Control	SM1000 / I500

Water Treatment

8	Valves	IQ / AWT / IQT
	Gates	IQ / AWT
	Metering Pumps	SM1000 / I500

Valves

Steam	IQ / AWT / IQT
Cooling Water	IQ / AWT / IQT
Fuel Control	IQML / Skilmatic SI
Regulators	SM1000

Actuator

Miscellaneous

Cooling Tower	IQ / AWT
Start Up Boilers	Skilmatic SI
Gas Turbine Control	Skilmatic SI
Fuel Storage	Skilmatic SI / IQ
Economiser Recirculator	Skilmatic SI / IQ

Actuator



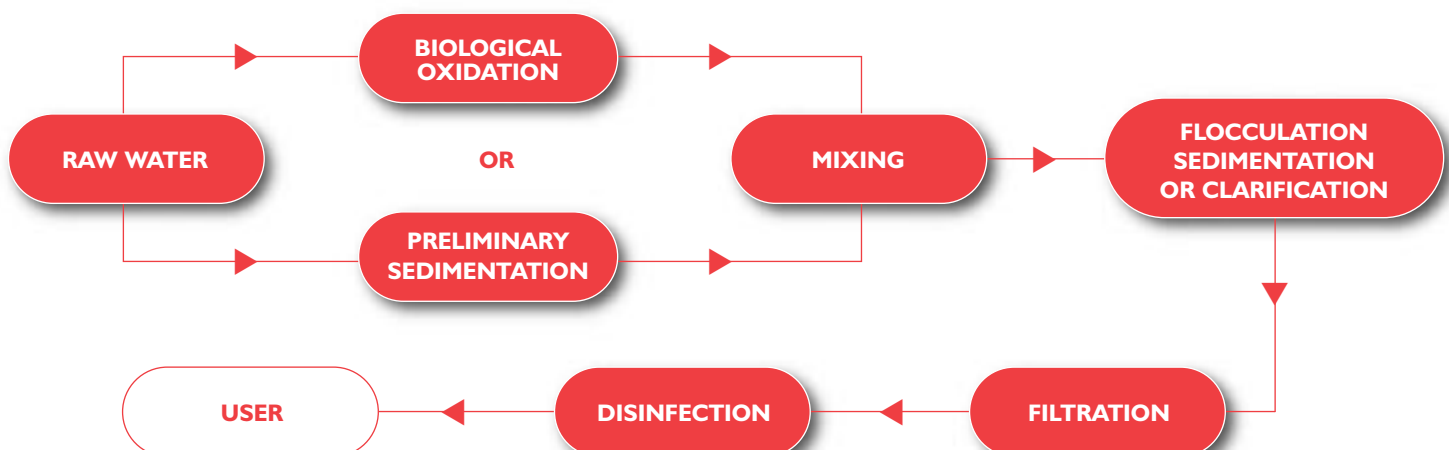
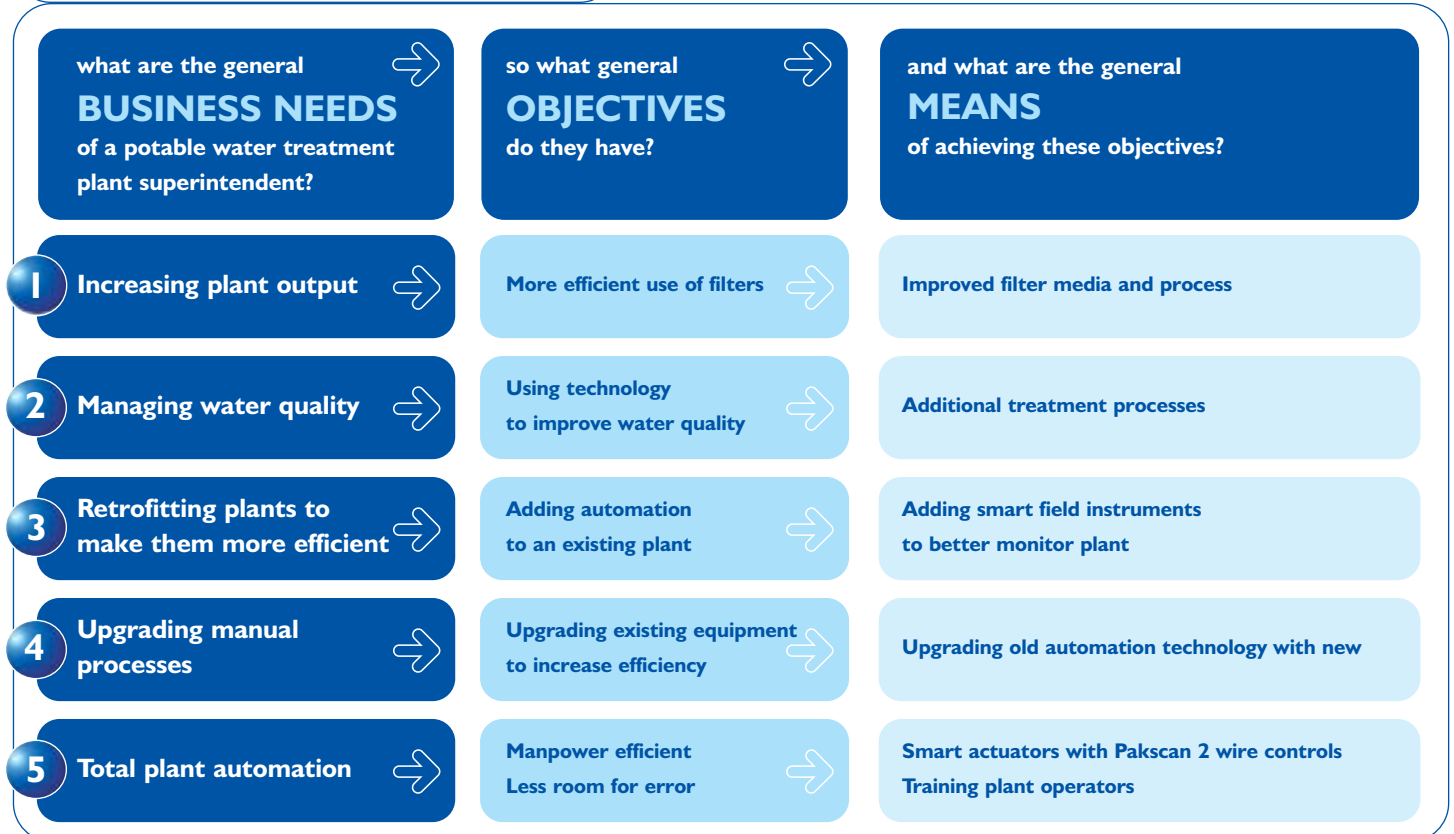
Water and Waste Water

The potential in the water industry for Rotork is massive, with large numbers of treatment plants, and with customers in every country of the world

There are major developments taking place in the water industry that provide opportunities for Rotork

- increasing importance of private water companies
- automation of traditional sand filter plants
- introduction of membrane filters

Potable Water Treatment



“ It’s a real challenge to always maintain our quality standards every day of the year ”

Water Treatment Plant Manager



Waste Water Treatment

what are the general
BUSINESS NEEDS
of a waste water treatment
plant superintendent?

so what general
OBJECTIVES
do they have?

and what are the general
MEANS
of achieving these objectives?

31
PAGES
32
for full details of asset management refer to pages

1 Need for adding
treatment capacity in a
growing community

Be able to collect and retain
all dirty water during any
major event

Automation of existing facilities including storm
water retention and pump stations

Planning the growth of the
system to meet demands

Building an automation strategy that can be
expanded as the plant grows

2 Pressure to improve
quality of effluent

Meet environmental standards
Gain community confidence

Full SCADA plant control
Selling plant technology to the community

3 Keeping up with waste
water treatment
technology

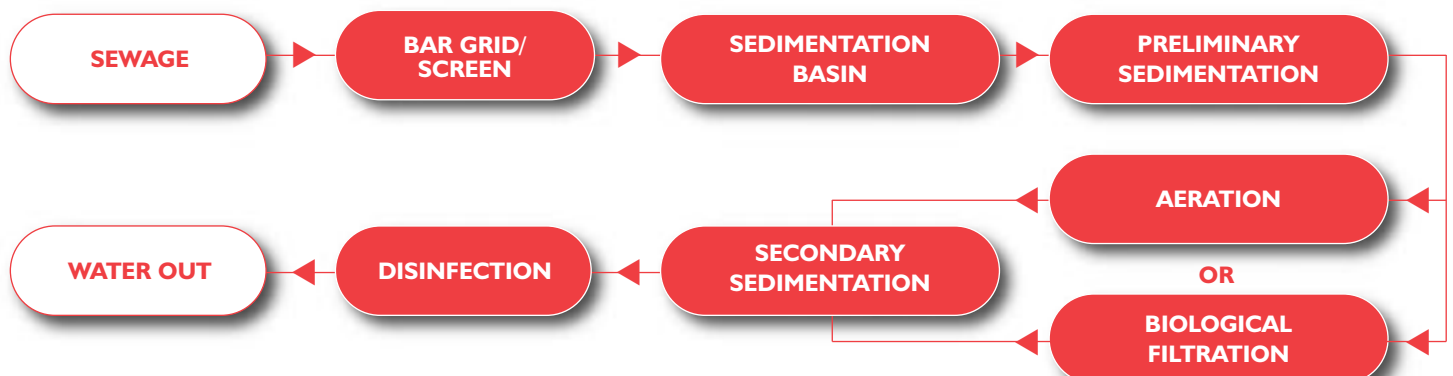
Adopting new technologies
being installed in the plant
Facing the challenges of
integrating these new processes

Manufacturers working with the plant personnel
Team work with contractors, integrators, plant
personnel to provide smooth plant start ups

4 Total plant automation

Manpower efficient
Less room for error

Smart actuators with Pakscan 2 wire controls
Training plant operators





Water and Waste Water

How can we help a Plant Superintendent...?

... to take advantage of “Best in the industry” factory support

Differentiate ourselves from others in the market by supporting the end users and our products after the sale. This includes warranty and training.

... to introduce smart actuator technology into his plant

Retrofit an existing valve so he can see the benefits.

... to improve process controls

Introduce network technology to plant automation so all data can be efficiently fed back to the host control system.

... to reduce costs

Supply reliable equipment that is “fit for service” and withstands the plant environment.

... to install an automated plant management system

Provide automation solutions including the upgrading of older actuators and their marriage into new control system where practical. (Rotork or other brand).

... to meet environmental standards

Provide comprehensive range of on/off, modulating and failsafe actuators to ensure plant efficiency and safety standards are met at all times.

... to bring equipment up to date

Replace obsolete actuator technology.

... to easily maintain the actuators

Use diagnostic tool to allow quick and easy routine plant maintenance.

Rotork Actuators are designed for water applications

Moist environments

- Never far from water and often below ground, our actuators are environmentally sealed from the factory and, with non-intrusive setting, do not need their covers removing in the field during calibration.
- Our watertight actuators have double O-ring sealed terminal compartments that can survive being submerged or water ingress through a conduit.

Hazardous Areas

- FM rated units available for hazardous rated areas that still retain watertight features.

Restricted or inaccessible areas

- Actuators are low maintenance, self-contained and compact and can be easily equipped with remote hand control stations.
- Alternatively all control and feedback information is easily accessed remotely through a range of different networking options.

Efficient Installation

- Actuators are designed with standard bases for easy mounting to valves and gates at the factory or in the field.
- Commissioning takes only minutes with the infrared setting tool.

“ It’s a real challenge to always maintain our quality standards every day of the year ”

Water Treatment Plant Manager



Rotork can offer the best solution for every application

Application	Duty Cycle	Rotork Product Range	Benefits
SLUICE & WEIR GATES General water & waste	on/off on/off on/off	IQ AWT EH Linear	Non-intrusive, networked Low cost basic Failsafe
GATE VALVES Water distribution, pump station manifolds	on/off on/off on/off	IQ AWT EH	Non-intrusive, networked Low cost basic Failsafe
BUTTERFLY VALVES WTP general water service	on/off on/off Modulating	IQT or IQ / IW Cylinders operators IQTM or IQM/MOW Skilmatic EH	Filter in, filter out, washwater, etc Water hydraulic or pneumatic Washwater influent/effluent rate of flow Effluent rate of flow (failsafe) Filter shutdown service
PLUG VALVES WWTP general water service	on/off on/off Modulating Modulating Modulating	IQT or IQ / IW Cylinder operators IQTM or IQM/MOW Skilmatic EH	Sludge handling Water hydraulic or pneumatic Pump suction/discharge Water service modulating duty Modulating failsafe Large diameter failsafe
AIR SERVICE BUTTERFLY VALVES Blower control	Modulating	IQTM or IQM/MOW	Filter backwash air scour Waste water oxidation
PLASTIC BALL VALVES Chemical dosing	on/off on/off	Q range ROM	Network able Low cost basic
SCUM SKIMMERS Tilting scum troughs	on/off on/off	IQ AWT	On/off - timed sequence operation Low cost basic
MUD VALVES Sludge removal	on/off on/off	IQ AWT	On/off - networked Low cost basic



Oil and Gas Facilities

There is a massive worldwide industry building new facilities for oil and gas. This offers a huge potential for Rotork.

Additional business comes from extensions, upgrades, retrofits, facilities and tie-ins of new facilities.



The specification and procurement of actuators for oil and gas facilities is normally done by the engineering contractor

what are the general
BUSINESS NEEDS
of oil and gas building
contractors and operations
managers ?



so what general
OBJECTIVES
do they have?



and what are the general
MEANS
of achieving these objectives?

1 Smooth project
management



Full functionality at installation
No delays in production
Controlled costs



Correct specifications for all equipment
Delivery of all components on time
All costs on budget

2 Operation in a tough
environment



Robust equipment



Durable equipment
Corrosion proof
Low maintenance

3 Safe operation



Effective emergency shut down

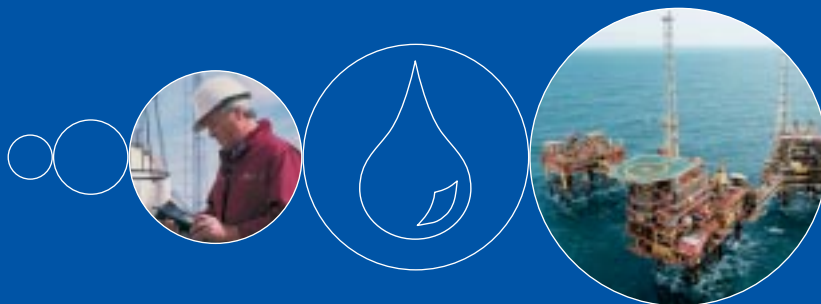


Fast acting equipment
Reliable after long periods of inactivity
Automatic control systems



“ The biggest challenge in building a platform is to manage the whole process efficiently, and deliver it on schedule ”

Platform Operations Director



Sometimes, we only see part of the picture, and we're happy to get a sale



We should all work together, to see the **big picture** then we'll all sell more!



In a new oil and gas project, actuators are purchased through three channels...

	Purchased by
• Bulk package	Main contractor
• Engineered packages	Specialist systems manufacturers
• Specific fabrications	Subcontractors

We must make sure we track down all of them

Don't be satisfied with just one order

Maximising our sales opportunities

We should follow these stages...



Main Contractors

Talk to them during tendering process and when they have won a contract

1 Sell them Rotork in their bulk package

2 Ask them who are their specialist system suppliers:

- Scrubbers
- Sand handling
- Metering
- Filtration
- Desulphurisation
- Gas treatment
- Compression
- Water injection
- Chemical injection
- Pig launcher/receiver
- Fuel gas
- Deluge systems



Specialist System Suppliers

Contact them yourself or via local office or agent

3 Sell them Rotork in their specialist systems

4 Ask them who are their valve suppliers and other subcontractors



Valve Suppliers and Other Subcontractors

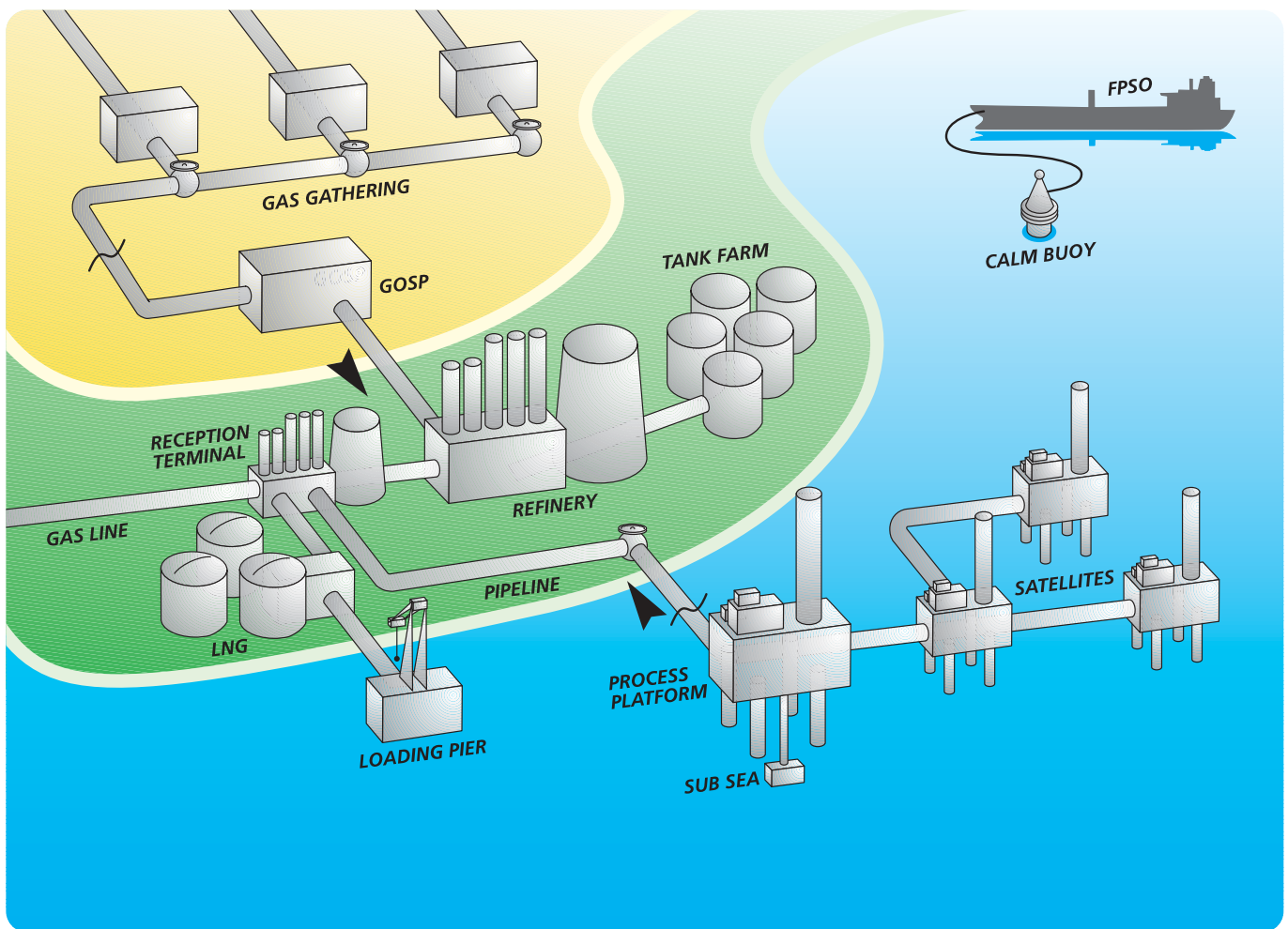
Contact them yourself or via local office or agent

5 Sell them Rotork in their applications



Oil and Gas Facilities

from
sea to land



Type of Application

Emergency Shut Down

Control

Batching

Sub Sea

Type of Actuator

Fluid

Skilmatic

Electric
Hydraulic

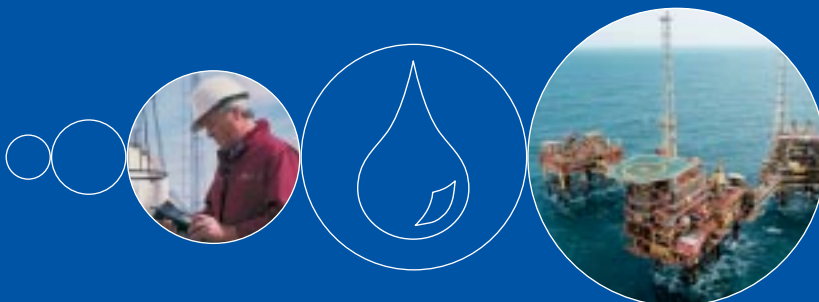
Pneumatic
Electric Hydraulic

Electric

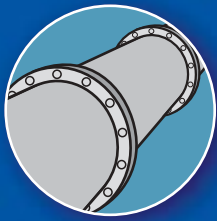
Hydraulic

“ The biggest challenge in building a platform is to manage the whole process efficiently, and deliver it on schedule ”

Platform Operations Director



Type of Operation	Requirements for actuators and systems	Actuators and systems types/models
PLATFORMS Receive crude oil and gas Partial processing Transmission to shore via pipelines or tankers	Explosion proof Corrosion proof Reliable Remote and local control Compact and lightweight Automatic shutdown Emergency shutdown	ACTUATORS Mainly pneumatic Some hydraulic Some electric SYSTEMS Pakscan
FLOATING PRODUCTION STORAGE AND OFFLOADING (FPSO) This is a vessel that processes and stores oil prior to further onshore processing	Explosion proof Corrosion proof Reliable Remote and local control Compact and lightweight Automatic shutdown	ACTUATORS Hydraulic Pneumatic Electric
RECEPTION TERMINALS Receiving gas and oil Gas conditioning Transmission via pipelines	Explosion proof Fail open or fail close Distribution control	ACTUATORS Electric Pneumatic SYSTEMS Pakscan
TANK FARMS Storage of crude oil, intermediates and final products	Reliable, even after long inactive periods. Remote control	ACTUATORS Electric SYSTEMS Pakscan
REFINERIES Separation of elements by fractional distillation Conversion by hydro-cracking to recover more petrol and diesel Treatment of products	Fast acting Controllable Isolation Remote control	ACTUATORS Electric Pneumatic Linear hydraulic
GAS/OIL SEPARATION PLANTS (GOSPS) Separating gas from crude oil prior to pipeline transmission or processing	Reliability Failsafe Reliable, even after long inactive periods	ACTUATORS Pneumatic Electric



Oil and Gas Pipelines and Storage

Rotork has installed large numbers of actuators in pipelines, and actuators with Pakscan systems in many storage and export facilities around the world



what are the general
BUSINESS NEEDS
of pipeline and storage
managers?

1 Maximum efficiency

2 Safe operation

3 Continuous information

4 Environmental
responsibility

so what general
OBJECTIVES
do they have?

All systems work continually
without interruption

Able to control a long
and complex operation

Advance warning of problems

Quick reaction to emergency

Regular testing of system integrity

Knowledge of local
and remote areas

Prevent leakage or spillage

Prevent emissions from
equipment

and what are the general
MEANS
of achieving these objectives?

Sustainable systems
Able to manage multiple products

Continuous control

Warning systems

Emergency response procedure

Fast shutdown

Partial closing and pressure/flow monitoring

Electrical monitoring systems
Diagnostics

Accurate control of all processes

Leak-proof design

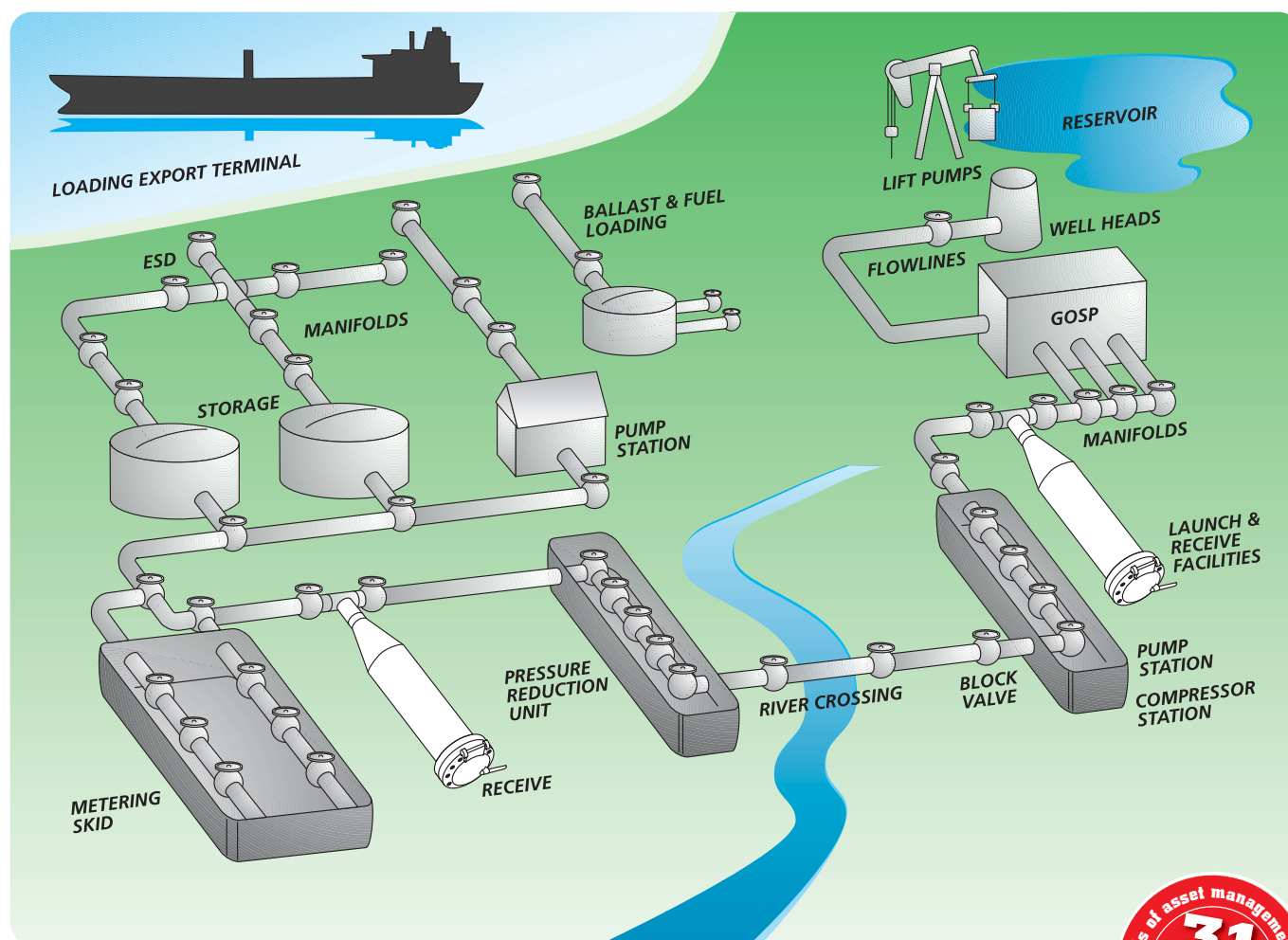


“ We are very aware of our responsibility
for the environment, and for safety ”

Tank Farm Supervisor



moving, storing and loading oil and liquid gases

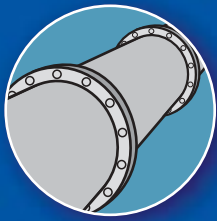


Storage and export operations

are a major market for actuators, as complex flows of multiple products need to be managed between tanks and loading facilities.

In these areas, actuators are needed to provide...

- accurate controls
- no mixing of products
- continuous visibility of all operations
- complete control of overall system
- immediate emergency shut-down capability (E.S.D)



Oil and Gas Pipelines and Storage

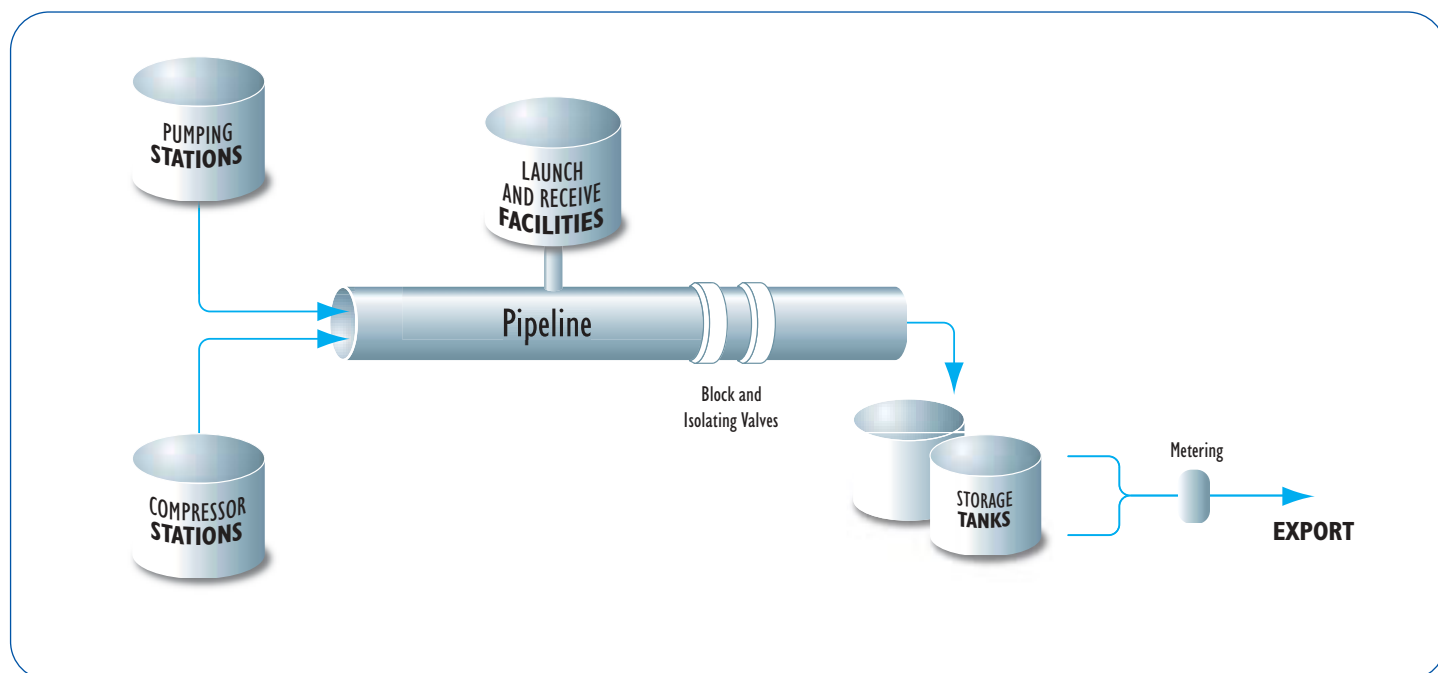
Type of Operation	Requirements for actuators and systems	Actuators and systems types/models
PUMPING STATIONS For liquids (crude, petroleum) Pumping liquids along the pipeline	Reliable Compact Low power consumption Positioning control Remote and local control Explosion proof	ACTUATORS IQ/IQT IQM Skil SYSTEMS Pakscan Fieldbus
COMPRESSOR STATIONS For liquid gases (LNG, LPG, Ethylene) Maintaining the high pressure and driving them along the pipeline	Explosion proof Powered by pipeline medium or by self contained power pack. Bespoke local and remote control systems. Fail open or fail close Partial closing Fast acting High reliability	ACTUATORS HPG unit Gas over oil EH SYSTEMS Pakscan Fieldbus
LAUNCH & RECEIVE FACILITIES Isolating the pipeline and inserting a device - for inspection, maintenance, cleaning, or separation of products	Reliable Accurate Manual control Visibility by operator	ACTUATORS Electric IQ Quarter turn double acting (pneumatic or gas over oil) Linear hydraulic/pneumatic (determined by type of power available, and speed of operation required.) SYSTEMS Fieldbus
BLOCK AND ISOLATING VALVES Isolating sections of a pipeline - at river crossings and for maintenance and in an emergency	Reliable, even after long inactivity Fast acting Failsafe Powered by pipeline medium or by self contained power pack or dedicated power supply. Active monitoring and testing Manual override, remote and local operation. Linear or quarter turn SCADA interface Delta P (▲P) shutdown controls	ACTUATORS Hydraulic Gas over oil HPG EH IQ SYSTEMS Modbus Profibus Foundation Fieldbus

“ We are very aware of our responsibility for the environment, and for safety ”

Tank Farm Supervisor



Type of Operation	Requirements for actuators and systems	Actuators and systems types/models
METERING Measuring volume of product being exported or imported. Measurements are used as a basis for invoicing, and so must be accurate and proven. Sometimes includes a meter prover, to verify the accuracy of the metering system.	Reliable Precision control Sequence control Interlock capabilities Remote and local control Serial communication compatibility Fast acting Modulation control	ACTUATORS IQ IQM IQF Spring return pneumatic Fail close and open SYSTEMS Pakscan Modbus Profibus
STORAGE AND EXPORT Storage of liquids and gases in large tanks, controlling complex flows, and pumping to export facilities	ACTUATORS Explosion proof Corrosion resistant Remote, local and manual control SCADA compatible ESD enabled SYSTEMS Long distance control High speed of operation Built-in redundancy	ACTUATORS Electric RFS SYSTEMS Pakscan Invision





Liquefied Natural Gas

LNG will play an important role in meeting the projected rise of natural gas consumption over the coming decade

**Federal Reserve chairman
Alan Greenspan**

has called for
“a major expansion of LNG
terminal import capacity”
in the USA



In many countries natural gas has become a preferred fuel for power generation, and growing demand cannot be satisfied by existing, local sourced production.

Today LNG accounts for less than 5% of the world's gas consumption. However, global production capacity could double before the end of the decade as the market for LNG continues to expand.

LNG has the fastest growth projection of any energy source and based on current proposals, at least a dozen new projects and up to 20 major expansions of existing facilities could be completed by the end of the decade.

When it is impractical or uneconomic to use pipelines, large volumes of natural gas can be moved from stranded reserves to market in liquid form.

When cooled to -160°C , natural gas becomes a clear, colourless liquid and is commonly referred to as LNG.

Storage and transportation of LNG is extremely hazardous, so safety and reliability of plant equipment are of paramount importance.

LNG projects provide great opportunities for electric, pneumatic and hydraulic actuator sales.



Exploration
and Production

The LNG supply chain is complex and highly technical, involving the extraction and liquefaction, shipment on special refrigerated tankers and regasification at a coastal import terminal.



Liquefaction



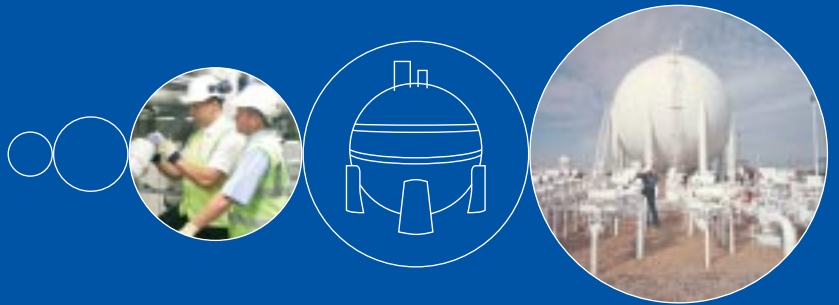
Shipping



Regasification
and Storage

“ Our terminal is in a remote coastal area, so we need all our equipment to be totally reliable ”

Operations Supervisor



LNG plants are normally situated in extreme environments

What are the main factors driving the LNG market?



LNG MARKET DRIVERS

Reduce operating cost to ensure gas is economically competitive at the 'burner tip'

Liberalised gas markets

Expanding gas market has increased the demand for LNG

LNG train & recirculation system must operate 24 hours a day

INDUSTRY CHALLENGES

Improve plant efficiency:

Improve profitability

Improve reliability

Maximise value added - Participate in spot trading to supplement static supply routes.

Meet increased demand

Prevent unscheduled shutdown of plant

SOLUTIONS

Improve efficiency of equipment (Minimise energy usage)

Improve accuracy of process control valves.

Reduce manpower by automation of routine tasks (e.g. sequential control of a booster pump and its associated suction & discharge valves).

Lower cost of ownership.
Use low maintenance equipment.
Reduce spare parts holding

Flexible supply chains:
Operate variable production levels
Guaranteed operation at any time.

Increase production capacity:
Build new plants
Expansion of existing plants

Use low maintenance products
Predictable reliability



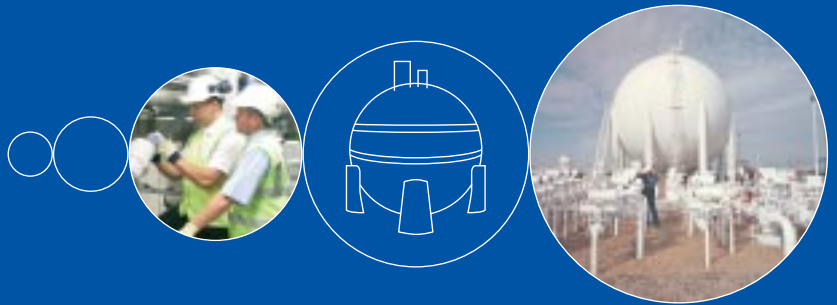
Liquefied Natural Gas

What challenges do LNG plant operators face and how can Rotork help them?

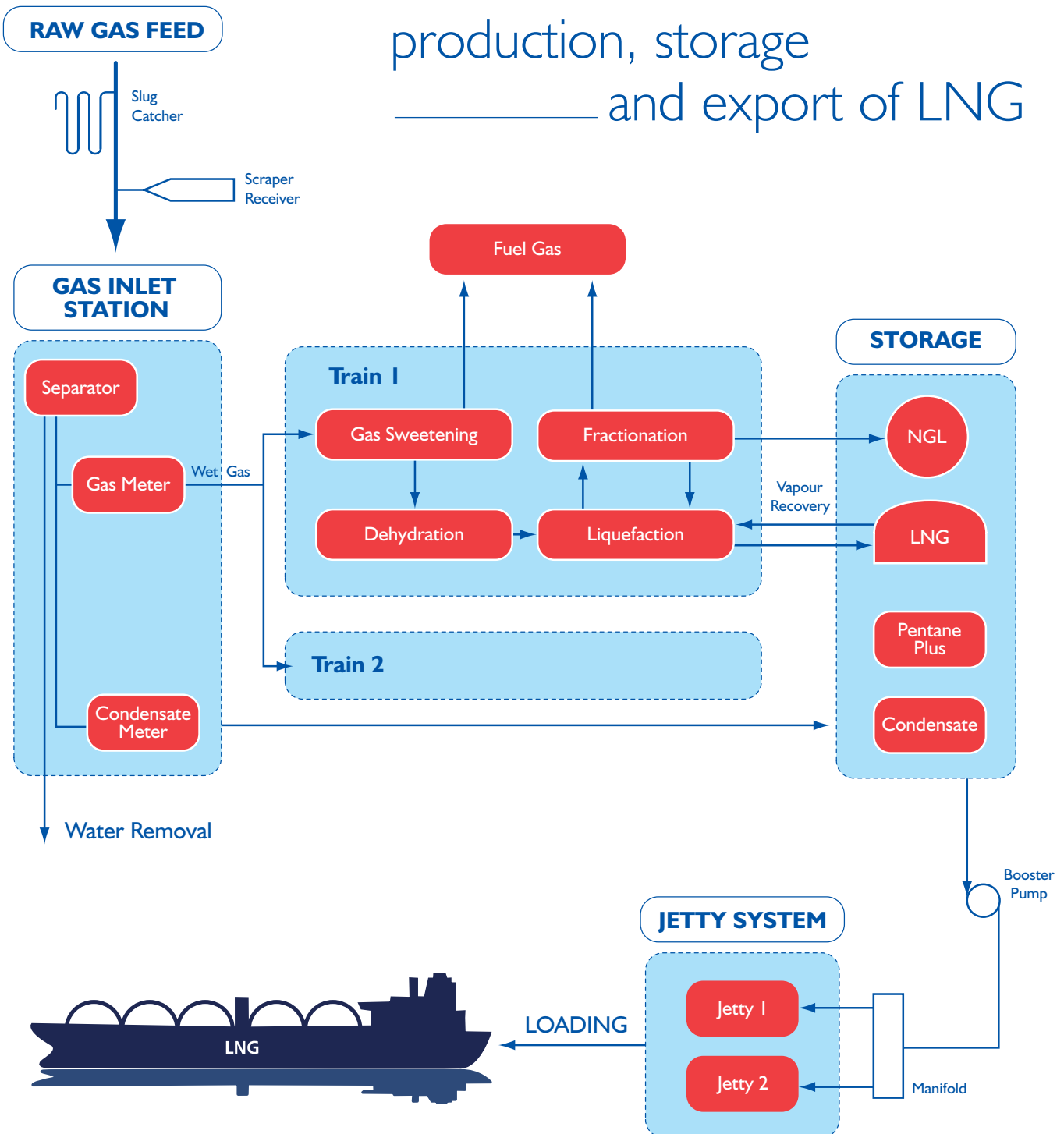
LNG plant operators CHALLENGES	so what general OBJECTIVES do they have?	and what are the general MEANS of achieving these objectives?
ENVIRONMENTAL		
1 Coastal locations provide harsh environments for field mounted equipment	Prevent equipment failure caused by proximity to saline water, high humidity, sand, ice	Equipment must have adequate corrosion protection (offshore paint specification) & good sealing to prevent water/dust ingress (IP68 min)
2 Remote locations	Fully Automate operation Increase On-site knowledge Low skill maintenance	Integrate control systems (Pakscan) Training of staff Equipment must be easy to operate and maintain (fit & forget designs)
3 Severe weather is often a problem	Plant must survive heat, extreme cold, icing, frequent lightning	Equipment must be designed to survive
SAFETY		
1 Safe operation	Prevent explosions	Hazardous area equipment (ATEX, FM) Robust design Warning systems (High Functionality) Emergency shutdown (ESD)
2 Environmental protection	No escape of product	Leak detection systems
3 Site security	Centralised information and control	Control systems
OPERATIONAL		
1 Easy site maintenance	Infrequent and simple maintenance	Low maintenance Easy to maintain
2 Management information	Constant information on all operations	Control systems Remote diagnostics
3 Control of all operations	Accurate control of every part of plant Increase plant efficiency	Advanced control systems

“ Our terminal is in a remote coastal area, so we need all our equipment to be totally reliable ”

Operations Supervisor



production, storage and export of LNG



This is a simplified diagram of the LNG process. In practice, every plant is unique in design.



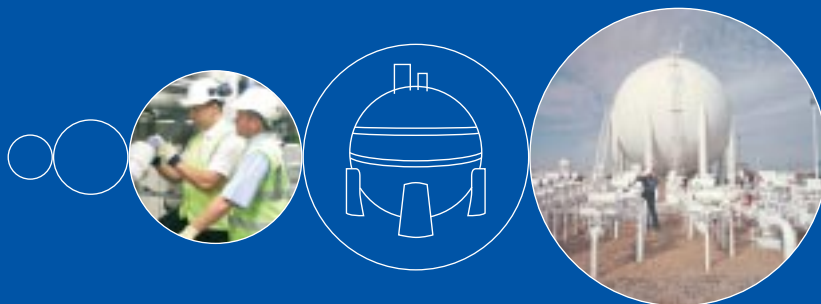
Liquefied Natural Gas

export terminals - where are the actuators?

Application	Requirements for valves, actuators and systems	Typical Rotork model
GAS INLET STATION		
SCRAPER RECEIVER Scraper is used for pipeline maintenance	Local control of through conduit gates. Interlocking for safe retrieval of scraper.	Multi-turn electric IQ & bevel gearbox. Hand-wheel & motor interlock system
SLUG CATCHERS Vessels separate liquid slugs formed by condensation of water & hydrocarbon	Finger/parallel type use 1/4 turn valves. Example: Drain from boot uses on/off control valves	Multi turn electric IQ & IW gearbox or direct acting quarter turn IQT
SEPARATORS Separates the gas, water and condensate	Gas inlet, condensate pump discharge & water disposal control valves	Control valve actuator Manual isolation
METERING Measuring volume of gas or condensate for fiscal purposes	Meter switching rotary valve Multi-turn gate valves for isolation	Control valve actuator Multi-turn electric IQ + IB gearbox
LIQUEFACTION TRAIN		
GAS INTAKE REGULATOR Controls the flow of gas into the train	Large 1/4 turn ball valves	Hydraulic double acting scotch yoke
GAS TREATMENT – SWEETENING & DEHYDRATION Take out materials that would freeze	Conventional globe & rotary valves with modulating duty.	Control actuator & Pneumatic double acting scotch yoke
REFRIGERANT COMPRESSORS	Avoid compressor surge by reg. recirculation. NGL liquids from comp.	Control valve actuator Gear & Automated
EXCHANGER	Isolation valves	Manual Gear operator
REFRIGERANT CIRCULATION	Compressor discharge valves control valve	Electric Multi-turn IQ Surge tank Control valve actuator
FLASHING Flashing reduces pressure & temperature	JT control valves	Control valve actuator
SHUTDOWN ESD system	triple eccentric, failsafe, tight shutoff	Pneumatic spring return operators F/C

“ Our terminal is in a remote coastal area, so we need all our equipment to be totally reliable ”

Operations Supervisor



Typical Application	Typical requirements for valves, actuators and systems	Typical Rotork
STORAGE		
BOOSTER PUMPS 2nd stage pumps	Pump discharge valves	Electric Multi-turn IQ
STORAGE TANKS	Liquid filling valves & tank isolation	Electric Multi-turn IQ
VAPOUR RECOVERY Boil-off to train	Vapour transmission Isolation valves	Electric Multi-turn IQ
LIQUID MOVEMENTS		
RECIRCULATION SYSTEM Avoid liquid traps to prevent re-gasification	Transmission system ON/OFF gate valves	Electric Multi-turn IQ + PakscanControl
PIPELINE CROSSOVERS Directing product around the plant	ON/OFF gate valves	Electric Multi-turn IQ + Pakscan Control
LIQUID SHUTDOWN Emergency shut down system	ESD ball valves	Hydraulic scotch yoke + close damper to prevent water hammer
JETTY SYSTEM		
TIE-INS LNG to jetty	jetty ON/OFF valves	Electric Multi-turn IQ + Pakscan Control
LIQUID LOADING	Pump & loading arm ON/OFF valves	Electric Multi-turn IQ + Pakscan Control
SHIP VAPOUR DISCHARGE return to train	Vapour recovery ON/OFF valves	Electric Multi-turn IQ + Pakscan Control
MANIFOLD SHUTDOWN Emergency shut down system	ESD ball valves	Hydraulic scotch yoke + close damper to prevent water hammer

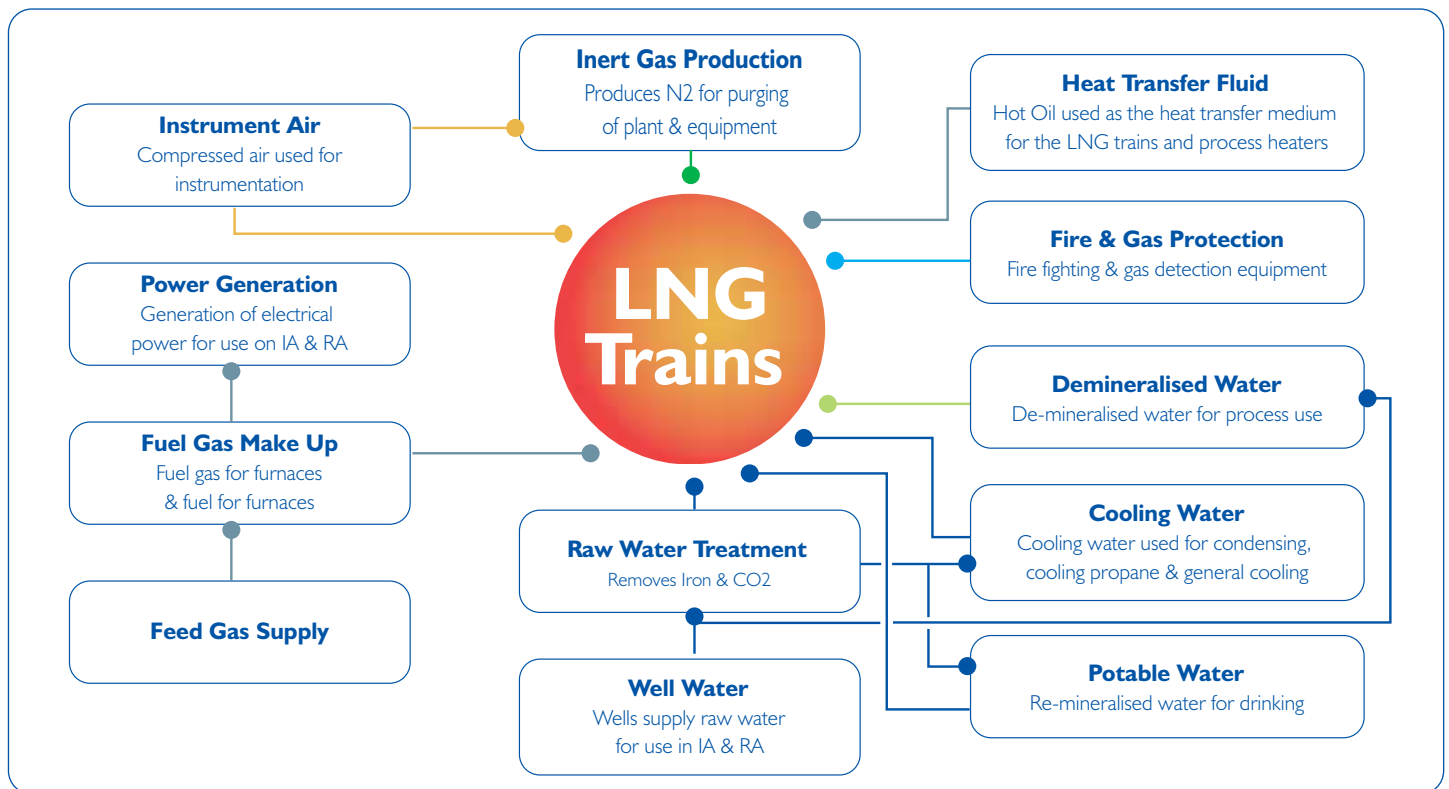
Note: All valves down-stream from train are cryogenic type

Cryogenic valves are available in all of the major valve configurations and can be controlled by Rotork products

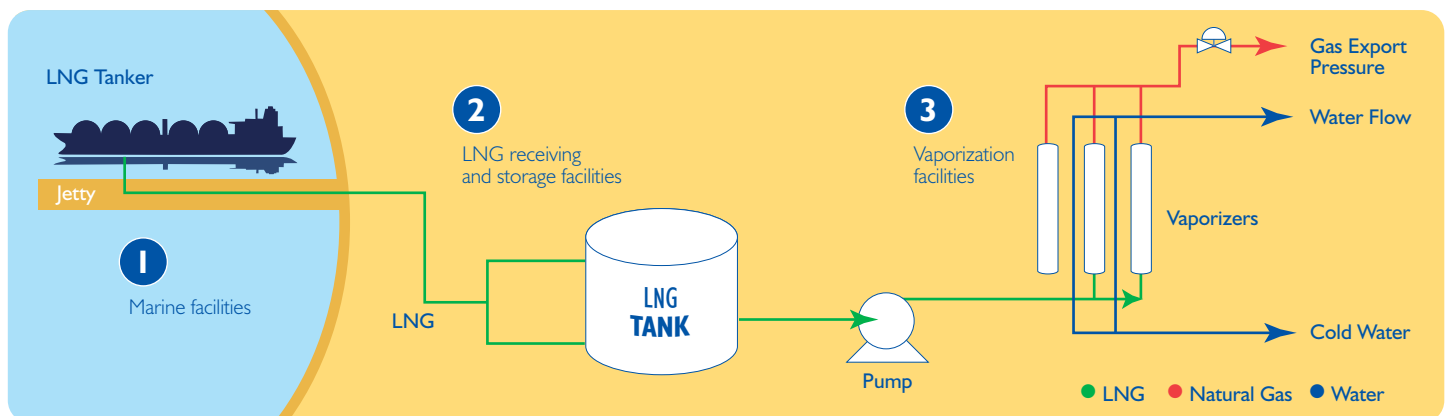


Liquefied Natural Gas

Utilities provide additional opportunities for actuators



LNG Import Terminals also provide major opportunities for actuators

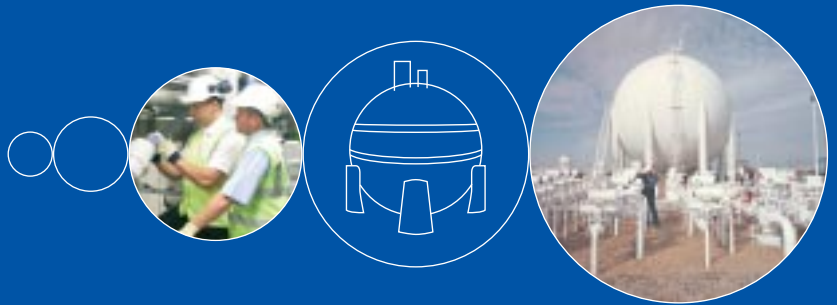


Valve applications

- Liquid arms unloading values
- Liquid circulation
- Tank pump discharge
- Tank liquid fill
- Vapour discharge
- Liquid to vapouriser
- Vapour from vaporiser valves
- Water cooling circuit valves
- Gas outlet valves

“ Our terminal is in a remote coastal area, so we need all our equipment to be totally reliable ”

Operations Supervisor



Rotork actuators are designed for LNG Plants

They're tough

- Reliable
- Corrosion proof
- Watertight enclosure
- Non-intrusive settings (where required)
- Extreme high/low temperature
- Quality Assured



They're safe

- Fire Safe systems available
- Emergency Shutdown Fail Safe systems available
- Explosion Proof Design

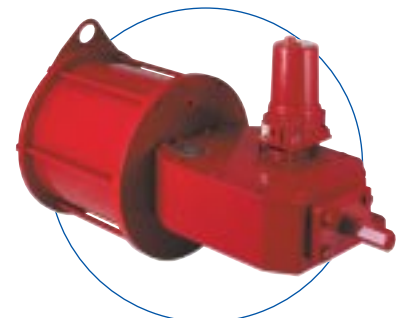


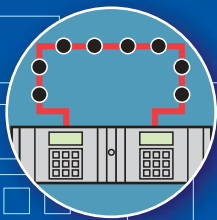
They're easy

- Low maintenance
- Simple operation
- Local and remote diagnostics

They're controllable

- Constant feedback information
- Network with automatic control systems
- Variable closing time prevents water hammer from damaging equipment





BUS Systems

BUS Systems can

greatly improve

the management of any type of plant...

- reduction in operating costs
- reduction in capital expenditure
- visibility of activities within plant
- provides information for automated controls
- facilitates predictive maintenance

Pakscan

With Pakscan systems Rotork takes responsibility for the delivery of the actuator data to the masterstation host communication ports. On correctly installed systems we undertake to provide a fully functioning system.

Produced by Rotork, Pakscan is the most successful BUS system for controlling valve actuators in the world today

Fieldbus



- Up to 240 field units distributed over a 20Km twisted pair loop
- Reduced cable costs
- Lower commissioning costs
- No restrictions on inter-node distances

Three elements

- Field units
- Two wire loop cable
- Masterstation



- Simple twisted pair cable
- Excellent control
- High efficiency
- Low maintenance costs
- Secure field communications

Masterstation monitors the full network at all times, with detailed diagnostics available on demand



- Simplifies programming of host system
- Intermediate control point

Fault Tolerant Field Network



- Short, open or ground faults on the loop do not prevent continuing operation

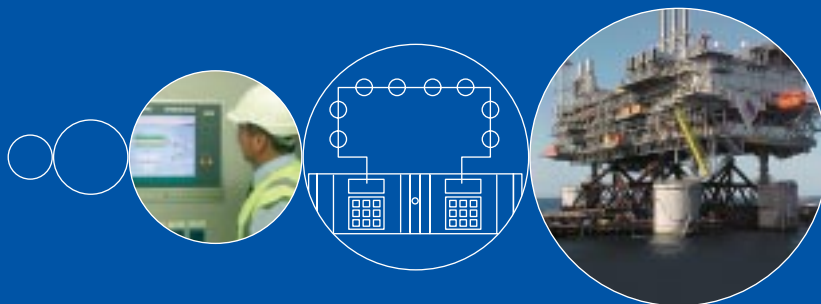
Comprehensive Indication



- Full plant status data available to the host system
- Display screen shows plant conditions

“ It’s vital that we can see and understand what’s going on throughout the plant ”

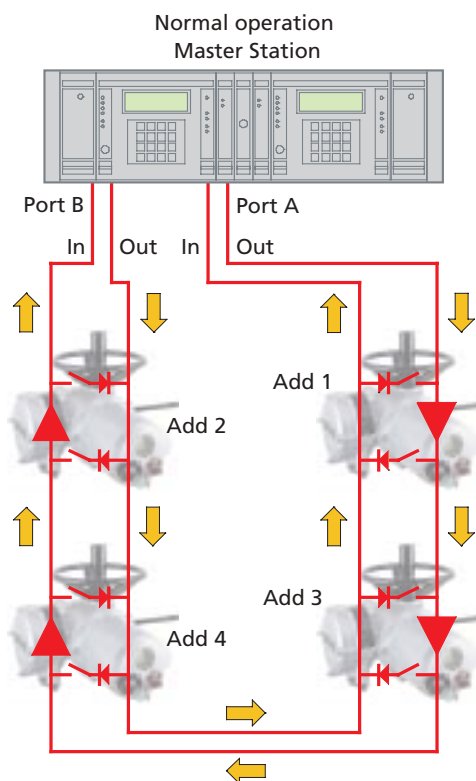
Operations Supervisor



Pakscan IIE Hot Standby masterstation



An IQ FCU printed circuit board



Hot Standby Pakscan IIE masterstation →

- System keeps working if there is a component failure in the master station
- High reliability by redundant configuration

Proven communications to all major DCS and PLC suppliers →

- Reduces system commissioning

Pre-configured data base →

- Quick and easy integration with host systems

Multiple host ports →

- Dual redundant comms link as standard
- Optional Ethernet connection provides wider connectivity

System communicates easily with new devices →

- Easy to expand network

Compatibility →

- Fully compatible with all current Rotork electric actuators, EH and Skilmatic SI actuators and In-Vision HMI products

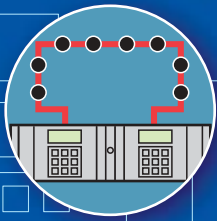
Capable of controlling third party devices →

- Controls pumps, heaters and mixers

High levels of surge protection →

- Protection from lightning strikes





BUS Systems

Pakscan Ethernet

LAN or WAN connection by Ethernet between Pakscan systems and Host systems

Ethernet is most popular network for communication of data in the world today



- Widespread in industrial controls and automation
- Many DCS and PLC systems use Ethernet networks
- Modern control systems use Ethernet backbones
- Easier and more flexible connectivity to master station

Pakscan Ethernet delivers data to the LAN using Modbus TCP



- High speed and wide bandwidth lets multiple users gain controlled access to the same actuator for control and diagnosis
- Multiple users can include main host, secondary host and temporary connections for maintenance and diagnostic analysis

Pakscan Ethernet automatically collects the data



- Status and alarm data about connected actuators and field devices is rapidly available

Embedded web server utilises TCP/IP capability



- Provides access to all information via pre-configured dynamic web pages

Automatic email notification

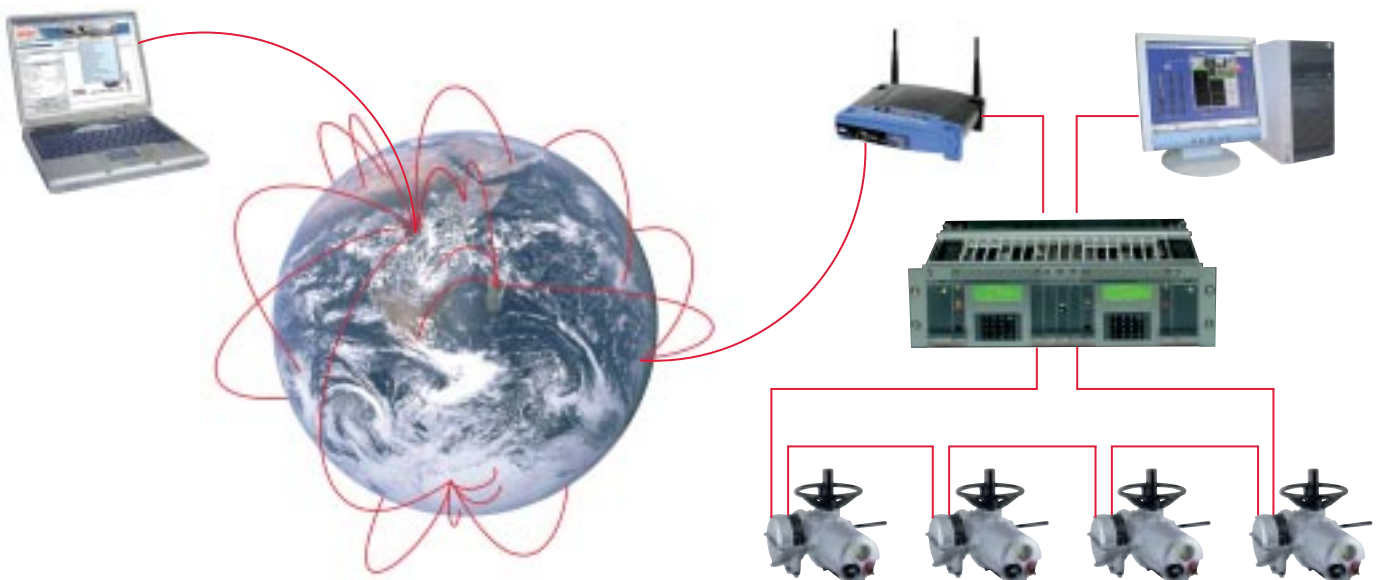


- Notifies selected personnel about alarm conditions or maintenance needs

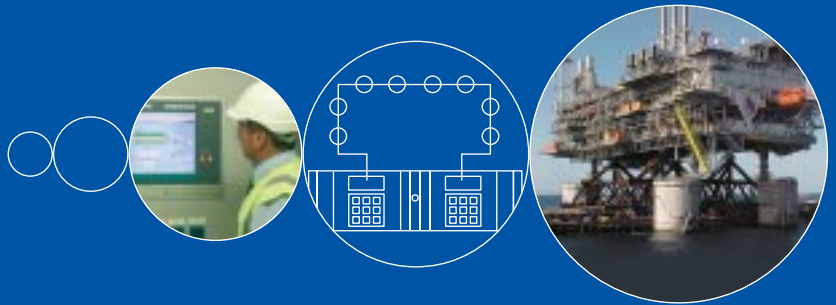
Security protection



- Password protected areas
- Standard firewall technology



“ Without information
control is impossible ”
Area Plant Manager



Open Systems

Many open Fieldbus systems exist, each designed for specific requirements

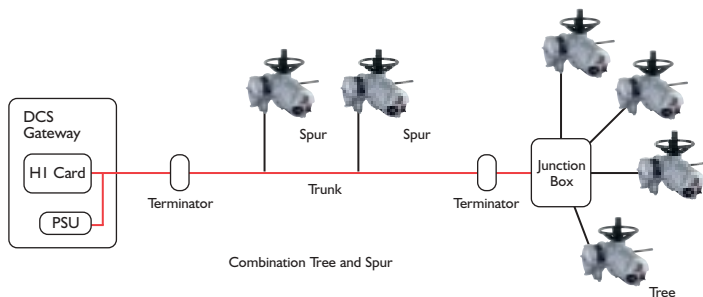
For general control and instrumentation applications the most popular systems include

- Profibus
- Modbus
- Foundation Fieldbus

Each system has its merits and its limitations. Rotork manufactures actuator interfaces for all these buses.

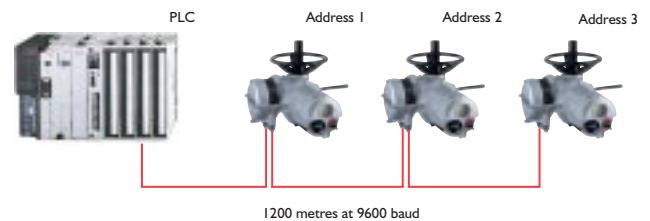
Foundation Fieldbus -

Promoted by the Fieldbus Foundation and popular in the USA
Used by DCS vendors such as Emerson and Honeywell



Profibus -

Promoted by the PNO and popular in Europe and Asia
Used by Siemens and Mitsubishi



What are the characteristics of an open system?

Published specifications in the public domain



- Multiple vendors for the hardware

Non-proprietary systems



- Users not tied to one supplier

Interoperability



- Equipment from different suppliers can co-exist on the same highway

Independent certification



- Open systems organisations provide certification facilities

What drawbacks exist with open systems networks?

Design



- Requires knowledge of chosen system
- Can involve more effort to achieve integration of multi-vendor products

Capability



- System capability may not meet expectations or desires

Field cable topology



- Restrictions in topology can lead to errors in design (e.g. Profibus does not tolerate spurs)

Fear of failure

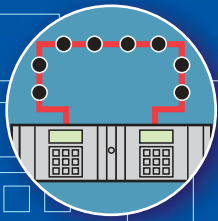


- Leads to purchases from one supplier, not taking advantage of multi-vendor products

No overall subcontractor responsibility



- Integrator has to take responsibility for performance of finished system



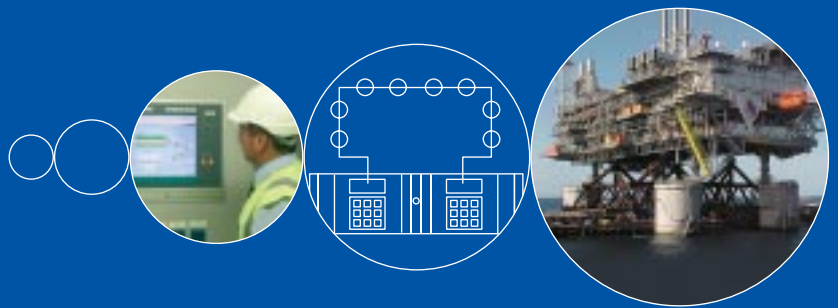
BUS Systems

Comparing the major BUS Systems

	Description	Pakscan	Foundation Fieldbus	Profibus
1	Highway Length (max)	20,000 mtrs (no repeaters needed)	1900 mtrs (without repeater) 9500 mtrs (with repeaters)	1200 metres (without repeaters) 6000 metres (with repeaters)
2	Number of nodes per highway	240 actuators max (The average node number on a Pakscan loop tends to be around 50)	Limited by number of function blocks required for each device & the function block capacity of the PLC gateway (The average node number tends to be around 10)	32 per segment (no repeater) 126 max per highway
3	Node command control and status feedback capability	Full digital and positional control plus full analogue and digital status feedback available from every actuator	Status is limited by the number of function blocks (DI,DO,AI & AO) and the capacity of PLC. Usually results in limited control capability and status information being available at PLC	Full digital and positional control plus full analogue and digital status feedback available from every actuator
4	Node/PLC Configuration	Simple to configure	Complex - requires specialist tools	Simple to configure
5	Number of gateways	One PLC Modbus gateway can collect data from all devices	One or more PLC gateways depending on number of nodes and information required from field devices	One PLC Profibus scanner can collect the data from all devices
6	Host Interface	Open - Modbus RS 485 Modbus TCP/IP (option)	Open - Foundation HI	Open - Profibus DP
7	Operator Interface (masterstation)	Standard - provides operator with a local indication of field diagnostics, gives full command capability and ability to programme devices on-line	Not Available	Not available

You need the right system for the right application

Senior Systems Integrator



	Description	Pakscan	Foundation Fieldbus	Profibus
8	Redundancy: Highway redundancy PLC redundancy Node redundancy	Standard Standard Not available	Not Available Not Available Not Available	Available Available Available
9	Topology	Simple Loop Master/Slave No limit on data collection	Complex Segments Master/Slave or Peer to Peer Limited number of function blocks per network segment which means loop topology can be complex to design	Simple trunk Master/Slave No limit on data collection
10	Terminations	Not required	Required - FF will not operate unless terminated	Required
11	System Scan Time	Fast - approx 200 msec - (estimate based on 10 nodes)	Slow - approx 1 sec - (estimate based on 10 nodes)	Fast - approx 10 msec at 1.5 Mbit/s
12	Command Execution Time (assuming 10 node system)	Exception protocol means commands are sent immediately to field device Command time is 40 ms at 2400 baud	Deterministic protocol means potentially slow response Can be 1 sec	Reasonably deterministic, though automatic retries can add to scan time. Fast - approx 10 msec at 1.5 Mbit/s
13	Test/configuration tools	Paktester recommended	Expensive test tools required to configure the devices	Must have a PLC to configure the system
14	Knowledge Base	Mature product - comprehensive reference list - extensive product knowledge	Specialist knowledge required - limited number of sites	Specialist knowledge, independent training available
15	Network Cable	Standard instrumentation cable	Special cable required	Special cable required



Asset Management

Good management of existing equipment is vital for every type of operation. That's why Rotork offers a full asset management programme – from an initial site survey through to a planned maintenance contract



Why do customers need asset management?

To reduce their costs

- Minimise long term costs
- No need to hold spares
- Reduce reactive breakdown costs

To increase their efficiency

- Prevention of downtime
- More accurate control of processes
- More reliable equipment
- Use correct actuators for every application

To manage their own labour better

- Reduce or redeploy labour
- No need to employ skilled labour for maintenance

To comply with legislation

- Prevent environmental impact from plant failure

Why should we focus on asset management with our customers?

We achieve closer contact with the end user

We become a partner, not just a supplier

We lock out competitors

We sell new units to replace obsolete actuators (Rotork and competitors)

We make money – from sales, service and parts

“ Rotork has looked after us very well, and we know they’ll always support us ”



key questions to ask your customers

Would you like us to
do a site survey?



Site Survey

- Inventory of all existing actuators - Rotork and others
- Identify obsolete products



Would you like us to
do a health check?



Health Check

- Open up each actuator and check condition
- Replacement of battery, O rings and external fasteners



Here is our report



Report

- Actuators on site (type, serial number, age)
- For each actuator, report on current condition, and on failed or worn parts
- Recommendations



Shall we replace
some actuators?

Replacement of Rotork or competitors' actuators

or

Shall we refurbish them?

Refurbishment of Rotork actuators to current specifications - and then give a one-year warranty



Shall we maintain
them regularly?

Contract

- Planned site surveys
- Regular maintenance programme



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