

Alderley

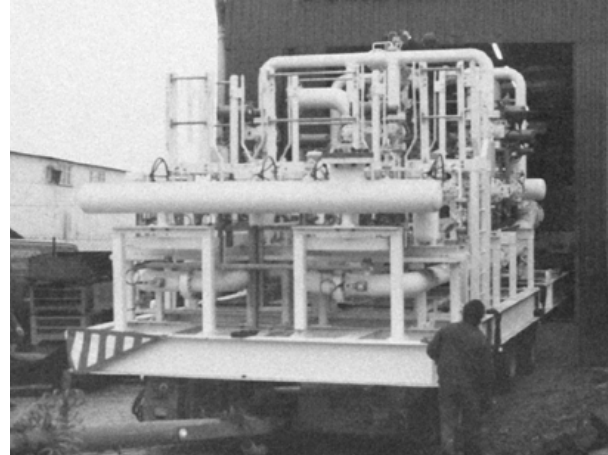
Technical excellence: delivered



Systems

Integrated solutions for the global energy industry

About Alderley



A leading provider of skid-mounted, integrated solutions for the global energy industry.

Since 1959, the companies that today make up Alderley™ have been at the forefront of providing expertly engineered and fully integrated solutions for the global energy industry.

Initially established to deliver innovative metering systems for the challenging North Sea environment, we now apply our vast experience and unrivalled technical capabilities across our entire range of skid-mounted solutions.

Repeatedly partnering with some of the biggest names in the industry, our solutions – including Metering, Produced Water Treatment, Wellhead Controls, Modular Wellsite Skids, Chemical Injection Systems, Surge Relief and Control Systems – have been installed in onshore, offshore and floating applications throughout the world.

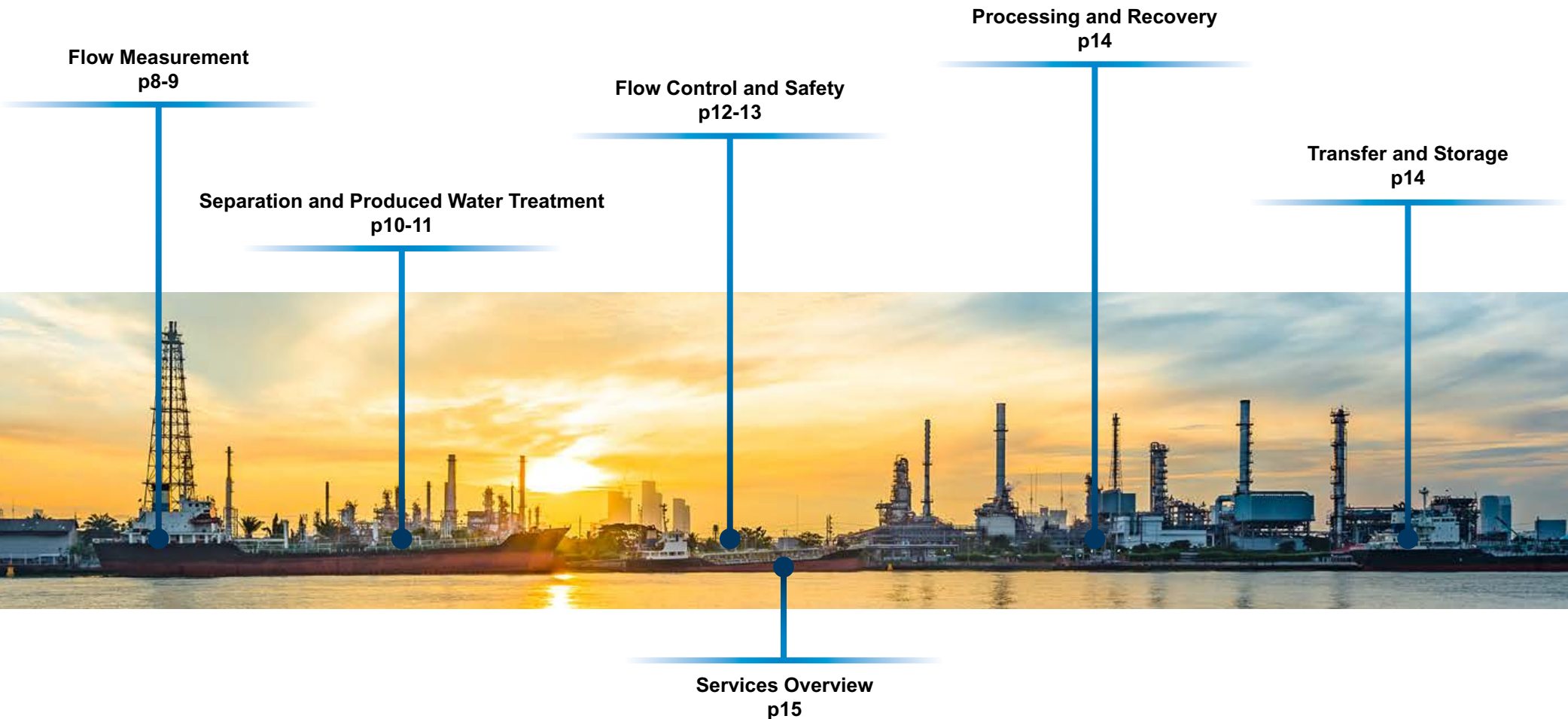
As a family business, our reputation is paramount; one founded upon family values, strong engineering roots, uncompromised quality, and technical and service excellence proven throughout our longstanding heritage.

With operations in the UK, United Arab Emirates and Kingdom of Saudi Arabia, our customers benefit from a local presence with the ability to leverage our global strengths.

We work closely with our customers to truly understand their needs. And as an independent systems integrator, we have the flexibility and capability to provide the right engineering solution: delivering the optimum fit, form and function at the lowest total cost of acquisition.

Overview Systems

Our multi-disciplined team of experts work with you to identify, configure and integrate any number of the following systems to deliver the right solution for your needs.



What We Do

Integrated Solutions

Whether customised or standardised, developed as a single skid or structured across multiple skids, an Alderley integrated solution always delivers the optimum fit, form and function.

High-integrity Pressure Protection System

Flow Control and Safety Solution (p12-13)

Chemical Injection System

Processing and Recovery Solution (p14)

Wellhead Shutdown System

Flow Control and Safety Solution (p12-13)

Emergency Shutdown System

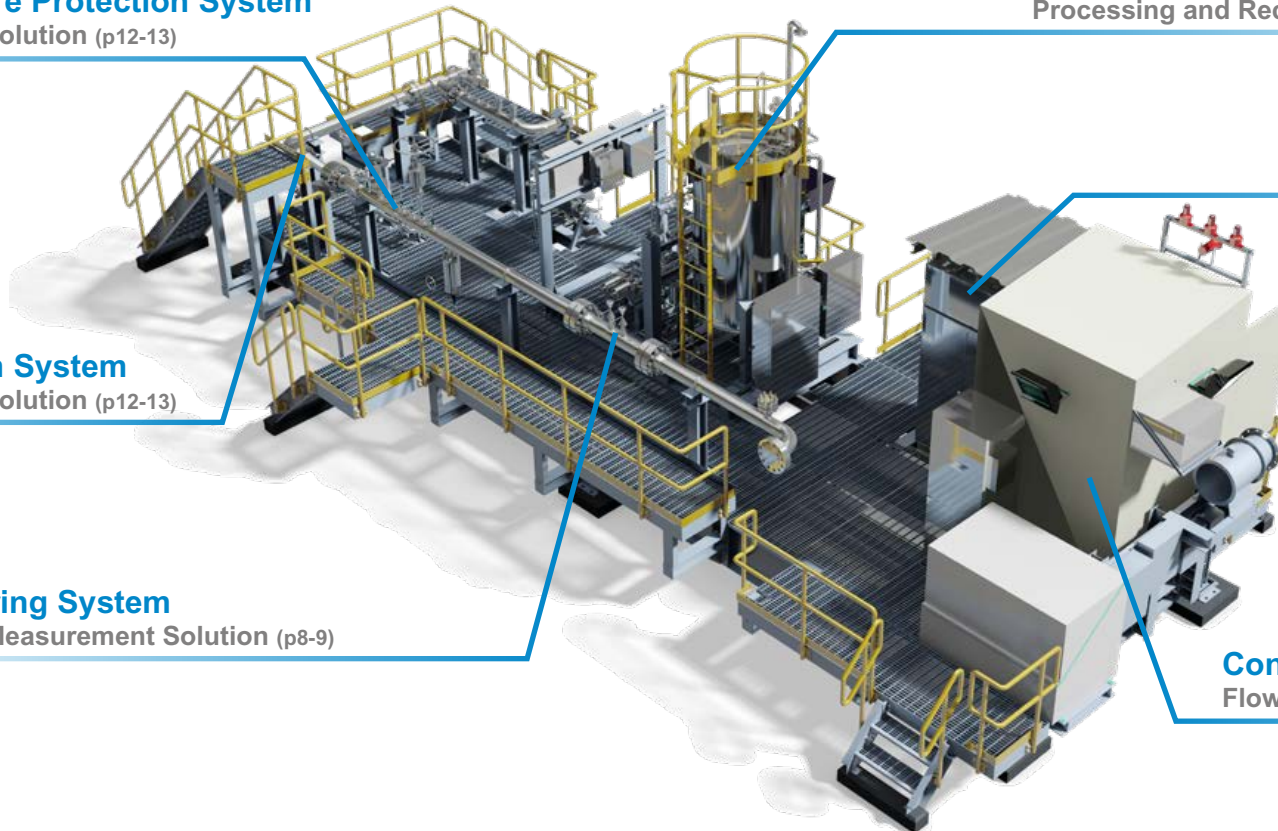
Flow Control and Safety Solution (p12-13)

Metering System

Flow Measurement Solution (p8-9)

Control and Communication System

Flow Control and Safety Solution (p12-13)



How We Do It

Technical Excellence: Delivered

As a family business, we pride ourselves on our quality, flexibility and customer service – always striving for technical excellence: delivered.

Technical excellence means using our engineering expertise to deliver the right solution: one that fulfils your operational requirements in terms of fit, form and function, whilst also meeting the commercial need to deliver the lowest total cost of acquisition.

Excellence from Concept to Delivery

From project inception, our engineering experts partner with you to help minimise costs and improve efficiency without ever compromising quality, safety and operational performance. And as an independent systems integrator, we can always advise and deliver the best-for-application / best-for-business solution, without bias towards a single system or OEM.

In-house Quality and Control

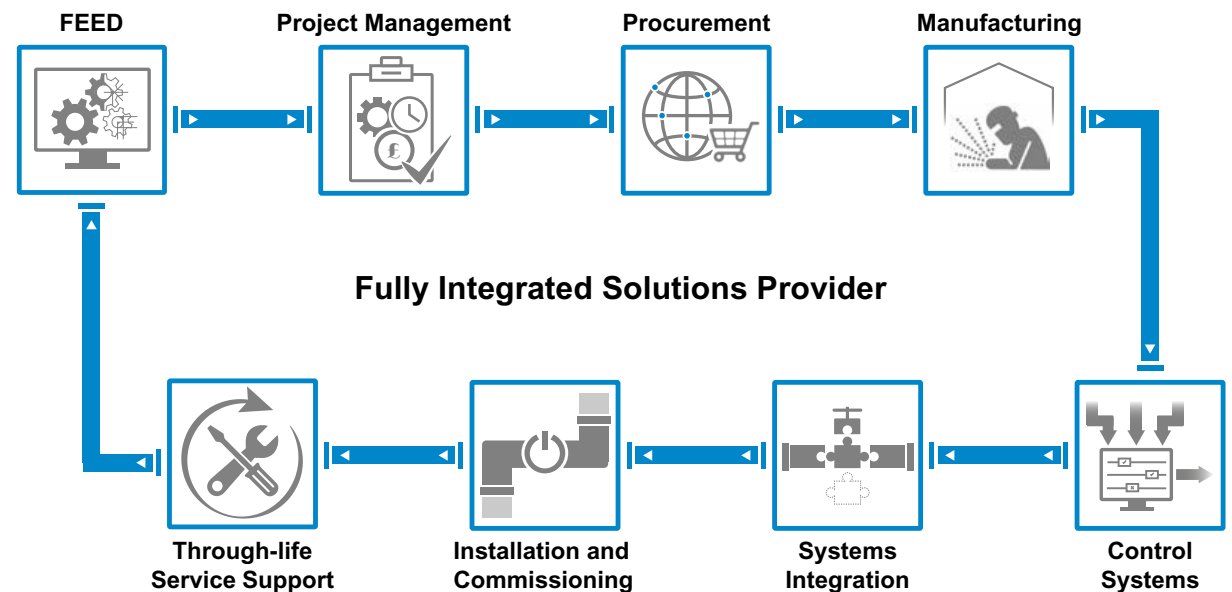
Fully integrated engineering facilities – encompassing project management, design, engineering, procurement, manufacturing and testing at each location – give us complete control over project execution and product quality from start to finish.

With all work conducted in-house, we have the flexibility and capability to customise any solution to meet your needs – including unique compact and multi-tier solutions for mobile and offshore applications, as well as options for flat-pack designs for assembly anywhere in the world.

Full Lifecycle Support

Upon completion, our technical experts can fully install and commission your assets to deliver a fast start-up and maximum efficiency. Furthermore, our dedicated Services team can provide 360° support to optimise performance throughout the life of your assets.

This intimately managed, full lifecycle approach ensures we always deliver the quality that has become synonymous with the Alderley name.



Global Experience

Since the late 1950s, Alderley have taken a fascinating and dynamic journey to become one of the leading engineering companies in the energy industry, having delivered over 750 systems worldwide.

Previously delivered solutions include:



Oil and Gas Metering | BP, Offshore, UK

Oil Metering System with 4 x 33% export streams. 12" ultrasonic meters with a 30" bi-directional prover and sample system. Gas Metering System with 2 x 100% export meter streams, 4" ultrasonic meters and one import meter stream.



Gas Metering | Technip France, FLNG, Australia

Cryogenic Export Metering Systems for propane and butane, plus an Export Metering System for condensate on FLNG. All packages utilise coriolis mass flow meters in 4 x 33% configuration with a parallel master meter stream.



LNG Metering | Ras Laffan LNG, Onshore, Qatar

4 x Cryogenic LNG Metering Systems utilising ultrasonic flow meter technology. Walk-in analyser shelter with gas sampling and chromatograph. Operating temperature -161°C.



Gas Metering | KOC / KNPC, Onshore, Kuwait

5 x Gas Metering Skids with stream sizes between 12" and 20", consisting of 4 duty streams, 1 spares stream and 1 check stream using ultrasonic flow meters. Also contains gas chromatograph, analyser shelter and control system.



Truck Loading Skids | Saudi Aramco, Onshore, Saudi Arabia

7 x Truck Loading Skids for liquid hydrocarbons consisting of PD meters, loading arms, connecting equipment and batch controllers, all to Aramco standards. Package also supplied with Metering Control Systems.



Surge Relief System | Saudi Aramco, Onshore, Saudi Arabia

Surge Relief System consisting of a high pressure surge system and a low pressure surge system, each with 5 streams. Replacement of 12 streams consisting of block valves, surge relief valves, piping and associated instruments.



Produced Water Treatment | BP / Aker Solutions, FPSO, Norway

A Produced Water Treatment package consisting of 2 x AP20 Deoiling Hydrocyclone vessels, 1 x Compact Flotation Unit and 2 x Oil Adsorption vessels for FPSO. The package is designed to reduce the oil-in-water content to 5 ppm downstream of adsorption media.



Gas Modular Wellsite Skids | Saudi Aramco, Onshore, Saudi Arabia

5 x Gas Modular Wellsite Skids along with Off-Plot Tie-in Facilities (OPTF) Skids and Annuli Riser Skids, and 15 x Oil Modular Wellsite Skids.



Produced Water Treatment | TOTAL / Saipem, FPSO, Angola

2 x Produced Water Treatment Systems and sand cleaning packages for FPSO. Each system comprises 2 x 50% 34" Alderley AP20 Deoiling Hydrocyclones, 2 x 50% 38" Alderley AP25 Desanding Hydrocyclones, 1 x Compact Flotation Unit and 1 x sand wash vessel.



Chemical Injection and Hydraulic Power Unit | OneSubsea / Pemex, Offshore, Mexico

1 x Hydrate Inhibitor Unit providing MEG (Ethylene Glycol) and MeOH (Methanol) via 2 x MEG Pump Skids, 2 x MeOH Pump Skids and 2 x Booster Pump Skids. 1 x Hydraulic Power Unit with separate reservoir skid.



Produced Water Treatment | Oman Oil Company, Onshore, Oman

A Degasser vessel, 2 x 100% progressive cavity pumps, 2 x solids filters, 2 x coalescing filters and a Compact Flotation Unit. The package is designed to reduce the oil-in-water content of the incoming fluid from 2,000 ppm to less than 30 ppm.



Wellhead Control Panel | Genesis Oil and Gas, Offshore, UK

Wellhead Control Panel housed within an enclosed AISI 316L stainless steel structure, supplied with electrical equipment suitable for use within a Zone 1, Gas Group IIA, and Temperature Class T3 environment. 1,200l supply reservoir. HP design pressure of 265barg.



Chemical Injection | Saudi Aramco, Onshore, Saudi Arabia

4 x Corrosion Inhibitor Skids with 2 x double diaphragm metering pumps and 2,800l atmospheric storage. The storage tank is a double-walled construction, and the Chemical Injection components are housed on a carbon steel skid base with integral drip tray.



Intervention and Workover Control System | Oceaneering, Offshore, UK

4 x 10ft Intervention and Workover Control Systems (IWOCs) HPU for a fixed production facility, including electrical equipment suitable for use within Zone 1, IIB T3 environment. Designed to DNV2.7-1 and BS EN 12079.

Solutions

Flow Measurement

Gas, Liquid, Oil, Petrochemical and LNG Metering

- Fiscal Metering
- Custody Transfer Metering
- Allocation Metering
- Provers
- Sampling and Analysis Systems
- Control and Supervisory Systems

Whether gas, liquid or LNG – our intimate knowledge of flow measurement solutions helps you achieve your operational, financial, contractual and regulatory commitments.



Gas, Liquid and LNG Metering

Ensuring continued flow measurement system performance is of paramount importance.

As an independent systems integrator with more than 60 years of experience in delivering highly reliable Metering Systems, our engineers are best placed to meet your hydrocarbon gas, liquid, petrochemical or LNG flow measurement requirements.

Fully versed in all relevant international standards and metering technologies – including ultrasonic, orifice, turbine, Venturi, coriolis and PD meters – you can be assured that an Alderley flow measurement solution is a best-for-application and best-for-business solution.



Previously delivered solutions include:

- Custody transfer and fiscal Gas Metering Systems including hydrogen and helium
- Cryogenic LNG Metering System with an operating temperature of -162°C
- Heavy fuel oil, crude and condensate Metering
- Asphalt Loading and Metering System with an operating temperature of $+260^{\circ}\text{C}$
- Metering of petrochemicals and hazardous substances including BTEX
- Unique compact and multi-tier solutions for offshore and FPSO applications



Meter Proving

Our metering experts have extensive knowledge in all types of proving solutions, including bi-directional ball provers, small volume provers, master metering, water draw calibration systems and mobile provers.

These can be supplied as a standalone system or integrated as part of a wider flow measurement solution.



Sampling and Analysis

High-accuracy gas flow metering needs representative product quality measurement. Therefore, there is often a requirement to integrate real-time measurement of density, chromatographic composition, Wobbe index, calorific value, dewpoint and sulphur into a Gas Metering Package with associated pressure reduction, filtration and gas conditioning systems.

For liquid applications our capabilities include fast-loop sampling, liquid density and viscosity measurement, water-cut analysis, Reid Vapor Pressure (RVP) analysers and Liquefied Petroleum Gas (LPG) chromatographs.



Control and Supervisory Systems

With vast experience in all types of Metering Control Systems – from simple, standalone flow computers to sophisticated panels incorporating dual redundancy – Alderley's dedicated Control Systems engineering team has successfully designed, manufactured, tested and delivered hundreds of Control Systems.

We work with all major flow computer suppliers, including Omni and Emerson. But our independence and technical abilities mean that we can design and deliver the metering control solution that best meets your individual needs.

Solutions

Separation and Produced Water Treatment

Primary, Secondary and Tertiary Produced Water Treatment

- 2- and 3-Phase Separators
- Desanding / Deoiling Hydrocyclones
- Compact Flotation Units (CFU)
- Induced Gas Flotation (IGF)
- Degassers
- Guard Filters
- Adsorption Filters
- Coalescing
- Nutshell Filters
- Media Filters

Enhance your operational efficiency and protect the environment. Our solutions remove the hydrocarbon from the by-products to ensure you only transport what you need to, whilst cleansing the produced water and sands prior to return.



Separation and Primary Produced Water Treatment Solutions

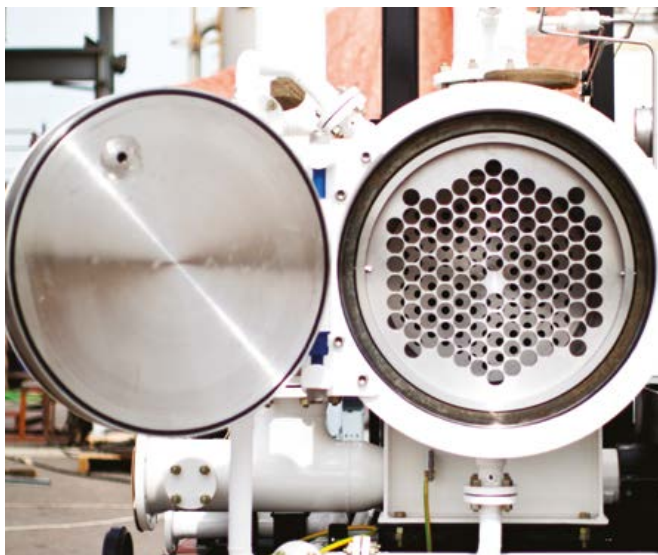
For the effective separation of gas/liquid or gas/oil/liquid, our 2- and 3-Phase Separators are designed and built to meet your processing requirements as well as the latest international standards.

To achieve liquid/liquid separation, our compact AP20 Deoiling Hydrocyclones provide a proven, efficient and highly erosion resistant solution to cleanse the produced water at a primary stage.

Solids and Sand Removal

To protect your downstream instruments without compromising efficiency, we can supply online Wellhead Desanding Packages that remove solids from multi-phase well fluids, including gas, water and oil.

All our Desanding Hydrocyclones can operate in high pressure, highly erosive wellhead conditions, and can be incorporated into specialist applications such as under-balanced drilling.



Secondary Produced Water Treatment Solutions

Using Computational Fluid Dynamics (CFD), our engineers can advise and design systems that minimise equipment footprint whilst maximising efficiency and performance.

By reintroducing bubbles of gas into the produced water, our two- and four-cell Induced Gas Flotation (IGF) Separators and our Degassers (liberating dissolved gas from the produced water) facilitate the removal of solids and oil droplets. Adhering to the gas bubbles, the particles are transported to the surface of the vessel where they can be skimmed off.

Chemicals may also be added to further improve the adherence of particles and help break down emulsions (see Chemical Injection Systems, p14).

For significant process performance on a minimal footprint, our Compact Flotation Units (CFUs) employ the proprietary Alderley diffuser swirl device to form a 'soft spin' cyclone. This creates the optimum gas bubble size and distribution for maximum oil recovery.

Tertiary Produced Water Treatment Solutions

Used as either a pretreatment to coalescing technologies or as a guard filter to protect downstream instrumentation, our solids filtration cartridges can remove solids to less than 2µm.

Advanced adsorption filtration technology can further reduce free and dissolved hydrocarbons to less than 5mg/l. Available in either bulk granular form or as a cartridge-based system (depending on the application requirements), this system can also effectively remove hydrocarbons such as BTEX (Benzene, Toulene, Ethylbenzene and Xylene) to meet the latest 'Risk-Based Approach' recommendation from OSPAR.

With the capability of delivering oil reduction to 2-5mg/l and 90% solids removal to 2µm, our nutshell and media filters help to remove the final free oil and suspended solids in your produced water.



Solutions

Flow Control and Safety

- Modular Wellsite Skids
- Surge Relief Systems
- Electrical Control Panels
- Hydraulic Power Units and Control Systems
- Wellhead Control Panels
- Emergency Shutdown Systems

From wellhead to point of sale: electrical and hydraulic control and safety systems are essential for the ongoing efficiency and safety of your operations.

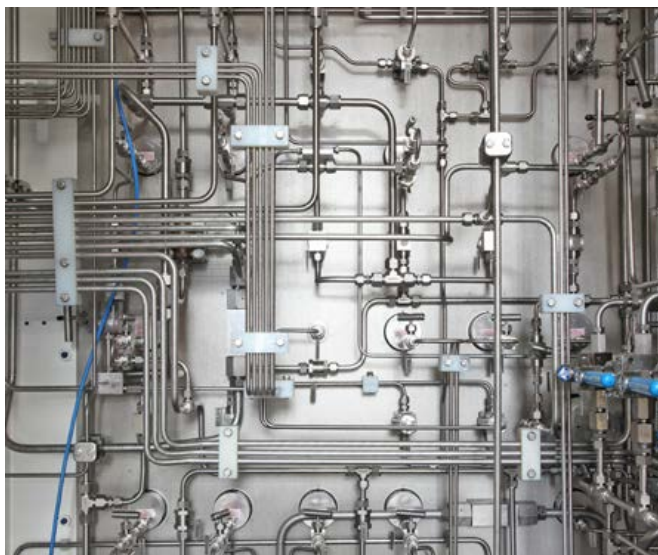


Oil and Gas Modular Wellsite Skids

Our Oil and Gas Modular Wellsite Skids contain a complete wellsite control and safety process system, all integrated onto a single skid. This provides a fully tested, ready-to-operate and easily transportable module to support a prompt installation and fast start-up.

Our Oil and Gas Modular Wellsite Skids typically include:

- Wellhead Control Panel with integrated PLC to supply hydraulic power directly to the wellhead / tree valves
- High-integrity Pressure Protection Systems to protect downstream equipment, operators and the environment
- Chemical Injection System(s) to inject a corrosion inhibitor into the pipeline and prevent hydrate formation
- Flow meter and associated sampling and analysis systems
- Fully integrated controls, communication systems and / or remote terminal unit (RTU) for offsite control
- All associated electronics, pipework, storage tanks, Safety Instrumented Systems (including to SIL2 or SIL3 as required) and process valves



Wellhead Control Panels and Hydraulic Control Systems

Performing a safety critical function on manned and unmanned platforms, our Wellhead Control Panels (WHCPs) are designed for monitoring, controlling and shutdown of various subsurface and surface valves – including Choke, ESD and HIPPS – to ensure safe operation.

With high working pressures up to 1,379barg / 20,000psig, our Hydraulic Power Units (HPUs) are designed to provide high and low pressure filtered hydraulic fluid to topside and subsea control valves. In the event of a loss of power, stored volume is provided via accumulators to ensure safe and effective operation.

Our other Hydraulic Control Systems include:

- Intervention and Workover Control Systems (IWOCs)
- Topside Umbilical Termination Units (TUTUs)
- Testing and Flushing Hydraulic Power Units (TFHPUs)
- Pressurised Control Cabins (PCCs)



Safety Systems

Emergency Shutdown Systems (ESD) offer an essential layer of protection in the event of an emergency, seamlessly shutting down processes in a structured and reliable manner to protect your people, equipment and the environment.

Designed in accordance with IEC 61508 and IEC 61511, our High-integrity Pressure Protection Systems (HIPPS) prevent the over-pressurisation of pipelines and downstream plants. Employed in high pressure processes, HIPPS will close dedicated shut-off valves if the pressure exceeds the defined system parameters.

Used on a range of applications, including pipelines, storage terminals, and marine loading and offloading, our Surge Relief Systems respond quickly, yet smoothly in the event of an emergency to release excess pressure into a dedicated safety outlet.



Electrical Controls and Interface Management

As a key component of our system integration capabilities, we design and build full human machine interfaces (HMI) to ensure effective operation. This includes the design and manufacture of an extensive range of Electrical Control Panels for use in zones 0/1/2 and non-hazardous areas, as well as to industry standards such as ATEX, IECEx, NORSOK and NEC as required.

Typical Control Panels include Programmable Logic Controllers (PLC), Master Control Systems (MCS), Motor Control Centres (MCC), consoles, control desks and distribution panels.

Solutions

Processing and Recovery

Protect your assets and improve performance with solutions to support contaminant removal, enhanced recovery techniques and hydrocarbon conditioning.

Chemical Injection Systems

Delivering a highly accurate and repeatable dosage, our Chemical Injection Systems can introduce a wide range of chemicals either at a fixed pressure or to a required flow rate with closed loop feedback.

Systems can be provided as a standalone solution or integrated as part of a wider processing solution, for example hydrate inhibitor injection on a Modular Wellsite Skid (see p12-13), or contaminant removal to

support Produced Water Treatment (see p10-11).

Key features typically include:

- Accurate dosing rates from $<0.01\text{l/min}$ to $>400\text{l/min}$
- Integral autonomous PLC or interfaced to platform MCS
- Integral autonomous MCC or interfaced to platform MCC
- Integral or standalone tanks, sized to suit application
- HVAC Systems available for high and low ambient temperature environments



Transfer and Storage

Whether internal or to third parties, be certain about your custody transfer processes. Our solutions help maximise process efficiency whilst ensuring accuracy.

Truck Loading and Unloading Skids

Ensuring reliable, accurate and seamless transfer of your hydrocarbons is of paramount importance. That is why our Loading and Unloading Skids are tailored specifically to your needs, whilst incorporating over 60 years of metering system experience.

Custody Transfer Flow Measurement Solutions, see pages 8 and 9 for more information.



Alderley Services

Training

- Benefit from the Alderley experience; optimise safety and performance
- On-site, in the classroom, or both with Virtual Reality
 - Specialists in Flow Measurement, Produced Water Treatment and Modular Wellsite Skids training

Installation and Commissioning

Expertly commissioned equipment – whether supplied by Alderley or another provider

Parts and Spares Management

Minimise costs and reduce downtime through a simplified supply chain

- Just-in-time spares management or a single source for reactive parts
- Obsolescence mitigation through inventory storage / sourcing alternative components

Maintenance and Life of Field

Ensure your operations continue to perform efficiently and compliantly

- Dedicated Services team with flexible arrangements, including guaranteed call-out times
- Preventative and corrective maintenance routines

Healthcare, Inspection and Audit

Ensure the ongoing integrity, performance and safety of your assets

- Condition Based Monitoring utilising Dynamic Uncertainty and remote diagnostic services
- Flow measurement calibration and certification, consultancy, audits and uncertainty calculations

Upgrades and Obsolescence Management

Proactively manage your risks from system failure and obsolescence

- Site surveys including full health and criticality assessments of your assets
- Brownfield metering and process system upgrades, including control and interface management systems

Visit www.alderley.com/Services for more information.

Alderley

Technical excellence: delivered



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