

Product Presentation Brief  
December, 2011



# NEW FLOW-ASSURANCE TECHNOLOGY for CRUDE OIL PIPELINES

STWA Applied Oil Technology (AOT™)

*“The device may hold potential for energy savings and increased pipeline flow rates for the oil production and transportation industry.”*

– U.S. Department of Energy

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# Applied Oil Technology (AOT™)

## For Commercial Crude Oil Pipelines

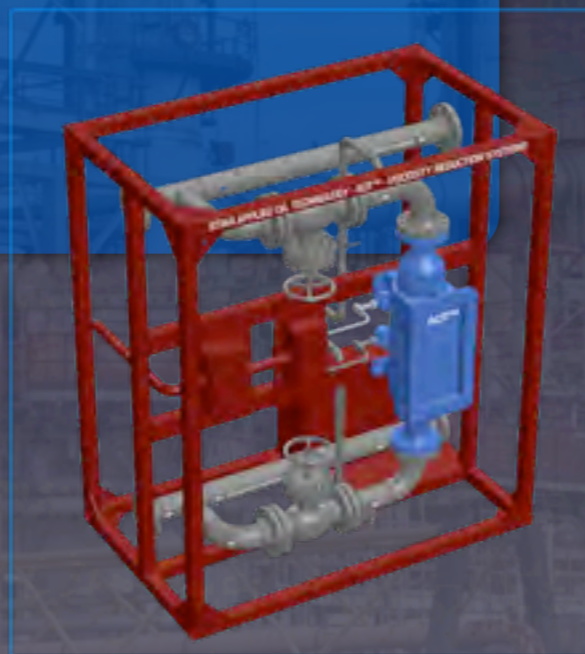
- Reduces operating costs
- Reduces pipeline pump energy usage
- Reduces emissions
- Potential for increasing pipeline maximum daily flow rate capacity



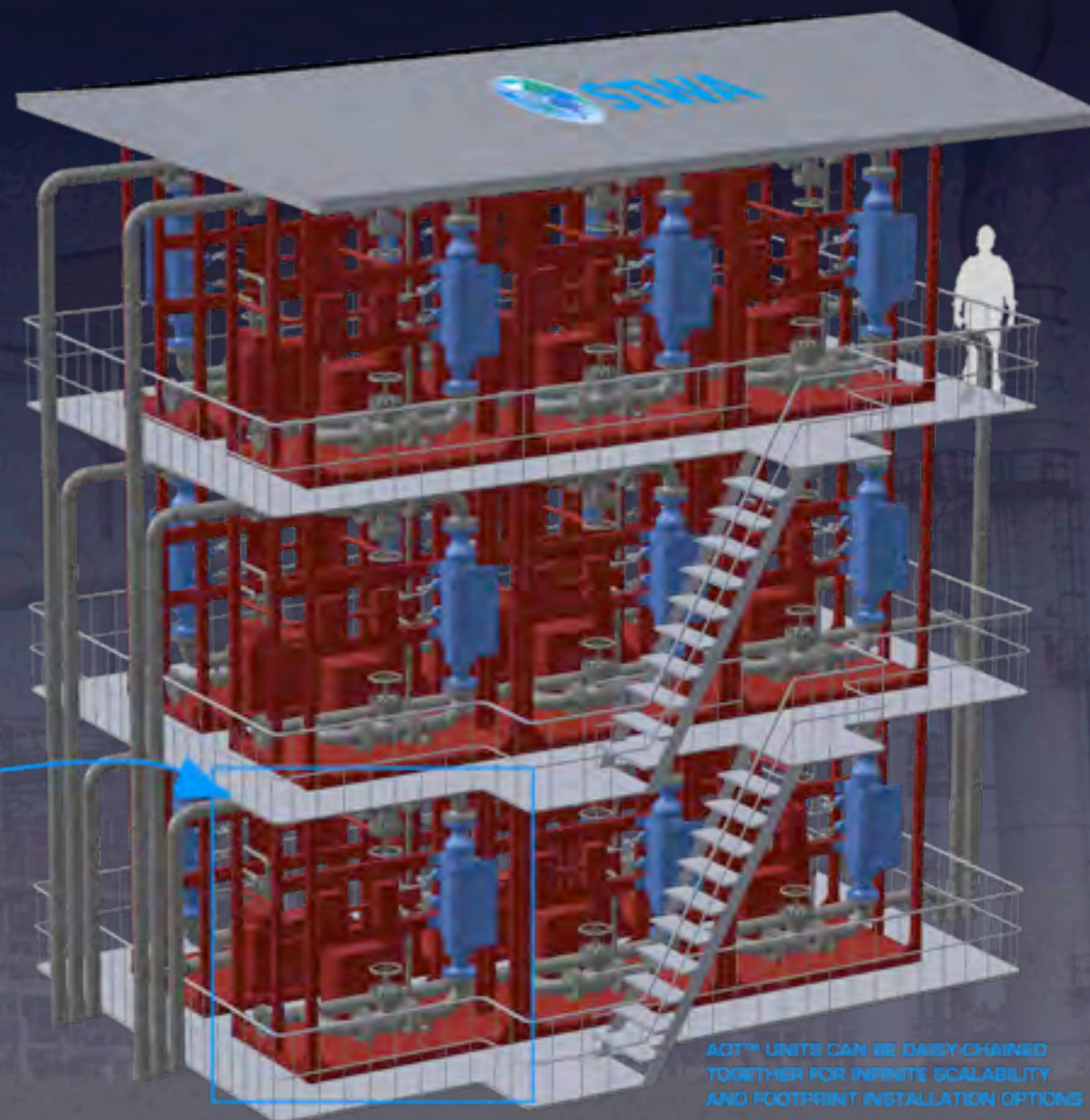
# Applied Oil Technology (AOT™)

## For Commercial Crude Oil Pipelines

- Unlimited scalability
- Common, Modular Units
- Off-the-shelf parts construction
- Low operation costs
- Easy to install
- Easy to maintain



STWA APPLIED OIL TECHNOLOGY  
PROTOTYPE 2



AOT™ UNITS CAN BE DAISY-CHAINED  
TOGETHER FOR INFINITE SCALABILITY  
AND FOOTPRINT INSTALLATION OPTIONS

# Applied Oil Technology (AOT™)

## For Commercial Crude Oil Pipelines

- Each AOT™ unit is interchangeable and made as a modular design.
- AOT™ units can be daisy-chained for scalability with no loss in performance.
- AOT™ units are designed to be transported by standard drop-bed tractor-trailer truck and are within US DOT highway transport dimensions.
- They also can be easily moved into location by standard heavy-duty forklift.



# Features & Benefits

Feature	Benefit
Temporarily Reduces Crude Oil Viscosity	<ul style="list-style-type: none"> <li>• Reduced Line-Loss per mile</li> <li>• Reduced Energy Consumption per mile</li> <li>• Reduced Pressure-Loss per mile</li> <li>• Crude Oil returns to natural state after a few hours</li> </ul>
Crude Oil Temperature remains unchanged	<ul style="list-style-type: none"> <li>• No impact in permafrost regions</li> <li>• No structural modifications to down-line pipelines required</li> </ul>
Crude oil remains chemically unchanged	<ul style="list-style-type: none"> <li>• Crude Oil chemical composition remains unchanged</li> <li>• No alterations or challenges to refining operations</li> </ul>
Reduces Pump Energy Consumption	<ul style="list-style-type: none"> <li>• Reduced daily fuel usage for a given flow rate</li> <li>• Reduced CO2 emissions/day</li> </ul>
Energy-Efficient Design	<ul style="list-style-type: none"> <li>• AOT has high energy-leverage benefits for the pipeline</li> <li>• AOT use consumes small amounts of energy to provide large amounts of energy savings</li> </ul>
Stand-Alone System Design	<ul style="list-style-type: none"> <li>• AOT is designed for ease integration into existing and/or new pipeline networks</li> </ul>
Off-the-shelf parts design	<ul style="list-style-type: none"> <li>• AOT uses off-the-shelf parts for ease of installation/maintenance/repair</li> <li>• AOT's off-the-shelf parts simplify supply-chain networks for manufacture and maintenance</li> </ul>

# Recent Achievement

**October, 2011**

**US DOE Confirms  
13.55% efficiency  
gain using AOT™**

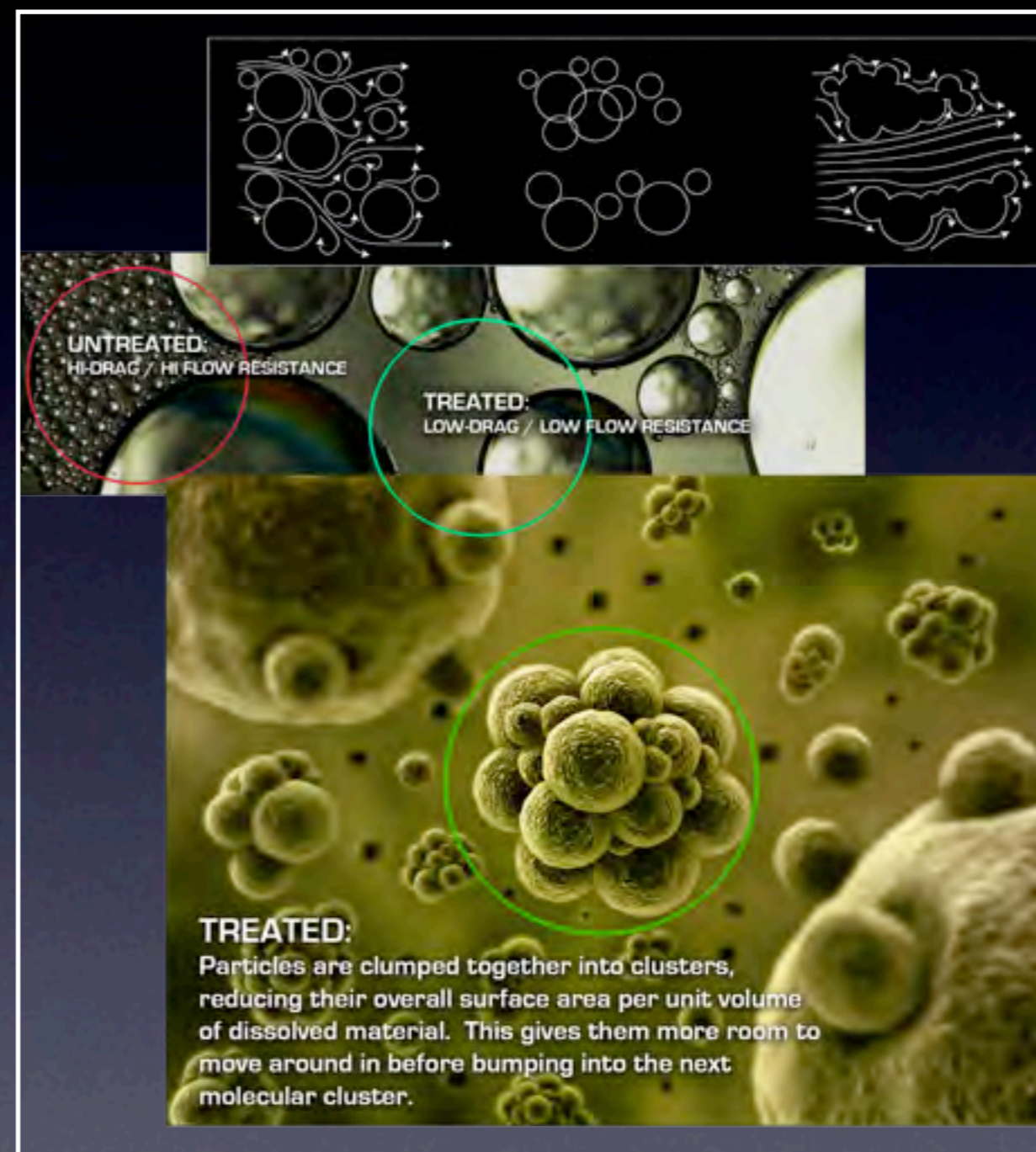


US DOE, Temple University's Dr. Tao and STWA personnel pose for a group photo after successful testing of STWA's Applied Oil Technology (AOT™) Prototype I. October 19, 2011

***U.S. Department of Energy Confirmed  
AOT™ Testing Was a Success***

# How AOT™ Works

- AOT™ uses precisely-controlled electric fields to reduce the viscosity of the crude oil.
- AOT™ does not change the temperature, or chemical composition of the crude oil.
- AOT™ causes the molecules of dissolved particulate matter to temporarily join into clumps.
- These clumps exhibit reduced friction within the pipeline, leading to more efficient operation.



molecular cluster  
move around in before bumping into the next  
of dissolved material. This gives them more room to  
reducing their overall surface area per unit volume  
particles are clumped

# Case Study

(Operational Efficiency Gains)

If the Trans-Alaska Pipeline were to realize the same 13.55% efficiency gain that AOT™ demonstrated at the US DOE:



- Each pumping station on the pipeline would save **\$9.377 Million** per year in operation costs
- Each pumping station would reduce emissions by **59.349 Million lbs** of **CO2**.

That's the equivalent of taking **5,183 cars off the road** with each pipeline pump station modified to save 13.55% of its energy use.



The 800-mile-long Trans Alaska Pipeline System (TAPS) is one of the world's largest pipeline systems. Starting in Prudhoe Bay on Alaska's North Slope, TAPS stretches through rugged and beautiful terrain to Valdez, the northernmost ice-free port in North America. Since pipeline startup in 1977, Alyeska - TAPS' operator - has successfully transported more than 16 billion barrels of oil.

# Case Study 2

(known in the industry as “De-Bottlenecking”)

If an example 500,000bpd pipeline were suddenly able to increase its maximum flow rate by 1% with oil at \$100/bbl:

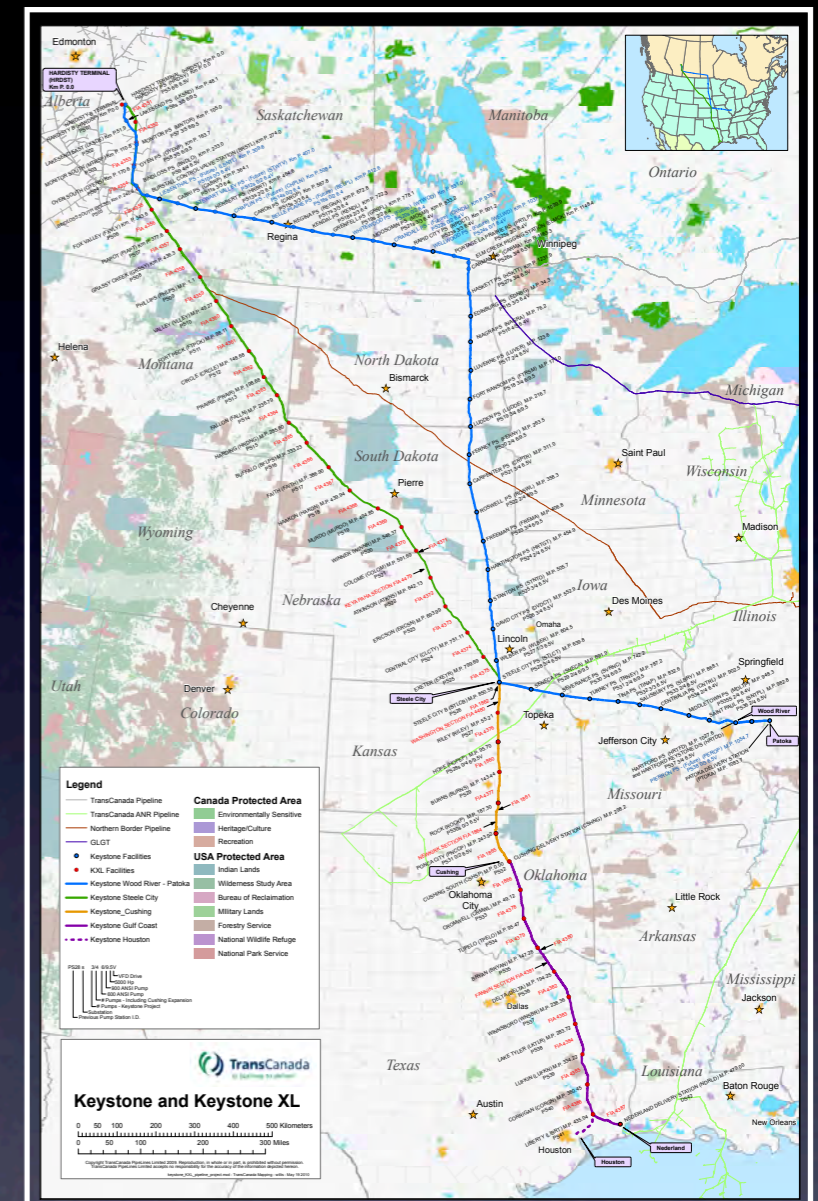
- Each 1% maximum flow rate gain is worth: **\$182.5 Million / Year** in additional product throughput value for that one pipeline alone.

Calculation:

$$500,000\text{bbl/day} \times 1\% = 5,000 \text{ more bbl/day}$$

$$5,000\text{bbl/day} \times \$100/\text{bbl} = \$500,000/\text{day}$$

$$\$500,000/\text{day} \times 365\text{days/yr} = \$182,500,000/\text{yr}$$



In the oil pipeline industry, there is a common problem that affects almost every pipeline operator around the world at various times throughout the year. The problem is commonly referred to as, “Bottlenecking” which, as the name implies, is where the desired throughput of a given pipeline is restricted by its carrying capacity. AOT™ presents the possibility for alleviating this common problem by increasing the maximum flow rate sustainable at a pumping systems’ maximum power capacity by reducing the viscosity of the crude oil inside the pipeline to reduce the fluid drag (friction-loss) per ton, per mile. Further testing for this data is being conducted at the US DOE facility purpose-built for AOT™ testing. The figures at left illustrate the financial incentive for a pipeline operator to increase their maximum flow rate by only 1% and are to be treated as a hypothetical example only. Actual results may vary

# Applied Oil Technology (AOT™)

## CONCLUSION

- Reduces Cost Per Mile
- Reduces Environmental Impact
- Makes Strong Business Sense
- Makes Strong Environmental Sense

