



## **Appendix 2: Crude oil Definition, properties and Classifications:**

### **➤ Definition:**

Crude oils are complex mixtures containing many different hydrocarbon compounds that vary in appearance and composition from one oil field to another. Crude oils range in consistency from water to tar-like solids, and in colour from clear to black. An "average" crude oil contains about 84% carbon, 14% hydrogen, 1%-3% sulphur, and less than 1% each of nitrogen, oxygen, metals, and salts. Crude oils are generally classified as paraffinic, naphthenic, or aromatic, based on the predominant proportion of similar hydrocarbon molecules. Practical limitations restrict assessment of the impact of crude oil release to the environment to a limited subset of key components. It is necessary to have a basic understanding of crude oil properties and classifications.

### **➤ Properties:**

Some of the most important physical properties of crude oil include:

#### **1. °API:**

$^{\circ}\text{API} = (141.5/\text{SG}_{@15^{\circ}\text{F}}) - 131.5$  the purpose of this equation was to extend the range of the specific gravity scale. Crude oil specific gravity (SG) changes, although small, may be important.

Crude Oils  $^{\circ}\text{API} = 10$  to  $50$

Higher  $^{\circ}\text{API}$ , more paraffinic crude, higher yields of gasoline.

Lower  $^{\circ}\text{API}$ , more aromatic crude, lower yields of gasoline.

#### **2. Density:**

The density of a substance is the quantity of matter contained in a unit volume of the substance. It can be expressed in three different ways.

##### **a) Mass Density, $\rho$ :**

It is defined as the mass of substance per unit volume.

**Units:** Kilograms per cubic metre,  $\text{kg/m}^3$

**Dimensions:**  $\text{ML}^{-3}$

Typical values:

Water = 1000 kg/m<sup>3</sup> Mercury = 13546 kg/m<sup>3</sup> Air = 1.23 kg/m<sup>3</sup>, Paraffin Oil = 800 kg/m<sup>3</sup>.

(At pressure = 1.01310 N/m<sup>2</sup> and Temperature = 288.15 K.)

### b) Specific Weight, $\gamma$ :

It is defined as the weight per unit volume. *Or*, the force exerted by gravity,  $g$ , upon a unit volume of the substance.

$$\gamma = \rho g$$

Where  $\rho$  = density,  $g$  = gravity and  $\gamma$  = specific weight

**Units:** Newton's per cubic metre, N/m<sup>3</sup>

**Dimensions:** ML<sup>-2</sup>T<sup>-2</sup>.

Typical values:

Water = 9814 N/m<sup>3</sup>, Mercury = 132943 N/m<sup>3</sup>, Air = 12.07 N/m<sup>3</sup>, Paraffin Oil = 7851 N/m<sup>3</sup>.

### c) Specific Gravity (SG) :

It is defined as the ratio of mass density of a substance to some standard mass density. For solids and liquids this standard mass density is the maximum mass density for water (which occurs at 4°C) at atmospheric pressure.

$$SG = \frac{\rho}{\rho_{H_2O @ 4^\circ C}}$$

**Units:** None, since a ratio is a pure number.

**Dimensions:** 1.

Typical values: Water = 1, Mercury = 13.5, Paraffin Oil = 0.8.

## 3. Viscosity:

Resistance to flow, usually measured @ 100°F (37.8°C) in centistokes (kinematics viscosity).

### a) Dynamic (absolute) Viscosity:

It is the tangential force per unit area required to move one horizontal plane with respect to the other at unit velocity when maintained a unit distance apart by the fluid.

The shearing stress between the layers of non turbulent fluid moving in straight parallel lines can be defined for a Newtonian fluid as:

The dynamic or absolute viscosity can be expressed like

$$\tau = \mu dc/dy \quad (1)$$

Where

$\tau$  = shearing stress

$\mu$  = dynamic viscosity

Equation (1) is known as the Newton's Law of Friction.

In the SI system the dynamic viscosity units are **N.s/m<sup>2</sup>**, **Pa s** or **kg/ms** where

1.  $1 \text{ Pas} = 1 \text{ N s/m}^2 = 1 \text{ kg/m s}$

The dynamic viscosity is also often expressed in the metric CGS (centimeter-gram-second) system as **g/cm.s**, **dyne.s/cm<sup>2</sup>** or **poise (p)** where

2.  $1 \text{ poise} = \text{dyne s/cm}^2 = \text{g/cm s} = 1/10 \text{ Pa s}$

For practical use the *Poise* is too large and it's usual divided by 100 into the smaller unit called the **centiPoise (cP)** where

3.  $1 \text{ p} = 100 \text{ cP}$

Water at 68.4°F (20.2°C) has an absolute viscosity of one - 1 - centiPoise.

#### b) Kinematic Viscosity

It is the ratio of absolute or dynamic viscosity to density - a quantity in which no force is involved. Kinematic viscosity can be obtained by dividing the absolute viscosity of a fluid with its mass density

$$\nu = \mu / \rho \quad (2)$$

Where

$\nu$  = Kinematic viscosity

$\mu$  = absolute or dynamic viscosity

$\rho$  = density

In the SI-system the theoretical unit is m<sup>2</sup>/s or commonly used **Stoke (St)** where

- $1 \text{ St} = 10^{-4} \text{ m}^2/\text{s}$

Since the *Stoke* is an impractical large unit, it is usual divided by 100 to give the unit called **Centistokes (cSt)** where

- $1 \text{ St} = 100 \text{ cSt}$

- $1 \text{ cSt} = 10^{-6} \text{ m}^2/\text{s}$

Since the specific gravity of water at 68.4°F (20.2°C) is almost one (1), the Kinematic viscosity of water at 68.4°F is for all practical purposes 1.0 cSt.

#### 4. Pour Point

Temperature at which oil ceases to flow. Diesel may contain waxes, smaller than candle wax, which could solidify in cold weather.

**5. Flash Point:**

It is the temperature above which the oil will spontaneously combust. Fractions in vacuum tower are the least combustible. They are the heaviest.  
Or

The lowest temperature at which a liquid will generate sufficient vapor to flash (ignite) when exposed to a source of ignition.

**6. Cloud Point:**

It is the temperature at which wax begins to crystallize from a distillate fuel.

**7. Vapor Pressure:**

It is the partial pressure of the vapor of a liquid in a closed container at equilibrium. Also known as Reid vapor pressure (RVP). True vapor pressure (TVP) is usually 5-9% > RVP

**8. Carbon Residue:**

Is the solid residue (%wt) remaining after heating to coking temperatures (700-800°C).

**9. Salt Content:**

(lb NaCl/1000 Bbl)

Desalting is necessary because NaCl content > 10 lbs/1000 BbL leads to corrosion

**10. Sediment and Water %:**

These inorganic particles can lead to operational problems.

**11. Acidity:**

The presence of acid-type constituents whose concentration is usually defined in terms of neutralization number. The constituents vary in nature and may or may not markedly influence the behavior of the oil.

**12. Sulfur content %wt:**

Sour crudes > 0.5 wt% and sweet crudes < 0.5 wt%. Today it is difficult to find crudes below 1% sulphur.

**13. Asphaltene content %wt:**

The Asphaltene fraction, like the resins, is defined as a solubility class, namely the fraction of the crude oil precipitating in light alkenes like pentane, hexane or heptane. This precipitate is soluble in aromatic solvents

like toluene and benzene. The Asphaltene fraction contains the largest percentage of heteroatoms (O, S, and N) and organometallic constituents (Ni, V and Fe) in the crude oil.

#### **14. Potential Hydrogen (pH):**

A measure of the acidity or alkalinity of a liquid or solid material (which signifies the concentration of hydrogen ion, the pH numbers range from 0 to 14. A neutral solution (as pure water has a pH of 7), acid solutions are less than 7, basic, or alkaline, solutions are above 7.

#### **➤ Classifications:**

The oil and gas industry classifies crude oil by where it was produced of its origin and often by its relative weight (API gravity or viscosity), light, intermediate or heavy. In addition to may also be classifies as per sulfur content sweet (it contains relatively little sulfur), or sour (it contains substantial amount of sulfur) and requires more refining in order to meet current petroleum specifications

#### **❖ API gravity or viscosity classifications:**

##### **1. Light crude oil**

Is liquid petroleum that has a low density and flows freely at room temperature. It has a low viscosity, low specific gravity and high API gravity due to the presence of a high proportion of light hydrocarbon fractions. It generally has low wax content. Light crude oil receives a higher price than heavy crude oil on commodity markets because it produces a higher percentage of gasoline and diesel fuel when converted into products by an oil refinery. Light crude generally has an API gravity of 38 degrees or more.

##### **2. Intermediate crude oil**

Crude with API gravity between 22 and 38 degrees is generally referred as medium crude.

##### **3. Heavy crude oil**

It's a type of crude oil which does not flow easily. It is referred to as "heavy" because its density or specific gravity is higher than that of light crude oil. Heavy crude oil has been defined as any liquid petroleum with an API gravity less than 22°, meaning that its specific gravity is greater than 0.933. This mostly results from crude oil getting degraded by being exposed

to bacteria, water or air resulting in the loss of its lighter fractions while leaving behind its heavier fractions.

### ❖ Sulfur content classifications:

#### 1. Sweet Crude oil

A type of petroleum that contains a low level of sulfur, and is often refined into gasoline. Light sweet crude oil is sweet crude oil of high quality and low sulfur levels, and is the most sought after type of oil. When the total sulfur level in the oil is less than 0.5% sulfur the oil is called sweet

#### 2. Sour crude oil

A type of petroleum that contains higher levels of sulfur, an impurity. This makes sour crude oil more difficult to refine into gasoline. Sour crude oil is often refined into heavy crude oil. When the total sulfur level in the oil is  $> 0.5\%$  the oil is called "sour".

### Appendix 3: Material Safety Data Sheet (MSDS)

#### 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY

Product name:	KS-50-38 DEMULSIFIER
Product code:	20040521
Supplier:	SINO OIL KING SHINE CHEMICAL CO., LTD. JIN YUAN RD 10. DEVELOPMENT ZONE, LANGFANG, HEBEI, P.R.C.  TELEPHONE: (86)316-5919778 FAX: (86)316-5918779
Emergency telephone number:	(86)316-5919778
Fax number:	(86)316-5918779

#### 2. COMPOSITION/INFORMATION ON INGREDIENTS

Identification of the preparation: Formulated product, Aromatic Hydrocarbons

Chemical Name Weight(%)	Formula	CAS-No	Class
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Poly-ethylene oxide-poly-propane oxide diethylenetriamine and pentaethylenehexamine				60-70
Petroleum Heavy		64742-94-5	Xn,R10,R36/37/38	10-20
AROMATIC				
Naphthalene	C <sub>10</sub> H <sub>8</sub>	91-20-3	Xn,R20/21/22 R65,R52	<15

### 3. HAZARDS IDENTIFICATION

<b>Most important hazards:</b>	Flammable material, Harmful to aquatic organisms. Dangerous and Harmful if swallowed.
<b>Specific hazards:</b>	Harmful if inhales, ingest, skin adsorbs, irritate to eyes and skins.

### 4. FIRST-AID MEASURES

<b>Inhalation:</b>	Move to fresh air promptly if inhalation of vapor accidentally. Keep the breath smooth. if symptoms persist, call first-aid immediately.
<b>Skin contact:</b>	Remove the contaminated clothes and wash before re-use. Wash off quickly with flowing water. PAGE: 2 of 6
<b>Eye contact:</b>	Flush away with flowing water or physiological saline.
<b>Ingestion:</b>	Immediately drink plenty of warm water, induce vomiting and ask for suggestion from physician.

### 5. FIRE-FIGHTING MEASURES

<b>Suitable extinguishing media:</b>	Dry powder, sand, carbon dioxide
<b>NOT suitable extinguishing media:</b>	Water stream is prohibited because it may cause fire



scatter.

**Specific hazards:** Poisonous and irritant fumes maybe produced during the burning process.

**Specific methods of fire-fighting and special equipment for the protection of firefighters:** First, cool the container with water spray. If possible, move the container to open place. must wear anti-fire clothes and respirator.

## 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions:** Withdraw all personal in polluted areas to safe place and remove all sources of ignition. Suggest person who handling release wear a positive-pressure supplied-air respirator and anti-fire suit.

**Environmental precautions:** Prevent the product from entering into drains and surface water.

**Methods for cleaning up:** use sand and other nonflammable material to absorb if small leakage. if much amounts of release happen, use foam to cover so as to reduce vapor pollution and use anti-explosive pump transfer products to tank car. Clean with detergents.

## 7. HANDLING AND STORAGE

**Handling:** Take precautionary measures against static discharges. To avoid ignition of vapors by static electricity discharges, all metal parts of the equipment must be grounded. In case of insufficient ventilation, wear suitable respiratory equipment.

**Storage:** Keep containers tightly sealed in a cool, well-ventilated place free of oxidizing agents. Prevent the static electricity accumulation.

**Period of validity:** 2 year.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Chemical Name:**

**National occupational exposure limits:**

**Engineering measures to reduce exposure:**

Ensure the whole process of production tightly sealed, keep good ventilation.

**Personal protective equipment:**

- Respiratory protection: Suitable respiratory equipment: Respirator with combination filter for vapor/particulate, when the concentration of the products in the air exceed certain level.
- Hand protection: Using PVC or other plastic material gloves.
- Eye protection: Tightly fitting safety goggles.
- Skin and body protection: Poisonous-osmotic-proof protective clothing, hard hat with brim, heavy duty work shoes.
- Hygiene measures: Do not smoke. When using do not eat or drink. Wash hands before breaks and immediately after handling the product. Contaminated work clothing should not be allowed out of the workplace. Handle in accordance with good industrial hygiene and safety practice.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Physical state:**

Solution

**Form:**

Liquid

**Color:**

Clear amber

**Odor:**

Sweet-scented

<b>pH:</b>	not applicable
<b>Melting point:</b>	<-20C
<b>Decomposition temperature:</b>	>200C
<b>Flash-point (closed cup):</b>	72C
<b>Autoignition temperature:</b>	485C
<b>Explosion limits:</b>	-lower 0.9 vol.% -upper 7.0 vol.%
<b>Viscosity:</b>	<500mPa.s (20C)
<b>Density:</b>	@20C 0.920~0.980 g/ml
<b>Vapor pressure (Reid):</b>	1.0~1.5kPa (40C)
<b>Water Solubility:</b>	<b>(20C)</b> immiscible
<b>Fat Solubility:</b>	miscible with most organic solvents

Note: The color of the final product may vary a little due to different batch of solvent and that does not affect the product's properties.

## 10. STABILITY AND REACTIVITY

<b>Stability:</b>	Stable at normal conditions
<b>Condition to avoid:</b>	Heating in air
<b>Materials to avoid:</b>	May react violently with oxidizing agents.
<b>Hazardous decomposition products:</b>	Incomplete combustion may produce small amounts of Carbon monoxide.

## 11. TOXICOLOGICAL INFORMATION

<b>Acute toxicity:</b>	HARMFUL: May cause lung damage if swallowed.
<b>Local effects:</b>	<p>Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting.</p> <p>May cause eye/skin irritation</p> <p>Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.</p>
<b>Sensitization:</b>	Did not cause sensitization on laboratory animals
<b>Chronic toxicity:</b>	Repeated and prolonged exposure to solvents may cause brain and nervous system damage. Prolonged skin contact may defat the skin and produce dermatitis.

## 12. ECOLOGICAL INFORMATION

<b>Mobility:</b>	The product is predicted to have low mobility in soil.
<b>Persistence:</b>	<p>There is evidence of degradation in water.</p> <p>Biochemical oxygen demand (BOD) = (28 days) 71%</p> <p>Chemical oxygen demand (COD) = 1.75 g/g</p>
<b>Bioaccumulation:</b>	The product has potential for bioaccumulation.
<b>Ecotoxicity:</b>	<p>LC<sub>50</sub> (turbot) 96hr semi static &lt; 100 mg/l</p> <p>EC<sub>50</sub> (skeletonema) 72hr &lt; 1mg/l based on biomass, water soluble fraction.</p> <p>EC<sub>50</sub> (skeletonema) 72hr &lt; 2.5mg/l based on growth rate, water soluble fraction.</p> <p>EC<sub>50</sub> (Arcacia tonsa) 48hr 12mg/l.</p> <p>The product is expected to be partially removed in biological treatment processes.</p> <p>Ecotox data is based upon information known about the solvent fraction of the formulation.</p>

### 13. DISPOSAL CONSIDERATIONS

<b>Waste from residues:</b>	If recycling is not practicable, dispose of in compliance with local regulations. Can be incinerated, when in compliance with local regulations. Must be reconditioned or disposed as special waste.
<b>Contaminated packaging:</b>	Can be offered for recycling, re-conditioning or puncture. Empty containers should be taken to local recyclers for disposal. Must be reconditioned or disposed as special waste.

### 14. TRANSPORTATION INFORMATION

#### RID

**Class :** 9

**Item:** 11 (c)

**TREM-CARD:**

**EAC/Hi:** 2 X / 90

**Proper shipping name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, NOS  
[AROMATIC PETROLEUM DISTILLATE]

#### IMO

**Class :** 9

**IMDG Page:** 9028

**Proper shipping name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, NOS  
[AROMATIC PETROLEUM DISTILLATE]

#### ICAO

**Class :** 9

**UN/ID No:** 3082

**Proper shipping name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, NOS  
[AROMATIC PETROLEUM DISTILLATE]

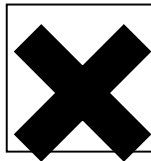
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Packing instruction (cargo aircraft) 914-NO LIMIT

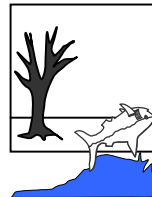
## 15. REGULATORY INFORMATION

### UN number and Classification according to Recommendation on the Transportation of Dangerous Goods.

Precaution symbols(s):



HARMFUL



Environmental  
hazards

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### R-phase(s):

R10

Flammable

R20/21/22

Harmful if inhalation, contacting with skin, ingestion.

R36/37/38

Irritating to eye, respiratory system and skin

R51/53

Toxic to aquatic organism, may cause long term adverse effects in the aquatic environment.

R65

Maybe harmful to lung if ingestion

### S-phrases:

S3/9

Storage in cooled and ventilated areas.

S7

Storage in tightly sealed container

S21

No smoking during using

S23

Do not breathe vapor/spray

S24

Avoid contact with skin

S57	Use appropriate containment to avoid environmental contamination.
S60	This material and its container must be disposed of as hazardous waste
S61	Avoid release to the environment . Refer to special instructions/safety data sheet.
S62	If swallowed do not induce vomiting: seek medical advice immediately and show this container or label.

## 16. OTHER INFORMATION

**Recommended use:** Oilfield chemical – demulsifier.

**Further information:**

This amendment incorporates information to comply with the following Directives:

Recommendations on the Transportation of Dangerous Goods

Registry of Toxic effects of Chemical Substances

Regulations concerning the international carriage of dangerous goods by rail.

International Maritime Dangerous Goods Code.

International Civil Aviation Organization – Technical Instructions.

**Revision Date:** 18/03/2005

**Appendix 4: Demulsifier Bottle test Procedures by SINO OIL KING SHINE CHEMICAL CO., LTD.**

## **Bottle Test of Demulsifier for Neem FPF**

### **1. Actuality**

At present, there are 8 OGMs in Neem oil field including OGM-1, OGM-2, OGM-3, OGM-4, OGM-5, OGM-6, OGM-8, OGM-9,. All the preceding OGMs were gathered at FPF main OGM and all the oil should be treated in Neem FPF.

Now, demulsifier KS-5038 from Sino king shine chemical Co.ltd is being injected in other oilfield of GNPOC except Neem FPF. Injection dosage is around 51ppm (average) and it's varying from field to another. The crude oil of Neem FPF is treated at 65~70°C and transported to Diffra FPF. Water cut in outlet is 0.5~ 1.5 %. The temperature of Neem oil in Diffra FPF inlet is around 35°C. It is not good for treatment in CPF.

**Table 1: The result of field trails in GNPOC oil field in 2007**

Oil Field (FPF)	Chemical(demulsifier)	BS&W (Water cut in outlet %)	Dosage mg/l (ppm)
HEGLIG	KS-5038	4.8	3.4
BAMBOO	KS-5038	50.1	9
TOMA SOUTH	KS-5038	25.1	1.4
ELTOOR	KS-5038	61.2	1.7
ELNAR	KS-5038	25.8	0.5
UNITY	KS-5038	15.3	2.5
MUNGA	KS-5038	19	0.7
NEEM	KS-5038	-	-
Average result of PPM from date 24-oct-2007 to 25-oct-2007			



## **2. Intention**

We are looking for a good test results by injecting demulsifier to reduce the water cut in Neem FPF outlet and decrease the load of treatment in Diffra FPF & CPF.

## **3. Test steps**

### **3-1 Oil sample**

It is necessary for us to get oil sample from main OGM without any other chemical, we got oil samples from the sample points from each 8 OGMs along the pipeline to FPF. Then we mixed (blended) all the sample equably and test it.

### **3-2 Testing methods**

We use the following method to appraise the efficiency of demulsifier.

1. Get fresh oil sample without any other chemicals (or before injection).
2. Shake and mix the oil sample until it become thick and homogeneity. Then fetch the oil sample from the barrel head.
3. Move 50ml oil sample to every test bottle and heat the sample by water bath (63°C) After that we inject 0.3ml demulsifier solution (1%) into every test bottle. The injection dosage should be 60ppm.
4. Cover the test bottle by lid and shake it 100 times until it mix very well then keep it in the water bath. (63°C) and start reading.
6. Read the volume of free water in the bottom of test bottle on 5, 10, 20, 30, 60, 90 minutes
7. Move 50ml oil sample to a 100ml centrifuge tube; inject 50ml menstruum (diesel) and 3 drops of demulsifier. Take the tube to centrifuge, check the water cut.
8. Compare volume of separated water and water cut for every sample.

## **4. DATA of Test**

### **4-1 Demulsifier test in Neem FPF**

**Table 2: Demulsifier test of oil sample from Neem FPF blend OGMs oil (water cut is .56 % average of Feb-2010)**

**(The following app. turbid=appreciably turbid)**

Demulsifier	Volume of oil	Dosage (ppm)	Volume of Separated water(ml)						
			5 min	10 min	20 min	30 min	60 min	90 min	Water quality
KS-5038	50	3	0.5	0.8	1.0	1.2	1.4	1.5	App. turbid
blank	50	0	0	0	0	Tiny	Tiny	Tiny	App. turbid

Depending on the preceding test, the treatment temperature is at 80°C. The testing temperature is 63°C. The datum hereinbefore proves that KS-5038 demulsifier has better efficiency in oil of Neem FPF, water cut in the oil is 60%.

## **5. Result of test:**

According to the preceding test, we can get a conclusion that K-5038 demulsifier is a good for Neem FPF. We believe that K-5038 would get good efficiency depending on this bottle test result.

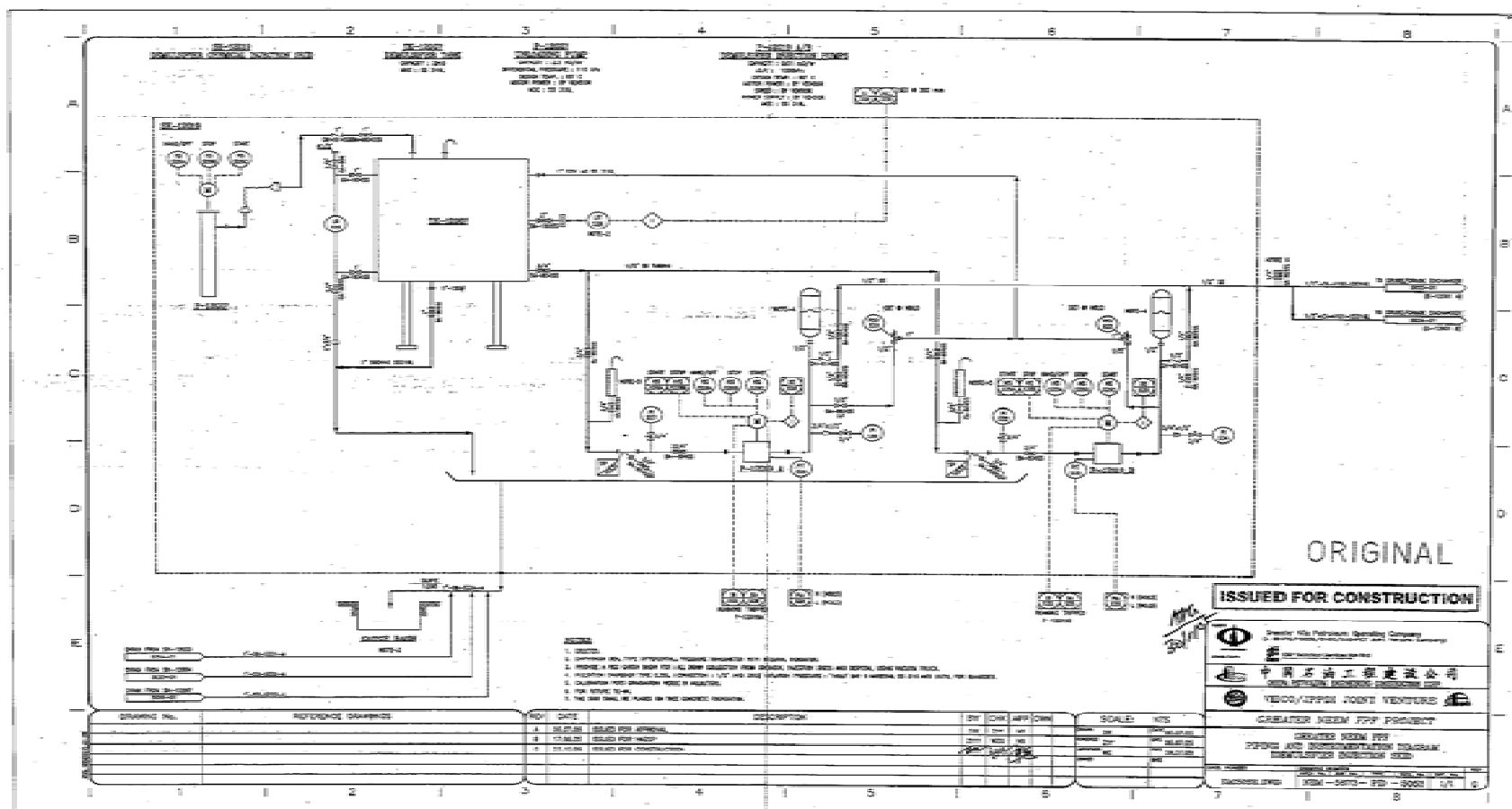
## **6. Conclusion:**

According to the preceding bottle test, we can sure that K-5038 is a good to inject now in Neem FPF

**Appendix 5: Demulsifier bottle test Results for Neem FPF**

Demulsifier Bottle Test for Neem									
Field: Neem		Operating Tem:69°C			WC%: 60		Emulsion:18%		
Demulsifier Type	Volume of oil( ml)	Dosage PPM	Volume of separated Water (ml )				Interface	Water Quality	Top Oil WC%
			10 min	15 min	30 min	60 min			
<i>QJIEK</i>	100	50	20.0	40.0	42.0	42.0	Fair	Clear	1.2
<i>54-012</i>	100	50	34.0	40.0	44.0	44.0	Sharp	Clear	1.2
<i>WK-1232</i>	100	50	5.0	27.0	32.0	42.0	Blurry	Fair	1.6
<i>X-8076</i>	100	50	3.0	38.0	42.0	44.0	Sharp	Clear	1.2
<i>QDS-27</i>	100	50	16.0	36.0	42.0	44.0	Sharp	Clear	0.8
<i>9054 A</i>	100	50	10.0	36.0	37.0	36.0	Sharp	Clear	1.8
<i>9009</i>	100	50	7.0	36.0	44.0	44.0	Sharp	Clear	0.4
<i>KT-1904</i>	100	50	36.0	38.0	42.0	42.0	Fair	Fair	0.8
<i>KT-1905</i>	100	50	20.0	30.0	34.0	40.0	Fair	Fair	0.4
<i>EW-2010038</i>	100	50	39.0	42.0	44.0	46.0	Sharp	Clear	0.2
<i>SU-125</i>	100	50	34.0	44.0	46.0	46.0	Sharp	Clear	0.3
<i>KS-5038</i>	100	50	30.0	42.0	44.0	46.0	Sharp	Clear	0.2
<i>9054 B</i>	100	50	26.0	38.0	39.0	40.0	Sharp	Clear	1.1
<i>SC-7000</i>	100	50	39.0	44.0	46.0	46.0	Fair	Fair	0.4
<i>SDD-3009</i>	100	50	35.0	37.0	40.0	45.0	Sharp	Clear	0.2
<i>SC-2190</i>	100	50	25.0	38.0	44.0	46.0	Fair	Fair	0.8
<i>ST-2501</i>	100	50	9.0	44.0	44.0	44.0	Fair	Fair	1.2
<i>Blank</i>	100	0.0	1.0	2.0	2.0	2.3	Blurry	Poor	

### Appendix 6: Piping & Instrumentation Diagram (P&ID) for chemical injection skid



## Appendix 7: Piping & Instrumentation Diagram (P&ID) for CPI separators

