



Indago Energy Limited

Hydrocarbon Dynamics

ASX: INK

# Annual General Meeting Presentation

May 2019





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## ASX listed - Energy focused

### Board & Management

Stephen Mitchell	Chairman
Ray Shorrocks	Non-Executive Director
Nick Castellano	Executive Director
Allan Ritchie	Non-Executive Director
Doug Hamilton	Business Development Manager

### Capital Structure

Cash:	\$1.3m (31 Mar 19)
Share Price:	\$0.035
Issued Cap:	211.6m Shares
Market Cap:	\$7.4 Million
Options	2.5m @14c (exp. 1/3/20)
Rights Issue (announced 24/5/19)	1 for 3 @ \$0.035 to raise up to \$2.4m

### Shareholder Summary

S McGregor Super Fund	6.9%
S Mitchell	5.9%
Lowell Resources Fund	5.1%
G Barnes	4.9%
A Khan	4.1%
Wheelbarrow Investments	3.8%
Top 50 Holders	66%

### Recent Activity - Summary

Modest sales of main product commenced

Significant Contingent Oil Resources reported in Kentucky project, successful pilot undertaken & sale of test oil occurred

New project in Utah and given substantial Contingent Resources

Appointed additional agents & distributors and now have reps in China, India, Middle East, Colombia & parts of Europe

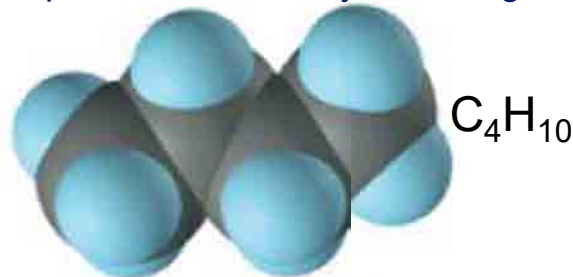
Conducted 13 field trials and oil from ~40 oil projects tested in laboratories



**HCD Multi-Flow®**, is a small, specially engineered carbon-based molecule that disaggregates & relieves the large agglomerations of waxes and asphaltenes naturally occurring in waxy and heavy crude oils.

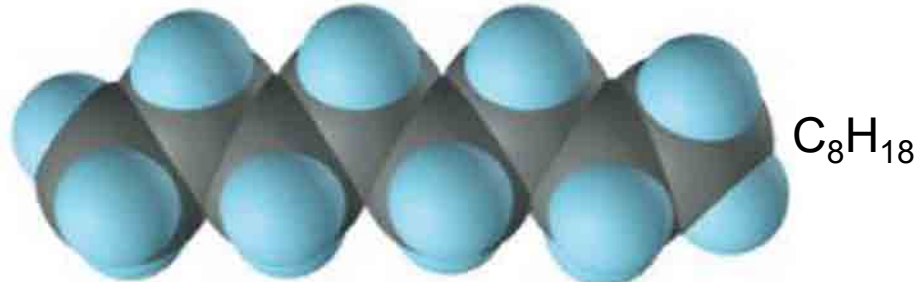
**Fewer than 5 carbon atoms**

Gaseous at room temperature



**5-15 carbon atoms**

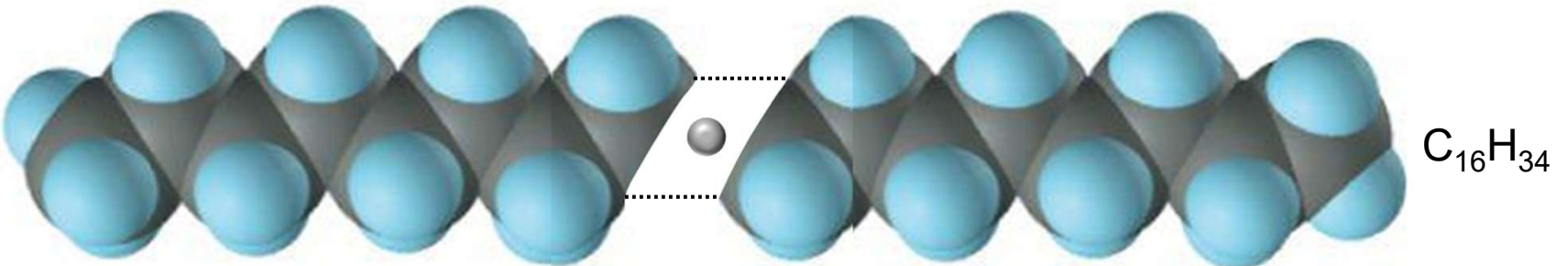
Liquid at room temperature



 **HCD Multi-Flow® molecule**

**>15 carbon atoms**

Solid at room temperature



The paraffin now passes into the liquid phase at room temperature

# Technology Used from Well bore to Refinery

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Improves oil production onshore and offshore by reducing viscosity and mitigating paraffin and asphaltene depositions in production equipment. Reduces reliance on, and costs of, diluents and chemical treatments.



Provides flow assurance for onshore and offshore pipelines by liquefying paraffin and asphaltene depositions. Reduces reliance on traditional solutions of heat, solvents and mechanical pigging.

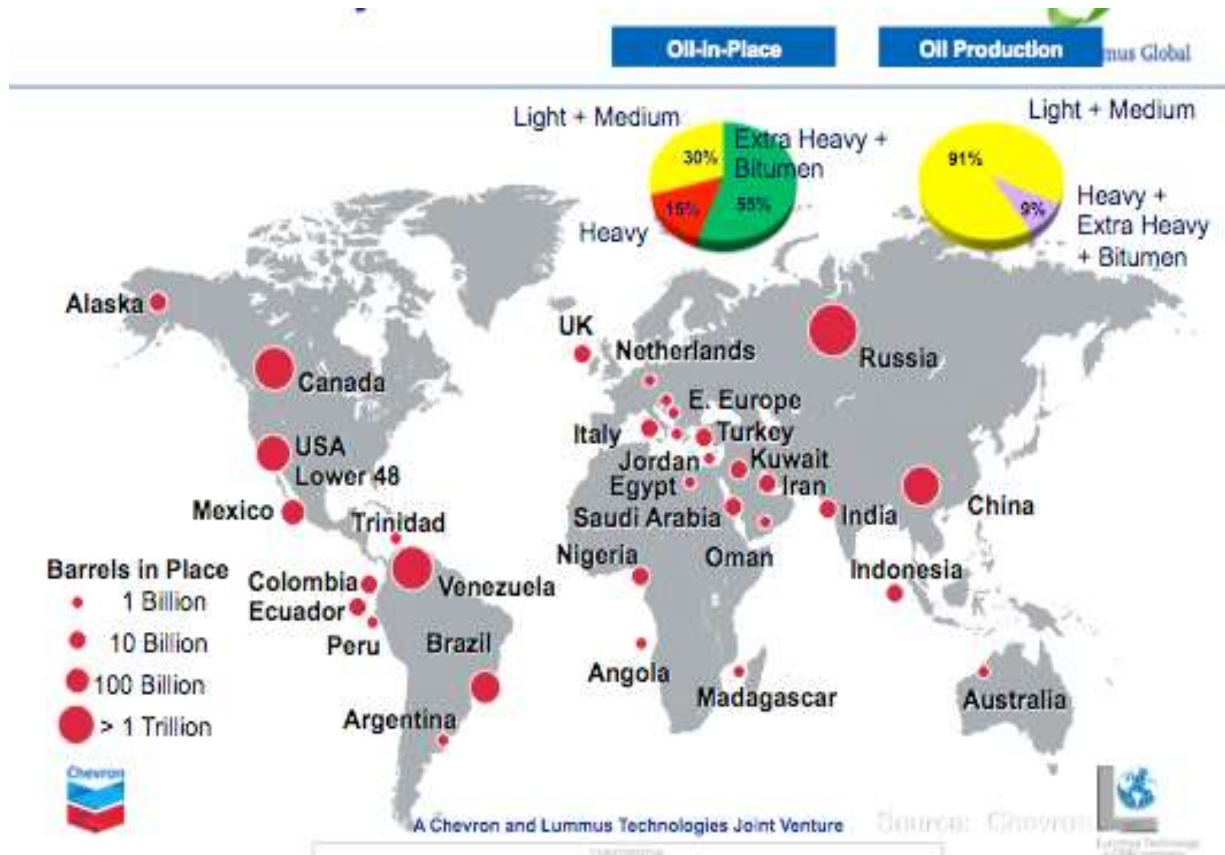


Liquefies oil sludge in transport and storage facilities, transforms the way cleaning operations are undertaken and recovers saleable hydrocarbons from the sludge.



## 70% of the world's crude oil resource is heavy but represents only 9% of world production

Advances in production and transport techniques improves heavy and extra heavy crude oil economics. HCD Multi-Flow has potential to further improve these economics.



Since acquiring HCD, Indago has focussed on the following countries:

- U.S.A
- Canada
- China
- Colombia
- India
- Oman
- Iraq
- Kuwait
- UAE



## Production Facilities - Phoenix



Production & storage facilities in Phoenix Arizona. Also storage facilities in Malaysia.

Current capacity is 10,000 drums/year. Could be lifted to 20,000 with additional staff.

Simple automation of facility could swiftly bring capacity to 130,000 drums/year (24 hours/day).



Middle East partner has the option to manufacture in the Middle East (with exclusive distribution rights) upon US\$20m payment.

TankClean product has recently been upgraded and is undergoing trials prior to replacing existing product.

Existing stock of ~ 380 drums of HCD Multi-Flow®



The value creation strategy for Indago's use of **HCD Multi-Flow®** is twofold:

1. **Build a portfolio of Upstream Projects**

Invest in known oil accumulations where the application of HCD technology may lead to commercial extraction, reserves growth and cash flow. Two projects acquired to date:

- Kentucky
- Utah

2. **Sell HCD Multi-Flow® and Tank Clean Products to Industry**

Targeting oil producers, pipeline operators, tank cleaners and refiners:

- Developed marketing team in North America with representatives in Texas, California and Alberta.
- Established agents & distributors in China, India, the Middle East, Colombia & parts of Europe.

In the last 12 months this sales force has been responsible for meetings with 120 potential customers, arranging 13 field trials for 7 producers and has collected and tested in independent laboratories ~40 crude oil samples from different projects.





# Field Trial Success

Over the last 18 months **HCD Multi-Flow<sup>®</sup>** was tested in 13 field trials including:

Project	Trial Purpose	Project Size & Dosage rate	Result & Status
China CNPC	Diluent Reduction in 1 well	38,000 bopd field @ 2,000 ppm	Diluent reduced by 40%, production increased 22%. Seeking expanded trial
California 1	1. Diluent Reduction 2. Clean-up of waterline	1,000 bopd field @ 2,000 ppm	Diluent requirement reduced by 40% and organic scale successfully removed from water pipe. Company purchased MF, but went into Chapter 11
Utah 1 & 2	Pour Point Reduction	23,000 bopd @ 1,000 ppm	Pour Point reduced by 10-14 <sup>o</sup> C. Company taken over
Kentucky	Viscosity Reduction	2C Resources 3.7 mmbo	Viscosity reduced to 490 cP from 50,000 cP, proof of concept
Canada 1	Pour Point Reduction	2,000 bopd field @ 1,000 ppm	Wax deposition problem resolved but field shut down because of Canadian Oil Market conditions
Canada 2	Replace butane injection	100 well field @ 500 ppm	MF superior to butane injection



# Lab Success – Seeking Field Trial

Over the last 18 months **HCD Multi-Flow**<sup>®</sup> has tested crude oils from 40 projects in independent laboratories & company bench tops, many of which field trials are being sought. Examples of lab successes include:

Project	Lab Result	Status
Cairn 175,000 bopd pipeline, India	Pour point reduced	Field trial proposal submitted
Colombia #1 42,000 bopd heavy oil field	Reduced viscosity for pipeline	Field trial sought
Colombia #2 2,000 bopd heavy oil field	Reduced viscosity for pipeline	Field trial sought
ADOC 45,000 bopd pipeline, Abu Dhabi	liquefied paraffin-rich sludge	Proposal Submitted
8,000 bopd offshore platform, Turkmenistan	Reduced pour point & BS&W	Proposal Submitted
Nexen 72,000 bopd bitumen field, Canada	Reduced diluent by 8%	Further testing required
ADNOC tank clean contract multiple tanks ranging in capacity from 1/2 to 1 million barrels	Liquefied tank sludge	Proposal Submitted
Major Operator 12,000 bopd heavy oil field, Canada	Reduced viscosity & pour point	Field trial proposal submitted



## Bench top Success – Seeking Field Trial

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Examples of bench top tests now progressing to field trial include:

Project	Bench Top Test Result	Status
California heavy oil producer downhole trial	Viscosity reduced	Field trial proposal submitted
Kuwait Oil Company downhole trial, Kuwait	Viscosity reduced	Field trial proposal submitted
Basrah Oil Company pipeline trial, Iraq	Viscosity reduced	Field trial proposal submitted
Basrah Oil Company tank clean, Iraq	Liquefied tank sludge	Field trial proposal submitted
Chinese Major offshore platform, Bohai Sea	Pour Point reduced	Field trial proposal submitted
Gulf of Mexico 1 pipeline trial	Liquefied paraffin & asphaltene	Lab test underway, field trial sought



# Testing Implications on Dosage Rates

- Tests and trials indicate dosage rates of HCD Multi-Flow® for use in paraffin rich crudes are typically between 250 - 750 ppm.
- Tests and trials indicate dosage rates of HCD Multi-Flow® for use in heavy, extra heavy and viscous crudes are in the 1,000 – 2,000 ppm range.
- Dosage rates will always vary considerably depending on individual applications and oil composition.

Multi-Flow Dosage Rates (ppm)	250	500	750	1000	1500	2000
End User Cost/bbl of oil treated (US\$)*	\$0.47	\$0.94	\$1.42	\$1.89	\$2.83	\$3.78

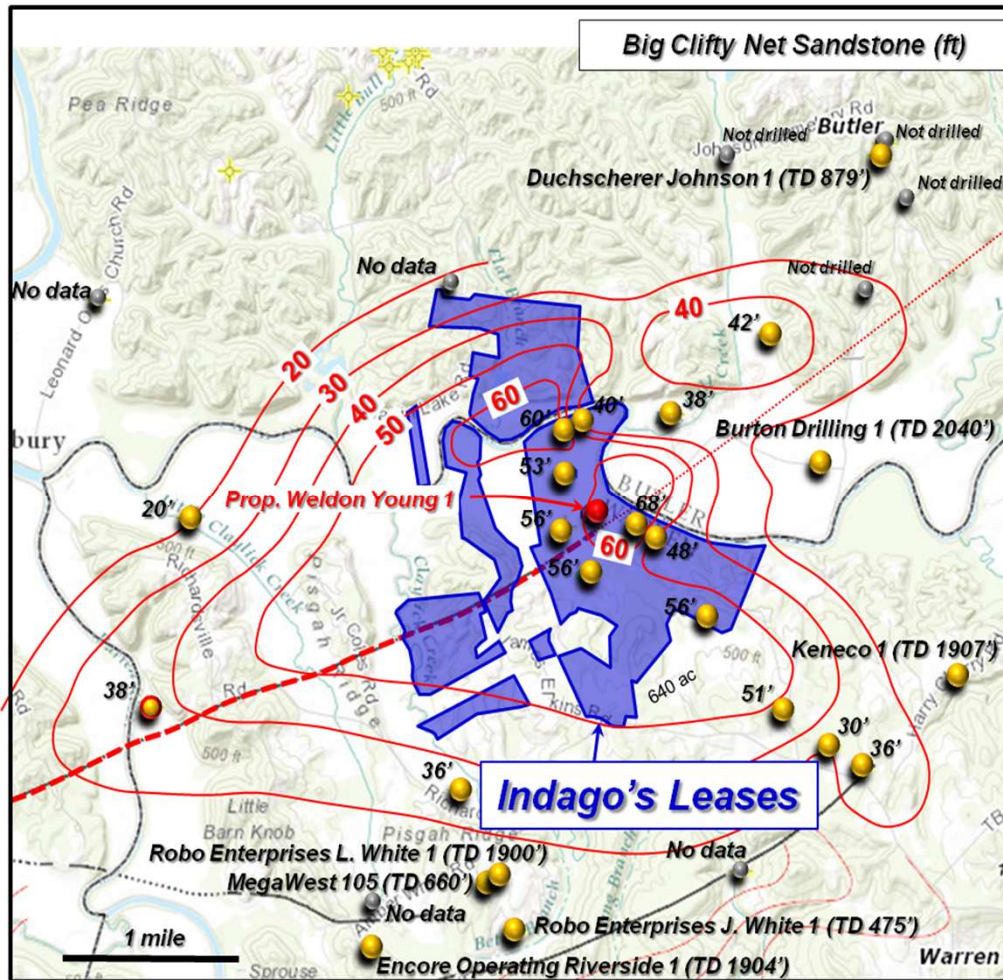
\* Based on the North American recommended retail price of HCD Multi-Flow®



# Upstream Activities



# Upstream Projects - Kentucky



Western Kentucky Oil Sands are estimated to have 3.4 billion barrels of original oil-in-place (OOIP).

Indago has leased 1,786 acres over which independent certifiers, Netherland Sewell & Associates, have estimated an OOIP of 42.3 million barrels (mmbbl). Of this OOIP, NSAI estimates that 7.5 mmbbl is 3C, 3.7 mmbbl is 2C and 1.9 mmbbl is 1C.

More than 10 wells previously drilled in INK's acreage demonstrates oil-saturated reservoir 12-20 metres thick at a depth of 125-215 metres with 10<sup>0</sup> API oil.



## Upstream Projects – Kentucky



The first well was cored & confirmed good porosity, permeability and oil saturation.

Well test then designed to ascertain if HCD Multi-Flow® could sufficiently reduce viscosity down hole to allow oil to be produced to surface.

Well was injected with HCD-Multi-Flow® and carrier fluid then swabbed and 82 bbls of oil were successfully produced to surface.

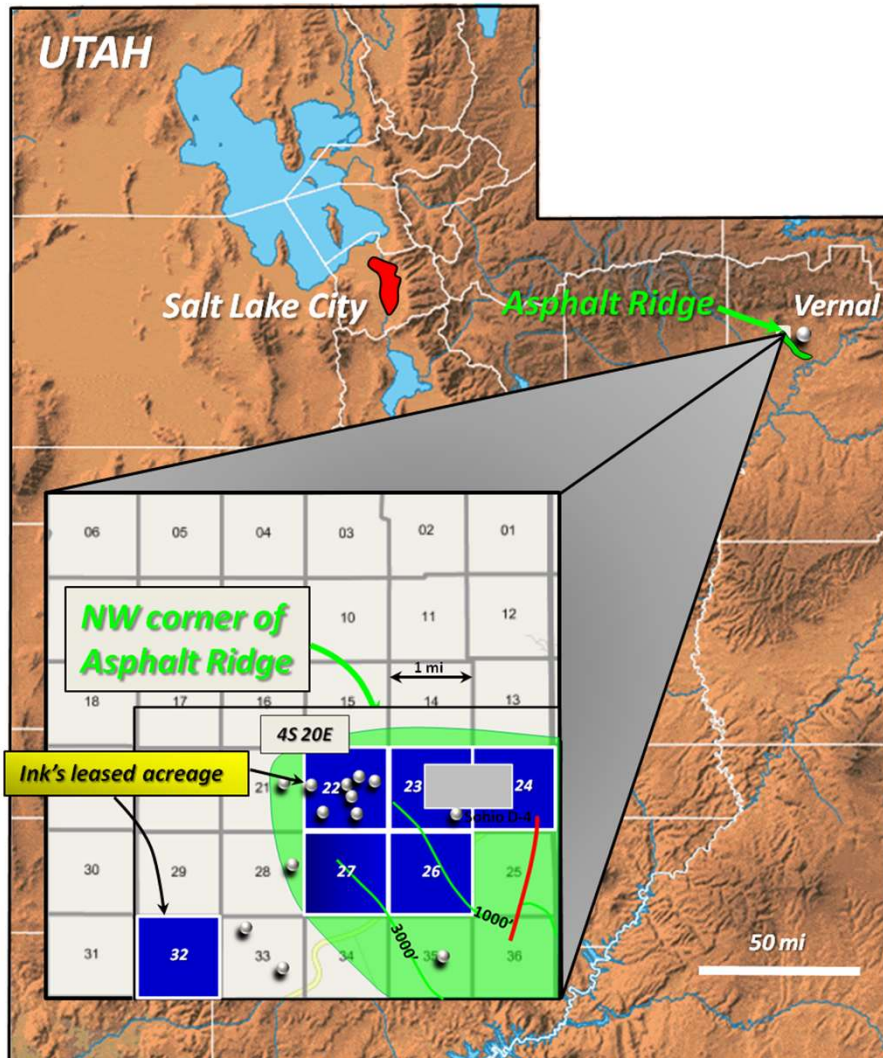


Well then placed on pump for further testing which ceased when water handling issues combined with low oil production were encountered.

After successful proof of concept, plans to design tests to prolong production are underway and possibly to test light oil shows above target encountered during drilling operations.



# Upstream Projects – Utah



Utah Oil Sands are well documented and estimated by the Utah Geological Survey (UGS) to contain 14-15 billion barrels of oil.

Indago has leased 3,459 acres over the NW part of Asphalt Ridge in the Uinta Basin over which independent certifiers, Netherland Sewell & Associates, have estimated an OOIP of 141.7 million barrels (mmbbl), and Contingent Resources of 24.8 mmbbl of 3C, 12.4 mmbbl of 2C and 6.2 mmbbl of 1C.

Previous operators have drilled around INK's acreage indicating an oil saturated reservoir 27-53 metres thick at depths from 60-914m.

Published results (UGS) from 6 wells drilled within INK's acreage, report oil saturation of 65.6% of 10-14<sup>0</sup> API oil in sandstones with porosity of 30.3% & permeability of 524 mD.





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## Upstream Projects – UTAH

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- INK completed a required cultural survey in April of 2019 and has applied for a permit to take bulk samples from the Rimrock Sandstone.
- Samples will be tested with HCD Multi-Flow® in a series of different processes to determine optimal treatment method to recover maximum oil with minimum HCD Multi-Flow®.
- Consideration being given to also test the deeper sections of the permit with a conventional well similar to the production test conducted in Kentucky.
- INK will consider a partner for the next stage of testing both in Utah and Kentucky.





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# Testing and Sales Initiatives



# Conclusions of Field & Laboratory Testing of Multi-Flow during 2018-2019

HCD Multi-Flow® has proven highly effective in Field and Laboratory testing undertaken during 2018-2019 in the following applications:

## 1. Pour Point Reduction

- Earlier case studies on the Puteri Platform, Abu Alpha and Syria demonstrated that HCD Multi-Flow® could reduce Pour Point of paraffin-rich crudes in the range of 9 to 53°C.
- Current field and laboratory testing in Utah and Turkmenistan is consistent with earlier results demonstrating Pour Point reductions in the range of 14 to 33°C.

## 2. Viscosity Reduction

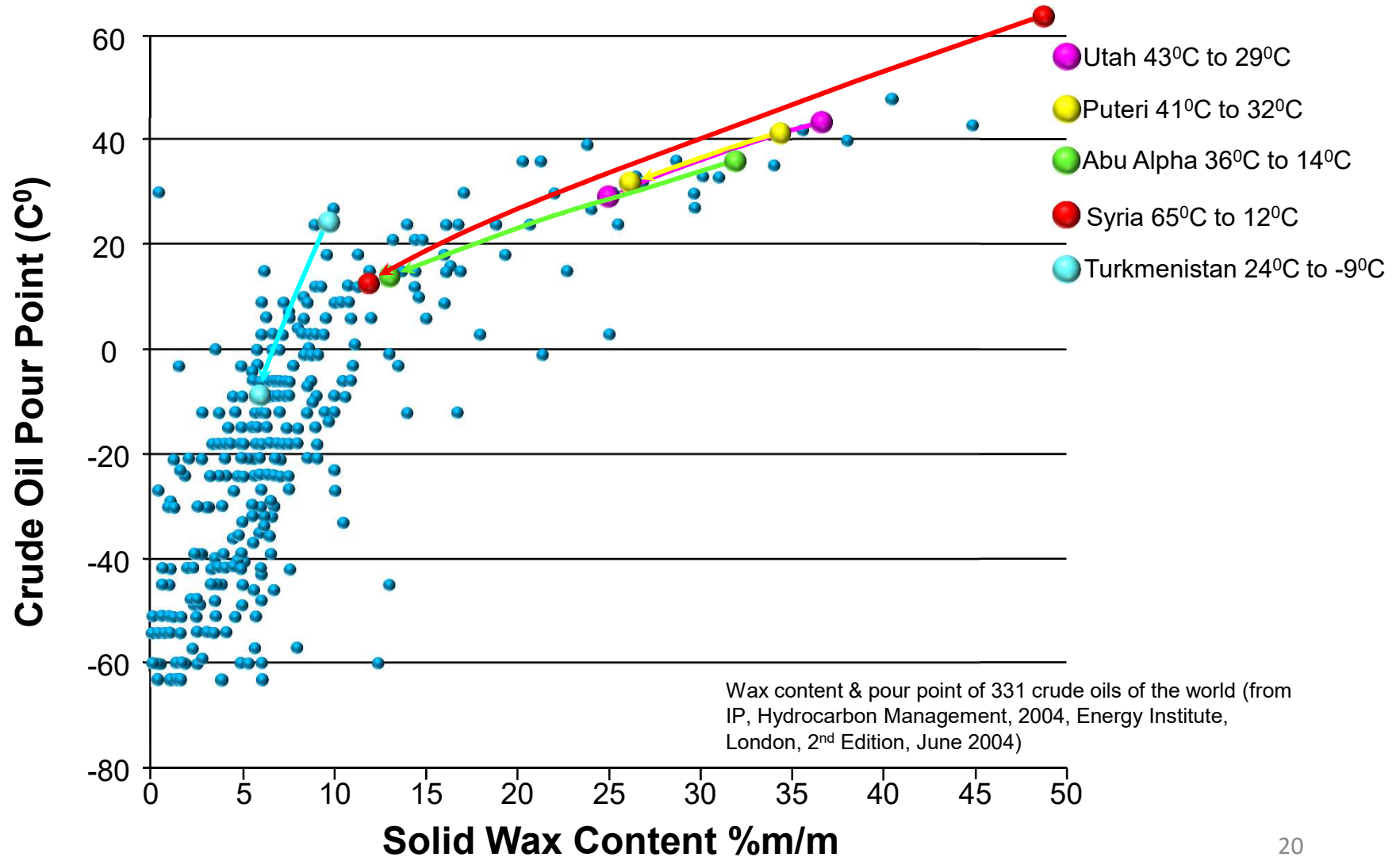
- Applications in viscosity reduction are a new direction for Indago from the earlier focus on pour point reduction in waxy crudes.
- Laboratory testing of heavy and extra heavy crudes and sludge consistently demonstrate viscosity reductions in the range of 40-99% depending on API<sup>0</sup>Gravity.

## 3. Diluent Reduction

- The application in diluent reduction is a direct consequence of the viscosity reducing characteristics of HCD Multi-Flow® . By reducing extra heavy crude oil viscosity by as much as 95%, HCD Multi-Flow® is doing the work of the diluent, but instead of a one-to-one ratio it works in thousands of parts per million.
- Indago successfully trialled HCD Multi-Flow® as a diluent reducer in California and China during 2018.



# Pour Point vs Wax Content & Pour Point Reduction with Multi-Flow

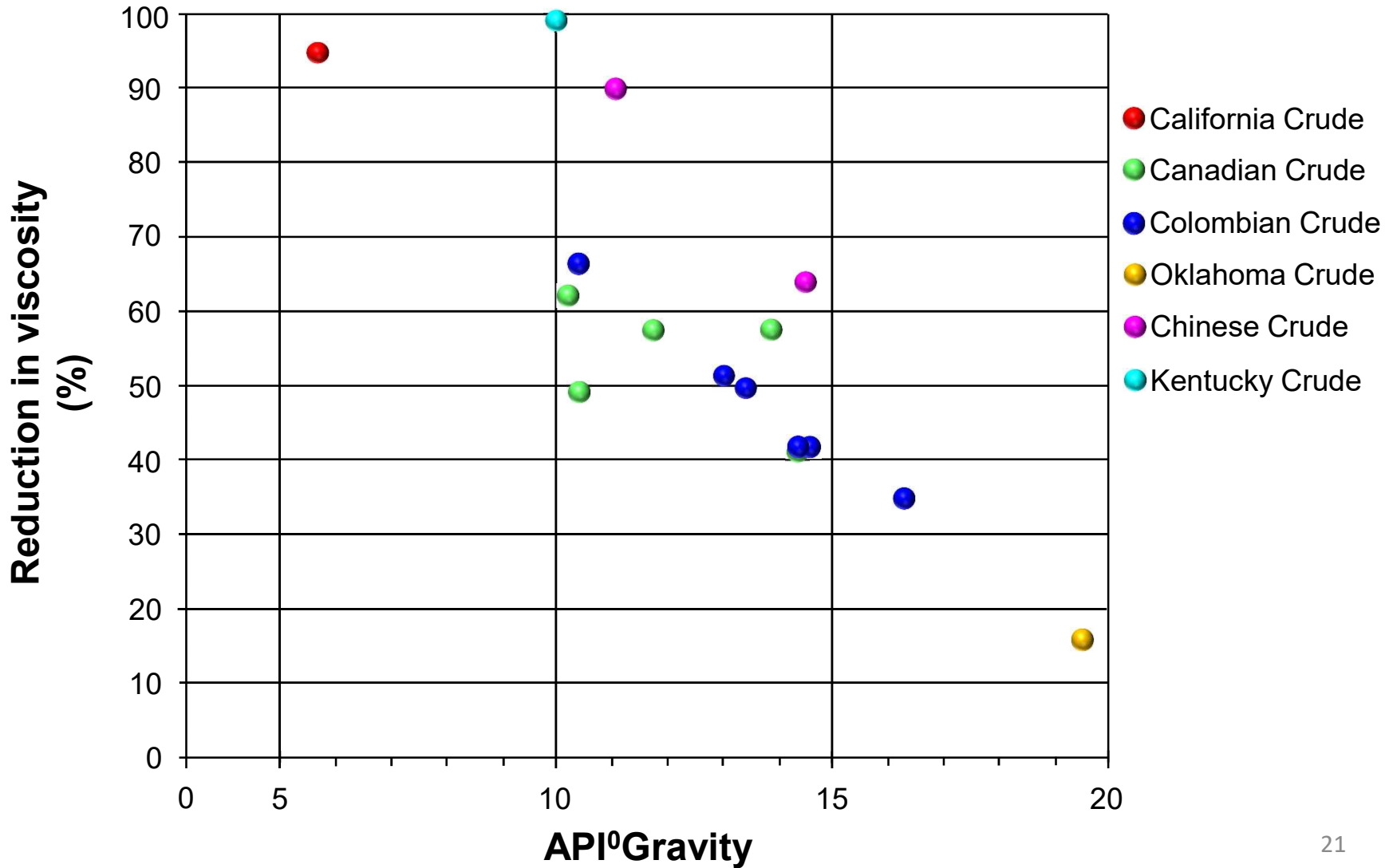




# Viscosity Reduction (%) with Multi-Flow versus API<sup>0</sup>Gravity

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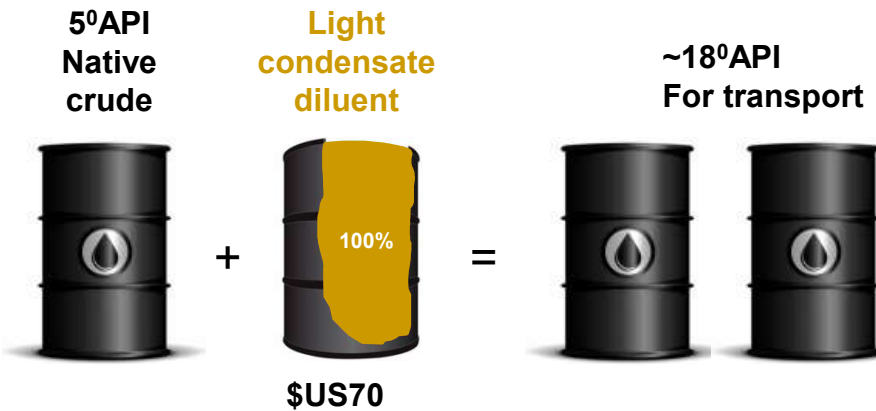


# Diluent vs Diluent + Multi-Flow<sup>®</sup> Explained California Heavy Oil

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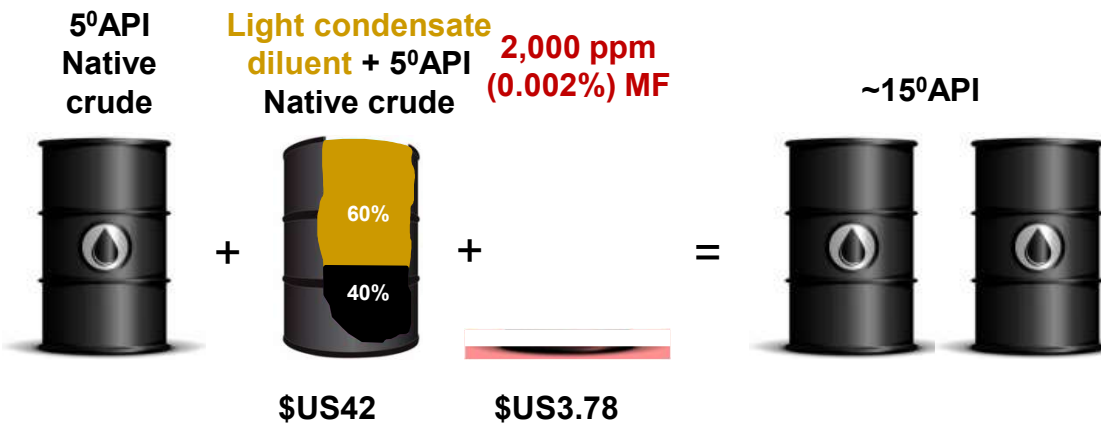
## 50:50 crude-diluent blend



Production				Costs			Net Back
Crude (bpd)	Diluent (bpd)	Blend (bpd)	Value (\$55/b)	Diluent (\$70/b)	Lifting (\$25/b)	Trucking (\$2.50/b)	per barrel (\$)
600	600	1200	\$66,000	\$42,000	\$15,000	\$3,000	\$5.00

Production				Costs			Net Back
Crude (bpd)	Diluent (bpd)	Blend (bpd)	Value (\$55/b)	Diluent + MF (\$70 + \$3.78/b)	Lifting (\$25/b)	Trucking (\$2.50/b)	per barrel (\$)
600	258	858	\$66,000	\$21,235	\$15,000	\$2,145	\$10.26

## 70:30 crude-diluent blend + HCD Multi-Flow



**Operator's Estimated Savings**  
\$US5.26/barrel



# UAE Independent Laboratory Results

## Diluent Equation

$$(0.905 \text{ gm/cc} \times 0.7) + (0.854 \text{ gm/cc} \times 0.25) + (0.805 \text{ gm/cc} \times 0.05) = 0.887 \text{ gm/cc} = 28^{\circ}\text{API}$$

UAE Sludge 70%      UAE Crude 25%      Multi-Flow 5%

Indicative of a paraffinic sludge

Test	UAE Sludge	UAE Crude	UAE Sludge + 25% UAE Crude	UAE Sludge + 5% MF + 25% UAE Crude
<b>API</b>				
API <sup>0</sup>	24.7	34.3	28.8	32.5
<b>BS&amp;W</b>				
Total Cut on Free Oil	56.00%	0.10%	32.00%	28.00%
BS&W Water	7.70%	0.00%	4.00%	4.75%
BS&W Sediment	0.30%	10.00%	0.00%	0.25%
BS&W Emulsion	48.00%	0.00%	28.00%	23.00%
Total Water Content	7.70%	0.00%	4.00%	4.75%
Total Oil Content	44.00%	99.90%	68.00%	72.00%
<b>Viscosity (cSt)</b>				
Viscosity at 41 Deg F.	Too thick to measure	13.54	extrapolated 874,000,000	1,447.00
Viscosity at 86 Deg F.	Too thick to measure	6.82	extrapolated 13,920,000	988.00
Viscosity at 104 Deg F.	Too thick to measure	5.39	extrapolated 2,657,000	860.20
Viscosity at 122 Deg F.	Too thick to measure	4.48	extrapolated 36,660	723.40

Multi-Flow substantially uplifts API gravity

Very low sediment content  
Very high emulsion content  
High water content

UAE Sludge + 25 % UAE Crude + 5 % Multi-Flow = 99% Viscosity Reduction

UAE Sludge + 25 % UAE Crude = Substantial reduction in emulsion & water  
+ 5 % Multi-Flow = further reduction in emulsion, slight increase in water liberated



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# Current Priorities

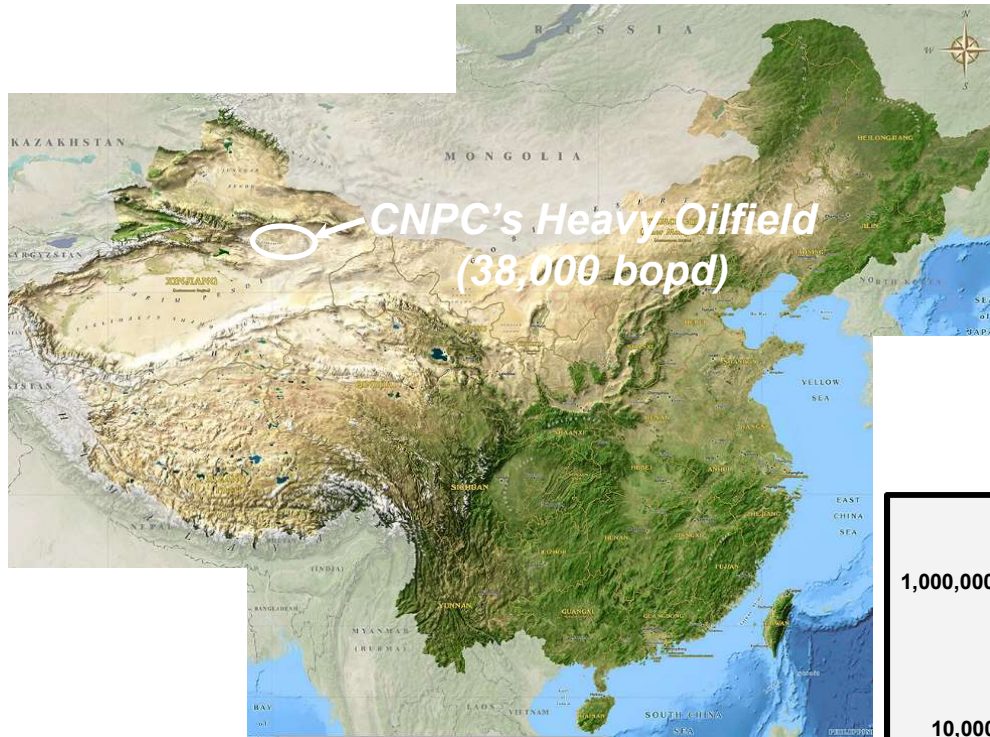




# Viscosity and Diluent Reduction in China

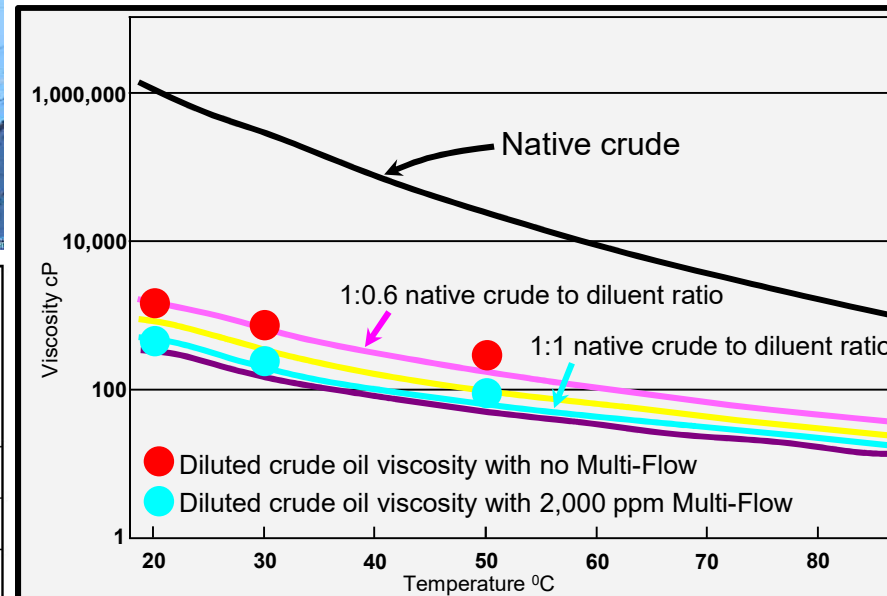
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- Viscosity of the diluted crude produced from the well was reduced by 65% at all temperatures (20°C, 30°C and 50°C).
- Viscosity reduction achieved by a crude oil-to-diluent ratio of 1:1 can now be achieved with a crude oil-to-diluent ratio of 1:0.6 by adding Multi-Flow, or a 40% reduction in diluent requirement.
- Production increased by 22%.
- Indago's distributor is negotiating a pilot-scale field trial in a cluster of ~80 wells.

Shear rate s <sup>-1</sup>	Temperature °C	Viscosity Mpa · s (without MF)	Viscosity Mpa · s (Two days after injecting MF)	Reducing %	Viscosity Mpa · s (Four days after injecting MF)	Reducing %
170	20	1496.04	1165.89	22.07%	512.76	65.73%
170	30	813.82	704.3	13.46%	279.74	65.63%
170	50	300.96	291.51	3.14%	104.23	65.37%





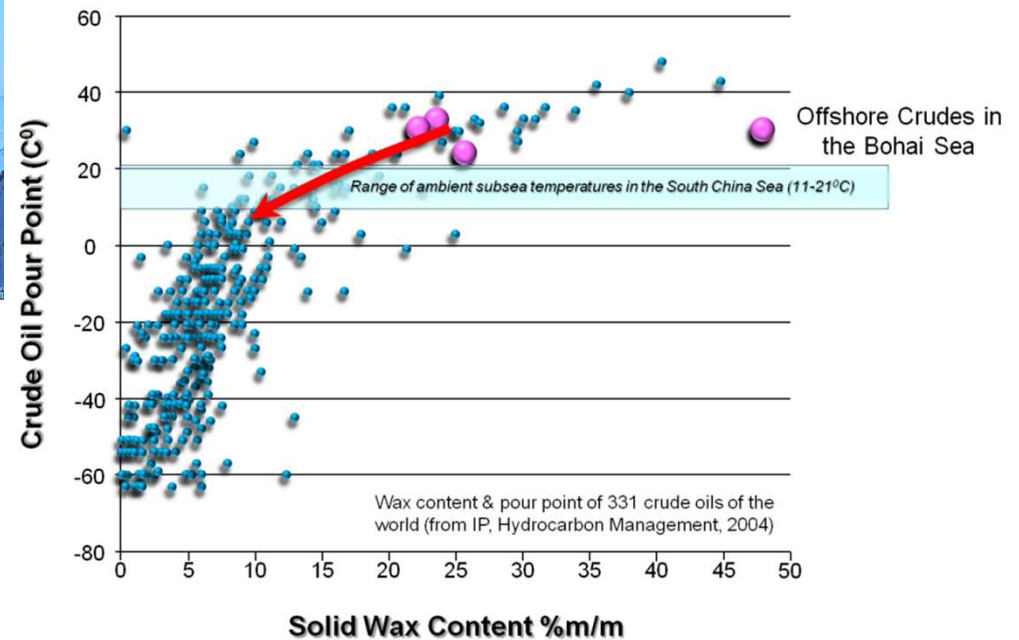
# Proposed Trial in the Bohai Sea, China

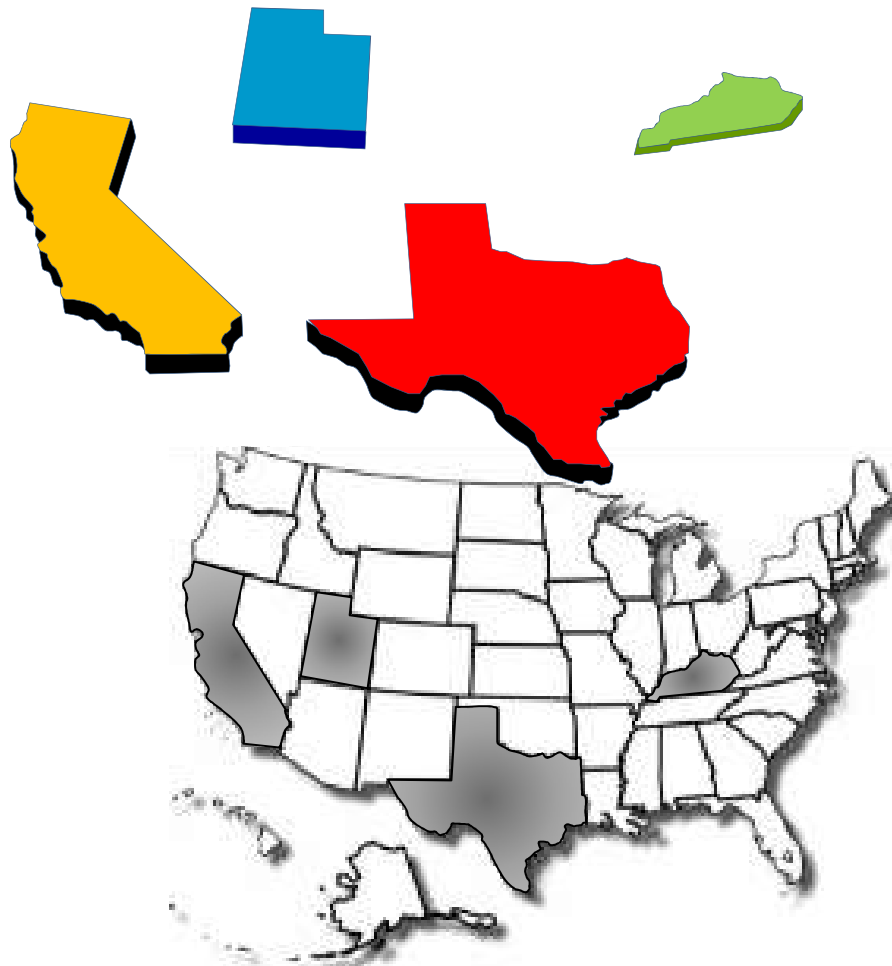
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- HCD proposed a trial in the Bohai Sea with a major Chinese Operator.
- The trial will address bitumen plugging in gravel pack completions and wax deposition in perforations & production tubulars.
- Drums of Multi-Flow have been purchased & delivered to Tianjin and the trial is expected to be undertaken in second half of 2019.





## **California**

- Multi-Flow testing in extra heavy (5-6<sup>0</sup>API) crudes was successful and led to modest drum sales to a small independent operator.
- The substantial viscosity reductions achieved by Multi-Flow has led to two down-hole trials with California's largest heavy oil producer who currently uses a significant quantity of viscosity reducing agents to enable artificial lift and pipeline transport. Several drums of Multi-Flow are onsite and the trial is waiting only for bottle testing to ensure compatibility of the Multi-Flow with the crude.

## **Utah**

- In Utah, separate trials with 2 of the largest producers in the Uinta Basin were about reducing pour point of the very waxy crudes. Multi-Flow reduced the pour point of one of the major producer's crude by 15<sup>0</sup>C and also increased the flash point to 126<sup>0</sup>F. INK is currently considering re-engaging with the company after the company was acquired

## **Texas**

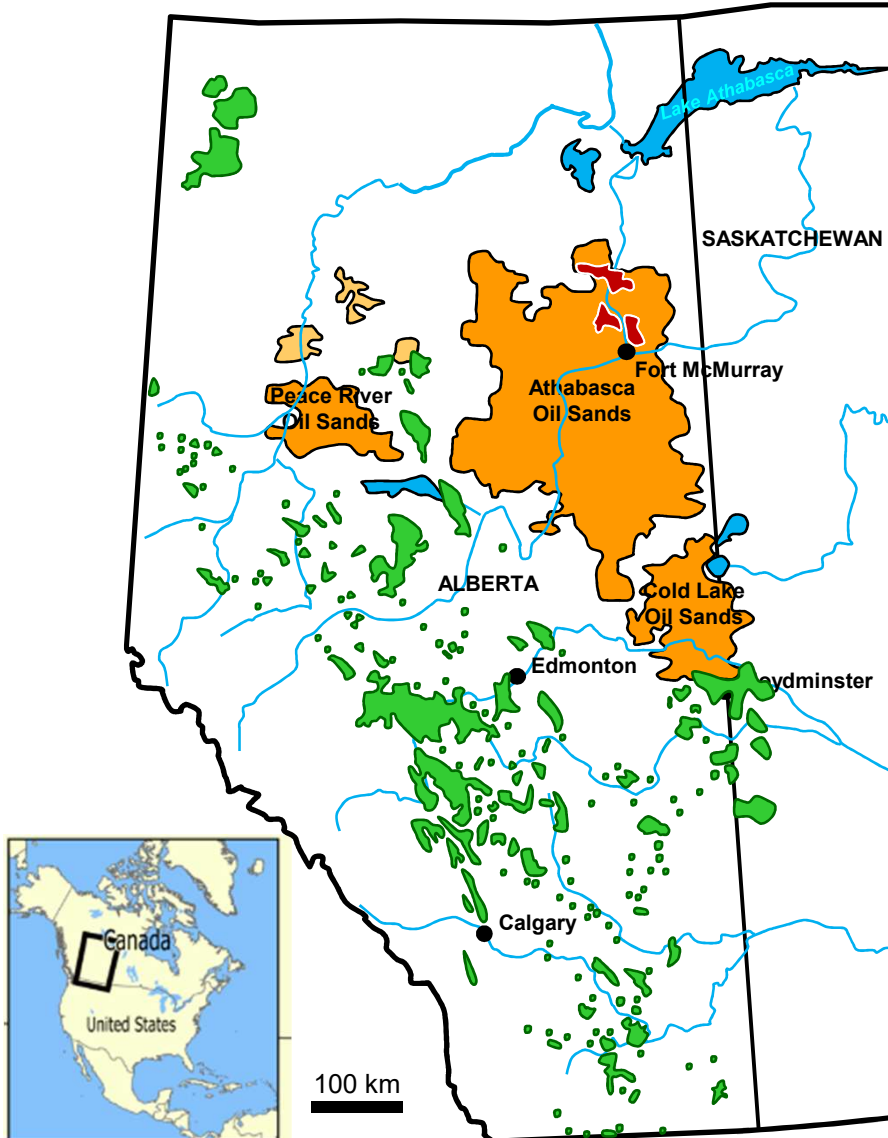
- In Texas the trial was about reducing Basic Sediment and Water (BS&W) to raise oil quality and crude oil sale price. While the BS&W was substantially reduced from 4% to 2%, the trial fell short of the 1% target for commercial application.

## **Kentucky**

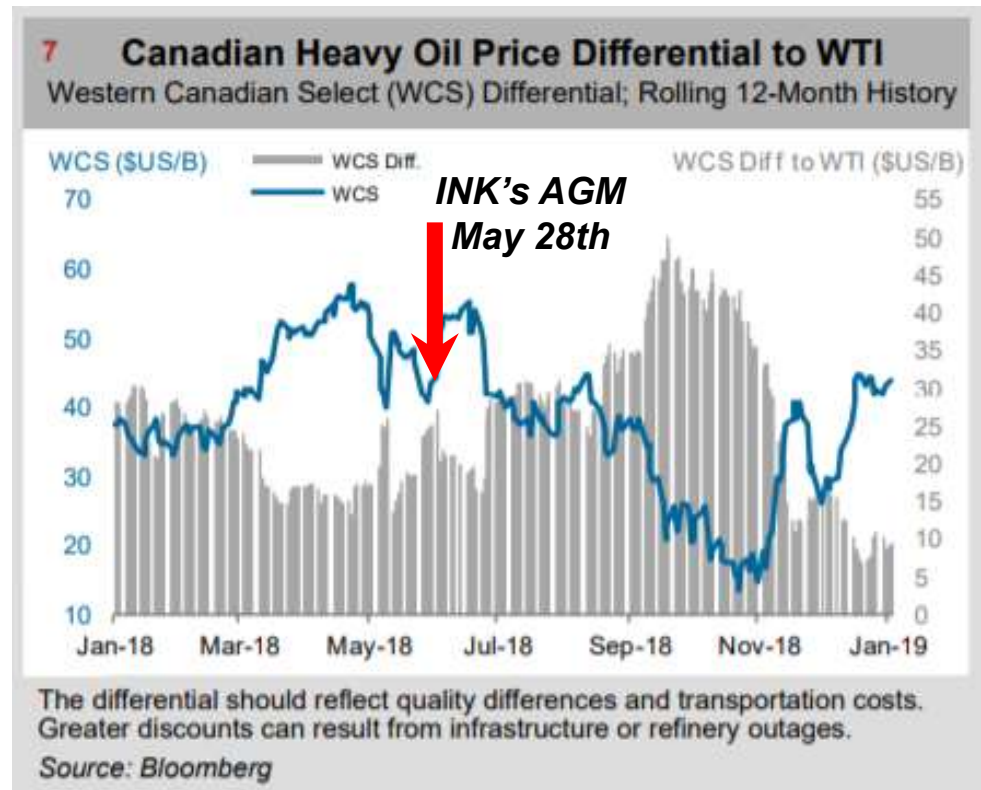
- Indago successfully drilled & stimulated a test well with Multi-Flow. Crude oil viscosity was reduced from 50,000 cP to 490 cP allowing crude to be swabbed to surface. Next steps are to design drilling, completion and recovery techniques to establish commercial flow rates.



# Current Priorities - Canada



- Indago has been pursuing opportunities in the Oil Sands, Mature Fines Tailings and Heavy Conventional Oil.
- Progress has been hampered by the Canadian Oil market conditions.

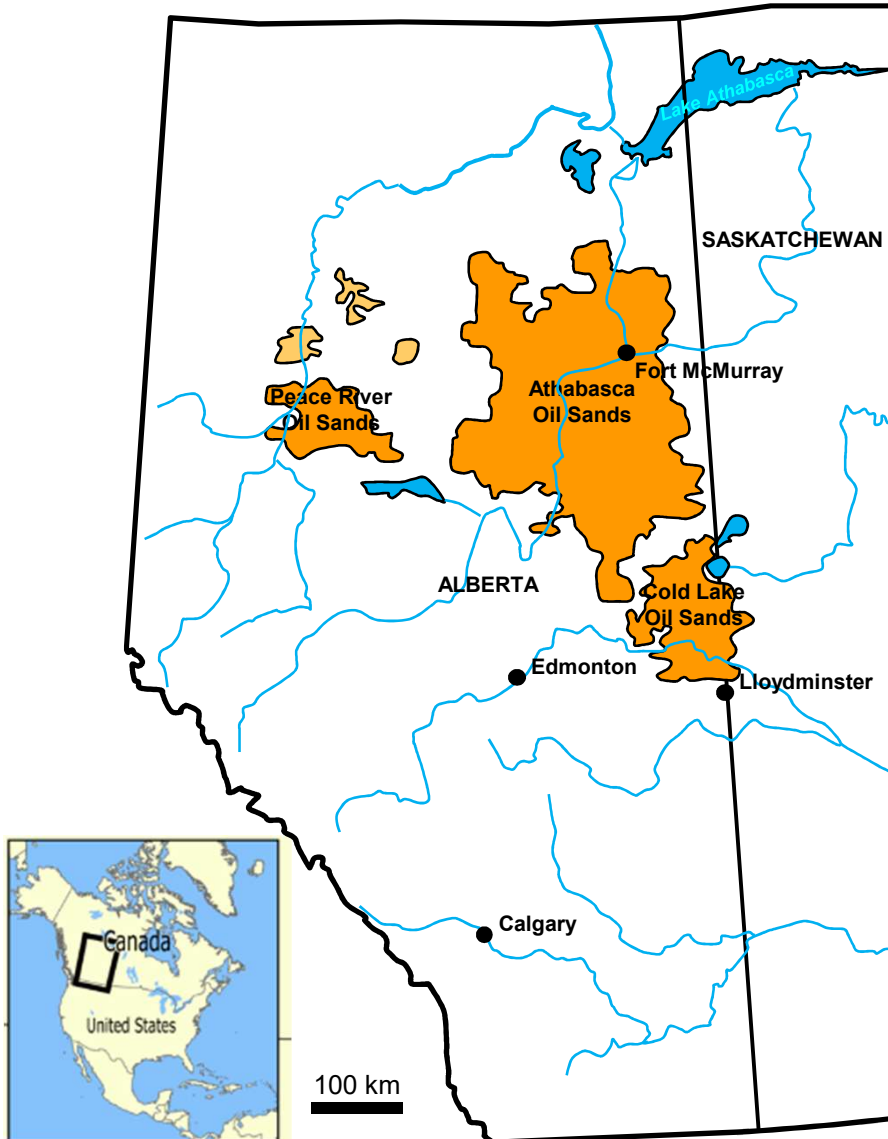




# Diluent Reduction in the Canadian Oil Sands

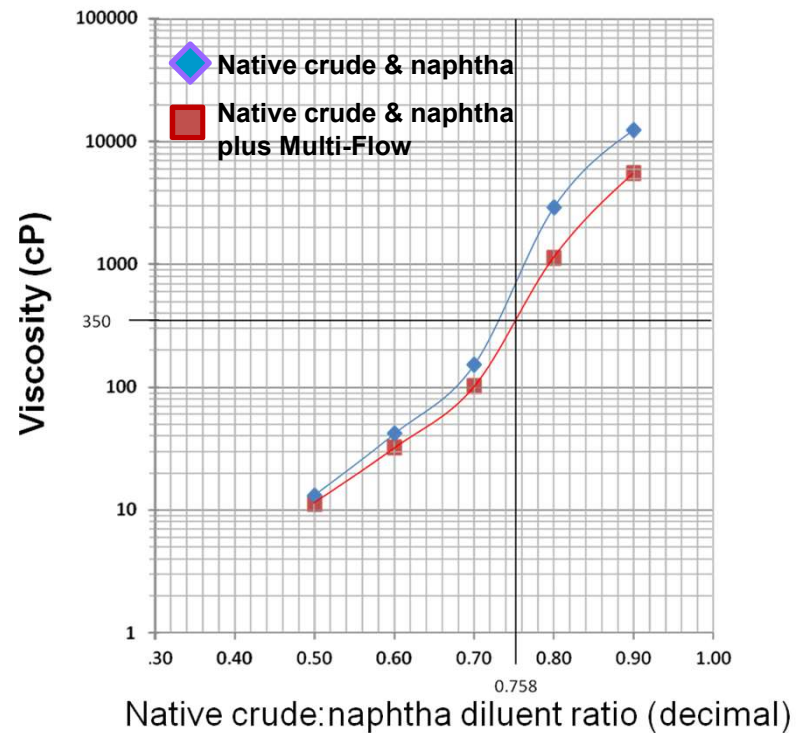
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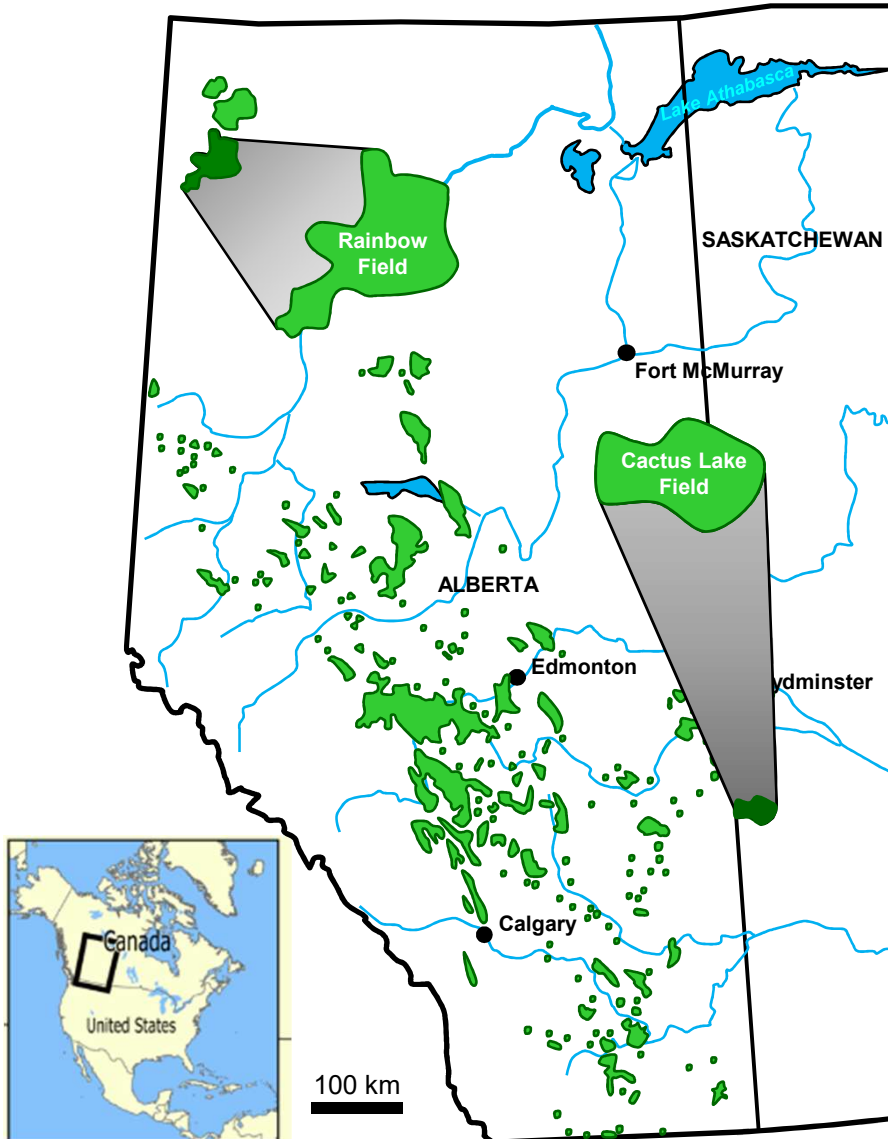
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## Canadian Oil Sands

- A major International operator provided old storage samples of “dead” Steam Assisted Gravity Drainage (SAGD) crude oil. Testing aimed at reducing the amount of diluent required to meet Canadian pipeline specifications by adding Multi-Flow. Results were a *proof of concept* with the addition of Multi-Flow reducing the diluent requirements by ~8%. The Company is now collecting samples of freshly produced SAGD crude to retest “live” samples.
- ~1.6 million bpd of diluted crude is exported by pipeline





## Heavy Conventional Oil

- The Cactus Lake Field trial was underway at the time of last year's AGM.
- 1,000 ppm MF uplifted crude oil gravity by 1.1<sup>0</sup>API & reduced viscosity from 1,001 cSt to 586 cSt (at 20°C).
- Despite being technically successful, progression to drum sales was curtailed by Canadian oil market conditions.
- Rainbow field produces ~12,000 bopd of waxy & asphaltenic crude creating deposition problems in the perforations, tubulars and gathering lines.
- HCD proposed a Multi-Flow squeeze and continuous feed to eliminate the deposition problems.
- The trial is scheduled for June 2019 (weather issues delayed an earlier commencement date).
- The operator is one of Canada's largest oil companies producing ~215,000 bopd.



## **Oman**

- GCD (HCD's Middle East Distributor) has progressed HabHab project to a 3 well pilot evaluation & design and is negotiating the final list of operators/contractors.
- OXY has progressed to product testing MF for a solution to their subsurface issues & requested sample of MF for internal testing.

## **Kuwait**

- GCD has proposed a well stimulation pilot with Kuwait Oil Company in the Abdulyah field. Kuwait Oil Company is the 6<sup>th</sup> largest oil company in the world and produces on the order of 3.5 million barrels of oil per day.

## **Iraq**

- GCD has proposed two pilot trials to Basrah Oil Company: a tank clean and a pipeline clean-up. Basrah Oil Company operates the giant oilfields of Southern Iraq including Rumaila & produce on the order of 3.2 million barrels of oil per day.

## **Abu Dhabi**

- GCD received successful results from testing at ADNOC's in-house laboratory testing of sludge and crude samples from ADNOC's tank farms. GCD also received positive independent lab test results for ADOC's Mubarraz Island and has submitted proposal to ADOC.

## **Turkmenistan**

- GCD's proposal to Dragon Oil to trial HCD Multi-Flow® last year has been delayed while the company restructures. However, outstanding laboratory testing of Petronas' crude in the neighbouring offshore block will provide impetus for Dragon Oil to move forward.



# Proposed Trial in Abduliyah Field, Kuwait

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- GCD has proposed a well stimulation pilot in the Abduliyah oilfield from the Kuwait Oil Company.
- Abduliyah oilfield has 100's of producing wells & is adjacent to the supergiant Greater Burgan field (largest sandstone reservoir ever discovered).
- The objective of the trial is to increase production flow rate by reducing crude oil viscosity.
- Drums of Multi-Flow have been purchased & delivered to Kuwait. The pilot is scheduled July-August 2019.
- Independent laboratory tests on Kuwait sludge samples showed substantial reduction in viscosity with the addition of Multi-Flow, augmenting potential of the field trial.

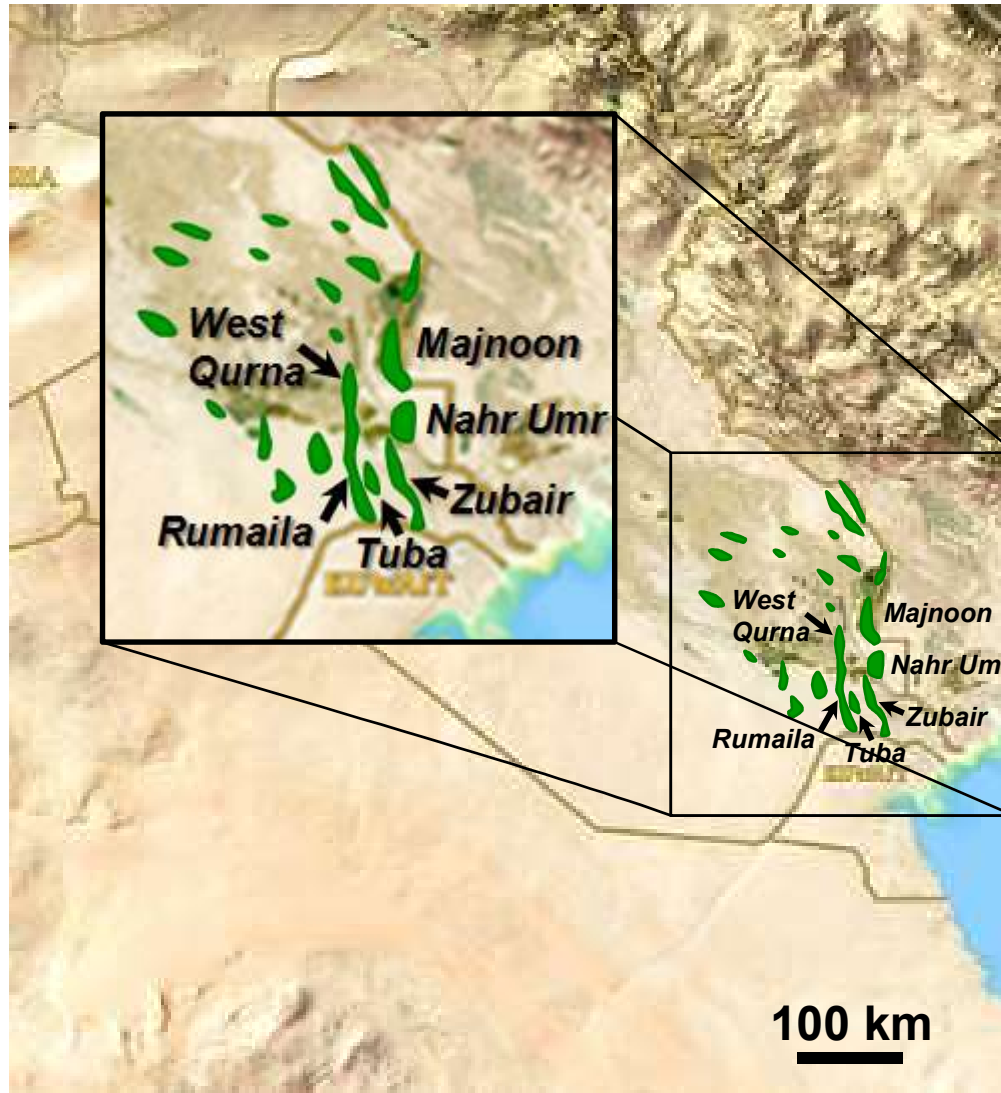




# Proposed Trials with Basrah Oil Company in Iraq

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- GCD has proposed two pilot projects to Basrah Oil Company (BOC) in Iraq, one for a tank clean, the other a small-scale pipeline clean-up across a length redirected from a high volume trunk line. The Ministry of Oil in Iraq has approved the pilots and referred the projects to BOC for technical evaluation. Data has been requested from BOC for final trial design. GCD anticipates 2H, 2019 start.
- Basrah Oil Company is the part of the Iraq National Oil Company that operates the oilfields of Southern Iraq & produces on the order of 3.2 million barrels of oil per day.
- Success in the pilot projects may give HCD access to major opportunities in the supergiant fields such as Rumaila which is the 3<sup>rd</sup> largest ever discovered and currently produces 1.3 million barrels of oil per day.



# ADOC Pipeline & Tank Clean Request



ADOC (Abu Dhabi Oil Company) requested a Preventative Maintenance Program for Flow Assurance in Production Facilities and Storage Tanks on Mubarraz Island utilizing HCD Multi-Flow® Technology

- Daily crude oil production on Mubarraz Island is 45,000 barrels.
- Storage tank capacities are 750,000 and 380,000 barrels of oil.



## ADOC Pipeline & Tank Clean Request



- ADOC (Abu Dhabi Oil Company) requested a Preventative Maintenance Program for Flow Assurance in Production Facilities and Storage Tanks on Mubarraz Island utilizing HCD Multi-Flow® Technology.
- Daily crude oil production on Mubarraz Island is 45,000 barrels.
- Storage tank capacities are 750,000 and 380,000 barrels of oil.
- Independent laboratory testing of the sludge was highly successful.





- ADNOC (Abu Dhabi National Oil Company) undertook testing of HCD Multi-Flow at their own internal ADNOC onshore laboratory under different environments. The performance of HCD Multi-Flow was accepted by ADNOC, and GCD has proceeded with the “Online Tank Desludging” pilot proposal.
- GCD and HCD were then invited and presented the final proposal to ADNOC’s oil storage tank main maintenance contractor. GCD is currently in negotiations for the initial five tank contract with capacities ranging from ½ to 1 million barrels of oil.
- ADNOC are currently collecting samples from the first tank to conduct further lab tests



# Petronas' Concession Offshore Caspian Sea, Turkmenistan



Pre-Heated 80°C

No.	Sample Name	Pour Point °C	Basic Sediment & Water (BS&W) %vol
1	Baseline CD-3:CD-4:CD-5 (ratio 1:1:1)	24	13
2	CD-3:CD-4:CD-5 (1:1:1) & 1,000 ppm Multi-Flow	9	0.3
3	CD-3:CD-4:CD-5 (1:1:1) & 2,000 ppm Multi-Flow	-6	0.3
4	CD-3:CD-4:CD-5 (1:1:1) & 5,000 ppm Multi-Flow	-6	0.3
5	CD-3:CD-4:CD-5 (1:1:1) & 1% Multi-Flow	-9	0.3

- HCD Multi-Flow reduced Pour Point from 24°C to -9°C, well below the winter Caspian Sea temperature average of 8°C.
- HCD Multi-Flow lowered the BS&W from 13% to 0.3%.
- HCD has proposed a field trial for Petronas' 8,000 bopd field.



# Heavy and/or Viscous Oil-Producing Areas & Pipeline Network of Colombia

Indago Energy Limited

Hydrocarbon Dynamics



## Llanos Basin

- characterized by light oil fields in the north and heavy oil fields in the south and central parts including the Rubiales field with OOIP of 4.38 billion barrels of 11.3-14.5<sup>o</sup>API crude.
- The south central Llanos Basin has many more fields and billions of barrels of reserves where crude oil gravity must be uplifted or diluted to meet pipeline specifications of 600 cSt & 15-16<sup>o</sup>API.

## Upper & Middle Magdalena Valley

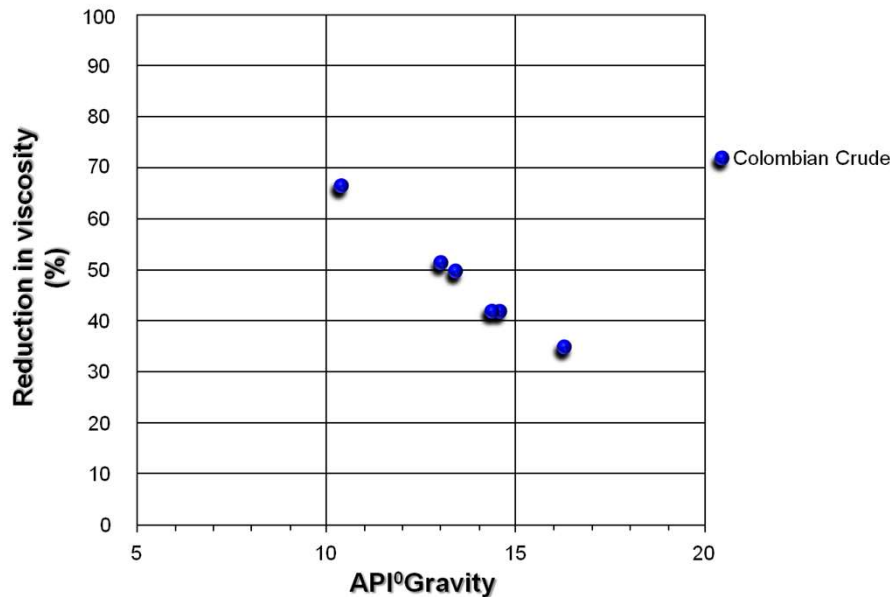
- characterized by crude oils from 15-20<sup>o</sup>API, but of unusually high viscosity and locally high in wax content.
- Some crudes are trucked to the Caribbean coast because they don't meet pipeline specifications.

## Pipeline Transport

- The National Oil Company of Colombia transport 400,000 barrels of oil per day through the pipeline network and is estimated at approximately one billion dollars on imported diluent to enable the heavy crudes to meet pipeline specifications of 600 cSt & 15<sup>o</sup>API.



# Viscosity Reduction in Laboratory Testing, Colombia



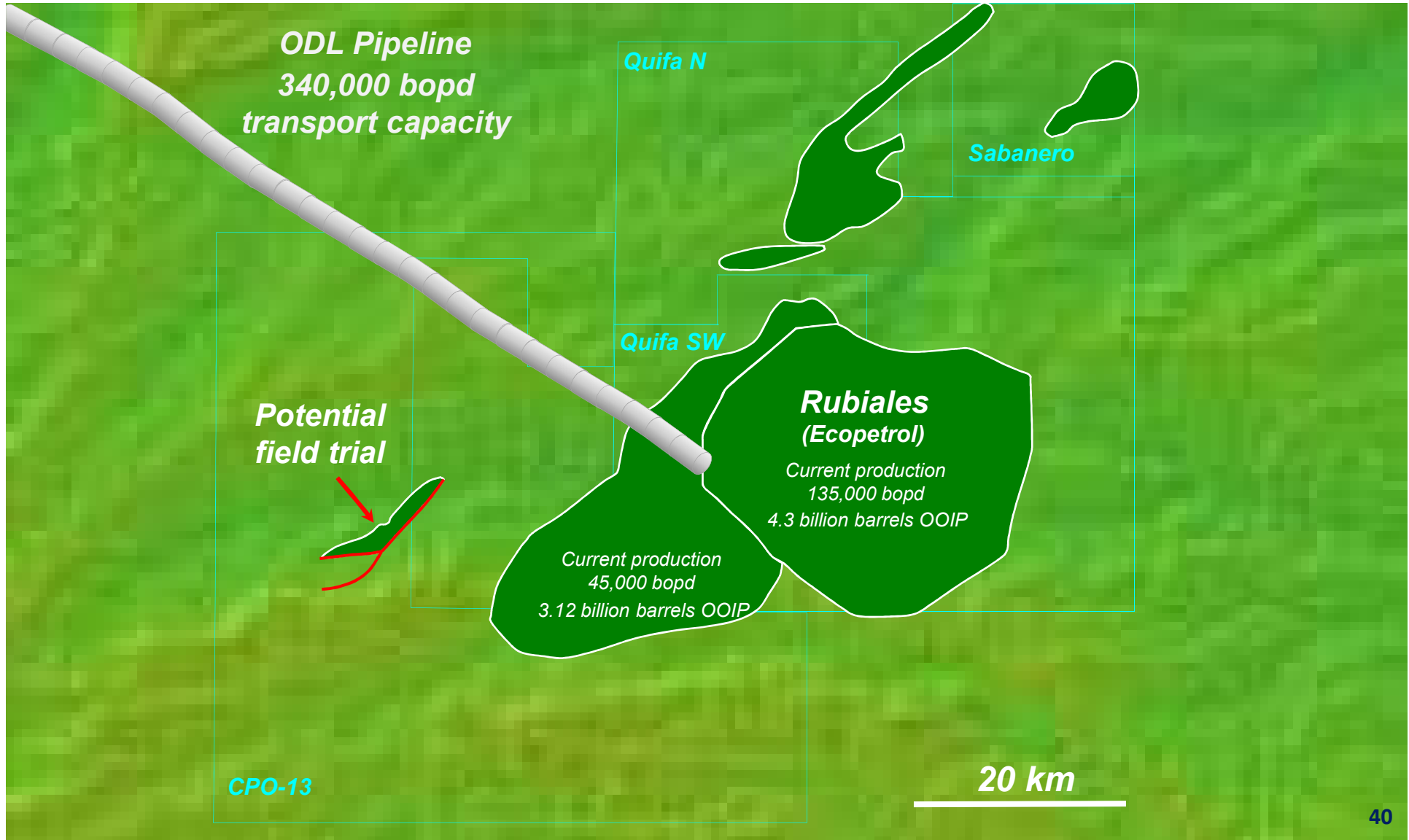
- Indago has tested crude oils from 4 fields, 3 in the Llanos and 1 in the Middle Magdalena Valley with 3 different operators.
- In laboratory testing at an independent laboratory Multi-Flow successfully reduced the viscosity of the crude from all 4 fields to below the pipeline specification of 600 cSt.
- Indago is negotiating with 3 companies to test Multi-Flow in field trials with the objective to make the heavy crude pipeline compliant without the need for diluent.



# Seeking Field Trial in the Vicinity of Rubiales Field, Llanos Basin, Colombia

Indago Energy Limited

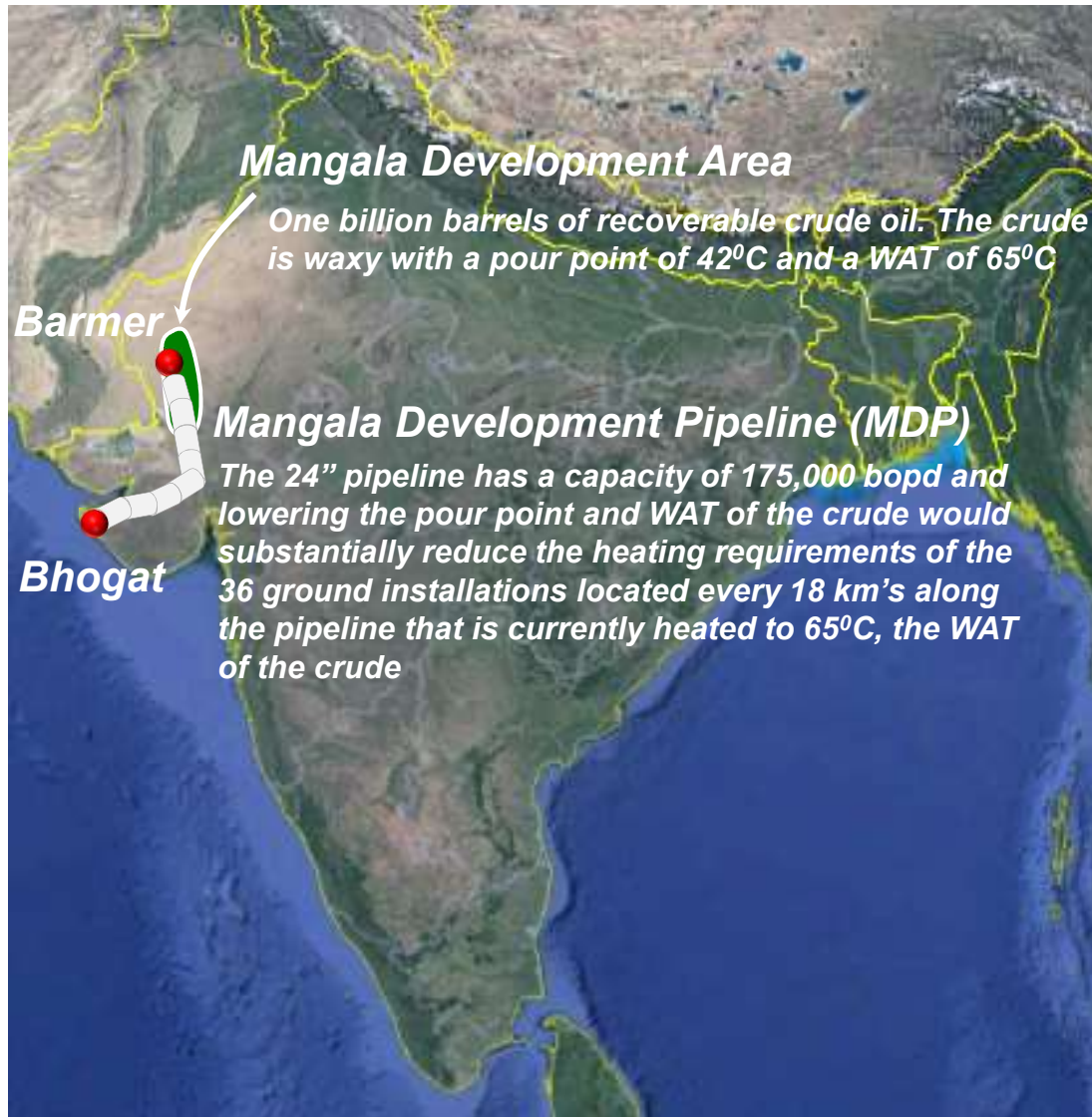
Hydrocarbon Dynamics







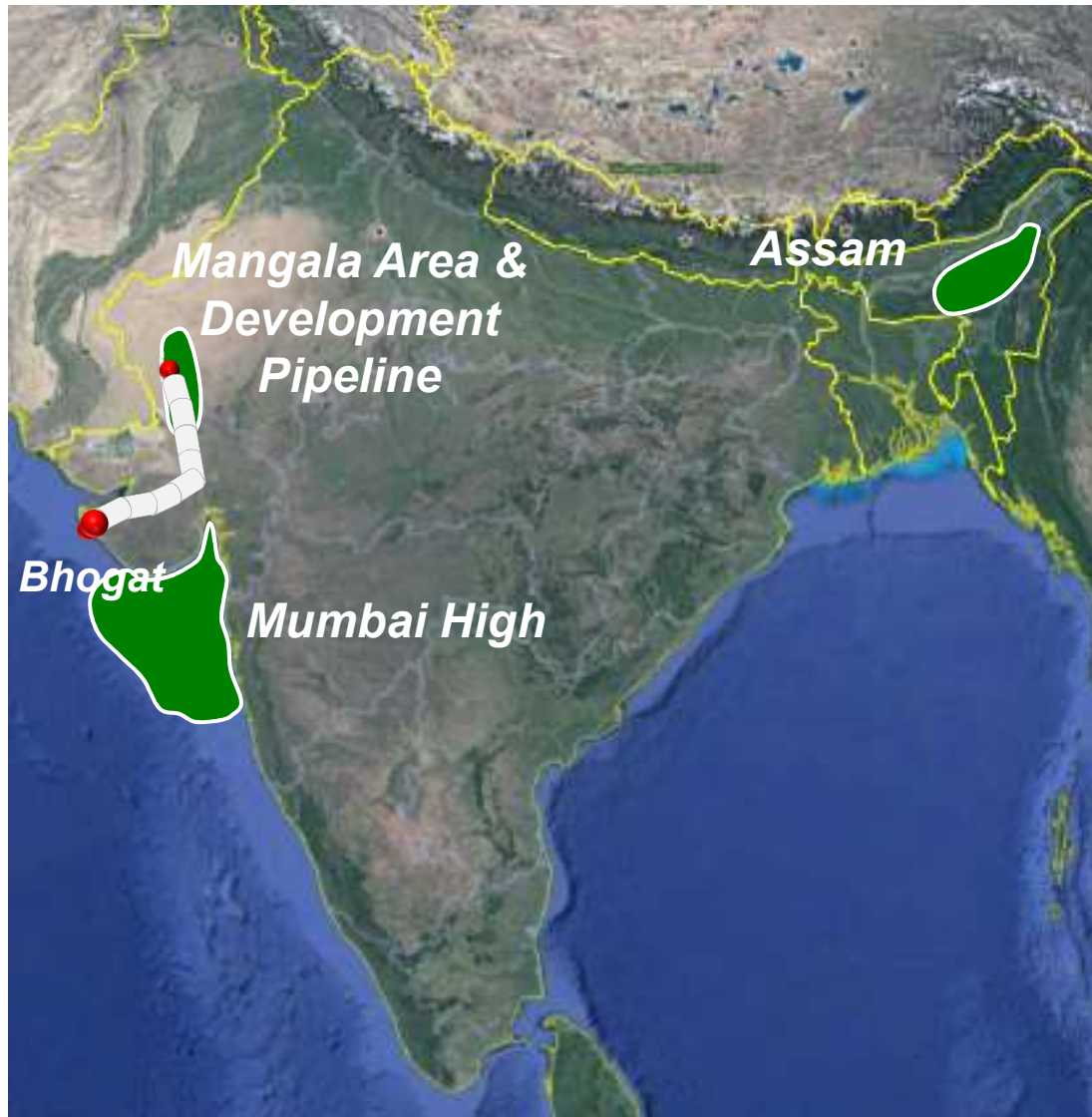
# Major Pipeline, India



- Indago proposed a two phase trial of HCD Multi-Flow on a 6,000 bopd recirculation line at the Bhogat terminal after successful lab results.
- Phase I aims at reducing the Pour Point & WAT of the crude by 15°C with dosage rates of Multi-Flow between 500 and 2,000 ppm.
- Phase II aims at reducing the Pour Point & WAT of the crude by an additional 10°C (total reduction of 25°C) with dosage rates of Multi-Flow up to a maximum of 5,000 ppm.
- Indago will seek to secure a contract for Multi-Flow to be applied to the 175,000 bopd pipeline should Phase I and/or Phase II meet the success criteria and commercial requirements.



# Assam and Mumbai High, India



## ***Baghewalla Field***

- Indago has proposed a two well Tri-phase Squeeze trial in the heavy Baghewalla field, Rajasthan for one of India's largest producers.

## ***Assam***

Indago's sales & marketing team has approached management at Assam and identified opportunities for Multi-Flow to treat wax deposition in non-piggable pipelines.

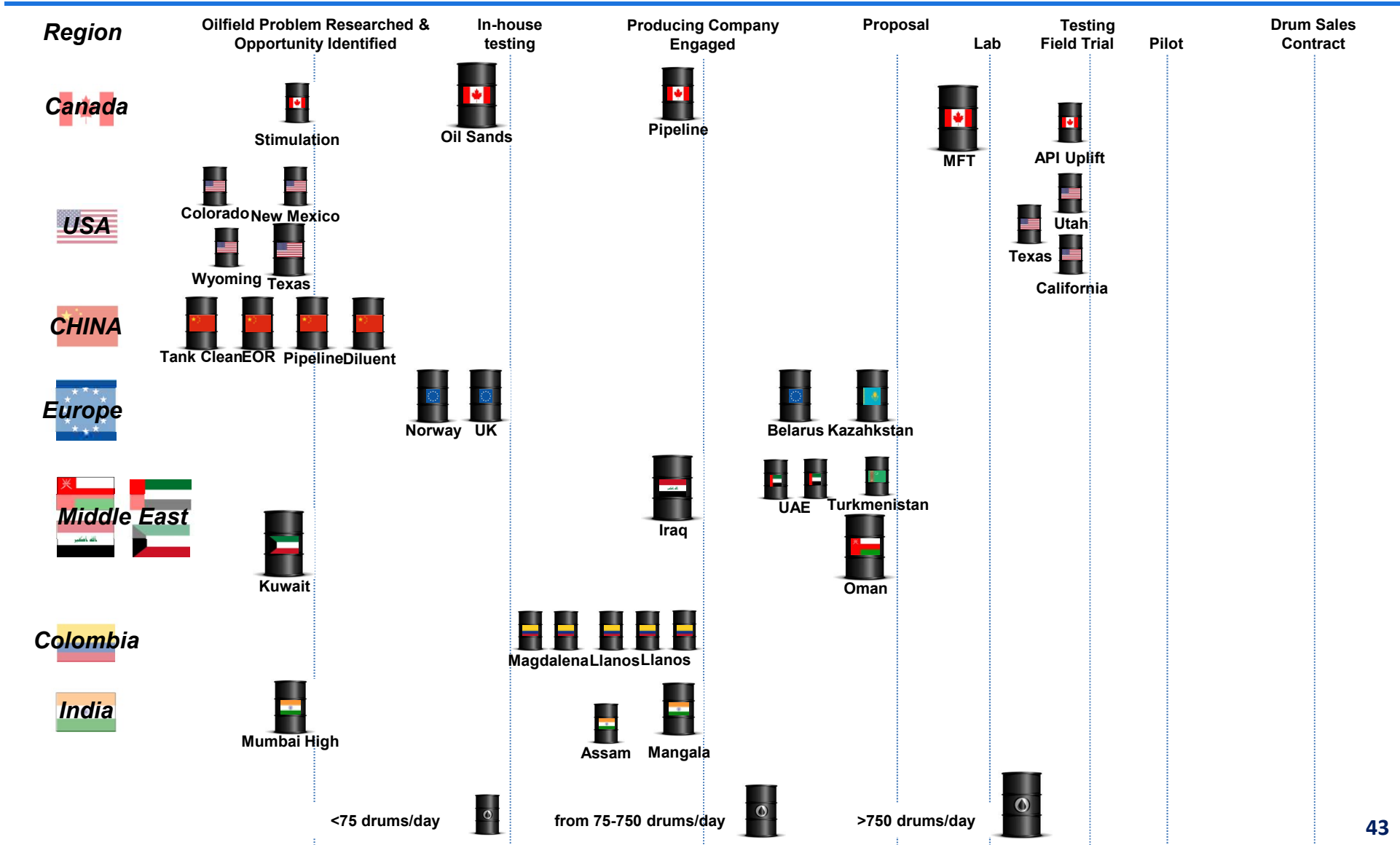
- Indago has submitted a proposal for a 34 km line that transports 4,400 bopd.
- Many other non-piggable pipelines that experience paraffin deposition have been identified as ideal candidates.

## ***Mumbai High***

- Indago's Sales & Marketing team are currently engaging the Managers of the offshore Mumbai High assets.

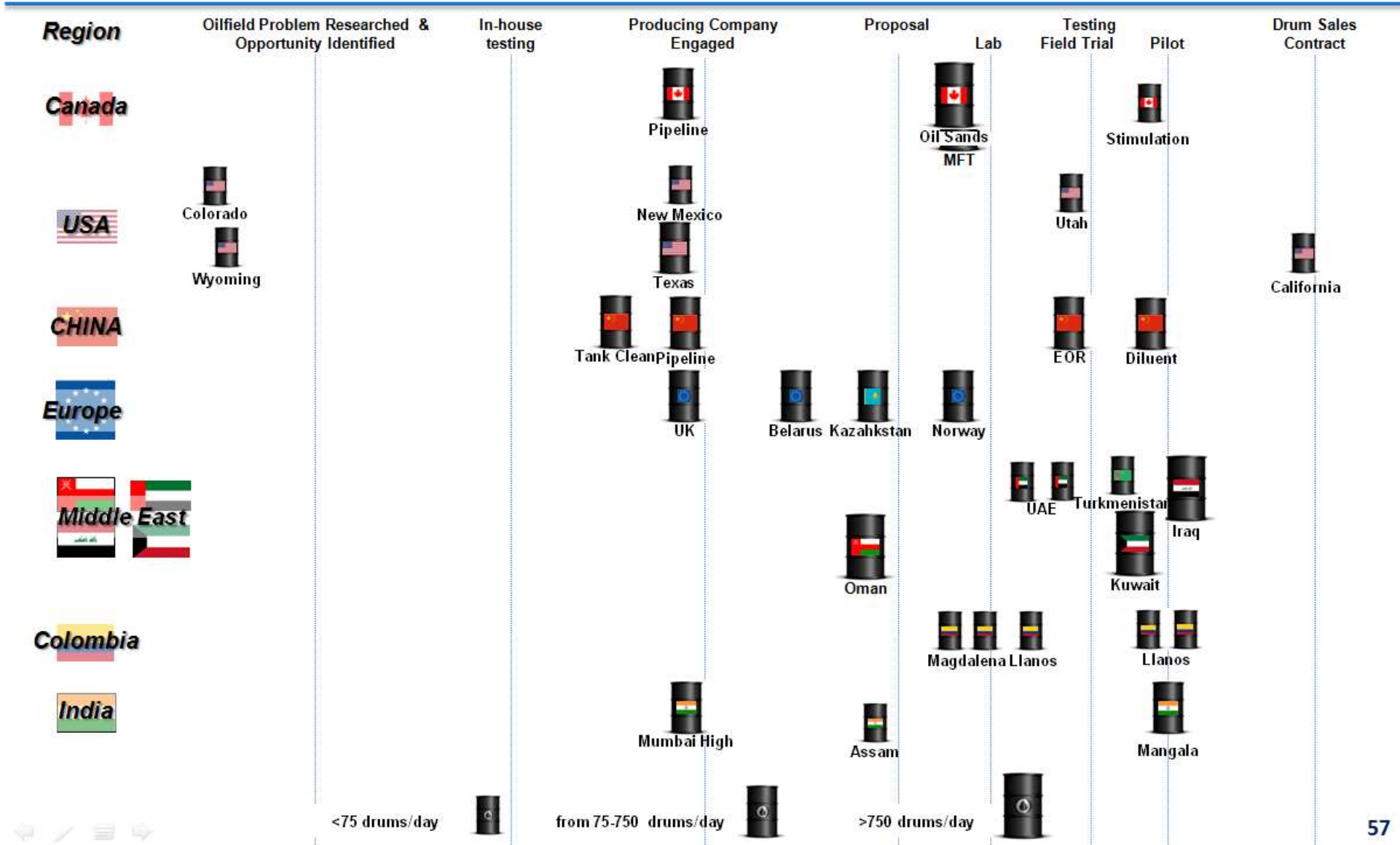


# Indago Progress





# Indago Progress





Indago Energy Limited

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