

NOTIFIED ENVIRONMENTAL STANDARDS

OF

OIL REFINERY INDUSTRY

**MINISTRY OF ENVIRONMENT AND FORESTS
NOTIFICATION**

New Delhi, the 18th March, 2008

G.S.R. 186(E).—In exercise of the powers conferred by Sections 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules further to amend the Environment (Protection) Rules, 1986, namely :—

1. (1) These rules may be called the Environment (Protection) Amendment Rules, 2008.
- (2) They shall come into force on the date of their publication in the Official Gazette.
2. In the Environment (Protection) Rules, 1986,—
 - (i) in Schedule -I, -
 - (a) for serial number 3, relating to 'OIL REFINERY INDUSTRY' and entries relating thereto, the following serial number and entries shall be substituted, namely:—

S. No.	Industry	Parameter	Standard
1	2	3	4
"3	Petroleum Oil Refinery	A. Effluent	
		Limiting value for concentration (mg/l except for pH)	
		1. pH	6.0–8.5
		2. Oil & Grease	5.0
		3. BOD ₅ @20°C	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
		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)			

1	2	3	4
		<p>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.</p> <p>(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.</p> <p>(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.</p>	

B. Emissions

		Limiting concentration in mg/Nm ³ , unless stated		
		Fuel Type	Existing refineries	New Refinery/Furnace/Boiler
(Furnace, Boiler and captive Power Plant)	Sulphur Dioxide (SO ₂)	Gas	50	50
		Liquid	1700	850
	Oxides of Nitrogen (NO _x)	Gas	350	250
		Liquid	450	350
	Particulate Matter (PM)	Gas	10	5
		Liquid	100	50
	Carbon Monoxide (CO)	Gas	150	100
		Liquid	200	150
	Nickel and Vanadium (Ni+V)	Liquid	5	5
	Hydrogen Sulphide (H ₂ 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 ₂ and NO _x . 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				

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1	2	3	4
		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 ³ , unless stated		
		Existing refineries		New Refinery /FCC Commissioned
		hydro processed FCC feed	Other than Hydro processed FCC feed	
	Sulphur Dioxide (SO ₂)	500	1700	500 (for hydro-processed feed) 850 (for other feed)
	Oxides of Nitrogen (NO _x)	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
	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 ₂ and NO _x . 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.		

1	2	3	4
		<p>(iii) Any concentration value obtained through manual monitoring, if exceeds the limiting concentration value, shall be considered as non-compliance.</p> <p>(iv) Data on Sulphur (weight in %), Nickel (PPM) and Vanadium (PPM) content in the feed to FCC shall be reported regularly.</p> <p>(v) Limit of Carbon Monoxide emissions shall be complied with except during annual shut down of CO boiler for statutory maintenance.</p>	

			Plant capacity (Tonnes/day)	Existing SRU	New SRU or Refinery Commissioned
{Sulphur Recovery Units (SRU)}	Sulphur recovery, %	Above 20	Above 20	98.7	99.5
	H ₂ S, mg/Nm ³			15	10
	Sulphur recovery, %	5-20	96	98	
	Sulphur recovery, %	1-5	94	96	
	Oxides of Nitrogen (NO _x), mg/Nm ³	All capacity	350	250	
	Carbon Monoxide (CO), mg/Nm ³	All capacity	150	100	
Notes:					
(i) Sulphur recovery units having capacity above 20 tonnes per 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.					
(ii) Data on Sulphur Dioxide emissions (mg/Nm ³) 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 75m³ and total vapour Pressure (TVP) of more than 10 kpa should have Fixed Roof Tank (FRT) with pressure valve vent.
- (2) Storage tanks with the capacity between 75 to 500 m³ and total vapour Pressure (TVP) of 10 to 76 kpa should have Internal Floating Roof Tank (IFRT) or External Floating Roof Tank (EFRT) or Fixed Roof Tank with vapour control or vapour balancing system.
- (3) Storage tanks with the capacity of more than 500 m³ 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 m³ and total vapour Pressure(TVP) of more than 76 kpa should have Fixed Roof 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 cm²/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 cm²/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 ³	(ii) 5
	Benzene:	
	(i) VOC reduction, %	(i) 99.99
	(ii) Emission, mg/m ³	(ii) 20
Toluene/Xylene:	(i) VOC reduction, %	(i) 99.98
	(ii) Emission, mg/m ³	(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 Rail 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 st Dec. 2008	w.e.f. January 01, 2009	Till 31 st 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 observed 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	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 factors (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."
 - (b) Serial number 35, relating to 'oil refineries (sulphur oxide) and entries relating thereto shall be omitted;
- (ii) in Schedule VI, in Part C, -
- (a) serial number 1 relating to 'Oil Refinery Industry' and entries relating thereto, the following serial number and entries shall be substituted, namely :-

"1. Petroleum Oil Refinery :

Parameter 1	Standard 2
	Quantum limit in Kg/ 1,000 tonne of crude processed
1. Oil & Grease	2.0
2. BOD _{3 days, 20°C}	6.0
3. COD	50
4. Suspended Solids	8.0
5. Phenols	0.14
6. Sulphides	0.2
7. CN	0.08
8. Ammonia as N	6.0
9. TKN	16
10. P	1.2
11. Cr (Hexavalent)	0.04
12. Cr (Total)	0.8
13. Pb	0.04

Parameter 1	Standard 2
	Quantum limit in Kg/ 1,000 tonne of crude processed
14. Hg	0.004
15. Zn	2.0
16. Ni	0.4
17. Cu	0.4
18. V	0.8
19. Benzene	0.04
20. Benzo (a) - Pyrene	0.08
Notes :	
(i) Quantum limits shall be applicable for discharge of total effluent (process effluent, cooling water blow down including sea cooling water blow down, washings, etc.) to receiving environment (excluding direct application on land for irrigation/horticulture purposes within the premises of refinery).	
(ii) In order to measure the quantity of effluent (separately for discharge to receiving environment, application for irrigation/horticulture purposes within the premises of refinery & blow-down of cooling systems), appropriate flow measuring devices (e.g. V-notch, flow meters) shall be provided with.	
(iii) Quantum of pollutants shall be calculated on the basis of daily average of concentration values (one 24-hourly composite sample or average of three grab samples, as the case may be), average flow of effluent during the day and crude throughput capacity of the refinery.	
(iv) Limit for quantity of effluent discharged (excluding blow-down from seawater cooling) shall be 400 m ³ /1000 tonne of crude processed. However, for refineries located in high rain fall area, limit of quantity of effluent only during rainy days shall be 700 m ³ /1000 tonne of crude processed."	

[F. No. Q-15017/15/2007-CPW]

R. K. VAISH, Jt. Secy.

Note : - The principal rules were published in the Gazette of India vide number S.O. 844 (E) 19th November, 1986 and subsequently amended vide S.O. 433 (E) dated 18th April, 1987, S.O. 64 (E) dated 18th January, 1988, S.O. 3 (E) dated 3rd January, 1989, S.O. 190 (E) dated 15th March, 1989, G.S.R. 913 (E) dated the 24th October, 1989, S.O. 12 (E) dated the 8th January, 1990, G.S.R. 742 (E) dated the 30th August, 1990, S.O. 23 (E) dated the 16th January, 1991, G.S.R. 93 (E) dated the 21st February, 1991 G.S.R. 95 (E) dated the 12th February, 1992, G.S.R. 329 (E) dated the 13th March, 1992, G.S.R. 475 (E) dated the 5th May, 1992 G.S.R. 797 (E) dated the 1st October, 1992, G.S.R. 386 (E) dated the 28th April, 1993, g.s.r. 422 (e) dated the 19th May, 1993, G.S.R. 801 (E) dated the 31st December, 1993, G.S.R. 176 (E) dated the 3rd April, 1996, G.S.R. 631 (E) dated the 31st October, 1997, G.S.R. 504 (E) dated the 20th August, 1998, G.S.R. 7 (E) dated the 2nd January, 1999, G.S.R. 682 (E) dated the 5th October, 1999, G.S.R. 742 (E) dated the 25th September, 2000, G.S.R. 72 (E) dated the 6th February, 2001, G.S.R. 54 (E) dated the 22nd January, 2002, G.S.R. 371 (E) dated the 17th May, 2002, G.S.R. 489 (E) dated the 9th July, 2002, S.O. 1088 (E) dated the 11th October, 2002 and G.S.R. 849 (E) dated the 30th December, 2002, G.S.R. 520 (E) dated 1st July, 2003, G.S.R. 92 (E) dated 29th January, 2004, G.S.R. 448 (E) dated 12th July, 2004, Corrigenda G.S.R. 520 (E) dated 12th August, 2004, G.S.R. 272 (E) dated 5th May, 2005, G.S.R. 315 (E) dated 16th May, 2005, G.S.R. 546 (E) dated 30th August, 2005, G.S.R. 46 (E) dated 3rd February, 2006, G.S.R. 464 (E) dated 7th August, 2006, G.S.R. 566 (E) dated 29th August, 2007 and G.S.R. 704 (E) dated 12th November, 2007.