



## PRODUCTION CHEMICAL TECHNICAL RECOMMENDATION

**PREPARED ON:**

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**Section #1: Executive Summary**

PureChem Services would like to thank Energy Works Management for the opportunity to present the following recommendation for Inhibiting Suspension water in the Cameron hills field. Based on proven field performance, CPF199WT is selected for Downhole Batch application in the Cameron hills field. CPF-199WT is designed to inhibit against corrosion in both fresh and brine based waters. It is well suited for inhibiting annular fluids

- Batch 0.5% CPF199WT into Casing to inhibit the fresh water used to suspend the well
- The Specific Gravity of CPF199WT is 1.0152, the specific gravity of water is 1.0000, the CPF199WT is heavier then water.
- Because of how heavy the CPF199WT is will sink thru any oil on top, and drop into the water.
- CPF199WT is water soluble, so as it drops thru the water it will inhibit the water fully right from the top all the way to the bottom of the hole, it will not float on top as most batch inhibitors will.
- The PH of the CPF199WT is 8, so it will not raise the PH of your downhole water ( Fresh water has a PH of 7-8)
- CPF199WT has a built in oxygen scavenger in the blend, this will get rid of any remaining Oxygen in downhole and will prevent further corrosion caused by free oxygen in the fluids.
- CPF199WT has been used on multiple wells for strategic oil in the Steen River / Gator /Laurin area in the past to inhibit fresh and produced waters to suspend new drills and suspend older wells.

**Section #2: Program Information**

**2.1. Well Info / Volume Calculations Based on inhibiting the water 0.5% with CPF199WT**

Lat	Long	Well Name	Production Casing	Cement Top Depth	Product	Volume Of water down hole (m3)	Recommended CPF 199WT Volume (L)
60.02528°	-117.4472°	J-62	139.7mm 23.1kg/m J-55	1352mK B	CPF-199WT	16m3	<u>80L</u>
60.04575°	-117.4735°	I-73	177.8mm 34.2kg/m J-55	1370mK B	CPF-199WT	28m3	<u>140L</u>
60.03675°	-117.4735°	A-03	139.7mm 23.07kg/m J-55	1489mK B	CPF-199WT	18m3	<u>90L</u>

**Section #3: Program Pricing**

Lat	Long	Well Name	*Cost/L	Batch Volume (L)	Cost
60.02528°	-117.4472°	J-62	4.88	<u>90L</u>	<u>\$439.20</u>
60.04575°	-117.4735°	I-73	4.88	<u>140L</u>	<u>\$683.20</u>
60.03675°	-117.4735°	A-03	4.88	<u>100L</u>	<u>\$488.00</u>
<b>Total Volumes/Total Costs</b>				<b>330L</b>	<b>\$1,565*</b>

\*Before Tax / Fees

**Section #4: Product Background**

CPF199WT should be applied as a batch treatment. CPF-199WT is designed to inhibit against corrosion in both fresh and brine based waters. It is well suited for inhibiting annular Fluids; CPF-199WT inhibits against oxygen, hydrogen sulfide, carbon dioxide, and organic acid corrosion. CPF-199WT is nonreactive; thermally stable and can be used in applications up to 145°C. CPF-199WT is used as a water-based inhibitor at a rate of 0.5% to 1.5%. For the applications at the higher end of the temperature Range and for higher H2S and CO2 levels, an application rate of 1.5% is recommended. For fresh water applications 0.5% to 1% is recommended. CPF199WT is a winterized product and does not freeze.

CPF199WT has been used on multiple wells for strategic oil in the Steen River / Gator /Laurn area in the past to inhibit fresh and produced waters to suspend new drills and older wells. This is our go to product for inhibiting any waters for suspensions or abandonments for strategic. The combination of oxygen scavengers, corrosion inhibitors and specialized weighting products makes the CPF199WT the best choice to inhibit downhole waters.

## Section #5: Laboratory and Analytical Services

Our laboratory facilities are designed to expedite the identification of best-in-class chemical solutions to resolve asset integrity, flow assurance and phase separation issues.

Our labs are located in Calgary, Drayton Valley, Grande Prairie, Alberta and Carlyle, Saskatchewan. Having multiple labs strategically located can provide timely turn-around on most analytical testing needed. Demulsifier bottle testing and some field testing can be performed at field labs throughout Alberta and Saskatchewan. PureChem also uses third party testing for some non-routine analysis.

### Calgary, Alberta

#### Corrosion Testing

- Linear Polarization Resistance Autoclave Corrosion Cells
- RCE
- High Pressure Liquid Chromatograph (HPLC)

#### Specialty Testing

- Raman Spectrometer
- Laser Particle Size Analyzer

#### Wax Analysis

- Brookfield PVS HTHP Viscometer
- Cold Finger Apparatus

#### Scale Analysis

- Dynamic Scale Loop

#### Gas/Liquid, Residual Analysis

- Gas Chromatograph

#### Full mud laboratory including:

- HTHP Filter Presses
- API Filter Presses
- Hot Roll Oven/Ageing Cells
- Particle Plugging Tester
- Lubricity Tester
- Fann/OFITE Viscometers
- Fann/OFITE Viscometers

#### Future equipment planned for Calgary includes:

- Inductively Coupled Plasma Spectrometer
- Ion Chromatograph
- Advanced Tribology Device
- Core Flow Apparatus



### Carlyle, Saskatchewan

Comprehensive product selection, product development and program design capabilities include:

- Comprehensive QC Program
  - Includes all incoming raw materials and all lots of blended products
  - QC samples retained for one year
  - Product Stability/Cold Temperature testing
- Fluid and Solids Analysis
  - Full Oil Analysis
  - Full Water Analysis
  - Millipore analyses
  - Solids/Scale/Deposit/Hydrocarbon analyses
- Corrosion and Scale Inhibitor Program Analysis
  - Residuals monitoring
  - Fe, Mn, Na, Ca testing and trending
  - Corrosion Failure Analyses
  - Emulsion tendency evaluation
  - Evaluation of water/oil phase partitioning and compatibility

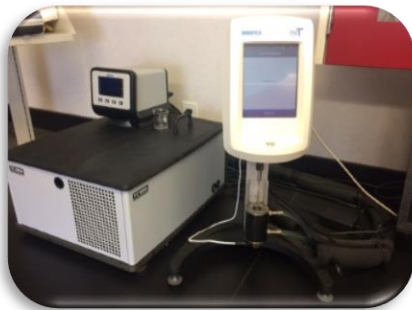
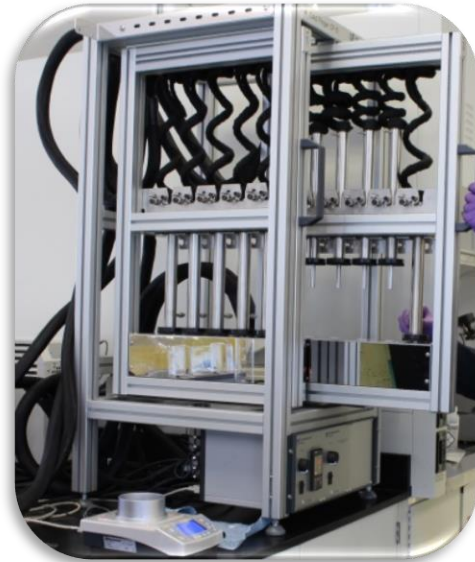
- Wax Analysis and PPD testing
  - Viscosity-temperature analysis
  - Molecular composition by GC-FID
  - Evaluation of wax dispersants and solvents
  - Hot flask testing
- Acid Stimulations
  - Designing acidizing packages
  - Acid compatibility testing
- Bacteria Counts
  - SRB, APB Bacteria Bottles
  - ATP (Luminultra)
- Fracturing Fluids
  - Fluid design, testing, trouble-shooting
  - Design and selection of Frac Fluid additives
- Demulsifiers
  - Bottle testing for product evaluation, trouble-shooting, and product development
  - Water Treating
  - Water compatibility
  - Scaling tendency calculation software (French Creek)



**Grande Prairie, Alberta**

The Grande Prairie Laboratory is a technical service and product evaluation laboratory that has complete testing capabilities for all problem solving requirements in the production chemicals market. The Grande Prairie laboratory is specially equipped with the latest paraffin cold finger testing apparatus and paraffin viscometers to select the most effective solution for the customer. Additional laboratory testing capabilities include:

- Production Chemical Residual
  - Corrosion Inhibitors
  - Scale Inhibitors
- Wax Analysis
  - Digital Melting Point Apparatus
  - Inhibitor testing
  - Solvency Testing
  - Dispersant Testing
- Solid Determination/Analysis
- Produced Water Testing
  - Brine Compatibilities
  - Emulsion Tendencies
  - Compatibility with Production Chemicals
- Emulsion Breaker Bottle Testing
- Water Analysis Reporting
  - PureChem Water Report
- Bacteria Testing
  - Bacteria Media Culture Bottles



**Brookfield Rheometer**



**Centrifuge – Incubator Oven**



**Lab Oven – Bottle Shaker**

**Cold Finger Apparatus**



Drayton Valley, Alberta

Our Drayton Valley lab is equipped to support most analytics required in the surrounding fields, capabilities include:

- Wax Analysis
  - Brookfield RVDV-II+Pro Viscometer
  - Cold Finger Apparatus
  - Digital Melting Point Apparatus
  - Inhibitor testing
  - Solvency Testing
- Dispersant Testing
- Oilfield Solids Analysis
  - Quantitative
  - Qualitative
  - Millipore
- Acid Package Testing
- Production Chemical Residual
  - Corrosion Inhibitors
  - Scale Inhibitors
- Produced Water Testing
  - Brine Compatibilities
  - Emulsion Tendencies
  - Compatibility with Production Chemicals
- Bacteria Testing
  - Luminultra
  - Bacteria Bottles
- Quality Control/Quality Assurance



- Material Compatibility Testing
- Emulsion Breaker Bottle Testing
- Water Analysis Reporting
  - PureChem Water Report
  - French Creek Water Report



**Sterling, Kansas**

Our Jacam division in Kansas brings some unique capabilities and equipment to the organization. The 10,200 square foot geochemical laboratory at the north manufacturing facility has state-of-the-art instrumentation including:

- Liquid Chromatography/Mass Spectrophotometry - LC/MS
- Gas Chromatograph/Mass Spectrophotometer - GC/MS
- Scanning Electron Microscope
- Ion Chromatography (IC)
- Inductively Coupled Plasma (two)
- High Pressure Liquid Chromatography
- Gel Permeation Chromatography
- Dynamic Scale Loop – DSL (two)
- Rotating Cylinder Electrode – RCE (three)
- Kettle Test for Corrosion Inhibitors (four)
- Wheel Tester



**Sterling, Kansas (Jacam Laboratory)**

## Section #6: Capabilities

Our PureChem facility in Carlyle, Saskatchewan (shown below) is situated on 20 acres of land next to the Canadian Energy Services drilling fluids division and our trucking division. This facility continues to expand to support the business.



### 6.1. Service and Delivery Capabilities

Canadian Energy Service's trucking division has a broad selection of vehicles suited for oilfield handling. Having full control over the transport of our products is a definite asset.

**Service Fleet**

- One pressure truck
- Three treater trucks
- Two batch trucks

**Transport Fleet**

- 28 tankers
- 39 tractor trailers
- Three acid tank trucks
- 15 hi-boys
- Five tridem trailers



## 6.2. Acid Blend and Storage Facilities

PureChem Services blends and supplies bulk acid to the industry.

HCL stored in a fully contained tank farm with storage capabilities up to 200 m<sup>3</sup>. Chemical resistant poly ethylene lining. Fiberglass tanks with poly fittings and poly load lines offer superior resistance to HCL.

- On site blending vessels provide the ability to build specialized acid blends.
- Emergency shower/eye wash station located at the tank farm built to ANSI and OH&S standards.
- Digital gauges to provide accuracy for tank and load levels.



## 6.3. H<sub>2</sub>S

### Scavengers – Fully Engineered Programs

PureChem Services is a basic manufacturer of triazine based liquid scavengers. Our team of dedicated specialists has over 30 years of experience in providing H<sub>2</sub>S solutions and offers the following services:

- Design and build services
- Scavenger selection
- Delivery and logistics
- Operator training
- Start-up and system optimization
- Monitoring and reporting



## Section #7: Quality, Health, Safety and Environment

The management of Canadian Energy Services is committed to providing a safe and healthy work environment that protects its customers, employees, the public and the environment. We will continue to invest significant resources to ensure our products and processes meet the highest standards.

CES maintains COR recognition through Enform as its certifying partner.

When handling any chemical, PureChem Services recommends that all company procedures be followed in regards to safe handling procedures and that the Material Safety Data Sheets are reviewed prior to commencement of the job. This safe work practice includes the wearing of Personal Protective Equipment, which includes but is not limited to:

- Personal monitor
- Safety glasses or chemical goggles
- Fire retardant coveralls
- Steel toed boots
- Hard hat
- Protective gloves



ISO 9001

PureChem Services is focused on delivering “best-in-class” service to our customers. The quality management systems in our manufacturing facilities are registered to ISO 9001:2015. PureChem Services is committed to delivering superior products, accurate quantities and timely deliveries to our customers.

# NOTES