

## AOT Pipeline Flow Assurance Technology:

In response to the rampant growth and advancements in the conventional energy production and transportation sector, STWA, Inc. has developed a new pipeline flow assurance technology called Applied Oil Technology [AOT].

AOT is a patented<sup>1</sup> solid-state flow assurance solution designed to improve the flow performance characteristics of crude oil pipeline systems and networks.

Each AOT system<sup>2</sup> is comprised of an ASME-code pressure vessel loaded with a proprietary, serviceable/replaceable, electrified “grid-pack” array of stainless steel electrical components inside, that treats oil passing through the system with a precisely-controlled electrical field.

AOT systems are powered by hospital-grade, dedicated power supplies, connected via Class I Div. I explosion-proof junction boxes and related hardware. The power supplies are able to be mounted in a standard 19” electronics rack in either a local weatherproof field enclosure, or located inside a nearby control room. Data signals, controls and automation for the power supplies are compatible with industry-standard systems and programmable logic control (PLC) systems.

1. The AOT system is based on physics principals developed under a research grant sponsored by STWA to Temple University with corresponding intellectual property licensed exclusively to the Company by the University. STWA maintains 47 patents and patents-pending worldwide. The technology's related patents are owned by Temple University and licensed exclusively to the Company in perpetuity. The Company's intellectual property portfolio is represented by Jones-Walker LLP of Lafayette, Louisiana.

2. High flow volume installations require multiple units installed in parallel as shown.

## AOT Benefits:

The STWA AOT System is designed to improve the flow of pipeline networks in the upstream, midstream and downstream networks and systems worldwide.

STWA's AOT has been inspected, certified and approved to meet or exceed the specifications and quality control requirements of major North American midstream pipeline operators.

STWA's AOT can be scaled to suit many different types of installation realities, from large-scale Midstream pipelines, fracwater remediation facilities, offshore production facilities, mobile transportation, gathering systems, and more.

Design Control Drawings, Certifications, Specifications, Protocols and Procedures are available upon request by qualified customers.



(Pictured: STWA AOT Crude Oil Pipeline Viscosity Reduction Flow Assurance System)

## HOW AOT WORKS:

The AOT system is a solid-state crude oil viscosity reduction system that is designed to coagulate dissolved particulate matter in crude oil into nano-scale particle clusters.

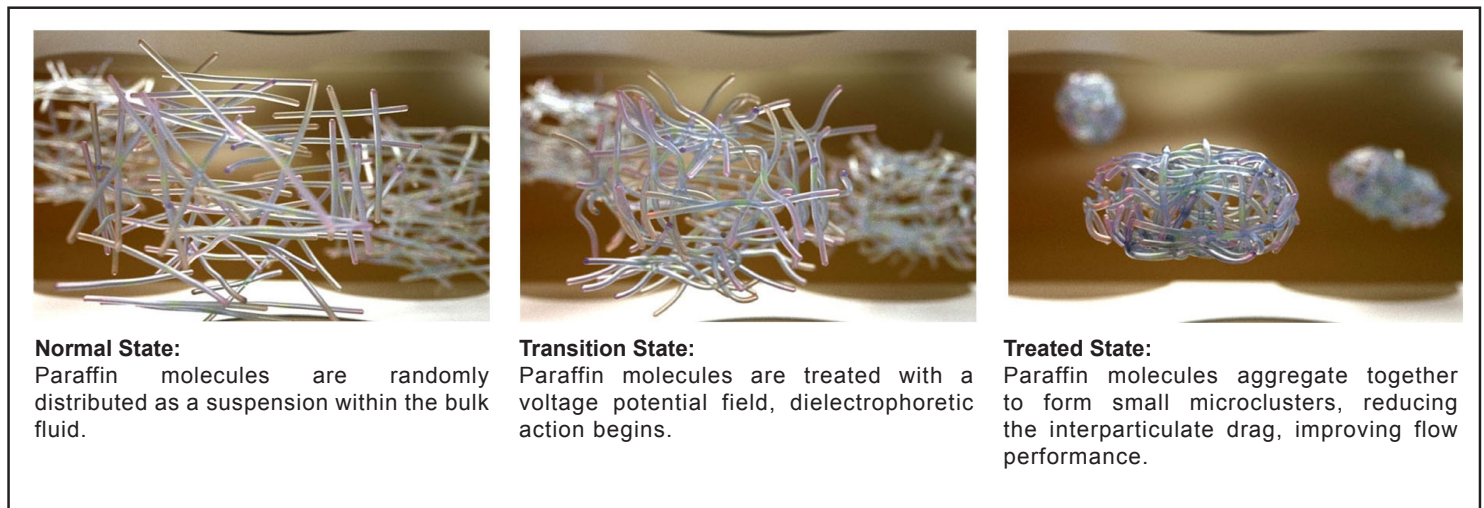
The purpose of aggregating these particles is to reduce their total surface area for a given volume-fraction dissolved in the crude oil, thereby reducing the friction-drag of these particles against the rest of the bulk fluid, a key component in fluid viscosity.

The newly aggregated particles make the same fluid act as though it has been thinned out with a super light end fluid product such as naphtha, natural gasoline, ethane, etc., yet while retaining its original chemical formula. This simple premise leads to multiple flow assurance benefits without the traditional penalties associated with the normal chemical treatment alternative methods. Viscosity reduction enables higher flow rates, lower system

pressures, higher efficiencies, generate environmentally-friendly benefits, lower operation costs, lower wear and tear on system components, and induce greater margins of system operational safety.

The technology operates under the same basic principals as an EC<sup>3</sup> (electrostatic-coalescer) commonly found in upstream Exploration & Production oilfields throughout the world for filtration of oil/water emulsions. In an EC system, the macro-scale hydrocarbon clusters facilitate easier filtration of the crude oil from water in the emulsion during the field dewatering process. In the AOT system, the nano-scale clusters reduce the total surface area for their volume-fraction of the fluid, thereby reducing the viscosity of the fluid, making it easier to flow.

3. <http://en.wikipedia.org/wiki/Coalescer>



(Artist's rendition of Dielectrophoretic Aggregation of paraffin molecules suspended in petroleum product bulk fluid. Actual results may vary.)

## COMPANY PROFILE

STWA, Inc. is a developer and vendor of commercial flow assurance solutions designed to deliver operational benefits to the global energy industry. As a trusted partner and certified supplier to oil producers and transporters here in North America and globally, STWA designs and manufactures industrial-grade equipment for improving the efficiencies and economics of the upstream, gathering and midstream energy sectors.

During the recent unprecedented expansion of the energy industry made possible by enhanced crude recovery techniques, STWA has diligently prepared a stable, robust foundation for growth, and is currently entering the market collaboratively with several leading entities within this market.