



FLEX-CHEM

LABORATORY

SERVICES

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EXECUTIVE SUMMARY

Flex-Chem offers a comprehensive suite of services tailored to meet the diverse needs of the oil and water industries. Our advanced testing methodologies provide precise insights into the quality and integrity of petroleum products and water resources, empowering clients to optimize processes, mitigate risks, and maximize operational efficiency.

In our water analysis services, we leverage cutting-edge tools and methodologies to conduct comprehensive assessments of water quality, scaling potentials, and corrosion risks. Our approach is anchored by the integration of advanced software like French Creek and instrumental analysis such as: ICP and IC, enabling accurate scaling predictions. Additionally, we employ a range of techniques including BOD, COD, algae concentration analysis, and physicochemical measurements such as pH, acid gases, DO, and turbidity. These thorough analyses equip our clients with the insights needed for informed decision-making, allowing for the development of effective treatment strategies and the implementation of sustainable water management practices.

For oil testing, we employ cutting-edge techniques such as gravimetric analysis for paraffin and asphaltene content, BS&W measurement via centrifugation, Pour point testing according to ASTM D97 standards, API gravity analysis, and cold flask testing/roller ball testing for solvent testing. These methods ensure accurate assessment of oil properties, enabling proactive measures to maintain asset quality, prevent equipment fouling, and optimize transport and storage in diverse environmental conditions.

Flex-Chem is committed to delivering actionable insights, unparalleled accuracy, and exceptional service to our clients. With our expertise, organizations can enhance operational resilience, minimize environmental impact, and ensure the longevity and reliability of their assets.



1. BACTERIA TESTING

Flex-Chem offers comprehensive RP-38 bottle testing and ATP testing for bacterial analysis. Designed to monitor your downhole and surface assets, our testing offers an assessment of kill efficacy and ongoing monitoring to ensure maximum protection.

RP 38 Bottle Testing

With RP-38 bottle testing, we conduct evaluations to gauge the efficiency of your biocide treatment against bacterial contamination. Our analysis can provide actionable insight into the effectiveness of your treatments or recommend effective concentrations, empowering you to make informed decisions for asset protection.

- **Standard Turnaround Time** – 28 Days
- **Rushed Turnaround Time** – 28 Days, Progress can be given along the way.

ATP Testing

Complementing RP-38 bottles, our ATP testing offers real-time monitoring, utilizing adenosine triphosphate detection to swiftly identify microbial presence. By detecting microbial activity quickly, we enable proactive measures to prevent potential damage to your assets, mitigating risk and optimizing operation integrity.

- **Standard Turnaround Time** – 3 Days
- **Rushed Turnaround Time** – 1 Day



2. CORROSION TESTING

Flex-Chem uses industry standard methods for corrosion management: our comprehensive monitoring services utilize techniques to assess corrosion rate as well as inhibitor efficacy, ensuring the integrity of your systems during acid applications and with standard production brines.

RCE/LPR

Rotating Cylinder Electrode with Linear Polarization Resistance can mimic downhole conditions by mimicking shear rate as well as fluid systems. Whether in acid systems or brines, our method delivers precise real time data, enabling informed decisions to optimize inhibitor performance and mitigate corrosion risk.

- **Standard Turnaround Time** – 5 Days
- **Rushed Turnaround Time** – 2 Days depending on scope of project.

Failure Analysis

Our services go beyond detection to analyze corrosion efficacy, in the event of a failure our technical team can pinpoint the source of corrosion by conducting a failure analysis on the failed piece. (ie tubing, rod, ect).

- **Standard Turnaround Time** – 5 Days
- **Rushed Turnaround Time** – 2 Days depending on scope of project.

Amine Residuals

Our lab offers corrosion inhibitor or residual monitoring, ensuring effective treatments of wells. Paired with the monitoring of iron and manganese residuals, we provide a comprehensive overview of system health, enabling proactive maintenance.

- **Standard Turnaround Time** – 3 Days
- **Rushed Turnaround Time** – 1 Day

Corrosion Coupons

On location we can utilize corrosion coupons, providing insights into actual field corrosion rates. The corrosion coupons act as a sacrificial probe, allowing for direct observation of corrosion in the operational environment.

- **Standard Turnaround Time** – 30-90 Days depending on Field Contact time.



3. SCALE ANALYSIS AND TESTING

Flex-Chem uses several techniques to predict scale formation, prevent scale formation, and determine the scale precipitation. We use both software and lab data to perform a thorough assessment of scaling potential.

Water Analysis -ICP (cations) IC (anions)

Flex-Chem utilizes French Creek software to predict scaling risk. Flex-Chem performs a mixture of testing methods to accurately determine the composition of field fluids. Ion Coupled Plasma (ICP-OES) is a highly accurate spectroscopy method used to determine the cations or metals present in the water. Ion Chromatography (IC) is a highly accurate method used to determine anion concentration.

- **Standard Turnaround Time – 3 Days**
- **Rushed Turnaround Time – 1 Days**

Scale Residuals - Phosphate

Flex-Chem can utilize the ICP to accurately monitor phosphate residuals, ensuring the effectiveness of treatment methods in controlling scale prevention.

- **Standard Turnaround Time – 3 Days**
- **Rushed Turnaround Time – 1 Days**

Static Bottle Testing

Flex-Chem can evaluate and determine scale inhibitor dosage and efficacy using static bottle testing. This method involves analyzing field brines and then mixing the cationic and anionic portions of the water in a controlled manner and then measuring the metals via ICP to determine the amount of scale precipitation. Inhibitor efficacy is determined by scale precipitation prevention.

- **Standard Turnaround Time – 5 Days**
- **Rushed Turnaround Time – 3 Days Depending on Scope of Project.**



4. WATER QUALITY TESTING

Flex-Chem utilizes a cutting-edge water recycling and quality testing service, meticulously crafted to uphold the sustainability and efficiency of water management systems. Our approach encompasses a diverse array of testing methodologies, allowing us to adopt a holistic perspective and devise optimal strategies for treating and controlling water recycling processes.

Chemical and Biological Oxygen Demand.

COD is a measure of the amount of oxygen required to oxidize organic and inorganic compounds in water through chemical processes. BOD measures the amount of dissolved oxygen consumed by microorganisms while decomposing organic matter in water under aerobic conditions. High COD values indicate the presence of pollutants that can deplete oxygen levels and high BOD values indicate an increased demand for oxygen by microorganisms, potentially leading to oxygen depletion in the water.

- **Standard Turnaround Time – 15 Days**
- **Rushed Turnaround Time – 7 Days**

Water Quality Testing and Data

Flex-Chem has many testing capabilities such as pH, Dissolved oxygen, Turbidity, and Algae Concentration. Assessing all these parameters enables Flex-Chem to view the recycled water from a holistic point of view and determine the most efficient method of water management.

- **Standard Turnaround Time – 3 Days**
- **Rushed Turnaround Time – 1 Day**



5. OIL ANALYSIS

Flex-Chem uses a combination of ASTM methods and Gravimetric methods to determine the full profiles of oil. By using a multifaceted approach and industry standard techniques Flex-Chem delivers precise and reliable results.

Oil Analysis

Gravimetric methods are utilized to assess paraffin and asphaltene content, providing insight into the composition of the crude oil and its potential for deposition issues. BS&W analysis utilizes centrifugation to separate water and sediment from crude oil ensuring compliance and salability standards. Pour point testing, conducted according to ASTM D 97 determines the lowest temperature at which oil remains fluid. API gravity is measured via a densitometer, providing essential information for classification.

- **Standard Turnaround Time – 3 Days**
- **Rushed Turnaround Time – 1 Days**

Cold Flask Analysis

Flex-Chem offers cold flask testing which can assess the solvent dispersion with paraffinic and asphaltene deposits in crude oil. This test evaluates the solvent's ability to disperse paraffin and asphaltenes by shaking a volume of field fluid with a percentage of solvent on a thin layer of paraffin or asphaltenes.

- **Standard Turnaround Time – 5 Days**
- **Rushed Turnaround Time – 2 Days**

Roller Ball Testing

Flex-Chem offers roller ball testing which can assess the solvency capacity with paraffinic and asphaltene deposits in crude oil. This test evaluates the solvent's ability to fully dissolve paraffin and asphaltenes by placing a compact ball of solids material fully submerged in solvent.

- **Standard Turnaround Time – 5 Days**
- **Rushed Turnaround Time – 2 Days**

6. SOLIDS ANALYSIS

Flex-Chem combines the methods of XRD, Gravimetric Analysis and ICP spectroscopy to provide a comprehensive insight into down hole scales. By leveraging the advanced analytical techniques, we can accurately and quickly determine the scale or solids material composition and treatment recommendations.

XRD Analysis

XRD plays a pivotal role in identifying the composition of scale or solids material present in oil and gas applications. XRD works by bombarding the sample with X-rays, which interact with the crystal structure of the material, producing diffraction patterns that are characteristic of the minerals and compounds contributing to the scale or solids material. These patterns then can be used to help identify the unknown solids material.

- **Standard Turnaround Time – 5 Days**
- **Rushed Turnaround Time – 1-2 Days**

Gravimetric Analysis

Gravimetric analysis involves the use of various solvents to dissolve the “like” portions of the materials in the solids sample. The amount of mass lost during the dissolution is measured. By determining the mass lost, types of salts, minerals, and other constituents can be quantified. Moreover, the acid portions of the solubility test can be analyzed via ICP and the soluble metals can be quantified and used to gain a deeper understanding of the solids material.

- **Standard Turnaround Time – 3 Days**
- **Rushed Turnaround Time – 1-2 Days**

FTIR Analysis

If a sample is not of crystalline or scale structure, the above methods will provide little to no usable data. Flex-Chem then employs FTIR analysis which can provide detailed information about the chemical composition and molecular structure of organic compounds, FTIR helps identify a variety of organic compounds from hydrocarbons (paraffin, asphaltene), to chemicals (polyacrylamide, corrosion inhibitors). With FTIR we can pinpoint the presence of organic matter and tailor treatment strategies accordingly.

- **Standard Turnaround Time – 5 Days**
- **Rushed Turnaround Time – 1-2 Days**



7. ANALYTICAL TESTING TURNAROUND TIME

Flex-Chem Analytical Testing Services

April 18, 2024

TEST	CATEGORY	STD TURN AROUND TIME	RUSHED TURN AROUND TIME	TEST CODE
Bacteria ATP	Bacteria	3	1	ATP
Bacteria RP 38 Bottles	Bacteria	28	-	RP38
Corrosion Coupons	Corrosion	3	1	CC
Corrosion LPR Rate	Corrosion	5	2	RCE
Failure Analysis	Corrosion/Scale	5	2	FA
Residuals Scale/Corrosion	Corrosion/Scale	3	1	Amine/PO4
Water Analysis	Corrosion/Scale	3	1	WA
Complete Oil Analysis	Oil	3	1	GLV-CS
Oil in Water TOG or TPH	Oil	3	1	O&G
Cold Flask Test	Paraffin/Asphaltenes	5	2	CFT
FTIR	Product/Organics	3	1	FTIR
Static Bottle Testing	Product	5	3	SBT
XRD	Scale	5	1-2	XRD
Gravimetric Solids	Solids	3	1-2	SA
Millipore Analysis	Solids	3	1	MFA
Total Suspended Solids	Solids	3	1	TSS
Algae	Water	3	1	ALG
Biological Oxygen Demand	Water	15	7	BOD5
Chemical Oxygen Demand	Water	3	1	COD
ICP Metals	Water	3	1	ICP
Turbidity	Water	3	1	TUR
Emulsion Break Test	Water	3	1	EB



PERMIAN LAB SUPPORT

Although Flex-Chem's flagship laboratory is in Yukon, OK, we take pride in standing by the lab turn-around times outlined in this report. General chemistry and wet chemistry testing can be completed at our satellite lab in Pecos, TX. Any testing beyond the capability of the satellite lab can be overnighted to our flagship lab in Yukon, OK. Flex-Chem consistently has personnel rotate from Texas to Oklahoma and back. Additionally, Flex-Chem uses FedEx overnight delivery to ensure prompt service and accurate turn-around times.

As an example, an operator requested fluid compatibility testing on a well in Ector County, TX prior to performing an acid job. Fluid samples were collected, compatibility tests were performed, and reports were submitted within two business days of the request.

CONCLUSION

In conclusion, Flex-Chem stands as a trusted partner in the oil and gas industry, offering a comprehensive range of testing and analytical services to address the complex challenges faced by our clients. Through advanced methodologies and rigorous testing protocols, we provide unparalleled insights into the quality, composition, and behavior of petroleum products and water resources.

At Flex-Chem, we are committed to driving innovation, promoting sustainability, and delivering tangible value to our clients. With our expertise, organizations can confidently navigate KPI requirements, optimize operational processes, and safeguard the integrity of their assets, ensuring long-term success and resilience in dynamic and challenging environments.