Produced Water Treatment
Providing clear solutions with innovative design
A world of experience
Worldwide experience in delivering the solution you need on time and on budget

At Alderley, we have a long experience in the management and processing of produced water, together with handling some of the more difficult applications. We can offer you advice and guidance through a range of services and technologies to ensure you meet production and produced water treatment goals.

We provide the complete solution, from stand-alone to fully integrated, skid mounted produced water treatment systems covering Primary, Secondary and Tertiary Treatment processes.

Installation and delivery is implemented in-house, including all design, project management, engineering, procurement, construction, installation and commissioning.

- Vast experience in offshore, onshore and FPSO applications
- Highly efficient and compact solutions
- Guaranteed to meet your compliance levels
- Full range of solutions covering all areas of the produced water treatment process
- Extensive knowledge and experience in standards and technologies

Extensive global reference lists are available covering all technologies and applications to demonstrate our capability and delivery. Please see below for examples of just a few of the projects we have delivered.

Customer/Contractor:
TOTAL/Saipem

Project:
Kaombo FPSO Project, Angola

Description:
Two identical produced water treatment systems and sand cleaning packages. The two systems each process 170,000 bwpd and comprise 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. The complete system is designed to meet the local oil-in-water discharge levels of <20mg/l and 0.5% by weight for oil on sand.

Customer/Contractor:
BP/Aker Solutions

Project:
Skarv FPSO Project, Norwegian Sea

Description:
A produced water treatment package consisting of 2 x AP20 deoiling hydrocyclone vessels, 1 x compact flotation unit and 2 x oil adsorption vessels. The target outlet oil-in-water concentration is 5 ppm downstream of adsorption media. All vessels were manufactured from duplex stainless steel.
Customer/Contractor: Murphy Sabah Oil Co. Ltd

Project: Kikeh FPSO, Malaysia

Description: 2 x AP20 deoiling hydrocyclones designed to treat 151,000 bwpd to meet the discharge requirement of 20 ppm oil-in-water. Vessels were manufactured from carbon steel with glass flake lining.

Customer/Contractor: Oman Oil Company Exploration & Production LLC

Project: Abu Tubul Block 60 - GPP Project, Oman

Description: A degasser vessel, 2 x 100% progressive cavity pumps, 2 x solids filters, 2 x coalescing filters and a compact flotation unit, all of which are skid mounted and suitable for working in the harsh desert environment. The package reduced the oil-in-water content of the incoming fluid from 2000 ppm to less than 30 ppm.

Customer/Contractor: AIOC (operated by BP Exploration) Halliburton International Inc

Project: Azeri, Chirag, Deepwater Gunashli (ACG) Phase 3 - DUQ platform, Azerbaijan

Description: Produced water treatment module comprising 5 x AP20 deoiling hydrocyclone vessels, 3 x AP50 desanding hydrocyclone vessels and 1 x degasser vessel. The package outlet specification is 29 mg/l oil-in-water and 98% removal of sand particles above 50 μm.
Primary Treatment
Solutions to meet the most stringent produced water requirements

However stringent your produced water treatment requirements, we can design and supply a system that meets your needs and surpasses environmental constraints, while maximising the income from the oil/gas field assets.

The challenges of ever more stringent water discharge specification levels to meet the tighter re-injection requirements and lower environmental limits on discharge, can have a significant effect on the hydrocarbon process train; together with a detriment to the environment if it is discharged prior to suitable processing. No single piece of equipment can tackle the complex process of treating produced water to meet increasingly stringent regulations for discharge or re-use.

Sand Cleaning and Sand Management

Alderley’s range of sand jetting and sand fluidiser devices enables the efficient removal of sand and solids from horizontal and vertical process vessels. Using a jetting water supply, often recycled produced water, the sand and solids are removed from the vessel without interrupting production. The resulting slurry is then diluted and pumped using eductors to the bagging or cleaning package.

Our sand cleaning packages remove surface oil by attrition, and dewater the solids for either direct discharge into the environment, or into a solids bagging unit. Guaranteed levels of oil on solids and water concentration can thus be achieved.

Our integrated sand management process ensures that while the footprint is minimised, performance is maximised.

Desanding Hydrocyclones

A desanding hydrocyclone uses the rapid increase in rotational velocity to create centrifugal acceleration of the fluid. This forces the solids towards the outside of the hydrocyclone liner, before they are dropped into the vessel, where they are accumulated.

Solids that have been separated by the desanding cyclone are accumulated in either an integral sand accumulator section or a separate accumulator vessel for higher pressure systems. Discharge of solids from the accumulator can be manual or automatic to suit your application needs.
Whether you are removing solids from wellhead production fluids to protect downstream equipment or treating produced water for discharge or re-injection, our desanding hydrocyclones use the latest technology to meet the most diverse of requirements.

Throughput, pressure drop, reliability and the efficiency of solids removal are all important factors when specifying a hydrocyclone. Alderley’s desanding hydrocyclones are designed to tolerate higher pressure drops and pass higher flow rates to bring highly efficient solids removal – all in the most compact of vessels.

- High efficiency design
- High online turndown (>5:1)
- Compact vessel ideal for offshore applications
- High purity alumina ceramic and silicon carbide liners giving high erosion resistance
- Individually removable liners or cartridge design
- Continuous or batch sand removal
- Easy integration with solids clean-up and disposal systems
- Low maintenance

Deoiling Hydrocyclones

Produced water is channelled into the hydrocyclone head tangentially to the wall. The multiple tangential inlet design combined with a tapering internal geometry creates an accelerating vortex in the fluid as it flows through the liner. Because of the difference in density between the oil and water, the induced centrifugal force pushes the oil into a central core. Careful differential pressure control is used to remove the oily core in a countercurrent flow.

- Low investment and running costs
- Ideal for retrofitting/upgrading existing produced water treatment systems
- Compact and efficient
- High turndown
- High erosion resistance
- Low fouling
Secondary Treatment

Efficient complementary technologies to further reduce oil-in-water levels

At Alderley we have vast experience in complete produced water treatment solutions to meet even the most demanding requirements.

Secondary treatment conditions produced water and solids in preparation for discharge or further polishing. Hydrocyclones provide excellent removal of sand and free oil-in-water, but the latest stringent regulations often require complementary technologies to reduce the levels of oil and other contaminants further.

Alderley’s flotation based technologies may also be used at the primary stage of treatment, where low pressure drop combined with efficient oil removal is required.

Induced Gas Flotation (IGF)

Alderley provide two and four cell IGF systems to meet the performance requirements of your application. The IGF works by recycling gas bubbles into the produced water. These bubbles adhere to solids and oil within the produced water and cause them to float to the top of the vessel where they are skimmed off.

The IGF vessels operate a controlled residence time system for each cell to maximise the efficiency of the system.

Chemicals may also be added to the system to improve the adherence of particles and break down emulsions. We will advise on the necessity for the use of chemicals as part of our detailed design service to you.

Degassers

Alderley can design and supply a degasser to fit your process requirements and needs. Produced water degassers are typically operated at close to atmospheric pressure. As the produced water enters the ‘degasser’ the dissolved gas is liberated, resulting in millions of tiny gas bubbles that adhere to residual oil droplets and ensures maximum hydrocarbon recovery.
Compact Flotation Units (CFU)

Alderley’s CFU utilises our proprietary diffuser swirl device, resulting in a ‘soft spin’ cyclone with the optimum gas bubble size and distribution within the CFU.

Our design has been optimised to maximise oil recovery while minimising the use of flotation gas. Using our multi-step pressure drop inlet we maximise efficiency while reducing chemical usage.

Computational Fluid Dynamics (CFD)

Alderley can undertake CFD studies. The objective is to optimise the effectiveness of separation technologies with respect to oil removal from produced water.

These services are utilised for both minimising equipment footprint while maximising efficiency, together with assessing existing process performance and providing brownfield upgrades.
Tertiary Treatment
Where stringent standards are required for re-injection or environmental discharge

Alderley can provide a wide range of tertiary or polishing technologies, including adsorption, coalescing, solids filtration and nutshell filters. Each of these technologies are chosen and combined, if appropriate, to deliver the best performance to meet the clients’ discharge specification.

These tertiary technologies typically reduce free and dissolved hydrocarbons to less than 5 mg/l and solids to 2 μm. Additional technologies can be added as required to further reduce the biochemical oxygen demand (BOD), chemical oxygen demand (COD) and other constituent components to deliver a complete produced water treatment solution.

Alderley can provide a range of tertiary separation processes along with project management and customer support to deliver a fully integrated package on time and on budget.

Adsorption Filters
Our advanced adsorption technology can reduce free hydrocarbons and dissolved hydrocarbons to less than 5 mg/l.

Hydrocarbons such as BTEX (Benzene, Toluene, Ethyl Benzene and Xylene) can be effectively removed to meet the latest “Risk Based Approach” recommendation to operators by OPSAR to further reduce emissions that pose a risk to the environment.

Depending on the process requirements, our adsorption technology can be delivered in bulk granular form or as a cartridge-based system.
Coalescing

Based around a range of both cartridge and proprietary designs, our coalescing technologies are used to maximise and enhance the performance of our other separation equipment, or as the final polishing stage for oil removal.

Solids Filtration

Used either as a pre-treatment to our coalescing technologies or as a standalone guard filter to protect downstream equipment, Alderley can deliver very efficient solids removal to less than 2 μm absolute filtration in a range of filter cartridge designs, sizes and materials. Cartridges can be individually removable from the housing or can be assembled as a bundled cassette design.

Nutshell Filters

Alderley’s range of polishing filters using nutshell media are typically used onshore to remove the final free oil and suspended solids entrained in the produced water.

Our superior design of media management minimises backwash duration and media attrition typically caused by other mechanical backwash systems.

Nutshell filters have the capability to deliver oil and solids reduction to less than 2-5 mg/l and 90% solids removal to 2 μm.

Delivering the best performance to meet the clients’ discharge specification.
Services
Focusing on through-life support care for our customers

From project execution, installation and commissioning to through-life support care, our service packages can be tailored to your exact requirements. We have decades of experience and a total focus on the oil and gas industry – so you can rest assured that you will be dealing with people who fully understand your application, process and the challenges that you face.

Our commitment to our customers and to the oil and gas industry is absolute. We are always happy to discuss specific requirements and advise on the best support package for you. We have invested in the facilities and people to bring the services you need closer to you.

Installation and Commissioning
In the early stages of your system’s life, we want to ensure you get everything you need to meet project timelines and site needs. Along with providing support for installation and commissioning, Alderley also provide Factory Acceptance Testing (FAT) at our manufacturing locations or Site Acceptance Tests (SAT) on-site across all our product offerings.

Brownfield Upgrades and Modifications
Through our team of multi-disciplined, experienced engineers, Alderley can provide solutions for all brownfield modifications and upgrades across all our product offerings. Our integrated solutions look to maximise performance from existing assets and extend the life of production facilities.

Spares Management
Through planned maintenance schedules, management of spares, repair services and obsolescence support, we help customers plan their Operational Expenditure (OPEX) as well as assist in reducing costs associated with downtime and carrying excess inventory.

Alderley have the technical expertise and capability to establish fit, form or function alternatives if the situation arises.
As part of our Spares Management we offer:

- Genuine article products ensuring your equipment stays within specification
- Start-up spares, operational spares, insurance spares
- Process guarantee to meet stringent regulations for discharge or re-use

Produced Water Treatment Training

Alderley’s training programmes offer best in class courses that can meet the needs of your staff, whether training for a specific project or piece of equipment, or providing an in-depth knowledge of available technologies. Courses can be held at any of Alderley’s facilities or on-site.

Care and Maintenance

Understanding that it is more efficient to prevent a problem than to repair it once it has happened, Alderley’s customer care ensures that you get the maximum value from your assets.

All customer care contracts are as bespoke as our applications, but can typically include a guaranteed call out time, telephone support, periodic system health checks, off-site software backups and electrical and instrumentation site audits.

Process System Review

Alderley can offer a wide range of services to review current process conditions against original delivery process design data and make recommendations to upgrade, modify or even add to existing process treatments. Typical process systems and equipment covered by these services can include:

- Separator upgrades
- Coalescing systems
- Online sand jetting internals
- Hydrocyclone and flotation unit upgrades
- Sand cleaning systems and sand collection units
- Retrofit hydrocyclones and filter cartridges

When you choose Alderley as your project partner we will stay with you every step of the way.