# **SERVICE REQUIREMENTS**

Currently, Nghi Son Refinery and Petrochemical LLC (**NSRP**) is eligible to issue the Certificate of Quality for Petroleum products by its Laboratory. Testing items and testing methods for Petroleum products are defined in **Annex 1**, **Annex 2** of this Scope.

When **NSRP**’s Laboratory is out of service, **NSRP** shall issue the Service Order to ***Service Provider*** to require the provision of testing service. ***Service Provider*** shall proceed the Service Order in the manner with highest priority for NSRP after receiving order from **NSRP**.

From NSRP side, NSRP is responsible to inform to Service Provider via email, telephone before picking up sample for their arrangement.

***Service Provider*** is allowed to use sub-contractors to perform the service. Sub-contractor shall have the competent as required in Section of this scope as same as for the ***Service Provider***. The list of sub-contractors shall be approved by Lab & QA Section of **NSRP**.

* + 1. ***Requirements for the test report approver.***

The test report approver shall take full responsibility for all activities in relation to the provision of the Services by the ***Service Provider*** and ensure the Services be performed in compliance with the Contract, the Scope of Services and the relevant laws and regulations.

The test report approver shall have at least five (5) years of professional work experience in the field of oil and gas analysis.

The test report approver shall have in-depth knowledge and experience in:

* + Organizational, project plan development.
  + Quality assurance / quality control principles.
  + Reporting techniques; and
  + Equipment qualification and calibration.
    1. ***Requirements for analysts***

All analysts shall meet the following requirements:

* + Having at least a bachelor’s degree in chemical engineering or analytical; and
  + Having enough competence, relevant valid certificates required at least three (3) years of experience in oil and gas analysis, especially test items defined in **Appendix 1**.
  1. **Requirements for competence of the laboratory**

In general, the laboratory utilized for this service shall be accredited to conform with ISO/IEC 17025:2017 for chemical testing field. In case of Service Provider is local supplier, the certificate of registration of testing service (Decision 107/2016/ND-CP) is acceptable.

* + 1. ***Requirement for the test method***

Appendix 1 of this scope specified the test method can be utilized. The Service Provider shall:

* + Use the latest version of test method specified.
    1. ***Requirement for the testing equipment***

All testing equipment utilized for testing shall meet the following requirements:

* + Having conformity certificates that prove equipment complying with test method.
  + Having the verification or validation records to verify / validate that equipment conforms to the specified test methods before being used.
  + Measuring equipment shall be calibrated.
    1. ***Assuring the test results***

Service Provider shall maintain a quality assurance program for the test methods used. Quality assurance activities should include but not limited to joining Proficiency Testing program, Check standard or duplicate testing.

# **3. Delivery time**

Upon the situation, NSRP, at their discretion, may request the service as the urgent or normal and it shall be specified in the Service Order.

In case of urgent service required, ***Service Provider*** is requested to deliver sample to Service Provider’s Lab within 24 hours after picking up sample from NSRP (NSEZ – Hai Yen Commune – Nghi Son District – Thanh Hoa). Test report shall be issued within 24 hours after received sample from NSRP.

In case of normal service required, ***Service Provider*** is requested to deliver sample to Service Provider’s Lab within 48 hours after picking up sample from NSRP (NSEZ – Hai Yen Commune – Nghi Son District – Thanh Hoa). Test report shall be issued within 72 hours after received sample from NSRP.

**Appendix 1: List of test items and test methods**

| ***TT*** | ***Materials or product tested*** | ***The name of specific tests*** | ***Limit of quantitation***  ***(if any)/range of measurement*** | ***Test method*** |
| --- | --- | --- | --- | --- |
|  | ***Gasoline, Diesel oil, Kerosene, Jet A1, Intermediate products, Fuel oil*** | *Determination of total Sulfur content*  *Ultraviolet fluorescence method* | *(1,0 ~ 8000) mg/kg* | *ASTM D5453*  *TCVN 7760* |
|  | *Determination of Sulfur content Energy dispersive X-ray fluorescence spectrometry method* | *to: 5 % mass/mass* | *ASTM D4294*  *TCVN 3172* |
|  | *Determination of distillation at atmospheric pressure* | *to: 450°C* | *ASTM D86*  *TCVN 2698* |
|  | *Determination of corrosiveness to copper*  *Copper strip Test* | *-* | *ASTM D130*  *TCVN 2694* |
|  | *Determination of density, relative density, or API gravity*  *Hydrometer method* | *(600 ~ 1100) kg/m3* | *ASTM D1298*  *TCVN 6594* |
|  | *Determination of density, relative density, and API gravity by digital density meter* | *-* | *ASTM D4052*  *TCVN 8314* |
|  | ***Fuel oil, Intermediate products*** | *Determination of distillation at reduced pressure* | *To 400°C at reduced pressure* | *ASTM D1160* |
|  | *Water in Petroleum Products and Bituminous Materials by Distillation* | *0 – 25%vol.* | *ASTM D95* |
|  | *Sediment in Crude Oils and Fuel Oils by the Extraction Method* | *0.01 – 0.40%mass* | *ASTM D473* |
|  | *Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter* | *-* | *ASTM D240* |
|  | ***Gasoline, Diesel oil, Kerosene, Jet A1, Intermediate products*** | *Determination of Gum content*  *Evaporation method* | *-* | *ASTM D381*  *TCVN 6593* |
|  | *Determination of Hydrocarbon content*  *Fluorescent indicator adsorption method* | *Aromatics:*  *(5,0 ~ 99) % v/v Olefins:*  *(0,3 ~ 55) % v/v Saturates:*  *(1,0 ~ 95) % v/v* | *ASTM D1319*  *TCVN 7330* |
|  | ***Gasoline, Kerosene, Jet A1, Intermediate products*** | *Determination of Sulfur content (Thiol Mercaptan)*  *Potentiometric method* | *(0,0003 ~ 0,01)*  *% mass/mass* | *ASTM D3227*  *TCVN 2685* |
|  | *Detection of active Sulfur species in Fuels and Solvents (Doctor Test)* | *-* | *ASTM D4952*  *TCVN 7486* |
|  | ***Gasoline, Diesel oil, Kerosene, Jet A1*** | *Determination of free water and particulate contamination*  *Visual inspection procedures* | *-* | *ASTM D4176*  *TCVN 7759* |
|  | ***Diesel oil, Intermediate products*** | *Calculated cetane index by four variable equations.* | *-* | *ASTM D4737*  *TCVN 3180* |
|  | *Determination of particulate contamination*  *Laboratory filtration method* | *Đến/to: 25 g/m3* | *ASTM D6217*  *TCVN 2706* |
|  | ***Diesel oil, Intermediate products*** | *Determination of evaluating lubricity by the high frequency reciprocating rig (HFRR)* | *-* | *ASTM D6079*  *TCVN 7758* |
|  | *Determination of aromatic hydrocarbon content*  *High performance liquid chromatography method with refractive index detection* | *MAH: (4 ~ 40) % m/m DAH: (0 ~ 20) % m/m  TAH: (0 ~ 6) % m/m PAH: (0 ~ 26) % m/m  total aromatic hydrocacbon:*  *(4 ~ 65) % m/m* | *ASTM D6591*  *TCVN 11589* |
|  | ***Diesel oil, Kerosene, Jet A1, Fuel oil, Intermediate products*** | *Determination of flash point by small scale closed cup tester* | *-30 ~ 300 oC* | *ASTM D3828*  *TCVN 6608* |
|  | *Determination of flash point by Pensky-Martens closed cup tester* | *40 ~ 370 °C* | *ASTM D93*  *TCVN 2693* |
|  | *Determination of kinematic viscosity of (and calculation of dynamic viscosity)* | *(0,2 ~ 300.000) mm²/s* | *ASTM D445*  *TCVN 3171* |
|  | ***Diesel oil, Fuel oil, Intermediate products*** | *Determination of Conradson Carbon Residue*  *Conradson method* | *-* | *ASTM D189-06(2019)*  *TCVN 6324:2010* |
|  | *Determination of Carbon Residue*  *Micro method* | *to: 30 % mass/mass* | *ASTM D4530*  *TCVN 7865* |
|  | *Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry* | *3 ppmw - 4.6% m/m* | *ASTM D2622*  *TCVN 6701* |
|  | ***Diesel oil, Fuel oil, Intermediate products*** | *Determination of pour point* | *≥ - 42 oC* | *ASTM D97*  *TCVN 3753* |
|  | *Determination of Ash content* | *(0,01 ~ 0,180)*  *% mass/mass* | *ASTM D482*  *TCVN 2690* |
|  | *Determination of Water content*  *Coulometric Karl Fischer titration* | *(10 ~ 25.000) mg/kg* | *ASTM D6304*  *TCVN 3182* |
|  | ***Kerosene, Jet A1, Intermediate products*** | *Determination of Flash point by tag closed cup tester* | *to: 93 oC* | *ASTM D56*  *TCVN 7485* |
|  | *Determination of Particulate contamination*  *Filtration method* | *-* | *ASTM D5452* |
|  | *Determination of the level of cleanliness*  *Portable automatic particle counter method* | *(4~30) µm(C), up to maximum 60.000 cumulative counts per mL* | *IP 565* |
|  | *Determination of Color automatic Tristimulus method* | *(0.5~8) ASTM Color unit*  *(0~+30) Saybolt Color unit* | *ASTM D6045* |
|  | *Determination of Saybolt color*  *Saybolt chromometer method* | *(-16~+30)* | *ASTM D156*  *TCVN 4354* |
|  | *Determination of total Acidity* | *Đến/to: 0,100*  *mg KOH/g* | *ASTM D3242-23*  *TCVN 7419:2004* |
|  | ***Kerosene, Jet A1, Intermediate products*** | *.*  *Determination of Aromatic Hydrocarbon content*  *High Performance liquid chromatography method with refractive index detection* | *mono-aromatic:*  *(0,8 ~ 44,0) % m/m di-aromatic:*  *(0,23 ~ 6,20) % m/m*  *total-aromatic:*  *(0,7 ~ 50,0) % m/m* | *ASTM D6379 TCVN 12921* |
|  | *Determination of Smoke Point* | *-* | *ASTM D1322*  *TCVN 7418* |
|  | *Determination of electrical conductivity* | *(1,0 ~ 2000) pS/m* | *ASTM D2624*  *TCVN 6609* |
|  | ***Jet A1, Intermediate products*** | *Determination of Freezing point* | *Đến/to -70oC* | *ASTM D2386*  *TCVN 7170* |
|  | *Determination of net heat of combustion* | *(40,19 ~ 44,73) MJ/kg* | *ASTM D3338/D3338M* |
|  | *Determination of heat*  *Precision method* | *-* | *ASTM D4809* |
|  | *Determination of Naphthalene Hydrocarbons content*  *Ultraviolet spectrophotometry method* | *(0,03~5,6) % v/v Procedure A*  *(0,08 ~ 5,6) % v/v Procedure B* | *ASTM D1840*  *TCVN 7989* |
|  | *Determination of thermal Oxidation Stability* | *-* | *ASTM D3241*  *TCVN 7487* |
|  | *Determination of water separation characteristics by Portable Separometer* | *to: 100 scale* | *ASTM D3948*  *TCVN 7272* |
|  | ***Jet A1, Intermediate products*** | *Determination of water separation characteristics by Portable Separometer* | *to: 100 scale* | *ASTM D7224* |
|  | ***Gasoline, Intermediate products*** | *Determination of Octane number* | *(40 ~ 120) O.N* | *ASTM D2699*  *TCVN 2703* |
|  | *Determination of Lead content*  *Atomic absorption spectroscopy method* | *(2,5 ~ 25) mg/L* | *ASTM D3237*  *TCVN 7143* |
|  | *Determination of Oxidation Stability*  *Induction period method* | *-* | *ASTM D525*  *TCVN 6778* |
|  | *Determination of Vapor Pressure*  *Dry method* | *(35 ~ 100) kPa*  *(5 ~ 15) psi* | *ASTM D4953*  *TCVN 7023* |
|  | *Determination of Vapor Pressure*  *Mini method* | *(1,0 ~ 18,6) psi*  *(7 ~ 130) kPa* | *ASTM D5191*  *TCVN 11588* |
|  | *Determination of Benzene content*  *Gas chromatography flame ionization detector method* | *(0,1 ~ 5) % m/m* | *ASTM D5580*  *TCVN 3166* |
|  | *Determination of MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and C1 to C4 Alcohols*  *Gas chromatography method use flame ionization detector (FID)* | *Individual ethers: (0,20 ~ 20) % m/m Individual alcohols: (0,20~12,0) % m/m* | *ASTM D4815*  *TCVN 7332* |
|  | *Determination of Manganese, iron content*  *Atomic absorption spectroscopy method* | *(0,25 ~ 40) mg/L* | *ASTM D3831*  *TCVN 7331* |
|  | *Determination of Hydrocarbon Types, Oxygenated Compounds, and Benzene*  *Gas chromatography flame ionization detector method* | *Aromatic: 0 ~ 50 % v/v*  *Olefin: (1,5 ~ 30) % v/v* | *ASTM D 6839*  *TCVN 12015* |
|  | ***Liquefied petroleum gases*** | *Determination of density or relative density*  *Pressure hydrometer method* | *(500 ~ 650) kg/m3* | *ASTM D1657*  *TCVN 6594* |
|  | *Determination of free water content* | *-* | *BS EN 15469* |
|  | *Calculation of certain physical properties from compositional analysis* | *-* | *ASTM D2598*  *TCVN 8362* |
|  | *Determination of Gage Vapor Pressure*  *LPG method* | *to: 3500 kPa* | *ASTM D1267*  *TCVN 8356* |
|  | *Determination of Volatility* | *(-50 ~ 5) °C* | *ASTM D1837*  *TCVN 8358* |
|  | *Determination of Hydrocarbons content*  *Gas chromatography method use flame ionization detector (FID)* | *(0,01 ~ 100) %* | *ASTM D2163*  *TCVN 8360* |
|  | *Determination of Residues* | *-* | *ASTM D2158*  *TCVN 3165* |
|  | *Determination of copper strip corrosion* | *-* | *ASTM D1838*  *TCVN 8359* |
|  | *Determination of total volatile Sulfur*  *Ultraviolet fluorescence method* | *Gaseous hydrocarbons:*  *(1 ~ 100) mg/kg  LP gases:*  *(1 ~ 196) mg/kg* | *ASTM D6667*  *TCVN 12923* |
|  | *Determination of Hydrogen Sulfide*  *Lead acetate method* | *-* | *ASTM D2420*  *TCVN 8361* |