

PARA- GONE™

Reduces the content of Paraffin and
Asphaltenes in well fluids.

WHAT IS IT?

Paragone is an emulsion of 18 species of microorganisms contained in an aqueous base than includes a biodegradable surfactant, the formulation is designed to improve the production and quality of the hydrocarbon by removing deposits of paraffin, asphaltenes and scales, as well as breaking emulsions.

USES AND APPLICATIONS

The diversity of present biotypes allows **Paragone™** to work effectively under extreme environments within the oil industry. This makes **Paragone™** useful in well cleaning treatment, flow lines and accessories, pumping systems and storage tanks as well as stimulation treatment by injection into the formation.

| MAXIMUM APPLICATION RANGE | |
|---------------------------|---------------------------------|
| Temperature | Max. 350°F |
| Salinity | 2.56 g/L total dissolved solids |
| H ₂ S | Max. 20% |

HOW DOES IT WORK?

During the metabolic process of **Paragone™** microbes, enzymes, surfactants, polysaccharides, alcohols and aldehydes are produced, among other

biochemical, depending on the environment in which they are grown and which will act together for the improvement of production.

MECANISM

SOLUBILIZES PARAFFINS AND ASPHALTENES



DESCRIPTION

The enzymes produced act as biological catalysts causing coal to be removed from the long chains of paraffin or asphaltenes molecules making them shorter and more soluble in lighter hydrocarbons. These enzymes continue to affect the short chains of paraffin and small molecules of asphaltenes until they are completely soluble in the oil.

MECANISM

CLOUD POINT [1]



REDUCE CORROSION

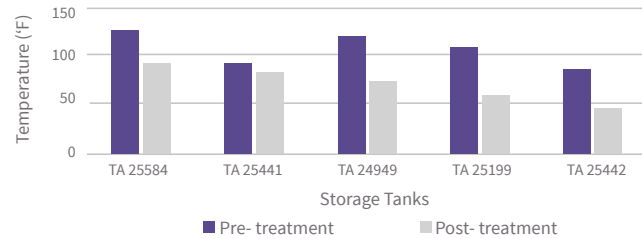


PREVENTS NUCLEATION OF SCALES



DESCRIPTION

Using a chromatograph the cloud point was measured before and after treatment with Paragone to 5 samples of oil taken from 5 storage tanks.



*The results showed a clear decrease of between 10 and 46% in the cloud point of the oil. The analysis of the chromatograms revealed a reduction in the relative concentration of individual n-alkanes in the micro crystalline region of the paraffin, this change could be responsible for the changes in the solubility of the oil and in the cloud point, since the n-alkanes have higher melting points so a reduction in their relative concentration results in lower cloud points. It was further observed that the general molecular characteristics of the oil did not show significant changes because of the treatment.

The active organisms secrete and deposit a polysaccharide film that forms a coating on the components of the well. This coating allows to reduce the corrosion and prevent the formation of incrustations whenever the reproduction of the microorganisms is maintained.

Bacteria sequester available oxygen, this inhibits oxidation reactions such as corrosion and the formation of precipitates of iron sulfate ($\text{Fe SO}_3 + \text{O} = \text{Fe SO}_4$). In the case of compounds containing calcium and sodium, the bacteria will use calcium and sodium ions in their metabolic reactions avoiding the nucleation of incrustations. In turn they remove the sulfur and use it as receptor electron in its metabolism reducing in this way the H_2S and the associated odor.

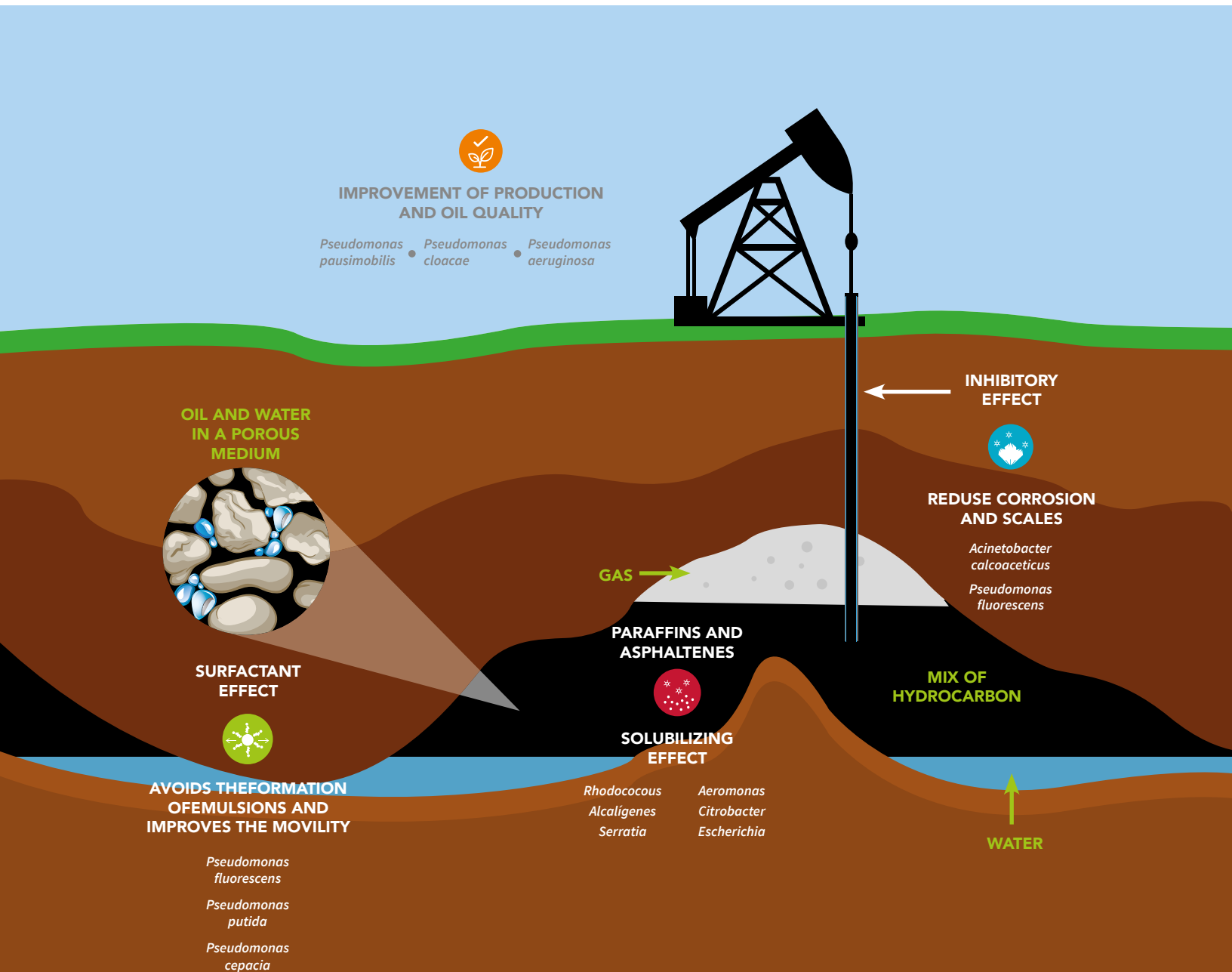
MECANISM

PREVENTS THE FORMATION OF EMULSIONS AND IMPROVES THE MOBILITY OF THE OIL.



DESCRIPTION

Due to the production of surfactants which reduce surface tension and the use of free oxygen, the emulsions tend to break or to not form at all. Reduces oil-rock surface tension by improving hydrocarbon mobility.



WHAT ARE THE BENEFITS?

- Reduces the content of Paraffin and Asphaltenes in well fluids.
- Removes deposits of Paraffin and Asphaltenes in the well and formation.
- Removes Paraffin and Asphaltene deposits in flow lines, pumping systems and storage tanks.
- Reduces and / or inhibits the process of nucleation of scales.
- Reduces and / or inhibits the corrosion process.
- Reduces and / or eliminates the formation of emulsions.
- Reduces BS & W (sediment and emulsions).
- Increases and stabilizes hydrocarbon production.
- Reduces viscosity, cloud point, pour point and surface tension of the oil to formation matrix
- Gravity API increase in some cases
- Reduces biogenic hydrogen sulfide (H₂S).
- Reduces damage to formation caused by polymers, drilling muds and fracture fluids.
- Reduces friction in the pipes.
- Increases sweep efficiency in secondary recovery operations.
- Decreases injection costs and reduces injection pressure in water floods.
- Reduces costs associated with oil production

HOW IT IS APPLIED?

PREPARATION:

PROCEDURE FOR BASIC TREATMENT OF A WELL USING PARAGONE™:

1. Collect the largest amount of information from the well to identify the type of problem you are presenting and determine the appropriate volume of treatment. If the well is under any chemical treatment it is necessary to delay the treatment with Paragone to allow biocides or other chemicals to dissipate from the oil well fluids. Paragone™ is compatible with many oil well chemicals. *Talk to your technical advisor.*

2. Prepare Nutrient Water in a clean container or tank. Nutrient water is formulated by dissolving 8 oz. of dry nutrient in 1 gallon of clean fresh water or produced salt water.

3. Mix Paragone™ with the nutrient water solution and wait for 5 to 10 minutes. The volume of Paragone used in the treatment should be equal to the volume of nutrient water. (1: 1 ratio). Never mix the dry nutrient directly with Paragone™, this can damage the microorganisms.

4. Pump 1 bbl. of Flush Water as a pre-flush.

5. The Flush Water is formulated by dissolving 12 oz. of dry nutrient per bbl. of clean fresh water or produced salt water.

6. Pump the Paragone™ and Nutrient mixture into the well.

7. Pump Flush water to the well as a treatment displacement. The displacement volume varies per well.

8. Shut the well in. The normal shutting time for a basic treatment is 24-48 hours and up to 7 days for a larger stimulation treatment. (squeeze)

9. After the appropriated shutting time open the well up to production.

10. Monitor the wells production and performance.

PREPARATION:

PROCEDURE FOR BASIC TREATMENT OF A WELL USING PARAGONE:



NOTES:

For water-sensitive formations, 2% KCl should be added to all fresh water used in the treatment.

Once the Paragone-Nutrient solution has been prepared, the mixture should be used within the next 6 hours.

A basic microbial treatment will last on average 30 to 90 days. Squeeze treatments can last 4 to 6 months.

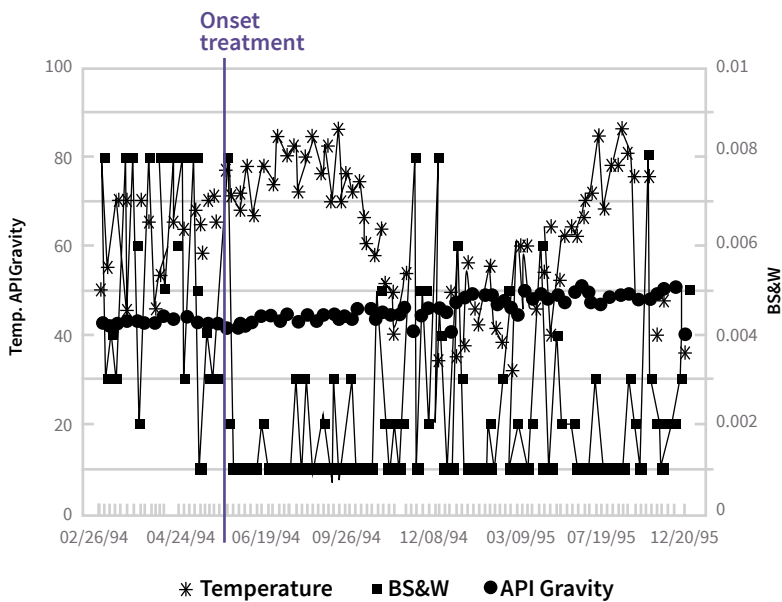
Treatment and volume is designed to address the specific problems of each well.

After the well is opened, the flow line pressure should be monitored. If a drop in flow line pressure is observed then the well need to shut in, in additional 24 hours. Sometimes partially digested pieces of paraffin or scale are broken lose and cause plugging of the flow line. When the well is shut in for an additional 24 hours, the paraffin pieces will dissolve, and the well can be re-open.

SUCCESS CASES

BS&W, API GRAVITY [2]

Kelton A-1 and A-2



AFTER TREATING KELTON WELL WITH PARAGONE THE FOLLOWING RESULTS WERE OBTAINED:

The **BS & W** declined drastically and remained consistently low.

API gravity increased from **43 to 50**.

SUCCESS CASES

COST OF MAINTENANCE PARAGONE VS CHEMICALS [3]

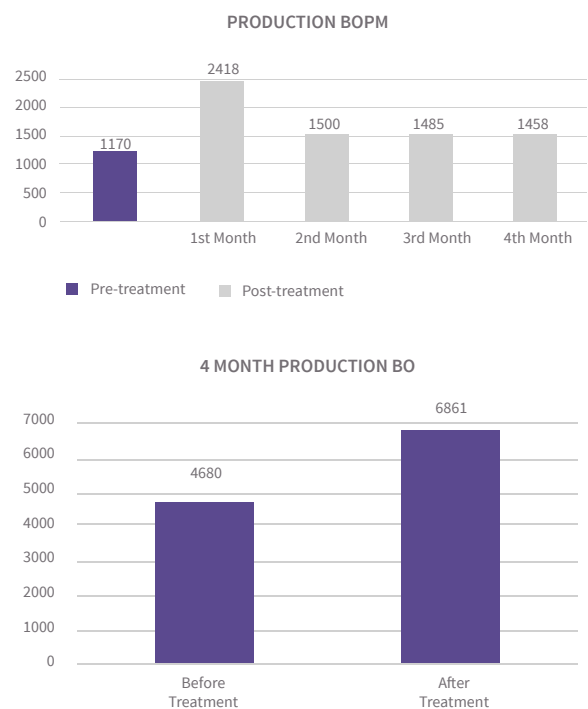
PARK COUNTY, WYOMING. SECONDARY WATER INJECTION RECOVERY.

Treatment with **Paragone™** saved \$ 71,310.05 USD in a year compared to previously used chemical treatments. The injection pressure was reduced by 10% allowing 1500BWPD to be reinjected. The number of solids in the separator decreased from 1.5% -3% to less than 1%, while water quality went from 1000ppm with chemical treatments to 98ppm with **Paragone™**.



RESULTS IN PRODUCTION [4]

Immediately after treatment with **Paragone™**, well # 4 of the Teapot Dome field increased its total oil production by 47%, this increase stabilized at 26% in the subsequent months. The cost of treatment with Paragone was recovered in 23 days and compared to the cost of hot oiling treatment the US government in charge of the field saved more than \$ 3,200 USD.



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REFERENCES.

[1] PENCOR. Production Enhancement Corporation, Oct 8, 1999. Cloud point measurement in storage tanks.

[2] MicroSol Denver Inc., May 1994. MEOR treatment in Kelton # 2 and # 3 wells. Results observed in BS & W and API gravity.

[3] Howell Petroleum. Park County Wyoming. Comparison of chemical treatment cost vs Paragone in secondary recovery by water injection.

[4] US Government. Teapot Dome field. MEOR treatment in the Teapot Dome field. Results obtained in production.



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