

JMN Specialties, Inc.

ASPHAHIB™

Paraffin / Asphalt Treatment

Product Functions and Applications

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Production Enhancement – Product Enhancement – Pipeline Reclamation Storage Tank Reclamation – Workover Fluids & Acidizing

ASPHAHIB™ compounds are formulated for use in the oil and gas industry to relieve the burden of paraffin / asphaltene and other organic deposits. These highly active dispersing agents in ASPHAHIB™ products perform like no other traditional product on the market today. Unlike solvents and other paraffin / asphaltene products that attack the surface of the deposit and work down, ASPHAHIB™ products penetrate, release and lift deposit suspending them in the fluid and allowing them to be carried out of the formation, well bore, flow-line or pipeline. ASPHAHIB™ products breakdown the adhesive nature of the organic deposit, preventing the paraffin / asphaltene crystals, along with other oil wet solids, from sticking to one another and the surrounding environment.

Production Enhancement

OIL WELLS – It is a well known fact that an oil well will encounter paraffin and/or asphaltene problems during its production life span. It may be early in its life when the well is producing high rates of oil and gas or in its later years when down-hole temperatures and pressures no longer exist. Perhaps the well has had formation damage as a result of bad acid stimulations or years of hot oil treatments. There may also be other factors such as viscosity problems with the low gravity oils or the cooling effect with gas induction and flash off. The most important factor in all of this is that paraffin and asphaltene do not remain soluble in crude oil. Paraffin and asphaltene deposition can choke the formation and well bore and gradually decrease its production. Over time it can completely eliminate a wells productivity and profitability rendering it not feasible to operate. Perhaps even causing temporary abandonment or premature P&A.

The following is a list of conditions under which paraffin and asphaltene separate from crude oil:

1. Cooling due to gas separation, expansion or induction in crude oil introduced naturally or mechanically to drive the production of the well. This is a typical function of gas drive reservoirs where gas forces oil through the formation causing pressure differential. This can also happen with mechanical induction as in the case of gas lift production and gas separation as a result of sheering through down-hole pumps.
2. Cooling due to temperature loss allowing the oil to become viscous, congeal or reach its cloud point. This is typical of crude with high pour points or cloud points. It is also typical for low gravity, heavy crude.
3. High temperature that cause flashing or vaporization of the volatile organics which results in volume loss leaving the oil rich in paraffin wax content. This is a typical result of extensive hot oil treatments, steam and fire floods.
4. Pressure differential alone has little or no effect on the solubility of paraffin in crude oil. The lack of pressure drops prevents the loss of dissolved gases and volatiles from bulk oil fluid. Pressure helps to maintain the crude at the temperature of the formation. However, it is impossible to produce oil without creating a considerable pressure differential within the formation. This pressure differential results in temperature reduction, which in turn causes paraffin to drop out of solution.
5. Formation Solids such as sand, salt, iron sulfide and scale can greatly increase or accelerate paraffin and crude separation. The wax crystals adhere to the solids forming a complex matrix within the well formation that will grow larger over time and restrict oil flow.
6. The introduction of cold fluids into the well such as acids or fracturing fluids can cause formation cool down which in turn may bring the oil temperature down beyond its cloud point. This condition allows paraffin to deposit in the formation causing a skinning effect or perhaps emulsion blockage.

AsphaHib's special properties allow it to be very effective in numerous applications including Production Enhancement, Product Enhancement, Storage Tank and Pipeline Reclamation.

Formation Stimulation – Enhanced Production can be achieved when **ASPHAHIB™** products are used for stimulation treatments to remove formation blockage caused by paraffin/asphaltenes, allowing the well to utilize its natural feed-in abilities and resulting in increased production.

Application Methods – Formation Squeeze via tubing displacement, casing displacement or coiled tubing unit. A stimulation treatment will range from 1-5 drums of the prescribed **ASPHAHIB™** Products with 5 to 15 drums of solvent and / or 20 to 30 barrels of crude or condensate. Spot the treatment compound at the formation face and into the near wellbore region. Use 1-2 barrels of treatment compound per foot of perforations. After soaking for a minimum of 16 hours, over flush at sub-fracturing pressures with 5 –10 barrels of light crude, condensate, or naphtha per foot of perforations prior to returning the well to production.

Down Hole Paraffin / Asphaltene Clean up – **ASPHAHIB™** products can enhance production by minimizing typical operational problems such as tubing restrictions and rod stacking. It will disperse the deposits by breaking their adhesive nature not allowing them to stick to one another or the surrounding environment.

Applications & Testing – For this application **ASPHAHIB™** products can be used alone or in conjunction with a solvent to remove deposition from tubing and rods. Typical applications include Batch and Soak, Batch and Circulate and Continuous Injection. A standard bench top solvency test should be performed on the deposit to qualify each solvent. Certain **ASPHAHIB™** products can be blended with the solvent(s) at a ratio of 25-40% active. Treatments range from 30 gallon to 110-gallon batches and continuous injection ranging from 120 to 480 PPM.

Flowline Restriction Removal – ASPHAHIB™ products can enhance profitability by reducing down time and production reductions associated with flow-line plugging. ASPHAHIB™ will penetrate and disperse the deposits breaking their adhesive nature and allowing them to be swept through the system without re-depositing.

Applications & Testing - As in down-hole treatments, ASPHAHIB™ products are used alone or blended into a solvent package for the removal and reduction of flow-line blockage. A typical flow-line application is continuous injection however repetitious batch treatments are also effective. Treatment rates can vary according to the severity of the blockage. Typically continuous injection rates run 120 to 600 PPM and batch treatments consist of 5 to 10 gallon treatments. When using solvents with any ASPHAHIB™ product it is necessary to conduct a standard solvency test to determine which solvent will be the most effective. Usual blends consist of 25 – 40% ASPHAHIB™ compound to solvent.

Heavy Oil Flow Enhancement – In regards to “Heavy Oil” or Low gravity crude, AsphaHib’s unique chemical carrier / surfactant combination works to reduce friction by dispersing the asphaltene and paraffin crystals and repelling their adhesive nature. It will change the viscosity of the crude allowing it to flow more freely and be produced and transported with greater ease.

Applications & Testing – This application is some what different from the above mentioned treatments. The main difference is the testing procedures. This testing can be performed in field bottle test or with a viscometer in the lab. Applications are typically continuous injection however repetitious batch treatments can also be effective. ASPHAHIB™ compounds may be used alone or blended with other flow aid products. Treatment rates range from 60 to 500 PPM depending on the nature of the crude.

Product Enhancement

- **Paraffin Inhibitors and Crystal Modifiers** – There is no doubt that conventional paraffin products have been effective over the years however there are times when even the best products fail in the system due to application restrictions or borderline test results in the lab. Perhaps the oil has already achieved its cloud point temperature at surface and the logistics of the well have you restricted to surface treatments or your cold-finger test results are not favorable enough to give you the confidence in the products performance. This is where the AsphaHib's special characteristics are utilized as an intermediate base product and can be formulated into your existing paraffin products to improve their effectiveness. AsphaHib's unique design allows it to be compatible with most paraffin / asphaltene products and solvents including Methanol.

Blends & Formulations – ASPHAHIB™ can be blended with or formulated into most of the conventional paraffin / asphaltene products on the market today. ASPHAHIB™ will enhance their performance and effectiveness by lending its penetrating and unique dispersing properties to the product. ASPHAHIB™ is usually added to an inhibitor formulation at a ratio of 5 to 15% by volume.

Application Techniques and Testing – The application methods used for these products is normally the same as it would be for conventional products. Continuous injection or batch treatment initial rates should be determined from lab testing. Testing can be performed with a cold-finger apparatus however it is a known fact that ASPHAHIB™ alone will not give favorable results on a cold-finger. The reason being is that ASPHAHIB™ is a DISPERSANT and NOT AN INHIBITOR but lab test have proven ASPHAHIB™ to improve the percent protection of conventional products by as much as 50%.

- **Paraffin Solvents** – Throughout the history of oil production, solvents have been the most widely use product in the battle against paraffin and asphaltene blockage. There is a multitude of solvents on the market today for the removal of paraffin. Solvents work to dissolve paraffin/asphaltene deposits from the surface down removing it layer by layer and retuning them to solution. Although temperature has a very important effect on particular solvents efficiency, the degree of solvency is directly related to

Kauri Butanol (KB) value. Most solvents contain only one component with a specific KB value. If a deposit dissolves well in that KB value solvent, then the removal will be a success. If a poor dissolution occurs, a solvent with a different KB value will be required. More effective solvents contain multiple components with a wide range of KB values. **ASPHAHIB™** is such a product. **ASPHAHIB™** contains revolutionary ingredients with multiple KB values allowing it to be highly effective on a broad range of deposits. Unlike solvents that attack the surface of the deposit, **ASPHAHIB™** penetrates and breaks the adhesive nature of the deposit and disperses it into smaller particles that are easy dissolved back into solution. **ASPHAHIB™** also prevents the particles from sticking to one another or the surrounding environment.

Blends & Formulations – ASPHAHIB™ can be blended with most of the solvents on the market today. **ASPHAHIB™** will enhance their performance and effectiveness by lending its multiple KB value, aggressive penetrating and unique dispersing properties to the product. **ASPHAHIB™** is typically blended into a solvent from 25 - 40% activity.

Application Techniques and Testing - A typical application is continuous injection however repetitious batch treatments are also effective. Treatment rates can vary according to the severity of the problem. Typically continuous injection rates run 120 to 600 PPM and batch treatments consist of 5 to 10 gallon treatments. When using solvents with **ASPHAHIB™** it is necessary to conduct a standard solvency test to determine which solvent will be the most effective.

Pipeline Reclamation

Oil Pipelines – ASPHAHIB™ can enhance pipeline operations by reducing pump pressure and flow restrictions associated with pipeline plugging. **ASPHAHIB™** will enhance pigging operations when used in conjunction with mechanical pigging. **ASPHAHIB™** will penetrate and disperse the deposits breaking their adhesive nature and allowing the pig to sweep them through the system without re-depositing. This will also benefit the pig as well by repelling the deposits from accumulating on the pig thus greatly reducing the chance of a “stuck pig”. **ASPHAHIB™** will reduce the

Horsepower needed to pump heavy oils by changing the oil viscosity and performing as a flow enhancer. It will disperse deposits and aid in their removal where pigging cannot be applied.

Application Techniques and Testing – ASPHAHIB™ for use in Oil Pipelines have broad range of applications. The most common are continuous injection, repetitive batch, batch and soak and batch and pig. As with flow-line treatments, **ASPHAHIB™** can be used alone or blended with solvents. Bench top testing is required to determine the most effective solvent with the best KB value. Treatment rates are difficult to determine for pipeline treatments due to the uncertainties that exist with pipeline plugging. Continuous injections are usually initiated at high rates (600 to 1200 PPM) to relieve the pressure restrictions. Batch treatments are calculated for the diameter and length of the pipeline.

Pigging Techniques – Utilizing ASPHAHIB™ in conjunction with a pigging program is the most effective way of reclaiming pipeline efficiency. The applications for **ASPHAHIB™/pigging treatments** are as follows: There should be 2 to 3 initial batch treatments of **ASPHAHIB™** or **ASPHAHIB™/solvent blend**. This will allow the **ASPHAHIB™** time to penetrate and start to release and disperse the deposits in the pipeline. Treatment volumes will depend on diameter and length of pipeline. Once the initial treatments are completed, the pig can be launched with the final treatment. A batch of **ASPHAHIB™** should be applied directly in front and directly behind the pig. This will keep the pig clean and insure against the chance of a “stuck pig”. A continuous injection of **ASPHAHIB™** or **ASPHAHIB™/solvent blend** can be substituted for the initial batch treatments it can also be utilized after the treatment to keep the pipeline restriction free.

- **Gas Transmission Lines –** In recent years the US Government has proposed regulations for the maintenance, inspection, cleaning and treatment for the interior of gas transmission pipelines. The basis being the recent failures and the public awareness from the news media. We are all aware of the fact that gas pipelines transport the natural gas from the producers to industry, homes and businesses. What most people are not aware of is the impurities, sludge and solid deposits that settle in these pipelines and if left unaddressed can cause all type of operational problems including catastrophic failure. It is in these applications that **ASPHAHIB™** truly proves its high performance abilities. **ASPHAHIB™**'s unique design allows it the versatility to perform as an exceptional pipeline cleaner.

Application Techniques and Testing – Before a recommendation for treatment can be made, samples must be obtained and analytical test performed to identify the deposits, solids or sludge to be removed. It is necessary to identify the composite makeup of the material in order to determine the **ASPHAHIB™** carrier and flush fluids. For these applications **ASPHAHIB™** can be micro-emulsified in water or blended with solvent carriers depending on the analytical reports. If it is determined that the substance is water soluble or inert such as sand, salt, iron sulfide or Glycol then **ASPHAHIB™** will micro-emulsify in water. This will create a tenacious cleaning solution that will penetrate and lift the deposits suspending them in the fluid and allowing them to be swept from the system with the pig train. On the other hand, if the analysis indicates hydrocarbon-based materials then **ASPHAHIB™** can be blended with the proper solvent package to carry out a successful job. The volume of these applications will vary with the diameter and length of the pipeline.

Pigging Techniques – The pig train will determine the agitation and cleaning efficiency. The more aggressive the pig train, the better the cleaning efficiency. The pig manufacturer can assist in determining the right pig train for each application.

Storage Tank Reclamation

- **Tank Bottom Build-Up** – Over a period of time, oil storage tank can accumulate large amounts of paraffin or asphaltene sludge in them which hamper operations and cause capacity problems for the owners. If unaddressed it can render a tank useless or cost a phenomenal amount of money to have the tank cleaned out and the contents disposed of properly. **ASPHAHIB™** can aid in the reclaiming of these merchantable products by dispersing them throughout the tank. **ASPHAHIB™** will suspend the crystals in the oil allowing them to flow freely from the tank and be processed with the rest of the oil.
- **Slop Oil** – Blend 50% **ASPHAHIB™** with desired solvent. Mix 1% – 5% of this compound with slop oil prior to treatment. By reducing oil/water interfacial tension and changing the wettability from oil-wet to water-wet, this will improve the productivity of centrifuge equipment and significantly increase clean oil sales.

Application Techniques and Testing – Heat, agitation, solvency and ASPHAHIB™ all play an important part in this application. The first determination to be made is the composite makeup of the bottom. Second, what is the volume of the build up in the tank? Third, what is the composite makeup of the oil and API gravity? This will determine if solvents or light crude is needed to aid in the treatment. Heat and agitation are also important factors in the treatment. Heat will accelerate the process and lessen the time needed for agitation. For the treatment of tank bottoms these 4 factors work in conjunction with one another. If one is left out it will take more of the other three to get results. If agitation is left out than the chance of attaining any result is nullified. A typical application rate for ASPHAHIB™ is 600 to 1200 PPM depending upon the volume of sludge in the tank. The ASPHAHIB™ plus solvent blend is batched into the tank while the agitation and heat is being applied. The agitation and heat should remain constant until the entire bottom is dispersed and dissolved. The application can be repeated if needed.

WORKOVER FLUIDS & ACIDIZING

- **Workover Fluids** – To reduce viscosity of heavy oil, add 20% ASPHAHIB™ by weight to a kerosene carrier fluid. Blending 3½% by weight of this compound with 11 – 14 API gravity crude reduces viscosity as much as 80%. Condensate can be used to reduce the viscosity of heavy oil in spite of its low flash point and potential for asphaltene precipitation upon contact with oil. To formulate a workover fluid with a higher flash point that will not precipitate asphaltenes after prolonged contact with heavy oil add 20% ASPHAHIB™ to a kerosene carrier fluid. This reduces flashing of the condensate/solvent that is mixed with the oil at higher temperatures.
- **Acidizing** – Some crude oils will form insoluble sludge when contacted with HCL. Asphaltenes are the primary ingredients of sludge, but resins, paraffin, hydrocarbon, fines and clays are also present. Once formed, this sludge is extremely difficult to remove, ASPHAHIB™ prevents sludge from occurring when the oil is treated prior to acidizing. ASPHAHIB™ is also used as a remedial treatment to redisperse precipitated solids in sludge caused by acidizing. Treatments using only solvents have not been effective in these applications. For use as a treatment prior to acidizing to

reduce sludging or as a post acid treatment to disperse formed sludge, add 30% **ASPHAHIB™** to an aromatic solvent. Blend thoroughly prior to application until a single phase is achieved.

ASPHAHIB™ provides a very cost-effective treatment and proven results which make it the product of choice when dealing with tough paraffin/asphalt problems in oil & gas operating systems.