

EFLLUENT & EMISSION STANDARDS FOR OIL REFINERIES: GUIDELINES

1.0 Guidelines for storage of off gas from bitumen tank, liquid sulphur storage & LPG odorant plant:

1.1 Off-gas from bitumen tank

The odorous off-gas is to be disposed off in an incineration or proper burning device.

1.2 Off-gas from liquid Sulfur storage

Vent from sulfur storage tanks is to be fed to sour gas or proper abatement system.

1.3 LPG odorant plant

The design and operation of the plant should ensure odor free environment.

2.0 Guidelines for reducing pollution to water, soil and ground water

1. 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.
2. Proper instrumentation/operating procedure and additional level alarm can ensure avoiding overfilling that may lead to soil contamination.
3. 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, ground water monitoring.
4. In order to avoid consequences of major oil spills from storage tanks, impermeable tank farm bund containment system is to be implemented across the industry.

3.0 Guidelines for minimizing emissions from Flare

1. 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;
 - (ii) Balancing the refinery fuel gas system;
 - (iii) Installing a gas recovery system;
 - (iv) Using high integrity relief valves; and
 - (v) Applying advanced process control
2. The flow rates of pilot, purge and vent gas to flare are to be monitored. Vent gas should have on/off flow indicator in addition. The opacity of the flare is to be measured.
 3. 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.
 4. 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.

4.0 Guidelines with regard to measurement of various parameters in the effluent & emissions:

Following monitoring protocol including frequency of monitoring, type of sampling (grab/composite) and method of analysis may be followed:

4.1 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 NDIR detector
5	Nickel + Vanadium (Ni + V)	USEPA CFR – 40 Part 60 Appendix A Method 29
6	Hydrogen Sulphide (H ₂ S)	USEPA CFR – 40 Part 60 Appendix A Method 15

4.2 Measurement of pollutant concentrations in the effluent

Sampling requirements and Method of analysis:

S. No.	Parameter	Monitoring frequency	Method	Reference
1	pH	Daily: grab sample for each shift with 8-hours' interval	By electrometric method using pH meter	APHA, 20 th edition 1998 4500 - H+B page 4-87 to 4-91
2	Oil & Grease	-do-	Soxhlet solvent extraction method	APHA, 20 th edition 1998, 5520 D page 5 - 38
3	BOD ₃ days, 27°C	Daily: composite sample (with 8-hours' interval) for 24-hours flow weighted average	Incubation followed by Winkler's Idometric titration using Azide modification	BIS, 1993, 3025 (part 44)
4	COD	-do-	Dichromate oxidation open reflux method followed by titration	APHA, 20 th edition 1998 5520 - B page 5-14 to 5-15
5	SS	-do-	By Gravimetric method 103-105 °C	APHA, 20 th edition 1998, 2540 D Page 2-57 to 2-58
6	Phenols	-do-	Distillation followed by Direct Photometric method	APHA, 20 th edition 1998 5530B & D Page 5-41 & 5-43 to 5-44
7	Sulphides	-do-	Iodometric Titration method	APHA, 20 th edition 1998 4500 S ²⁻ F Page 4-167
8	CN	-do-	Distillation followed by Argentometric titration	APHA, 20 th edition 1998 4500 CN-C & D Page 4-37 to 4-39
9	Ammonia as N	Once in a month: composite sample (with 8-hours' interval) for 24-hours flow weighted average	Distillation followed by phenate method	APHA, 20 th edition 1998 4500 NH ₃ B & F Page 4-104, 105 and 108 & 109
10	TKN	-do-	Digestion followed by distillation and	APHA, 20 th edition 1998 4500 N org B

S. No.	Parameter	Monitoring frequency	Method	Reference
			titration	Page 4-124 to 125
11	PO ₄ -P (available)	-do-	Spectrophotometric method using stannous chloride reduction method	APHA, 20 th edition 1998 4500 P D Page 4-145 to 146
12	Cr (VI)	-do-	Spectrophotometric method using Diphenyl Carbazide	APHA, 20 th edition 1998 3500 Cr B Page 3-66 to 3-68
13	Total Cr	-do-	Oxidation followed by spectrophotometric method using Diphenyl Carbazide	APHA, 20 th edition 1998 3500 Cr B Page 3-66 to 3-68
14	Pb	-do-	Nitric Acid Digestion followed by AAS method (Direct Air-Acetylene Flame)	APHA, 20 th edition 1998 3030E & 311 B Page 3-8 & 3-17 & 18
15	Hg	-do-	By mercury analyzer (cold vapour generation technique)	APHA, 20 th edition 1998 3112 B Page 3-22 to 24
16	Zn	-do-	Nitric acid digestion followed by ASS method	APHA, 20 th edition 1998 3030E & 311 B Page 3-8 & 3-17 & 18
17	Ni	-do-	Nitric acid digestion followed by ASS method	APHA, 20 th edition 1998 3030E & 311 B Page 3-8 & 3-17 & 18
18	Cu	-do-	Nitric acid digestion followed by ASS method	APHA, 20 th edition 1998 3030E & 311 B Page 3-8 & 3-17 & 18
19.	V	-do-	Acid digestion followed by AAS method (Direct Nitrous Oxide - Acetylene flame)	APHA, 20 th edition 1998 3111 B & D Page 3-17 & 18 and 3-20 to 21
20.	Benzene	Once in a month: grab samples for each shift with 8-hours' interval	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	-do-	Liquid-liquid extraction Chromatographic Method	APHA, 20 th edition 1998, 6440 B Page 6-79 to 84