

NATCO DUAL FREQUENCY

Electrostatic treaters, coalescers, and desalters

For dehydration and desalting during oil production and desalting crude feedstock entering the refining process

Aligned with United Nations Sustainable Development Goals: 12—Responsible consumption and production, 13—Climate action.



Energy Consumption Reduction:

Lower electricity consumption by up to 82%[†]

Emissions Reduction:

Lower CO₂e emissions intensity per barrel of oil processed by up to 82%[†]

Size Reduction:

Minimize footprint with the most compact electrostatic dehydration and desalting technology



NATCO DUAL FREQUENCY electrostatic treater.

Production dehydration and desalting

NATCO DUAL FREQUENCY* electrostatic coalescers separate increasing volumes of produced water in a single stage and remove salt from produced crude more sustainably than AC electrostatic coalescers. They are especially useful as fields age and upstream gravity separators, often designed for smaller water treatment volumes, are unable to cope. As new reservoirs, reservoir compartments, or both are produced, fluid properties often differ from the separator's original design basis and the salt content of the water produced with crude oil often changes, making it challenging to meet commercial specifications for pounds of salt per thousand barrels of oil. Moreover, mixing crude oils with different compositions and solids content often generates challenging stable oil emulsions and increases crude oil conductivity. Both phenomena degrade the ability of water droplets to collide, grow, and gravitationally separate, increasing the need to add a demulsifier.

NATCO DUAL FREQUENCY dehydrators and desalters provide the flexibility you need in your production processing designs to manage the uncertainty inherent in field development planning, especially for heavy crude oil—where electrostatic dehydration may be challenging because of smaller differences in oil and water densities—or when the produced water has very low salinity. They are also ideal for retrofitting existing facilities during planned turnarounds to reduce unit delivery costs when oil production is declining or when you need to add capacity but space and electricity supply are limited. In either case, you will greatly reduce your electric power requirements and consequently, your Scope 1 or Scope 2 emissions.

The treater can be delivered as a heater treater, providing heating and dehydration in a single vessel and eliminating the need for an externally heated heat transfer fluid. It can also be supplied as a degassing treater, eliminating the need for a separate degasser.

Refinery desalting applications

NATCO DUAL FREQUENCY electrostatic desalters desalt a wide range of crude oil slates more sustainably than AC technology. Based on years of scientific observation and evaluation at our Process Systems Technology Center and subsequent validation during refinery commissioning and operations, we've identified oils that have very high conductivity because of their inherent composition. Crude oil conductivity is also a function of temperature. Moreover, blending feedstocks from different sources and with different API gravities can increase conductivity.

High conductivity reduces the effectiveness of AC-generated electric fields in coalescing the small washwater droplets and desalting the crude oil charge entering the refinery process. This poor performance of legacy electrostatic technologies makes it challenging to meet downstream fluid specifications for pounds of salt per thousand barrels of oil—even in multistage AC desalting systems. NATCO DUAL FREQUENCY electrostatic desalter is not particularly sensitive to oil conductivity because the applied voltage, base and modulation frequencies, and waveform parameters can be adjusted—a differentiated feature for dealing with highly stabilized emulsions that is unique in the market.

NATCO DUAL FREQUENCY desalters provide the flexibility you need for initial refinery desalting process designs to manage the uncertainty inherent in crude oil supply. They are also ideal for retrofitting existing facilities during planned turnarounds to increase feedstock composition handling flexibility or when you need to add capacity but space and electricity supply are limited. In either case, you will greatly reduce your electric power requirements and consequently, your Scope 1 or 2 emissions.

[†] Compared with conventional AC and AC-DC electrostatic treater technology

NATCO DUAL FREQUENCY

How it works

Within the NATCO DUAL FREQUENCY treater, bulk water and larger water drops are coalesced and separated by gravity in the weaker AC field that exists between the grounded water phase and the electrodes. The stronger DC field between the electrodes causes rapid movement of the remaining small water droplets through electrophoretic attraction, causing them to collide, coalesce, grow, and separate by gravity. The modulated voltage waveform ensures coalescence without fragmenting (which would arrest water droplet growth), enabling droplets to descend to the bottom of the vessel via gravity. This electrostatic separation process has a higher flux per square foot, which reduces vessel size requirements, while the advanced power unit decreases electric power demand.

In desalter applications, washwater is injected through a proprietary injection quill upstream of the mixing valve in the inlet piping. Together with the electrophoretic movement of the water droplets, this provides a very high degree of mixing. Superior mixing and improved dehydration make the NATCO DUAL FREQUENCY treater much more effective than conventional AC desalters of similar size.

Use of a high base frequency for the electrostatic field provides stronger electrostatic forces even in high-conductivity crudes and crude blends. Low-frequency amplitude modulation of the field improves conditions for water droplet coalescence, further enhancing dehydration and desalting efficiency.

Improvements based on operator feedback

The fourth-generation NATCO DUAL FREQUENCY treater’s power unit includes several upgrades to enhance the process engineer’s visibility and ability to tune the electrostatic dehydration and desalting process. Additionally, the plant electrical engineer’s maintenance has been simplified compared with the previous-generation treater. All modifications are the result of feedback from operators and refiners using the third-generation technology.

With the new unit installed,

- treater transformers can operate at higher ambient temperatures and with wider power variations
- new sensors monitor trends in the health of key components, enabling warnings before as well as during an upset condition
- unit maintenance can be performed without removing it or draining the oil
- a ruggedized edge computing device, such as the AgoraGateway* device, enables optional remote, real-time health monitoring and life-of-asset collaboration.

Unlike legacy electrostatic treater transformers, which rely on inefficient, voltage-limiting reactors for overcurrent protection, our fourth-generation power units incorporate microcontrollers to proactively manage the current, protecting the unit while reducing energy usage and hence emissions.

Treater Transformer and Component Specifications	
Input voltage	380–480 VAC
Output	75 kW
Ambient temperature	–4 to 131 degF [–20 to 55 degC]
Dry chopper with X purge system	
Digital signal processing technology with several load-responsive controller (LRC) functions included	
Prognostic health monitoring (PHM) feedback	
Improved IGBT [†] protection	
Improved protection from transients, harmonics, and more	
Event capture	
Digital input and output via Modbus®	
CE [‡] -rated bushings	
Composite grids using proprietary material to minimize risk of arcing for production operations, limited to 300 degF [149 degC]	

All specifications are subject to change without notice.

[†] Insulated gate bipolar transistor

[‡] Conformité Européenne

slb.com/oil-treatment



*Mark of Schlumberger.
Transition Technologies is a mark of Schlumberger.
Other company, product, and service names are the properties of their respective owners.
Copyright © 2022 Schlumberger. All rights reserved. 22-MPS-1310921