



# Indago Energy Limited

June 12, 2018

## Market Update

This market update covers only the more advanced marketing initiatives related to the sales and use of Indago's (INK) key products, including HCD Multi-Flow® ("Multi-Flow") and associated technologies and follows from the update provided in the AGM presentation. The update covers:

- Field testing with oil producers
- Oil storage testing with owners and contractors
- Testing & marketing efforts to pipeline operators
- Initiatives to replace diluent in oil production and transportation
- Canadian Oil Sands Initiatives (other than MFT)
- Mature Fine Tailings initiatives
- Progress on INK's project in Kentucky
- Progress on INK's project in Utah

It should be noted that there is no certainty that any of these more advanced marketing initiatives will result in future orders.

### Utah

Company 1. After successful bench top tests, INK is conducting trials in two wells for a large US producer in Utah where high wax contents and high pour points cause significant additional costs in transportation and production. Tests to date have shown reductions in pour point in the order of 20°F in the wells beset with black wax problems and more modest results with the yellow wax oils. Once the current tests are completed, INK and the producer will analyse results to determine what quantity of Multi-Flow should be applied field wide or whether further delivery mechanisms need be explored to optimise results.

Company 2. INK is also conducting similar tests in two producing wells in Utah's Uinta Basin for a large Canadian based oil producer. Preliminary field results at lower dosage rates have been modest so dosage rates have been increased and a review of the operator's field practices in applying Multi-Flow is underway.

### California

California's annual oil production is on the order of 170 million barrels most of which is heavy and extra heavy. The extra heavy crudes are highly viscous and unmanageable with respect to handling, storing or transporting unless they are diluted with costly light crude oil. INK has been testing HCD

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Multi-Flow with independent operators producing extra heavy crude oils with the aim of reducing the amount of light oil needed as diluents, and thereby provide substantial cost savings for the operators. Initial tests have demonstrated that the application of Multi-Flow successfully reduced the diluent needs by 40% of an independent operator producing 5-6<sup>0</sup>API gravity crude, representing costs savings on the order of \$6/barrel. INK and the producer are fine-tuning the diluent + Multi-Flow to native crude ratio and should soon start dosing field wide. Should Multi-Flow be successful in this application it could provide a commercial demonstration for other, much larger producers in California.

### Texas

INK recently concluded a 5-month trial on a South Texas oil field aimed at reducing BS&W levels in a stripper well (1-10 bopd) to enhance crude oil sales price. The test succeeded in reducing BS&W levels to below 2% from the previous 4-5%, with the owner commissioning a follow-up trial in a more valuable 35 bopd producing well. That test commenced on June 1<sup>st</sup>, 2018 and is ongoing.

### Saskatchewan Heavy Oil

In Saskatchewan, INK is engaged with a medium sized independent producer in a trial aimed at lowering heavy crude oil density to achieve a higher oil price. The field produces approximately 10,000 bopd of raw crude with crude oil gravity in the order of 14.4<sup>0</sup> API. The crude is sold into the Western Canada Select (WCS) marketing system at a discount that is comprised of a diluent blending fee and an equalization charge. The discount is reduced as the API crude oil gravity is increased. To date, application of Multi-Flow has raised the crude oil gravity to 15.5<sup>0</sup> at modest treatment dosage rates. Field operations have been paused to clean a sales oil tank, and the trial will recommence shortly at a higher feed rate of Multi-Flow. Should the target crude oil gravity of 16.7<sup>0</sup> be achieved at a commercial dosage rate of Multi-Flow commercial discussions will likely follow.

### North Central Alberta Heavy Oil

In North Central Alberta, INK has concluded a laboratory trial for a large Canadian oil producer aimed at lowering heavy crude oil viscosity. The operator experiences problems in the winter when the relatively high pour point and high viscosity of the crude reduces flow on a sales pipeline, increasing the operating pressure to its maximum. The raw crude is waxy and asphaltenic with a density of 15.67<sup>0</sup>API (at the industry standard temperature of 15<sup>0</sup>C), a pour point of -18<sup>0</sup>C, and a kinematic viscosity of 472.82 centi-Stokes at 30<sup>0</sup>C. At a lab treatment rate of 5% Multi-Flow (approximately 1000 – 1500 ppm rate in the field), INK improved the gravity of the crude to 17.7<sup>0</sup>API, lowered the pour point to -30<sup>0</sup>C, and reduced kinematic viscosity to 330.56 centi-Stokes. The operator is preparing to move to a field trial. This particular application is only relevant to a brief period in winter and potential

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drum sales would be modest. However, the technical success of the laboratory trial has caught the attention of the operator who is now considering other, larger scale applications.

### Major Alberta Pipeline

In Central Alberta, INK is engaged in a field trial with a major pipeline operator to reduce the Basic Sediment & Water (BS&W) content of the crude being transported in one of their pipelines. The specification at the intake of the pipeline is 0.5% BS&W, but operators are currently shipping crude with BS&W levels much higher than this specification, and the excess BS&W must be removed before the crude is blended for international transport on another pipeline. The pipeline company arranged a trial pitting Multi-Flow against a competitor product and is yet to formally inform INK of the results. If Multi-Flow lowers the BS&W content of the crude from 3-4% down to less than 0.5% as is possible, and beats competitor products, INK would expect discussions to commence on a commercial agreement with the pipeline company. The pipeline capacity is on the order of 400,000 bopd and therefore represents an exciting opportunity.

### Northeastern British Columbia Waxy Crude

In Northeastern British Columbia, INK has commenced a field trial with a major Canadian oil and gas producer to provide a cleanup and flow improvement on a problematic vertical oil well. The raw crude is relatively light at 36<sup>o</sup>API (at 15<sup>o</sup>C) but because of high wax content and very high pour point, the well often chokes off because of wax deposition in the production tubulars near surface. The current chemical treatment and “wax knifing” jobs on the well are not sufficient to keep it operating efficiently or economically. Multi-Flow will be used to flush the well initially and then be continuously fed down the annulus at varying concentrations until the pour point is reduced sufficiently to prevent wax deposition in the tubulars. Should Multi-Flow prove successful in this field, it would represent a good opportunity to market other applications across this large company’s operations.

### Canadian Oil Sands (SAGD) Initiative

The Athabasca Oil Sands deposit is the third largest oil reserve on earth and the crude is either mined near surface or produced by steam assisted processes at depth. Regardless of the production method, once at surface, the bitumen is highly viscous and near-solid at room temperature with API gravity on the order of 10<sup>o</sup> and a dynamic viscosity in the range of 10,000-100,000 centipoise. To enable transport, handling and storage a diluent is added to the bitumen (usually natural gas condensate, naphtha or light synthetic crude) in concentrations of 25%-50%. Daily production and export to the USA for refining of the combined products is on the order of 1.6 million barrels.

The ability of Multi-Flow to reduce the amount of diluent required to enable handling, storage and transport of extra heavy 5-6<sup>o</sup>API gravity California crude demonstrates the potential for Multi-Flow to

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greatly reduce the amount of diluent needed to make the 10<sup>0</sup>API gravity Canadian crudes pipeline compliant. Bench-top testing followed up by independent laboratory analysis demonstrated that Multi-Flow substantially reduces viscosity of the Canadian SAGD heavy crudes, and the next steps for INK are to test Multi-Flow in combination with the various diluents utilised in Canada. INK has engaged several major Oil Sands producers to test their crudes in this manner.

Net cost of diluent to the Canadian Oil sands producers is from \$13-15 per barrel of oil produced, so even a modest reduction in the bitumen to diluent ratio is of major benefit to the producers. If the 2,000 ppm dosage rate that proved successful in the California extra heavy crudes is indicative for the Canadian heavy oils, then this would represent an exciting opportunity for Indago.

### Canadian Mature Fines Tailings Initiative

Mature Fines Tailings (MFT's) have been a vexing issue for the Oil Sands Mining Industry in Alberta, Canada since mining began in 1967. Residual bitumen in the water-slurry mine waste binds with clays in the water to form stable gel-like suspensions that won't settle, making problematic the dewatering of the tailings ponds. The accumulated volume of toxic sludge residing in the tailings ponds is estimated at 1.3 trillion litres, and the incremental addition from current mining operations is on the order of 100 billion litres annually. INK targeted the MFT's because Multi-Flow's hydrophobic (repels water) and oleophilic (seeks oil) nature could efficiently extract crude oil from water. As anticipated, Multi-Flow readily extracted residual bitumen from the MFT's in bench top testing in-house and was verified by independent laboratory testing at CoreLab Canada and AGAT laboratories.

Dozens of technologies have historically been tried in dewatering the tailings ponds but typically disappoint because they are too expensive, and the key to Multi-Flow becoming a viable tailings dewatering technology hinges on whether or not the bitumen extracted from the process is saleable and recovered in sufficient concentrations to offset the cost of the Multi-Flow. INK has entered into an agreement with an independent operator currently contracted by a major Oil Sands miner to resolve dewatering problems and reclaim bitumen from their ponds, and will shortly commence trials to establish optimal Multi-Flow concentrations that maximise bitumen yields. Should Multi-Flow prove effective at extracting bitumen at viable dosage concentrations, potential monthly drum sales would be considerable.

### Colombia

Indago has appointed an agent to specifically target producers and pipeline operators in the Llanos basin in Colombia where many oil fields exist hosting collectively billions of barrels of reserves with crude oil gravity between 11 and 14.5<sup>0</sup>API that must be uplifted or diluted to meet the pipeline specifications of 15-16<sup>0</sup>API gravity. Currently, approximately 400,000 barrels of oil per day are

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transported by pipeline and 80,000 barrels of imported light oil are utilised daily to enable this transport at a cost of approximately \$1.5 billion/annum. The current ratio of native crude to diluent stands at approximately 83:17. A 10% reduction in diluent equates to a ratio of native crude to diluent of 85:15, and each 10% reduction in required diluent reduces diluent costs by \$150 million/annum. INK reduced the native crude to diluent ratio in the extra heavy 5-6<sup>o</sup>API gravity California crudes from 50:50 to 70:30 (a 40% reduction) and is building on this success to market Multi-Flow in Colombia for the same purpose. INK is currently in negotiations with a private independent company to target the business of utilising Multi-Flow to reduce diluent requirements on the Colombian pipeline network.

INK is also in the early testing phase with four independent oil producers in the Llanos and Middle Magdalena basins who are beset with high viscosity issues and whose aim is to reduce viscosity and uplift crude oil gravity to allow pipeline access. Each of these independent operators produce in the order of 30,000 bopd representing large potential targets for Multi-Flow sales.

### India

Indago has established a presence in India aiming to target product sales to three major oil producers and several tank cleaning service providers.

Company 1. INK is working with a major independent operator that produces and transports very waxy, high pour point crude oil from the Rajasthan region of India. Daily oil production from the project is approximately 200,000 bopd, of which 175,000 bopd is transported 670 km along a continuously heated pipeline to the port. Multi-Flow has proven commercially effective at lowering pour points of waxy crude oils for pipeline flow assurance internationally, and is now testing with the Rajasthan crudes. Testing is at an early stage. It should be noted that HCD used a 250 ppm dosage that proved commercial for 5 years on the Puteri Platform in the South China Sea to resolve similar problems.

Company 2. INK is working with a major Indian oil producer in the Assam region. The Assam region produces ~30 million barrels of oil per year of paraffinic crude with a wax content of 11% and a pour point of 30<sup>o</sup>C. The pour point is much higher than the average year round ambient temperatures at surface, creating production, handling, storage and transport problems. INK proposed field trials with Multi-Flow to reduce the pour point of the crude to ensure flow assurance across the operations. The Indian company expressed an interest to complete the trials in advance of the cooler winter temperatures in the region. The potential for drum sales is substantial as daily oil production in the Assam region is in excess of 80,000 bbls.

Company 3. INK is engaged in discussions with one of India's largest producers in the offshore Mumbai High Oil Field. This oil field is India's largest containing approximately half of India's recoverable

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reserves. Current production is greater than 200,000 bopd of very waxy crude with a pour point of 30°C, which is much higher than the ambient sea floor temperature across which the sub-sea pipeline transport network traverses, creating major flow assurance issues. Multi-Flow had major success in similar subsea applications in the South China Sea, and INK is in the process of acquiring Mumbai High crude oil samples for testing to reduce pour point. If testing proves successful potential drum sales are substantial as the Mumbai High field produces more than 200,000 bopd.

INK is also in discussions with several of India's service providers that clean tanks and recover sludge for the oil and refining industries. The Indian service providers have all broadly adopted a thermo-mechanical process that cracks the sludge *in situ* and recovers saleable hydrocarbons. However HCD's Tank Clean maintains three major advantages over the thermo-mechanical process: Tank Clean delivers greatly reduced tank cleaning downtime (7 days compared to 50 days), recovers more hydrocarbons and is much cheaper. These advantages have created a great deal of interest amongst the service providers.

### Middle East

INK's Middle East distributor Gulf Green Crude Dynamics (GGCD) is in advanced discussions to apply HCD products in three down-hole trials in a very substantial heavy oilfield in Oman. Proposals have also been submitted with two major producers in Oman to trial Multi-Flow in downhole and pipeline applications. GGCD has the right to establish a blending facility in the Middle East for HCD products and long-term exclusive manufacturing IP rights in the region upon payment to INK of US\$20 million. It is anticipated that GGCD will need to establish successful sales and raise significant capital to exercise this option.

In the United Arab Emirates, GGCD is in advanced discussions to participate in tank cleaning operations located in Abu Dhabi on a trial basis. The proposed tank is large and if the trial proceeds, 70 drums of HCD Tank Clean will be required and if successful, could be expected to lead to additional sales to many similar tanks in that facility.

In Abu Dhabi, GGCD has successfully tested tank sludge for viscosity enhancement and pipeline flow assurance with a major international company.

GGCD has submitted proposals with an independent international oil and gas producer headquartered in Dubai for two downhole trials to address paraffin deposition problems and a pipeline application to resolve calcium carbonate scale deposition in offshore Turkmenistan.

In Iraq, GGCD has submitted proposals for application of HCD products to enhanced oil recovery, pipeline flow assurance applications and tank cleaning operations associated with the Rumaila field,

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(the world's 3<sup>rd</sup> largest field) which currently produces 1.3 million bopd. GGCD has also successfully bench top tested sludge samples with Tank Clean from a major tank farm in Iraq and has submitted samples for independent laboratory testing.

### China

INK's Chinese distributor Qinghua Energy Company is pursuing opportunities for the application of HCD products with three of China's largest oil producers. Promising bench top testing results have been achieved from a number of candidate fields and tank cleaning opportunities across China, and these samples are now at the stage of independent laboratory validation. The most advanced sales initiatives are in the Bohai Sea operations where discussions have progressed to a downhole trial to apply Multi-Flow to resolve the problem of relative permeability negatively affecting oil and water transmissibility. The company currently uses polymer to address the relative permeability problem but the polymer creates difficult to break emulsions that degrade the crude oil quality. Success in the proposed trial could lead to application of Multi-Flow initially on one platform with the ultimate target being across 12 offshore platforms. There are also major tank cleaning opportunities in the Bohai Sea operations associated with the polymer problem.

Qinghua is also negotiating a trial tank clean that if successful could lead to Multi-Flow being required in 100 additional tanks within the Bohai Sea division.

### South East Asia

INK's Senior Engineer based in Malaysia, has good relationships in the region and is currently pursuing an opportunity for a pilot with a major international oil company to treat a 3km tract of pipeline at surface utilising Multi-Flow to assist with paraffin deposition occluding crude flow. A successful pilot could lead to other lucrative arrangements with this 100,000 bopd producer.

### Belarus

INK's distributor has informed INK that HCD Tank Clean has been approved for use by the Government of Belarus and a tank cleaning pilot has been approved by a State-owned entity following a successful demonstration of the HCD Tank Clean product on liquefying samples of the tank sludge. INK, via its distributor, is in discussions with the Government of Belarus for applications on other State-owned projects such as pipelines and well bores.

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### Kazakhstan

Multi-Flow has been approved by a major international oil company for multiple uses in Kazakhstan including an underground pipeline clean followed by a pilot continuously dosing the pipeline for flow assurance. A decision on whether to proceed is expected this quarter.

### Norway

HCD Tank Clean was successfully bench-top tested on Bunker C crude that resides in tanks within a large tank farm in Norway. The tank farm is owned by a major international oil company with whom INK is in discussions to undertake a pilot tank cleaning that, if successful, could expand into a major tank cleaning contract. The initial tank cleaning pilot is a small tank that would require ~17 drums of HCD Tank Clean. If the pilot is successful, INK would target product sales to the 500 tanks that comprise the facility, monthly drum sales would be substantial.

In order to take advantage of sales opportunities in the European Union, INK is in the process of having its key product registered under the EU's REACH compliance regime. This process is complicated by INK's reluctance to disclose the composition of its key products, but registration is expected to occur in the current quarter.

### Russia

Multi-Flow has successfully treated a sludge sample from a large Russian oil transportation company that needs 3,000 tons of oil sludge treated per month in the Krasnodar and Volgograd regions of Russia. This initial test work has led to a small order for full scale testing. If results from full scale testing are successful, this could lead to a seasonal order in the colder months. INK is also exploring the possibility of appointing agents and or distributors to market HCD products in Russia to upstream and pipeline operators.

### Additional Tank Cleaning Sales Initiatives with NESL

Indago has appointed a distributor to advance the sale of its Tank Clean product to over 30 specific tank clean operators or tank farm owners, largely in Europe and north America. The Distributor, Non Entry Systems Ltd (NESL) is UK based and also manufactures state of the art tank cleaning equipment. The distribution agreement allows NESL to market HCD Tank Clean to its client base and has already resulted in the sampling of dozens of sludges from various tanks around the world. Indeed the sales efforts in Belarus and Kazakhstan and related to NESL initiatives.



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### INK's Progress on Kentucky Project

A key component of INK's business strategy is to purchase, appraise and develop its own production and reserves using its own technology and has targeted projects by the stringent criteria of a small capital outlay, a modest work obligation and a substantial upside, the exploitation of which is facilitated by the unique properties of Multi-Flow.

The very large, shallow heavy oil deposit in the *Western Kentucky Tar Sand Play* in the western Kentucky portion of the Illinois basin is emblematic. INK leased 1,700 acres in Warren County where the primary target, the Big Clifty Sandstone, is thick (from 12-20 metres thick), porous (average porosity of 15.5%), permeable (average 192 mD) and oil-saturated (32-45%) with 10<sup>0</sup>API gravity oil. Moreover, US-based petroleum engineering firm Netherland Sewell and Associates (NSAI) certified that on INK's 1,700 acres there is an estimated 42 million barrels of Original-Oil-In-Place and further estimated that the recoverable net Contingent Resources were 1.873 MMBO (1C), 3.745 MMBO (2C) and 7.49 MMBO (3C).

INK drilled, cored and logged its first appraisal well, Weldon Young No. 1 in May, 2018 and confirmed the presence of thick, porous, permeable and heavy oil saturated sandstone. The core currently resides with CoreLab in Houston where detailed analysis is being undertaken in support of the design of a well stimulation programme that will include the injection and soaking of Multi-Flow and an organic carrier fluid. Injection pressures are being determined by analysis of the full wave sonic log and aided by the compensated density and neutron logs that were run as part of the logging suite. Injection pressures that exceed the fracture gradient of the rock may well be recommended on the basis of this analysis.

Well testing of Weldon Young No. 1 is expected to commence next quarter and is designed to determine if Multi-Flow will be able to maintain the oil in a liquid state from the reservoir to the well head and thus enable the oil to be pumped using conventional equipment. The well drilling, coring and logging as well as the stimulation programme currently in design is inexpensive when compared to the large potential upside existing on INK's acreage, and the much greater potential upside play-wide.

### INK's Progress on Asphalt Ridge Utah Project

Consistent with the commitment to developing its own production and reserves utilising the unique properties of Multi-Flow, INK acquired 1,920 acres over a portion of Asphalt Ridge in the Uinta Basin, Utah, targeting the oil sands in the Upper Cretaceous Rimrock Sandstone of the Mesaverde Group. The Rimrock Sandstone is one of several well documented oil sands in the State of Utah that, according to the Utah Geological Survey, contains oil sands with 14 to 15 billion barrels of measured oil in place.

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The Rimrock Sandstone in sections immediately adjacent to INK's acreage acquisition occurs at a depth range of between 60 and 914 metres and is between 27 and 53 metres thick with an average porosity of 30.3%, an average permeability of 524 mD, and an oil saturation of 65.6%. Oil gravity is from 10-14<sup>o</sup>API. Determining the extent to which these reservoir parameters and reservoir depths extend into INK's leased acreage is paramount in the appraisal programme currently being designed by INK technical staff. The larger programme will thus aim to demonstrate the continuity, thickness and amount of oil saturation of the Rimrock Sandstone across INK's leased acreage, and demonstrate whether or not the Multi-Flow technology can increase API oil gravity and reduce oil viscosity to enable the crude to be lifted to surface with conventional oilfield equipment. Aside from the ongoing appraisal programme design since INK's May 3<sup>rd</sup>, 2018 ASX announcement, INK technical staff have bench top tested samples of oil sands collected from Asphalt Ridge and are encouraged that Multi-Flow effectively extracted heavy oil from the sample to the extent that little or no residual asphalt was visible in the treated sand sample.

Next steps will involve obtaining samples from nearby deposits on which detailed testing will occur to more accurately define oil extraction, dosage rates required and permit early stage process engineering.

INK is assessing other potential upstream projects for possible acquisition including projects with modest production where there is an expectation that Multi-Flow can make a material impact on production and recovery rates as well as on cost reductions via the replacement of diluent.

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