

**STANDARDS FOR EMISSION OR DISCHARGE OF  
ENVIRONMENTAL POLLUTANTS**

<sup>1</sup>**SCHEDULE – I** (See rule 3)

Sr. No.	Industry	Parameter	Standards
1	2	3	4
1.	<b>CAUSTIC SODA INDUSTRY</b>		Concentration not to exceed, miligramme per lit. (except for pH and flow)
		Total concentration of mercury in the final effluent*	0.01
		Mercury bearing waste-water generation (flow)	10 kilolitres/ tonne of caustic soda produced.
		pH	5.5 to 9.0
		*Final effluent is the combined effluent from (a) cell house, (b) brine plant, (c) chlorine handling (d) hydrogen handling (e) hydrochloric acid plant.	
**2.	<b>MAN-MADE FIBRES (SYNTHETIC)</b>		Concentration not to exceed miligramme per litre (except for pH)
		Suspended solids	100
		Bio-chemical oxygen demand <sup>2</sup> [BOD 3 days at 27°C]	30
		pH	5.5 to 9.0
<sup>3</sup> [3.	<b>PETROLEUM OIL REFINERY</b>	<b>A. EFFLUENT</b>	
		1. pH	6.0-8.5
		2. Oil & Grease	5.0
		3. BOD <sub>3 days, 27° C</sub>	15.0
		4. COD	125.0
		5. Suspended Solids	20.0
		6. Phenols	0.35
		7. Sulphides	0.5
		8. CN	0.20
		9. Ammonia as N	15.0
		10. TKN	40.0
		11. P	3.0

<sup>1</sup> The Environment (Protection) Rules, 1986 are referred to as principal rules in all subsequent Notifications beginning with S.O. 32(E), dated 16.2.1987 published in the Gazette no. 66, dated 16.2.1987. The Schedule to be principal rules was renumbered as Schedule-I vide S.O. 32(E) supra.

\*\* Standards notified at Sl. No. 60 may also be referred.

<sup>2</sup> Substituted by Rule 2 of the Environment (Protection) Amendment Rules, 1996 notified by G.S.R.176(E), dated 2.4.1996 may be read as BOD (3 days at 27°C) wherever BOD 5 days 20°C occurred.

<sup>3</sup> Substituted by Rule 2 (i) of the Environment (Protection) Amendment Rules, 2008 notified by G.S.R.186(E), dated 18.3.2008.

Sr. No.	Industry	Parameter	Standards
1	2	3	4
		12. Cr (Hexavalent)	0.1
		13. Cr (Total)	2.0
		14. Pb	0.1
		15. Hg	0.01
		16. Zn	5.0
		17. Ni	1.0
		18. Cu	1.0
		19. V	0.2
		20. Benzene	0.1
		21. Benzo (a) – Pyrene	0.2

**Notes:-**

- (i) Concentration limits shall be complied with at the outlet, discharging effluent (excluding discharge from sea water cooling systems) to receiving environment (surface water Bodies, marine systems or public sewers). In case of application of treated effluent directly for irrigation/horticulture purposes (within or outside the premises of refinery), make-up water for cooling systems, fire fighting, etc., the concentration limits shall also be complied with at the outlet before taking the effluent for such application. However, any use in the process such as use of sour water in desalter is excluded for the purpose of compliance.
- (ii) In case of circulating seawater cooling, the blow-down from cooling systems shall be monitored for pH and oil & grease (also hexavalent & total chromium, if chromate treatment is given to cooling water) and shall conform to the concentration limits for these parameters. In case of reuse of treated effluent as cooling water make-up, all the parameters (as applicable for treated effluent) shall be monitored and conform to the prescribed standards.
- (iii) In case of once through cooling with seawater, the oil & grease content in the effluent from cooling water shall not exceed 1.0 mg/l.

**B. EMISSIONS****Limiting concentration in mg/Nm<sup>3</sup>, unless stated**

(Furnace, Boiler and Captive Power Plant)	Fuel Type	Existing refineries	New Refinery/ Furnace/ Boiler
		Sulphur Dioxide (SO <sub>2</sub> )	Gas
	Liquid	1700	850
Oxides of Nitrogen (NO <sub>x</sub> )	Gas	350	250
	Liquid	450	350
Particulate Matter (PM)	Gas	10	5
	Liquid	100	50

Sr. No.	Industry	Parameter	Standards		
1	2	3	4		
		Carbon Monoxide (CO)	Gas	150	100
			Liquid	200	150
		Nickel and Vanadium (Ni+v)	Liquid	5	5
		Hydrogen Sulphide (H <sub>2</sub> S) in fuel gas	Liquid / Gas	150	150
		Sulphur content in liquid fuel, weight%	Liquid / Gas	1.0	0.5

**Notes:-**

- (i) In case of mixed fuel (gas and liquid) use, the limit shall be computed based on heat supplied by gas and liquid fuels.
- (ii) All the furnaces/boilers with heat input of 10 million kilo calories/hour or more shall have continuous systems for monitoring of SO<sub>2</sub> and NO<sub>2</sub>. Manual monitoring for all the emission parameters in such furnaces or boilers shall be carried out once in two months.
- (iii) All the emission parameters in furnaces/boilers having heat input less than 10 million kilo calories/hour will be monitored once in three months.
- (iv) In case of continuous monitoring, one hourly average concentration values shall be complied with 98% of the time in a month. Any concentration value obtained through manual monitoring, if exceeds the limiting concentration value, shall be considered as non-compliance.
- (v) Data on Nickel and Vanadium content in the liquid fuel (in ppm) shall be reported. Nickel and Vanadium in the liquid fuel shall be monitored at least once in six months, if liquid fuel source & quality are not changed. In case of changes, measurement is necessary after every change.

(FCC Regenerators)

**Limiting concentration in mg/Nm<sup>3</sup>, unless stated**

	Existing refineries		New Refinery /FCC Commissioned
	Hydro processed FCC feed	Other than Hydro processed FCC feed	
Sulphur Dioxide (SO <sub>2</sub> )	500	1700	500 (for hydro-processed feed) 850 for other feed)
Oxides of Nitrogen (NO <sub>x</sub> )	400	450	350
Particulate Matter (PM)	100	100	50
Carbon Monoxide (CO)	400	400	300
Nickel and Vanadium (Ni+V)	2	5	2
Opacity, %	30	30	30

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**Notes:-**

- (i) In case part feed is hydro-processed, the emission values shall be calculated proportional to the feed rates of untreated and treated feeds.
- (ii) FCC regenerators shall have continuous systems for monitoring of SO<sub>2</sub> and NO<sub>x</sub>. One hourly average concentration values shall be complied with 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.
- (iii) Any concentration value obtained through manual monitoring, if exceeds the limiting concentration value, shall be considered as non-compliance.
- (iv) Data on Sulphur (weight in %), Nickel (PPM) and Vanadium (PPM) content in the feed to FCC shall be separated regularly.
- (v) Limit of Carbon Monoxide emissions shall be complied with except during annual shut down of CO boiler for statutory maintenance.

		Plant Capacity (Tonnes/day)	Existing SRU	New SRU or Refinery Commissioned
{ Sulphur, Recovery Units (SRU) }	Sulphur recovery, %	Above 20	98.7	99.5
	H <sub>2</sub> S, mg/Nm <sup>3</sup>		15	10
	Sulphur recovery, %	5-20	96	98
	Sulphur recovery, %	1-5	94	96
	Oxides of Nitrogen (NO <sub>x</sub> ), mg/Nm <sup>3</sup>	All capacity	350	250
	Carbon Monoxide (CO), mg/Nm <sup>3</sup>	All capacity	150	100

**Notes:-**

- (i) Sulphur recovery units having capacity above 20 tonnes per day shall have continuous systems for monitoring of SO<sub>2</sub>. Manual monitoring for all the emission parameters shall be carried out once in a month.
- (ii) Data on Sulphur Dioxide emissions (mg/Nm<sup>3</sup>) shall be reported regularly.
- (iii) Sulphur recovery efficiency shall be calculated on monthly basis, using quantity of sulphur in the feed to SRU and quantity of sulphur recovered.

**C- FUGITIVE EMISSION**

## Storage of Volatile Liquids : General Petroleum Products

- (1) Storage tanks with capacity between 4 to 75m<sup>3</sup> and total vapour Pressure (TVP) of more than 10 kpa should have Fixed Roof Tank (FRT) with pressure valve vent.
- (2) Storage tank with the capacity between 75 to 500 m<sup>3</sup> and total vapour Pressure (TVP) of 10 to 76 kpa should have Internal Floating Root Tank (IFRT) or External Floating Root Tank (EFRT) or Fixed Roof Tank with vapour control or vapour balancing system.
- (3) Storage tanks with the capacity of more than 500 m<sup>3</sup> and total vapour Pressure (TVP) of 10 to 76 kpa should have Internal Floating Roof Tank or External Floating Roof Tank or Fixed Roof Tank with vapour control system.
- (4) The tanks with the capacity of more than 75 m<sup>3</sup> and total vapour Pressure (TVP) of more than 76 kpa should have Fixed Root Tank with vapour control system.
- (5) Requirement for seals in Floating Roof Tanks:
  - (i)
    - (a) IFRT and EFRT shall be provided with double seals with minimum vapour recovery of 96%.
    - (b) Primary seal shall be liquid or shoe mounted for EFRT and vapour mounted for IFRT. Maximum seal gap width will be 4 cm and maximum gap area will be 200 cm<sup>2</sup>/m of tank diameter.
    - (c) Secondary seal shall be rim mounted. Maximum seal gap width will be 1.3 cm and maximum gap area will be 20 cm<sup>2</sup>/m of tank diameter.
    - (d) Material of seal and construction shall ensure high performance and durability.
  - (ii) Fixed Roof Tanks shall have vapour control efficiency of 95% and vapour balancing efficiency of 90%
  - (iii) Inspection and maintenance of storage tanks shall 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.

**Storage of Volatile Liquids : Benzene Storage**

- (1) FRT with vapour to incineration with 99.9% of removal efficiency for volatile organic compounds (VOC) shall be provided.
- (2) IFRT/EFRT with double seals, emission-reducing roof fitting and fitted with fixed roof with vapour removal efficiency of at least 99% shall be provided.

**Solvents for Lube-Base Oil production (Furfural, NMP, MEK, Toluene and MIBK)**

IFRT with double seals and inert gas blanketing with vapour removal efficiency of at least 97% shall be provided.

Emission control for Road tank truck/Rail tank wagon loading			
Loading of Volatile Products	Gasoline and Naphtha:		
	(i) VOC reduction, %.		(i) 99.5
	(ii) Emission, gm/m <sup>3</sup>		(ii) 5
	Benzene:		
(i) VOC reduction, %		(i) 99.99	
(ii) Emission, mg/m <sup>3</sup>		(ii) 20	
Toluene/Xylene:			
(i) VOC reduction, %		(i) 99.98	
(ii) Emission, mg/m <sup>3</sup>		(ii) 150	
Note:			
(i) It shall be applicable for Gasoline, Naphtha, Benzene, Toluene and Xylene loading.			
(ii) Road tank Truck shall have Bottom loading and Roll tank wagon shall have Top submerged loading.			
(iii) Annual leak testing for vapour collection shall be done.			

**Standards for Equipment Leaks**

- (1) Approach: Approach for controlling fugitive emissions from equipment leaks shall 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 allowable time frame.

- (2) **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 inch are to be covered.
- (3) **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 @ 20° C between 0.3 to 1.0 kPa.
- (4) 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.
- (5) **Definition of leak:** 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 to:

Component	General Hydrocarbon (ppm)		Benzene (ppm)	
	Till 31 <sup>st</sup> Dec. 2008	w.e.f. January 01, 2009	Till 31 <sup>st</sup> Dec., 2008	w.e.f January 01, 2009
Pump/Compressor	10000	5000	3000	2000
Valves/Flanges	10000	3000	2000	1000
Other components	10000	3000	2000	1000

- (6) In addition, any component observe to be leaking by sight, sound or smell, regardless of concentration (liquid dripping, visible vapor leak) or presence of bubbles using soap solution should be considered as leak.
- (7) **Monitoring Requirements and Repair Schedule:** Following frequency of monitoring of leaks and schedule for repair of leaks shall be followed:

Component	Frequency of monitoring	Repair schedule
	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.
Pump seals	Quarterly	
Compressor seals	Quarterly	
Pressure relief devices	Quarterly	
Pressure relief devices (after venting)	Within 24 hours	
Heat Exchangers	Quarterly	
Process drains	Annually	
Components that are difficult to monitor	Annually	
Pump seals with visible liquid dripping	Immediately	
Any component with visible leaks	Immediately	Immediately
Any component after repair/ replacement	Within five days	-

- (8) The percentage leaking components should not be more than 2% for any group of components monitored excluding pumps/compressors. In case of pumps/compressors it should be less than 10% of the total number of pumps/compressors or three pumps and compressors, whichever is greater.
- (9) Emission inventory: Refinery shall prepare an inventory of equipment components in the plant. After the instrumental measurement of leaks, emission from the components will be calculated using stratified emission factor (USEPA) or any other superior factors. The total fugitive emission will be established.



- (10) Monitoring 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 (AVO) leak detection; and (iii) Soap bubble method.
- (11) Data on time of measurement and concentration value for leak detection; time of repair of leak; and time of measurement & concentration value after repair of leak should be documented for all the components.
- (12) Pressure relief and blow down systems should discharge to a vapour collection and recovery system or to flare.
- (13) Open-ended lines should be closed by a blind flange or plugged.
- (14) Totally closed-loop should be used in all routine samples.
- (15) Low emission packing should be used for valves.
- (16) High integrity sealing materials should be used for flanges.

#### **D. Emission Standards for VOC from Wastewater Collection and Treatment**

- (1) 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).
- (2) The collection system shall be covered with water seals (traps) on sewers and drains and gas tight covers on junction boxes.
- (3) 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 odour. 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.
- (4) Wastewater from aromatics plants (benzene and xylene plants) shall be treated to remove benzene & total aromatics to a level of 10, 20 ppm respectively before discharge to effluent treatment system without dilution].