BELIZE:

STATUTORY INSTRUMENT

No. 101 of 2009

REGULATIONS made by the Minister responsible for the Environment in exercise of the powers conferred upon him by sections 7, 26, 44 and 45 of the Environmental Protection Act, Chapter 328 of the Substantive Laws of Belize, Revised Edition 2000-2003, and all other powers thereunto him enabling.

(Gazette 8th August, 2009)

1. These Regulations may be cited as the — Short title.

POLLUTION (AMENDMENT) REGULATIONS, 2009

and shall be read and construed as one with the Pollution Regulations, which as amended are hereinafter referred to as the principal Regulations. — S.I. 56 of 1995 S.I. 60 of 2002

2. The principal Regulations are hereby amended by the addition of a new Part XII: 01 immediately after Part XII (Regulation 44) as follows:

PART XII: 01
PROHIBITION OF THE MANUFACTURE OF OZONE LAYER DAMAGING SUBSTANCES

44.01 Regulation 44 in the principal regulation is hereby amended by including under subsection 44(a) the words **"be it virgin, used, recycles or reclaimed"** after the words "these Regulations." — Schedule substance defined. Third Schedule.

47.A Regulation 47 in the principal regulation is hereby a by adding two new sub-regulations after Regulation 47 (9) as follows:

License to import or Export HCFCs, HFCs or any other type of refrigerant gases or mixtures thereof.

47.A (10) Any individual or company can apply, on the form prescribed in Seventh Schedule, to the Chief Environmental Officer for a license to import or export any type of schedule substances including Hydro Chloro-fluorocarbons (HCFCs), Hydro Fluorocarbons (HFCs), or any other type of refrigerant gases or mixtures thereof, as listed in PART 6, 7, 8, and 9 of the Third Schedule, except Chlorofluorocarbons (CFCs), in accordance with:

(a) A license granted by the Department pursuant to the Eight Schedule.

(b) Any license issued pursuant to sub-regulation (10) shall be valid for a period of 30 calendar days.

Labeling.

47.A (11) All imports or exports of any schedule substance shall comply with regulations 47:01".

Labeling.

47.01. A Regulation 47:01 in the principal regulation is hereby amended by including under subsection 47.01 (2) new subsections as follows:

(iii) Country of Origin
(iv) Contacts of Manufacturer
(v) Brand Name

Reporting of data on purchases and use of CFCs.

47.02. A Regulation 47.02 of the principal regulation is hereby amended, 47.02 (1), by inserting the words "HCFCs, HFCs or any other kind of refrigerant gases or mixtures thereof" after the words "especially CFCs" appearing therein.

Regulation 47:02 in the principal regulation is hereby amended by including under subsection 47.02 (2) by inserting the words "and imports" after the word "purchase" appearing therein.

48.01A Regulation 48.01 of the principal regulation is hereby amended by adding a new sub-regulation (5) as follows: Prohibitions.

48.01 (5) The importation of Chloro-fluoro-carbons (CFCs) or mixtures containing CFCs, and equipment or parts containing CFCs is prohibited with effect from 1st January 2010.

3. The Third Schedule of the principal Regulations are hereby amended by the Addition of **new Parts 6 through 9** thereunder: Schedules.

THIRD SCHEDULE [Regulations 44 and 45] SCHEDULED SUBSTANCES

PART 6
Hydrochorofluorocarbons (HCFC)

Chemical Name	Common Name
CHF_2Cl-Chlorodifluoromethane	HCFC22
$C_2HF_4Cl_2$-Dichlorotrifluoroethane	HCFC123
C2HF4Cl-Chlorotetrafluoroethane	HCFC124
$C_2H_3FCl_2$ - Dichlorofluoroethanes	HCFC141
CH_3CFCl_2-1,1-Dichloro-1-fluoroethane	HCFC141b
$C_2H_3F_2Cl$-Chlorodifluoroethane	HCFC142
CH_3CF_2Cl-1-Chloro-1,1-difluoroethane	HCFC142b

PART 7
Hydrofluorocarbon (HFC)

Chemical Name	Common Name
CF_3CH_2F-1,1,1,2-Tetrafluoroethane	HFC134a
CHF_2CH_3-1,1-Difluoroethane	HFC152a
CF_3CHF_2-Pentafluoroethane	HFC125
CF_3CH_3-1,1,1-Trifluoroethane	HFC143a
CH_2F_2-Difluoromethane	HFC32
CHF_3-Trifluoromethane	HFC23
$CF_3CH_2CHF_2$–1,1,1,3,3-Pentafluoropropane	HFC245fa

PART 8
Hydrofluorocarbon Mixtures (HFC)

Mixture	Common Name
R143a/125/134a	R404A
R143a/125	R507A
R32/125/134a	R407A
R32/125/134a	R407B
R32/125/134a	R407C
R32/125	R410A
R23/116	R508A
R23/116	R508B

PART 9
Other Blends

Mixture	Common Name
CFC 12/HFC 152a	R500
HCFC 22/HCFC 124/HFC 152a	R401 (MP 39)
HFC 134a/Iso-butane/Octofluorpropane	R413A (MO49)
HCFC-22/R-600a/HCFC-142b	R-406A
HCFC-22/HFC-143a/HFC-125	R-408A (FX 10)
HCFC-22/HCFC-124/HCFC-142b	R409A (FX 56)
HCFC-22/HFC-152a	R-415B

Including any other kind of refrigerant gases such as Hydrocarbons.

PART XII: 02

OTHER POLLUTION CONTROL MEASURES FOR THE PETROLEUM INDUSTRY

Offences.

49:01 (1) No flaring of petroleum or process gas shall be carried out within a radius of one (1) mile from a human settlement especially a village, town, city, resort, farm or hotel.

(2) Whenever flaring is required, only Efficient Flaring Heads will be used in order for emissions from the flare to be completely smokeless, and the minimum standards required shall be as follows:

(a) for each flare system it is necessary to establish the maximum quantity of waste gas, which can be handled. It is also required to establish the minimum quantity of pilot and purge gas to ensure safe, stable operation and readiness to take the maximum quantity of waste gas. There is need to measure of pilot, purge and vent gas to the flare. The composition and sulphur should be determined. After establishing base data, the refineries should aim towards using essentially pilot and purge gases in the flare. Under this condition the flare should be completely smokeless. The above may be achieved by a combination of the following techniques:

(i) reducing relief gas to flare by management/ good housekeeping practices; and

(ii) balancing the refinery fuel gas system; and

(iii) installing a gas recovery system; and

(iv) using high integrity relief valves; and

(v) applying advanced process control;

(b) the flow rates of pilot, purge and vent gas to flare are to be monitored. In addition, vent gas should have on/off flow indicator. The opacity of the flare is to be measured;

(c) for normal to 20% of max flare capacity the flare should be smokeless. At higher capacities low smoke is desirable. The flare system is to provide safe, reliable stand-by system to meet short periods of venting due to start-up, shutdown and emergencies. Pilot should be under monitoring and under continuous detection. Flare should be under observation;

(d) quantity of gas vented to the flare should be reported. The periods of venting should be recorded and target is to have it for less than 5 minutes in consecutive two hours and 24 hrs in a year. Noise level is to be measured and reported.

Minimum national standards for effluent and emissions.
Schedule 11
Schedule 12

49:02(1) All petroleum refineries, including refinery processing units, shall comply with the minimum national standards for the discharge of effluent and emissions contained in Schedule 11 and 12 Schedule respectively.

(2) Without prejudice to sub-regulation (1) above, all petroleum refineries, including refinery processing units, shall also comply with the following national minimum emission standards -

(a) in case of mixed fuel (gas and liquid) use, the limit is to be computed based on heat supplied by gas and liquid fuels;

(b) all the furnaces/boilers with heat input of 10 million kilo calories/hour or more shall have continuous systems for monitoring of SO_2 and NO_x. Manual monitoring for all the emission parameters in such furnaces/boilers shall be carried out once in two months;

(c) all the emission parameters in furnaces/boilers having heat input less than 10 million kilo calories/hour shall be monitored once every three months;

(d) in case of continuous monitoring, one hourly average concentration values shall be met 98% of the time in a month. Any concentration value obtained through manual monitoring, that exceeds the limiting concentration value, shall be considered as non-compliance;

(e) data on Ni + V content in the liquid fuel (in ppm) shall be reported. Ni + V content in the liquid fuel could be monitored once every six months, if liquid fuel source & quality are not changed. In case of changes, measurement is necessary after each change.

(3) The minimum national standards for emissions for fluid catalytic cracking (FCC) regenerators shall be as contained in Schedule 12, including the following: Schedule 12

(a) in case part feed is hydro-processed, the emission values shall be calculated proportional to the feed rates of untreated and treated feeds;

(b) FCC regenerators shall have continuous systems for monitoring of SO_2 and NO_x. One hourly average concentration values shall be met 98% of the time in a month, in case of continuous monitoring. Manual monitoring for all the emission parameters shall be carried out once in two months;

(c) any concentration value obtained through manual monitoring, if exceeds the limiting concentration value, shall be considered as non-compliance;

(d) data on Sulphur (weight %), Ni (ppm) and V (ppm) content in the feed to FCC shall be reported;

(e) limit of CO emissions shall be met except during annual shut down of CO boiler for statutory maintenance.

(4) The Minimum national standards for emissions from sulphur recovery units shall be as contained in Schedule 12, including the following: Schedule 12

(a) sulphur recovery units (SRUs) having capacity above 20 tonnes/day shall have continuous systems for monitoring of SO_2 Manual monitoring for all the emission parameters shall be carried out once in a month;

(b) data on sulphur dioxide emissions (mg/Nm^3) shall be reported;

(c) sulphur recovery efficiency shall be calculated on monthly basis, using quantity of sulphur in the feed to SRU and quantity of sulphur recovered.

Schedule 12

(5) The minimum national standards for emissions from the storage of volatile liquids (general petroleum products excluding benzene) shall be as contained in Schedule 12, including the following:-

(a) requirements for seals in floating roof tanks –

(i) IFRT & EFRT are to be provided with double seals with minimum vapour recovery of 96%;

(ii) primary seal shall be liquid or shoe mounted for EFRT and vapour mounted for IFRT. Maximum seal gap width shall be 4 cm and maximum gap area will be 200 cm^2/m of tank diameter;

(iii) secondary seal will be rim mounted. Maximum seal gap width shall be 1.3 cm and maximum gap area will be 20 cm^2/m of tank diameter;

(iv) material of seal and construction should ensure high performance and durability.

(b) fixed roof tanks shall have vapour control efficiency of 95% and vapour balancing efficiency of 90%.

(c) inspection and maintenance of storage tanks should be carried out under strict control. For the inspection, API RP 575 may be adopted. In-service inspection with regard seal gap should be carried out once in every six months and repair to be implemented in short time. In future, possibility of on-stream repair of both seals shall be examined.

(6) The minimum national standards for the storage of benzene shall be as follows:

(a) FRT with vapour to incineration with 99.9% of removal efficiency for volatile organic compounds (VOC).

(b) EFRT with double seals, emission-reducing roof fitting and fitted with fixed roof with vapor removal efficiency of at least 99%.

(7) In respect of the storage of solvents for lube-base oil production (Furfural, N-Methyl-2-Pyrrolidone (NMP), Methyl Ethyl Ketone (MEK), Toluene and Methyl Isobutyl Ketone (MIBK)), IFRT with double seals and inert gas blanketing, with vapour removal efficiency of at least 97% shall be complied with.

(8) In respect of the storage of off-gas from bitumen tanks, the odorous off-gas shall be disposed off in an incinerator or other proper burning device approved by the Department of the Environment.

(9) In respect of the storage of off-gas from liquid sulphur storage, the vent from the sulphur storage tanks shall be fed to sour gas or to a proper abatement system.

(10) In respect of LPG odorant plants, the designs and operation of the plants shall ensure an odor-free environment and comply with guidelines set for that purpose by the Department of the Environment.

(11) The following national minimum standards shall be observed for the purpose of reducing pollution to water, soil and ground water from petroleum refineries, petroleum refinery complexes, and petroleum refinery units; namely –

(a) the system design, level of automation and operation should ensure minimum oil carry over during the water drainage operation. Oil carry over in turn will result in VOC emission from the effluent from different stages and higher oil content in the effluent discharge;

(b) proper instrumentation/operating procedure and additional level alarm must be observed to avoid overfilling that may lead to soil contamination;

(c) for avoiding persistent leakage from tanks, the refineries should follow regular tank inspection, leak detection from tank bottoms, provision of double tank bottoms or impervious membrane liner below the tank bottom and there should be ground water monitoring;

(d) in order to avoid consequences of major oil spills from storage tanks, impermeable tank farm bund containment system shall be implemented across the petroleum industry.

(12) The minimum national standards for controlling fugitive emissions from equipment leaks shall be as contained in Schedule 12, including the following approach, components, applicability, and leak definition; namely –

(a) **Approach**: Approach that will be employed for controlling fugitive emissions from equipment leaks is to have proper selection, installation and maintenance of non-leaking or leak-tight equipment. Following initial testing after commissioning, the monitoring for leak detection is to be carried out as a permanent on-going Leak Detection and Repair (LDAR) programme. Finally detected leaks are to be repaired within an allowable time frame.

(b) **Components to be covered:** Components that shall be covered under LDAR programme include (i) Block valves; (ii) Control valves; (iii) Pump seals; (iv) Compressor seals; (v) Pressure relief valves; (vi) Flanges – Heat Exchangers; (vii) Flanges – Piping; (viii) Connectors – Piping; (ix) Open ended lines; and (x) Sampling connections. Equipment and line sizes more than 1.875 cm or ¾ in are to be covered.

(c) **Applicability:** LDAR programme would be applicable to components (given at-2 above) for following products/compounds: (i) hydrocarbon gases; (ii) Light liquid with vapour pressure @ 20°C > 1.0 kPa; and (iii) Heavy liquid with vapour pressure at 20°C between 0.3 to 1.0 kPa.

(d) While LDAR will not be applicable for heavy liquids with vapour pressure < 0.3 kPa, it will be desirable to check for liquid dripping as indication of leak.

(e) **Leak definition:** A leak is defined as the detection of VOC concentration more than the values (in ppm) specified below at the emission source using a hydrocarbon analyzer according

to measurement protocol (US EPA – 453/R-95-017, 1995 Protocol for equipment leak emission estimates may be referred).

(f) In addition, any component observed to be leaking by sight, sound or smell, regardless of concentration (liquid dripping, visible vapor leak) or presence of bubbles using soap solution shall be considered as leaking.

(13) The minimum national standards for VOC emissions from wastewater collection and treatment shall be as follows:-

(a) all contaminated and odorous wastewater streams shall be handled in closed systems from the source to the primary treatment stages (oil-water separator and equalization tanks);

(b) the collection system shall be covered with water seals (traps) on sewers and drains and gas tight covers on junction boxes;

(c) oil-water separators and equalization tanks shall be provided with floating/fixed covers. The off-gas generated shall be treated to remove at least 90% of VOC and eliminate odor. The system design shall ensure safety (prevention of formation of explosive mixture, possible detonation and reduce the impact) by dilution with air/inert gas, installing LEL detector including control devices, seal drums, detonation arrestors, etc. The system shall be designed and operated for safe maintenance of the collection and primary treatment systems;

(e) wastewater from aromatics plants (benzene and xylene plants) shall be treated to remove benzene/aromatics to a level of 10 ppm before discharge to effluent treatment system without dilution.

(14) The frequency for sampling the parameters for the minimum national standards for the discharge of effluent and emissions for all petroleum refineries, including petroleum refinery units, shall be done in accordance with these Regulations and the requirements in the Eleventh Schedule and Twelfth Schedule. Schedule 11 Schedule 12

(15) The analytical methods for the parameters referred to in sub-regulation (14) above shall be done in accordance with standard methods acceptable to the Department of the Environment or those contained in the Fourteenth Schedule. Schedule 14

49:03 (1) All equipment used in the petroleum industry shall be monitored on a regular basis in accordance with the Thirteenth Schedule so as to detect and repair leaks. Monitoring and Maintenance of equipment.

(2) The following minimum national standards shall apply to the monitoring, detection and repair of leaks referred to in sub-regulation (1) above –

(a) the percentage leaking components shall not be more than 2% for any group of components monitored excluding pumps/compressors. In case of pumps/compressors it shall be less than 10% of the total number of pumps/compressors, or three pumps and compressors, whichever is greater;

(b) Refineries shall prepare an inventory of equipment components in the plant. After the instrumental measurement of leaks, emission from the components shall be calculated using stratified emission factors (USEPA) or any other superior factors. The total fugitive emission shall be established;

(c) the following types of monitoring methods may be judiciously employed for detection of leaks:

(i) instrumental method of measurement of leaks;

(ii) audio, visual and olfactory measurement of leaks;

(iii) (AVO) leak detection system; and

(iv) soap bubble method of measurement of leaks.

(3) The data on the time of measurement of the leak, the concentration value for leak detection, the time of repair of the leak, and the time of measurement and concentration value after the repair of the leak shall be documented and maintained by the petroleum refineries in respect of all components.

(4) The following additional standards shall also apply in respect of equipment referred to in sub-regulation (1) above –

(a) pressure relief and blow down systems shall discharge to a vapor collection and recovery system or to flare;

(b) open-ended lines shall be closed by a blind flange or plugged;

(c) totally closed-loop shall be used in all routine samples;

(d) low emission packing shall be used for valves; and

(e) high integrity sealing materials shall be used for flanges.

Prohibitions.

49:04 (1) No person shall install a petroleum refinery or a unit that produces fuel with a sulphur content of more than 2.00% by mass.

(2) Subject to sub-regulation (3) below, no person shall combust any petroleum or petroleum oils with a sulphur content of more than 2.00% by mass.

(3) The Department of the Environment may authorize in writing, the use of heavy fuel oils with a sulphur content of between 1.00% and 3.00% by mass where such use does not produce emissions which exceed critical loads and which are permitted under any other law.

49:05 A person who fails to comply with the minimum national standards set out in these Regulations and in the Eleventh, Twelfth, Thirteenth and Fourteenth Schedules commits an offence and shall be liable on summary conviction to a fine of not less than twenty thousand dollars or to imprisonment for a period not exceeding two years, or to both such fine and period of imprisonment.

Offence and penalty.

3. The principal Regulations are hereby amended by the addition to the Schedules of a new Eleventh Schedule, Twelfth Schedule, Thirteenth Schedule and Fourteenth Schedule.

MADE by the Minister responsible for the Environment this 27th day of July , 2009.

(HON. GASPAR VEGA)
Minister of Natural Resources and the Environment

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SCHEDULE 11

NATIONAL MINIMUM EFFLUENT STANDARDS FOR PETROLEUM REFINERY

S. No.	Parameter	Limiting value for concentration (mg/l, except for pH)	Limiting value for quantum (kg/1000 tonne of crude processed, except for pH)	Averaging Period
Parameters to be monitored daily: grab samples for each shift with 8-hours' interval				
1	Ph	6.0 – 8.5	-	Grab
2	Oil & Grease	5	2	-do-
Parameters to be monitored daily: composite sample (with 8-hours' interval) for 24-hours flow weighted average				
3	$BOD_{3\ days,\ 27^{0}C}$	15	6	24-hours
4	COD	125	50	-do-
5	SS	20	8	-do-
6	Phenols	0.35	0.14	-do-
7	Sulphides	0.5	0.2	-do-
8	CN	0.2	0.08	-do-
Parameters to monitored once in a month: composite sample (with 8-hours' interval) for 24-hours flow weighted average				
9	Ammonia as N	15	6	-do-
10	TKN	40	16	-do-
11	P	3	1.2	-do-
12	Cr (VI)	0.1	0.04	-do-
13	Total Cr	2.0	0.8	-do-
14	Pb	0.1	0.04	-do-
15	Hg	0.01	0.004	-do-
16	Zn	5.0	2	-do-
17	Ni	1.0	0.4	-do-
18	Cu	1.0	0.4	-do-
19	V	0.2	0.8	-do-
Parameters to monitored once in a month: grab samples for each shift with 8-hours' interval				
20	Benzene	0.1	0.04	Grab
21	Benzo(a) Pyrene	0.2	0.08	-do-

SCHEDULE 12

NATIONAL MINIMUM EMISSIONS STANDARDS FOR PETROLEUM REFINERY

A. Minimum National Standards for Emissions from furnace and boilers:

S. No.	Parameter		Limiting concentration in mg/Nm^3, unless stated
			Refineries, furnaces, boilers
1	Sulphur Dioxide (SO_2)	Gas firing	50
		Liquid firing	850
2	Oxides of Nitrogen (NO_x)	Gas firing	250
		Liquid firing	350
3	Particulate Matter (PM)	Gas firing	5
		Liquid firing	50
4	Carbon Monoxide (CO)	Gas firing	100
		Liquid firing	150
5	Nickel + Vanadium (Ni + V)	Liquid firing	5
6	Hydrogen Sulphide (H_2S) in fuel gas	-	150
7	Sulphur content in liquid fuel, weight %	-	2.0

B. Minimum National Standards for Emissions from Fluid Catalytic Cracking (FCC) regenerators:

S. No.	Parameter	Limiting concentration in mg/Nm^3, unless stated
		Refineries or FCC
1	Sulphur Dioxide (SO_2)	500 (for hydro-processed feed) 850 (for other feed)
2	Oxides of Nitrogen (NO_x)	350
3	Particulate Matter (PM)	50
4	Carbon Monoxide (CO)	300
5	Nickel + Vanadium (Ni + V)	2
6	Opacity, %	30

C. Minimum National Standards for Emissions from Sulphur Recovery Units:

S. No.	Plant capacity (Tonnes/day)	Parameter	Refineries or SRU
1	Above 20	Sulphur recovery, %	99
		H_2S, mg/Nm^3	10
2	5 – 20	Sulphur recovery, %	98
3	1 – 5	Sulphur recovery, %	96
4	-	Oxides of Nitrogen (NO_x) mg/Nm3	250
5	-	Carbon Monoxide (CO) mg/Nm3	100

D. Minimum National Standards for Emissions from Storage of volatile liquids: Storage of general petroleum products

Requirements on type of storage tanks shall be as follows:

S. No.	Total Vapour Pressure (TVP), kPa	Tank Capacity, m^3	Type of Storage Tank
1	> 10	4 – 75	Fixed Roof Tank (FRT) with pressure valve vent
2	10 – 76	75 – 500	Internal Floating Roof Tank (IFRT) or External Floating Roof Tank (EFRT) or Fixed Roof Tank with vapour control or vapour balancing system
3	10 – 76	> 500	Internal Floating Roof Tank or External Floating Roof Tank or Fixed Roof Tank with vapour control system
4	> 76	> 75	Fixed Roof Tank with vapour control system

E. Minimum National Standards for emissions from loading of volatile products

S. No.	Item	Standards
1	Applicable products	Gasoline, Naphtha, Benzene, Toluene, Xylene
2	Type of loading: (i) Road tank truck (ii) Rail tank wagon	 (i) Bottom loading (ii) Top submerged
3	Vapour collection: Road tank truck/ Rail tank wagon	Annual leak testing
Emission control for Road tank truck/ Rail tank wagon loading		
4	Gasoline and Naphtha: (i) VOC reduction, % or (ii) Emission, gm/m^3	 (i) 99.5 or (ii) 5
6	Benzene: (i) VOC reduction, % or (ii) Emission, mg/m^3	 (i) 99.99 or (ii) 20
7	Toluene/Xylene: (i) VOC reduction, % or (ii) Emission, mg/m^3	 (i) 99.98 or (ii) 150

F. Minimum National Standards For Fugitive Emissions From Equipment Leaks

S. No.	Component	General Hydrocarbon (ppm)	Benzene (ppm)
1	Pump/Compressor	7500	2500
2	Valves/Flanges	6000	1500
3	Other components	6000	1500

SCHEDULE 13

MONITORING AND REPAIR SCHEDULE FOR LEAKS DETECTION IN PETROLEUM INDUSTRY

1. **Below is the schedule for the frequency for monitoring of leaks, and schedule for repair of leaks:**

S. No.	Component	Frequency of monitoring	Repair schedule
1	Valves/Flanges	Quarterly (semiannual after two consecutive periods with < 2% leaks and annual after 5 periods with < 2% leaks)	Repair will be started within 5 working days and shall be completed within 15 working days after detection of leak for general hydrocarbons. In case of benzene, the leak shall be attended immediately for repair.
2	Pump seals	Quarterly	
3	Compressor seals	Quarterly	
4	Pressure relief devices	Quarterly	
5	Pressure relief devices (after venting)	Within 24 hours	
6	Heat Exchangers	Quarterly	
7	Process drains	Annually	
8	Components that are difficult to monitor	Annually	
9	Pump seals with visible liquid dripping	Immediately	Immediately
10	Any component with visible leaks	Immediately	Immediately
11	Any component after repair/replacement	Within five days	-

SCHEDULE 14

RECOMMENDED ANALYTICAL METHODS IN PETROLEUM INDUSTRY

1. With regard to captive power plants, the standards prescribed for furnaces shall be applicable.

2. Emission monitoring shall be carried out as per Regulations set by the Department.

3. The following methods may be used for measurement of pollutant concentrations in the **emissions**:

S. No.	Parameter	Method of measurement
1	Sulphur Dioxide (SO_2)	USEPA CFR – 40 Part 60 Appendix A Method 6
2	Oxides of Nitrogen (NO_x)	USEPA CFR – 40 Part 60 Appendix A Method 7
3	Particulate Matter (PM)	USEPA CFR – 40 Part 60 Appendix A Method 5
4	Carbon Monoxide (CO)	USEPA CFR – 40 Part 60 Appendix A Method IOA / Combustion analyzer with electro chemical detector / NDIR detector
5	Nickel + Vanadium (Ni + V)	USEPA CFR – 40 Part 60 Appendix A Method 29
6	Hydrogen Sulphide (H_2S)	USEPA CFR – 40 Part 60 Appendix A Method 15

4. The following methods may be used for measurement of pollutant concentrations in the **effluent**:

S. No.	Parameter	Method	Reference
1	Ph	By electrometric method using pH meter	APHA, 20th edition 1998 4500 - H+B page 4-87 to 4-91
2	Oil & Grease	Soxhlet solvent extraction method	APHA, 20th edition 1998, 5520 D page 5 - 38
3	$BOD_{3\ days,\ 27^0C}$	Incubation followed by Winkler's Idometric titration using Azide modification	BIS, 1993, 3025 (part 44)
4	COD	Dichromate oxidation open reflux method followed by titration	APHA, 20th edition 1998 5520 - B page 5-14 to 5-15
5	SS	By Gravimegtric method 103-105 °C	APHA, 20th edition 1998, 2540 D Page 2-57 to 2-58
6	Phenols	Distillation followed by Direct Photometric method	APHA, 20th edition 1998 5530B & D Page 5-41 & 5-43 to 5-44
7	Sulphides	Iodometric Titration method	APHA, 20th edition 1998 4500 S^{2-} F Page 4-167
8	CN	Distillation followed by Argentometric titration	APHA, 20th edition 1998 4500 CN-C & D Page 4-37 to 4-39
9	Ammonia as N	Distillation followed by phenate method	APHA, 20th edition 1998 4500 NH_3 B & F Page 4-104, 105 and 108 & 109
10	TKN	Digestion followed by distillation and titration	APHA, 20th edition 1998 4500 N org B Page 4-124 to 125
11	PO_4-P (available)	Spectrophotometric method using stannous chloride reduction method	APHA, 20th edition 1998 4500 P D Page 4-145 to 146
12	Cr (VI)	Spectrophotometric method using Diphenyl Carbazide	APHA, 20th edition 1998 3500 Cr B Page 3-66 to 3-68
13	Total Cr	Oxidation followed by spectrophotometric method using Diphenyl Carbazide	APHA, 20th edition 1998 3500 Cr B Page 3-66 to 3-68

S. No.	Parameter	Method	Reference
14	Pb	Nitric Acid Digestion followed by AAS method (Direct Air-Acetylene Flame)	APHA, 20th edition 1998 3030E & 311 B Page 3-8 & 3-17 & 18
15	Hg	By mercury analyzer (cold vapour generation technique)	APHA, 20th edition 1998 3112 B Page 3-22 to 24
16	Zn	Nitric acid digestion followed by ASS method	APHA, 20th edition 1998 3030E & 311 B Page 3-8 & 3-17 & 18
17	Ni	Nitric acid digestion followed by ASS method	APHA, 20th edition 1998 3030E & 311 B Page 3-8 & 3-17 & 18
18	Cu	Nitric acid digestion followed by ASS method	APHA, 20th edition 1998 3030E & 311 B Page 3-8 & 3-17 & 18
19.	V	Acid digestion followed by AAS method (Direct Nitrous Oxide -Acetylene flame)	APHA, 20th edition 1998 3111 B & D Page 3-17 & 18 and 3-20 to 21
20.	Benzene	Gas chromatograph Method (Purge and Trap Technique) or Liquid-liquid extraction GC/MS Method	6410 B Page 6-59 to 72
21.	Benzo(a) Ppyrene	Liquid-liquid extraction Chromatographic Method	APHA, 20th edition 1998, 6440 B Page 6-79 to 84