



Treatment of oily water

Nutshell filters have long been a trusted solution for treating oily water in oil and gas processing. These filters utilise multi-grade nutshell media, typically walnut or pecan shells, which offer a vast surface area for efficient oil absorption.

As produced water flows through the filter, the nutshell media effectively captures and retains large amounts of oil. A daily backwash cycle then flushes the filter bed, stripping away oil and solids to restore the media's effectiveness and ensure consistent performance.

Challenges in pumping

The performance of nutshell filters depends on the design and operation of pumps that keep oil suspended in produced water as it moves through the system and those that circulate the nutshell fibrous media without causing damage.

This requires specialised low-shear pumps that prevent oil and water emulsification while maintaining the necessary flow rates for high processing volumes. Additionally, Variable Speed Drives (VSDs) provide precise control over pump operation, which is crucial for handling slurries with varying particle sizes and concentrations. By enabling real-time adjustments, VSDs help maintain optimal efficiency, ensuring pumps operate as close as possible to their Best Efficiency Point (BEP). This extends the life of seals and bearings while minimising volute erosion and impeller wear from abrasive particles.

Seal plans vary based on application requirements, with common choices including Plan 13, which recirculates product from the seal chamber back to pump suction, and Plan 32, which injects clean or cool liquid from an external source into the seal chamber for enhanced performance.

Material selection is project-specific, ranging from carbon steel to stainless steel, duplex, and super-duplex alloys to

ensure corrosion resistance in sour environments and durability under demanding conditions.

Additionally, pumps must meet strict safety standards due to potentially explosive environments. Most are ATEX-certified for Zone 1, 2, or 3 or, increasingly, IECEx-certified to ensure compliance with the latest industry regulations.

Speed and reliability

In the fast-paced oil and gas sector, meeting strict project timelines is essential. Pumps must be designed, manufactured, and delivered on schedule to integrate seamlessly into the overall system's skid design.

Compact and reliable pump and seal support systems are critical for quick and easy installation, especially in space constrained environments.

Proven track record

Amarinth has earned a reputation as the preferred provider of pumps for nutshell filter applications. Through close collaboration with leading produced water treatment package providers and engineering firms, the company develops bespoke, high performance solutions tailored to market needs.

With unmatched agility, Amarithh consistently meets the industry's demanding lead times, delivering reliable, efficient, and safety-focused pumping solutions for oily water treatment.

Today, Amarithh pumps are trusted by leading oil and gas processing facilities worldwide, resulting in repeat business and referrals for new projects.



For decades, Amarithh has been at the forefront of delivering high performance pumping solutions to oil and gas operators tackling complex offshore and onshore challenges worldwide.

The company has played a pivotal role in greenfield exploration, supplying bespoke pumps for new production rigs and Floating Production Storage and Offloading (FPSO) vessels, and supporting brownfield sites looking to boost output, extend asset life, and upgrade aging or obsolete pumping systems cost-effectively.

A key area of Amarithh's pump expertise lies in produced water treatment using nutshell filters, an established method in oil and gas processing. These filters use multi-grade nutshell media, typically walnut or pecan shells, to efficiently capture oil. The effectiveness of this process depends on precision engineered pumps that deliver produced water at optimal flow rates, preventing oil and water emulsification.

With an agile, customer-centric approach, Amarithh has forged strong partnerships with leading produced water treatment providers and engineering firms. The company consistently meets demanding lead times, delivering robust, tailored solutions that enhance efficiency, reliability, and safety in produced water treatment.

Through selected case studies, Amarithh showcases its success in supplying pumping solutions for nutshell filter projects, helping operators achieve their performance and operational targets.

Marjan Oil Field, Saudi Arabia

Marjan oil field expansion

The Marjan oil and gas field, located in the Arabian Gulf off the eastern coast of Saudi Arabia, is undergoing one of the most complex and ambitious expansions in decades.

As part of Saudi Aramco's commitment to boost production, the Marjan project aims to increase the field's capacity by 300,000 barrels per day (bpd), reaching a total output of 800,000 bpd of Arabian Medium crude oil by 2025. This monumental undertaking involves extensive offshore construction, installation of the largest platforms, laying of long subsea cables, and development of intricate subsea pipeline networks.



Effective produced water treatment

A critical aspect of this expansion was the treatment of produced water - water that comes out of the well alongside the oil. Removing oil from produced water is essential for both environmental protection and efficient field operation. Nutshell filters were selected to perform this vital task, separating oil from the water to meet environmental regulations. However, the complexity of the project posed a significant challenge, as none of Aramco's existing vendors could deliver a viable solution for the demanding conditions at Marjan.

Innovative collaboration to solve the problem

To address this challenge, AES Arabia Ltd., a leader in water and wastewater treatment systems, partnered with Peter Gould of PGIL, a consultancy specialist in the oil and gas industry. Peter Gould, having previously worked with Amarith, knew of Amarith's reputation for providing innovative and reliable pumping solutions for some of the world's most demanding oil and gas projects.

Bespoke pump solution

Amarith was commissioned to design and manufacture three bespoke low-shear pumps specifically for the nutshell filter separators. These pumps were equipped with variable speed drives to carefully regulate the flow of produced water into the filters, helping to prevent the emulsification of oil and water. Emulsification could significantly impair the efficiency of the nutshell filtration process, so precise flow control alongside innovative pump design was critical to ensuring optimal performance.

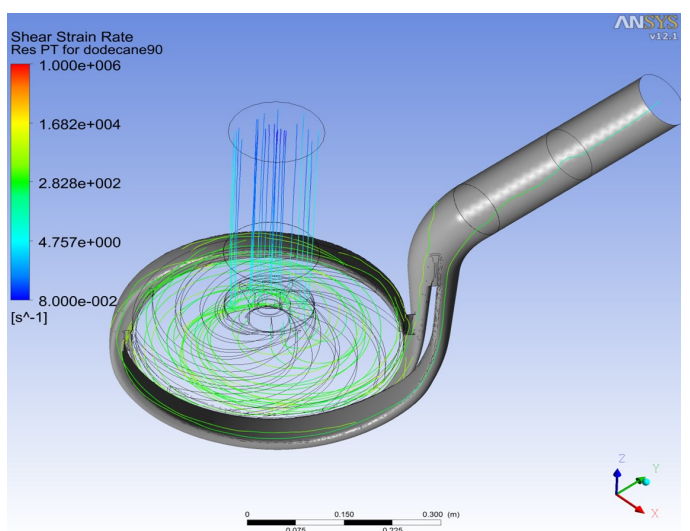
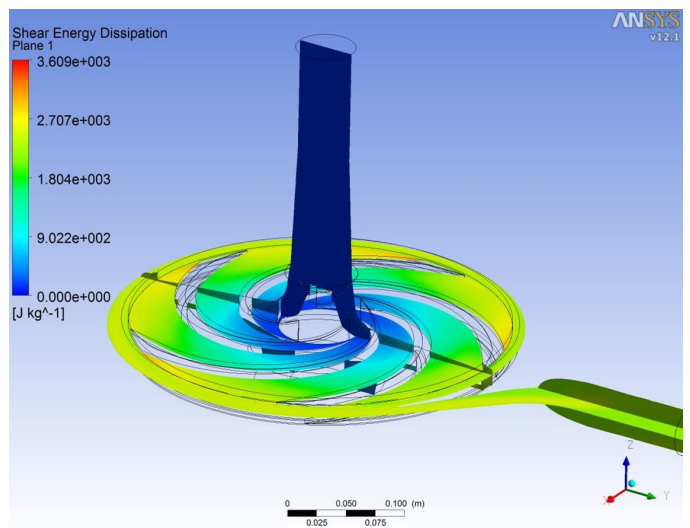
The original specification from AES Arabia called for a Plan 32 seal system to handle particulates in the pumped fluid. However, during the design phase, it was found that the pressure in the pumps was too high for a Plan 32 seal system.

Amarith therefore proposed a Plan 13 seal system, which could handle the high pressure and the particulates while providing continuous flow of clean process fluid to the seal faces. This ensured smooth operation and reduced the risk of potential failures in the harsh offshore environment.

Successful installation and operation

The bespoke pumps were successfully installed and rigorously tested to meet the stringent operational requirements of the Marjan oil field's nutshell filtration system.

The pumps have now been integrated into the water treatment process, providing reliable performance and helping Aramco meet the environmental and operational demands of this landmark project.



Sasol's Natural Gas Development, Mozambique

Sasol's gas development in Mozambique

Sasol, a global leader in chemicals and energy, has been operating natural gas blocks in Mozambique's Inhambane province since 2006. A recent expansion of these gas blocks is set to support key infrastructure developments, including the 450MW Central Térmica de Temane Power Plant and a new facility for liquefied petroleum gas (LPG) production. A critical element of this development is the construction of a light oil, gas, and LPG processing facility, where separating oil from produced water using nutshell filters is a crucial requirement.

Finding a pump solution for the nutshell filters

Arabian Industries, a renowned EPC company based in Oman, was contracted to deliver a skid package of nutshell filters to efficiently remove oil from the produced water. However, they initially struggled to find a pump supplier capable of meeting the demanding specifications for the project. Recognising the complexity of the task, consultant Sam Camborieux from Pemtech Ltd. was brought in to provide expertise. Having worked with Amarith on previous challenging projects, Sam turned to Amarith, confident in its ability to deliver bespoke pumping solutions for critical oil and gas applications, including nutshell filtration systems.

Amarinth's tailored solution

Amarinth responded to the challenge by designing an innovative solution for the nutshell filters. The pump featured a specially engineered volute and impeller design, which allowed for the use of fixed speed motors instead of the more costly variable speed drives. This not only reduced the overall cost of the system but also maintained the precise performance required for the efficient separation of oil and water. In addition to the unique impeller design, a Plan 13 seal support system was selected to ensure there would be no leakage during operation. The Plan 13 system allows for continuous pressure balancing, ensuring long-term reliability and reducing the risk of seal failures in the demanding environment of the natural gas facility.

"We have utilised the Amarith nutshell re-circulator pump design as the product of choice for our produced water separation units for over 15 years.

From our first order for a plant in Azerbaijan to our most recent for one in UAE for ADNOC, I can confirm that these modules have been operating with consistent and compliant performance in terms of both process efficiency and mechanical integrity with no more than normal, expected planned maintenance being required.

I have no hesitation in endorsing the brand for similar applications as I am aware that many of our competitors have also done over the years."

Sebastian Camborieux

Pemtech Ltd.

Reliable operation and successful oil-water separation

The pumps have been successfully commissioned and integrated into the processing facility. They are now operating reliably, enabling the nutshell filters to effectively separate oil from the produced water, ensuring the smooth

operation of the plant and meeting the environmental standards required for the project.

Jurassic Gas Field, North Kuwait

North Kuwait Jurassic Gas Field Development

The North Kuwait Jurassic gas field is a significant contributor to Kuwait's oil and gas production, currently accounting for 11% of the country's daily output. Located onshore, the field is part of Kuwait's ambitious 2040 oil strategy, which aims to increase oil output capacity to 4 million barrels per day (bpd) and boost gas production to over 1 billion mcf/d. To support this strategy, Kuwait has commissioned two mega Jurassic gas projects, which will raise gas production by nearly 50%, increasing it from 630 mcf/d to 950 mcf/d. The field is expected to reach peak production by 2027 and remain economically viable until 2043.

Efficient produced water treatment

As gas production increases, so does the volume of produced water that needs to be treated. Crescent Engineering, based in Dubai, UAE, was selected to provide nutshell filters to treat the produced water from the North Kuwait Jurassic field. Crescent Engineering is known for its expertise in designing efficient separation systems to ensure the safe disposal or re-injection of treated water. A key challenge in this project was sourcing specialised pumps for the nutshell filters, as these filters require low-shear pumps to prevent emulsification of oil and water, which would reduce the efficiency of the filtration process.

Amarinth's bespoke pump solution

Crescent Engineering engaged Julian Hill, a consultant with extensive experience in the produced water industry, to source the necessary pumps for the nutshell filter package. Julian Hill turned to Amarith due to its proven track record of providing bespoke pumps for challenging oil and gas applications, including nutshell filters.

Amarinth designed and manufactured low-shear pumps specifically tailored for this project. These pumps were engineered to carefully control the flow of effluent water into the nutshell filters, preventing emulsification and ensuring the efficient separation of oil from the water. Additionally, the pumps required a custom seal plan to address the specific demands of the North Kuwait Jurassic gas field's produced water treatment system. This unique seal configuration ensured reliable, leak-free operation in the harsh conditions of the field.

Reliable and efficient operation

Amarinth completed the design and manufacture of the pumps on schedule, meeting the critical timeline of the project. The pumps have been successfully installed and are now operating reliably in the North Kuwait Jurassic field, enabling the nutshell filters to effectively separate oil from the produced water. This efficient water treatment is a key element in supporting the ongoing gas production and helping Kuwait achieve its 2040 oil and gas output goals.

