Chapter NR 279

PETROLEUM REFINING

NR 279.01 Purpose. The purpose of this chapter is to establish effluent limitations, standards of performance, and pretreatment standards for dishcarges of wastes from the petroleum refining category of point sources and subcategories thereof.

Note: The authority for promulgation of this chapter is set forth in Wis. Adm. Code chapter NR 205.

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.

NR 279.02 Applicability. The effluent limitations, standards of performance, pretreatment standards, and other provisions in this chapter are applicable to pollutants or pollutant properties in discharges resulting from operations of petroleum refining facilities in any of the following process or operation subcategories.

(1) TOPPING PROCESS. This subcategory includes facilities which produce petroleum products by topping and catalytic reforming whether or not they include any other additional process. Facilities which include catalytic cracking or thermal processes (coking, visbreaking, etc.) are excluded from this category.

Note: This subcategory is similar to API category A.

(2) CRACKING PROCESS. This subcategory includes facilities which produce petroleum products by topping and cracking whether or not they include any other additional process but excludes facilities in subcategories (3), (4), and (5) of this section.

Note: This subcategory is similar to API category B except that is does not include facilities in which more than 15% of the production consists of first generation petrochemicals.

(3) PETROCHEMICAL OPERATION. This subcategory includes facilities which produce petroleum products by topping, cracking, and petrochemical operations whether or not they include any other additional proscess but excludes facilities in subcategories (4) and (5) of this section.

Note: This subcategory is similar to API category C and includes facilities having 15 percent or more of their production in first generation petrochemicals.

(4) LUBE PROCESS. This subcategory includes facilities which produce petroleum products by topping, cracking and lube oil manufacturing whether or not they include any other process but excludes facilities in subcategories (3) and (5) of this section.

Note: This subcategory is the same as API category D.

(5) INTEGRATED PROCESS. This subcategory includes facilities which produce petroleum products by topping, cracking, lube oil manufacturing processes, and petrochemical operations whether or not they include any other additional process.

NOTE: This subcategory is the same as API category E.

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.

NR 279.03 Definitions. The following special definitions are applicable to terms used in this chapter. Definitions of other terms and meanings of abbreviations are set forth in Wis. Adm. Code chapter NR 205.

(1) "API" means the American Petroleum Institute.

(2) "Ballast" means waters from a ship which are treated in the refinery waste treatment facilities.

(3) "Barrel" means the volume unit equal to 42 gallons.

(4) "BTX" means benzene, toluene, and xylene.

(5) "Capacity" or "rated capacity" means the capacity in stream days as reported to and published annually by the "Oil and Gas Journal", Box 1260, Tulsa, Oklahoma 74101.

(6) "Feedstock" means the crude oil and natural gas liquids fed to the topping units.

(7) "Mgal" means 1000 gallons.

(8) "Mbbl" means 1000 barrels.

(9) "Once through cooling water" means waters used for heat removal purposes that do not come into direct contact with any raw material, intermediate product, or final product.

(10) "Petrochemical operation" means the production of second generation intermediate petrochemicals (i.e. alcohols, cumene, ketones, trimers, phthalic anhydride, styrene, etc.) or first generation petrochemicals and isomerization products (i.e. BTX, olefins, cyclohexane, etc.) when 15% or more of the refinery production consists of first generation petrochemicals and isomerization products.

(11) "Process configuration" means a numerical expression of the refinery stream complexity determined in accordance with section NR 279.07.

(12) "Process factor" means a number based on the process configuration and subcategory which is used in calculating discharge limitations.

(13) "Runoff" means as appropriate the flow of storm water from process areas treated in the main waste treatment facility, or from other areas bypassing that facility.

(14) "Size factor" means a number, based on the refinery subcategory and its capacity which is used in calculating dishcarge limitations for the refinery stream.

(15) "Stream" means a crude oil processing facility and connected further processing units.

(16) "Stream day" means an operating day of a refinery production line.

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.

NR 279.04 Compliance with effluent limitations and standards. Discharge of pollutants from facilities subject to the provisions of this chapter shall not exceed, as appropriate:

(1) By July 1, 1977 effluent limitations representing the degree of effluent reduction attainable by the application of the best practiable control technology currently available;

(2) By July 1, 1977 pretreatment standards for existing discharges to publicly owned treatment works;

(3) By July 1, 1983, effluent limitations representing the degree of effluent reduction attainable by the application of the best available technology economically achievable;

(4) Standards of performance for new sources; or

(5) Pretreatment standards for new sources discharging to publicly owned treatment works.

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.

NR 279.05 Modification of effluent limitations. (1) Effluent limitations representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available may be modified in accordance with this section.

(2) An individual discharger or other interested person may submit evidence to the department that factors relating to the equipment or facilities involved, the process applied, or other such factors relating to such discharger are fundamentally different from the factors considered in the establishment of the effluent limitations. On the basis of such evidence or other available information the department will make a written determination that such factors are or are not fundamentally different for that facility compared to those specified in the Petroleum Refining Development Document, EPA 440/1-74-014-a. If such fundamentally different factors are found to exist, the department shall establish for the discharge effluent limitations in the WPDES permit either more or less stringent than the limitations in this chapter, to the extent dictated by such fundamentally different factors. Such limitations must be approved by EPA which may approve, disapprove, or specify other limitations.

(3) Copies of this Development Document, "Petroleum Refining," EPA 440/1-74-014-a, published April, 1974, are available for inspection at the office of the department of natural resources, the secretary of state's office, and the office of the revisor of statutes, and may be obtained for personal use from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20460.

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.

NR 279.06 Application of effluent limitations and standards. (1) The effluent limitations and standards set forth in this chapter shall be used in accordance with this section to establish the quantity of quality of pollutants or pollutant properties which may be discharged by a point source subject to the provisions of this chapter, except as;

(a) They may be modified in accordance with section NR 279.05,

(b) They may be superseded by more stringent limitations and standards necessary to achieve water quality standards or meet other legal requirements, or

(c) They may be supplemented or superseded by standards or prohibitions for toxic pollutants or by additional limitations for other pollutants required to achieve water quality.

(2) For each stream in a petroleum refining facility subject to the provisions of any one of the subcategories of section NR 279.02 the quantity or quality of each pollutant or pollutant property which may be discharged daily in process waste water, by an existing source after application of best practicable or best available treatment, or by a new source to meet standards of performance requirements, shall be determined by multiplying the appropriate limitation of section NR 279.10, 279.11, or 279.12 by the appropriate size factor, by the appropriate process factor, and by the daily capacity in thousands of barrels, and adding to this quantity where applicable an additional quantity for runoff or ballast water treatment in accordance with (c) and (d) below.

(a) The size factor shall be determined in each instance for the appropriate subcategory and daily capacity from table 1.

Table 1
Size Factors

Capacity	Subcategories				
Mbbl/stream day	(1)	(2)	(3)	(4)	(5)
Less than 24.9	1.02	0.91	0.73		
25.0 to 49.9	1.06	0.95	0.76		
less than 49.9				0.71	
50.0 to 74.9	1.16	1.04	0.83	0.74	
75.0 to 99.9	1.26	1.13	0.91	0.81	
100.0 to 124.9	1.38	1.23	0.99	0.88	
less than 124.9					0.73
125.0 to 149.9	1.50	1.35	1.08	0.97	0.76
150.0 to 174.9				1.05	0.83
150.0 or more	1.67	1.41	1.13		
175.0 to 199.9				1.14	0.91
200.0 to 224.9					0.99
200.0 or more				1.19	
225.0 or more					1.04

(b) The process factor shall be determined in each instance for the appropriate subcategory and process configuration from table 2. Process configuration shall be determined in accordance with section NR 279.07.

Table 2
Process Factors

Process Configuration	Subcategories (1)	(2)	(3)	(4)	(5)
less than 2.49	0.62	0.58			
2.5 to 3.49	0.67	0.63			
3.5 to 4.49	0.80	0.74			
less than 4.49	0		0.73		
4.5 to 5.49	0.95	0.88	0.80		
5.5 to 5.99	1.07	1.00	0.91		
6.0 to 6.49	1.17	1.09	0.99		
less than 6.49				0.81	0.75
6.5 to 6.99	1.27	1.19	1.08		
6.5 to 7.49				0.88	0.82
7.0 to 7.49	1.39	1.29	1.17		
7.5 to 7.99	1.51	1.41	1.28	1.00	0.92
8.0 to 8.49	1.64	1.53	1.39	1.09	1.00
8.5 to 8.99	1.79	1.67	1.51	1.19	1.10
9.0 to 9.49	1.95	1.82	1.65	1.29	1.20
9.5 to 9.99	2.12			1.41	1.30
9.5 or more		1.89	1.72		
10.0 to 10.49	2.31			1.53	1.42
10.5 to 10.99	2.51			1.67	1.54
11.0 to 11.49	2.73			1.82	1.68
11.5 to 11.99	2.98			1.98	1.83
12.0 to 12.49	3.24			2.16	1.99
12.5 to 12.99	3.53			2.34	2.17
13.0 to 13.49	3.84				
13.0 or more				2.44	2.26
13.5 to 13.99	4.18				
14.0 or more	4.36				

Note: For example, the lube process refery stream with 125000 bbl daily capacity of the example in section NR 279.07 has a process configuration of 7.26. For subcategory 4 the process factor is 0.88 and the size factor for 125 Mbbl capacity is 0.97. From section NR 279.10, the average daily BOD limitation for best practicable treatment is 9.1. The average daily BOD limitation for the example stream is 9.1 × .88 × .97 × 125 or 971 pounds per day plus any applicable allowance for treated runoff or ballast.

(c) An additional allowance shall be made for process area runoff water treated in the main refinery waste treatment facility in accordance with table 3 for the pollutant parameters specified therein and the volume of runoff daily, either

1. for the days on which runoff occurs, with the average determined on a monthly basis, or

2. for each day of the year based on the daily runoff as projected from the mean annual rainfall.

Table 3
Limitations for Treated Runoff Water

Pollutant Parameter	Additional limitation in lbs/1000 gals of runoff treated For BPT ave.	max.	For BAT ave.	max.	Std. of performance ave.	max.
BOD	0.21	0.41	0.071	0.088	0.21	0.41
TSS	0.17	0.24	0.071	0.084	0.17	0.27
COD	1.6	3.1	0.19	0.21	1.6	3.1
Oil and grease	0.067	0.126	0.014	0.218	0.067	0.126

(To convert to kg/cu m, multiply by 0.12)

(d) An additional allowance shall be made for ballast water treated in the main refinery waste treatment facility in accordance with table 4 for the pollutant parameters specified therein and the ballast water treated daily, either

1. For the days on which ballast water is treated, with the average determined on a monthly basis using the number of days in the month, or

2. For each day of the year based on the daily average of ballast water treated annually.

Table 4
Limitations for Treated Ballast Water

Pollutant Parameter	Additional limitation in lbs/1000 gals of ballast water treated					
	For BPT		For BAT		Std. of performance	
	ave.	max.	ave.	max.	ave.	max.
BOD	0.21	0.40	0.071	0.088	0.21	0.40
TSS	0.17	0.26	0.071	0.084	0.17	0.27
COD	2.0	3.9	0.26	0.32	2.0	3.9
Oil and grease	0.067	0.126	0.014	0.018	0.067	0.126

(To convert to kg/cu m, multiply by 0.12)

(3) Runoff from other than process areas, such as tank fields, which is not treated in the main waste treatment facility of a refinery shall not exceed a concentration of 35 mg/l of TOC or 15 mg/l of oil and grease when discharged.

(4) Once through cooling waters may be discharged with a TOC concentration not to exceed 5 mg/l. Other limitations of this chapter do not apply to such discharges.

(5) In any case in which the permittee can demonstrate that the chloride ion concentration in the effluent exceeds 1000 mg/l, the department may substitute TOC as a pollutant parameter in lieu of COD. Effluent limitation for TOC shall be based on adequate data from the refinery correlating TOC to BOD. In the absence of such data the effluent limitation for TOC shall be established in a ratio of 2.2 to 1 to the applicable effluent limitation for BOD.

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.

NR 279.07 Process configuration. The process configuration of a refinery stream is determined from the daily capacity of the refinery stream in each of the processes identified under the four process categories of this section as such capacity is related to the crude throughput. The daily capacity in each process is expressed as a decimal fraction of the crude throughput. The sum of these fractions in each process category is multiplied by the weight factor set forth in the table for that category, and the sum of these products is the process configuration for the refinery stream:

Process category	Weight Factor	Processes identified in category
Crude processing	1	atmospheric distillation vacuum distillation desalting

Cracking and coking processes	6	fluid catalytic cracking vis-breaking thermal cracking moving bed catalytic cracking hydrocracking fluid coking delayed coking
Lube processing	13	hydrofining white oil manufacturing propane-dewaxing, deasphalting duo sol, solvent, dewaxing lube vac, tower, wax fractionating centrifuging and chilling methyl ethyl ketone dewaxing deoiling (wax) naphthenic lubes sulfur dioxide extraction wax pressing wax plant (with neutral separation) furfural extraction clay contacting-percolation wax sweating acid treating phenol extraction
Asphalt processing	12	production oxidation emulsification

Note: For example, for a lube process refinery stream of 125,000 bbl/day capacity the process configuration is determined as follows:

Process category-process		Capacity Mbbl/day	Fraction of throughput		Weight factor		Process configuration
Crude-	atm. distillation	125	1				
	vac. distillation	60	.48				
	desalting	125	1				
total			2.48	×	1	=	2.48
Cracking-	fluid cat. cracking	41	.328				
	hydrocracking	20	.160				
total			.488	×	6	=	2.93
Lube-	hydrofining	5.3	.042				
	furfural extraction	4.0	.032				
	phenol extraction	4.9	.039				
total			.113	×	13	=	1.47
Asphalt	production	4.0	.032	×	12	=	.38
Refinery stream process configuration							7.26

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.

NR 279.10 Effluent limitations, best practicable treatment. The following effluent limitations for all or specific subcategories when applied in accordance with section NR 279.06 establish, except as provided in section NR 279.05, the quantity or quality of pollutants or pollutant properties which may be discharged by a facility subject to the provisions of this chapter after application to wastes of the best practicable control technology currently available.

(1) The pH of all discharges shall be within the range of 6.0 to 9.0.

(2) The 30-day average and daily maximum limitations for BOD_5, suspended solids, and other parameters are set forth in Table 5.

Table 5

BPT Effluent Limitations

Effluent limitation in lbs/1000 bbl per stream day by subcategory

Subcategory	(1)		(2)		(3)		(4)		(5)	
Parameter	ave.	max.	ave.	max.	ave.	max.	ave.	max.	ave.	max.
BOD	4.25	8.0	5.5	9.9	6.5	12.1	9.1	17.9	10.2	19.2
TSS	3.6	5.6	4.4	6.9	5.25	8.3	8.0	12.5	8.4	13.2
COD	21.3	41.2	38.4	74.0	38.4	74.0	66	127	70	136
Oil & Grease	1.3	2.5	1.6	3.0	2.1	3.9	3.0	5.7	3.2	6.0
Phenolic compounds	.027	.060	.036	.074	.0425	.088	.065	.133	.068	.14
Ammonia (as N)	.45	.99	3.0	6.0	3.8	8.25	3.8	8.3	3.8	8.3
Sulfide	.024	.053	.029	.065	.035	.078	.053	.118	.056	.124
Chromium, T	.071	.122	.088	.15	.107	.183	.100	.273	.17	.29
Chromium, +6	.0044	.01	.0056	.012	.0076	.016	.011	.024	.011	.025

Note: To convert to kg/1000 cu m multiply by 2.856.

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.

NR 279.11 Effluent limitations, best available treatment. The following effluent limitations for all or specific subcategories when applied in accordance with section NR 279.06 establish the quantity or quality of pollutant properties which may be discharged by facility subject to the provisions of this chapter after application to wastes of the best available technology economically achievable.

(1) The pH of all discharges shall be within the range of 6.0 to 9.0.

(2) The 30-day average and daily maximum limitations for BOD_5, suspended solids, and other parameters are set forth in Table 6.

Table 6

BAT Effluent Limitations

Effluent limitation in lbs/1000 bbl per stream day by subcategory

Subcategory	(1)		(2)		(3)		(4)		(5)	
Parameter	ave.	max.	ave.	max.	ave.	max.	ave.	max.	ave.	max.
BOD	.75	.92	.99	1.2	1.3	1.7	2.2	2.7	2.6	3.2
TSS	.75	.88	.99	1.2	1.3	1.6	2.2	2.6	2.6	3.0
COD	2.8	3.5	5.4	6.8	6.1	7.6	11.0	13.8	13.4	16.8
Oil & Grease	.14	.18	.19	.24	.26	.32	.40	.50	.48	.60
Phenolic compounds	.15	.19	.0039	.0055	.0054	.0077	.0087	.012	.010	.015
Ammonia (as N)	.18	.24	1.2	1.6	1.5	2.0	1.5	2.0	1.5	2.0
Sulfide	.015	.019	.017	.026	.022	.035	.035	.055	.042	.066
Chromium, T	.037	.044	.049	.058	.068	.080	.11	.13	.13	.15
Chromium, +6	.00062	.00097	.0008	.0013	.0011	.0017	.0018	.0029	.0021	.0033

Note: To convert to kg/1000 cu m multiply by 2.856.

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.

NR 279.12 Standards of performance. The following effluent limitations for all or specific subcategories when applied in accordance with section NR 279.06 establish the quantity or quality of pollutants or pollutant properties which may be discharged by a facility which is a new source subject to the provisions of this chapter.

(1) The pH of all discharges shall be within the range of 6.0 to 9.0.

(2) The 30-day average and maximum daily limitations for BOD_5, suspended solids and other parameters are set forth in Table 7.

Table 7

Standards of Performance Effluent Limitations

Subcategory	Effluent limitation in lbs/1000 bbl per stream day by subcategory (1)		(2)		(3)		(4)		(5)	
Parameter	ave.	max.	ave.	max.	ave.	max.	ave.	max.	ave.	max.
BOD	2.2	4.2	3.1	5.8	4.1	7.7	6.5	12.2	7.8	14.7
TSS	1.9	3.0	2.5	4.3	3.3	5.2	5.3	8.3	6.3	9.9
COD	11.2	21.7	21.	41.5	24	47	45	87	54	104
Oil & Grease	.7	1.3	.93	1.7	1.3	2.4	2.0	3.8	2.4	4.5
Phenolic compounds	.016	.031	.02	.042	.027	.056	.043	.088	.051	.105
Ammonia (as N)	.45	1.0	3.0	6.0	3.8	8.3	3.8	8.3	3.8	8.3
Sulfide	.012	.027	.017	.037	.022	.050	.035	.078	.042	.093
Chromium, T	.037	.064	.049	.084	.068	.116	.105	.180	.13	.220
Chromium, +6	.0025	.0052	.0032	.0072	.0044	.0096	.0072	.0022	.0084	.0019

Note: To convert to kg/1000 cu m multiply by 2.856.

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.

NR 279.13 Pretreatment standards for new sources. The pretreatment standards for discharges to publicly owned treatment works from new sources subject to the provisions of this chapter shall be as set forth in Wis. Adm. Code chapter NR 211. In addition the limitations for incompatible pollutants shall be those set forth in section NR 279.12, except as provided in Wis. Adm. Code section NR 211.30 (2). Wastewaters from such new sources may not be discharged to publicly owned treatment works except in compliance with this section.

History: Cr. Register, June, 1976, No. 246, eff. 7-1-76.