Appendix C:
Concept Paper for Changes to Rule 11-10: Cooling Towers

Rules to Be Amended or Drafted

Regulation of organic gases and toxic air contaminants from cooling towers at refineries requires amendment to Air District Regulation 11, Rule 10, *Hexavalent Chromium Emissions from Cooling Towers* which will be renamed *Hexavalent Chromium and Total Hydrocarbon Emissions from Petroleum Refineries Cooling Towers*.

Goals

The goal of this rulemaking is to achieve technically feasible and cost-effective total hydrocarbon (THC) and hazardous air pollutants emission reductions from cooling towers at Bay Area refineries by requiring more rapid detection of heat exchanger leaks.

Background

The Bay Area has five large-scale petroleum refineries which operate a total of 34 cooling towers. These cooling towers are large, industrial heat exchangers that are used to dissipate significant heat loads to the atmosphere through the evaporation of water. When heat exchanger leaks go undetected for long periods of time, significant quantities of organic compounds can be stripped from the cooling tower water and emitted to the atmosphere.

Process and Source Description

Cooling towers are part of a heat exchange system consisting of a device or a collection of devices used to transfer heat from process fluids to water without intentional direct contact of the process fluid with the water and to transport and/or cool the water in a closed-loop system (cooling tower system). Figure E1 (below) depicts a basic cooling tower structure.

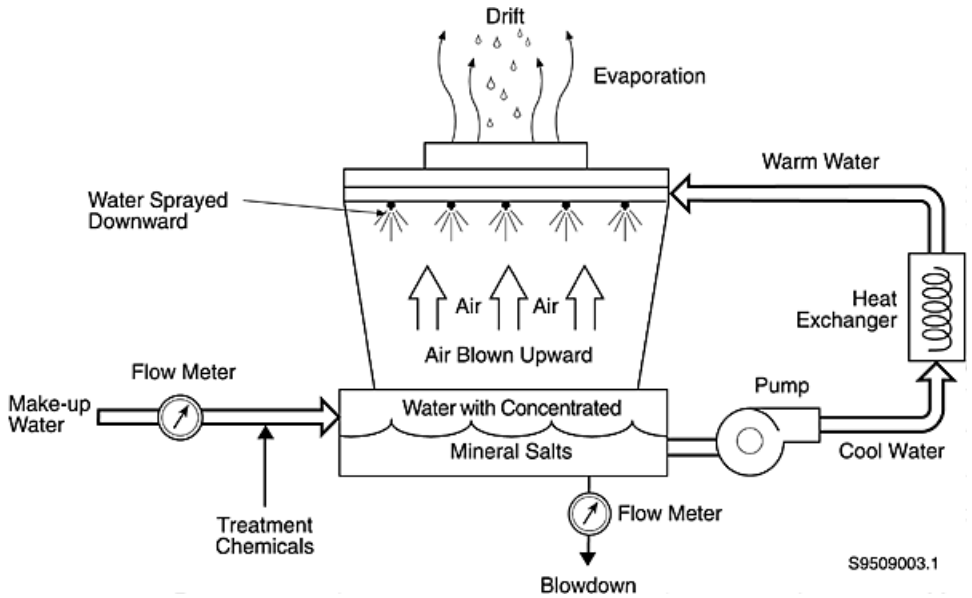

Figure C1 – Cooling Tower

Cooling towers can be designed as either natural draft or mechanical draft devices. Natural draft cooling towers are large hyperbolic structures that look similar to those found at nuclear power plants. They use natural convection of warmed air to create air to cool the water. Mechanical draft cooling towers use large fans to force air either through or across the water to cool it.

Regardless of the design, a small proportion of the cooling water is entrained in the updraft as mist, commonly called *drift*. When the water in the droplets evaporates, any dissolved solids in the cooling water form particulate matter.[1]

When heat exchanger leaks occur (from process fluids leaking into cooling water), the volatilization of hydrocarbons and/or HAPs in the contaminated cooling water lead to emissions. Such leaks tend to occur when heat exchanger tube sheets fail or when tubes rupture as a result of corrosion or the use of inferior materials during the exchanger construction process.

Emissions resulting from leaks can become significant if heat exchanger leaks go undetected for long periods of time. In 2010 a heat exchanger leak at a Bay Area refinery resulted in emissions of at least 52 tons of VOC over a recorded period of a few weeks. The total magnitude of emissions from the leak event was greater; emissions from the event were only estimated once the leak was detected, which was likely weeks if not months after the leak began.

Regulatory History and Context

District Regulation 11, Rule 10 was developed in 1989 to reduce hexavalent chromium emissions from cooling towers.

In 2009, The U.S. Environmental Protection Agency (EPA) promulgated, and in 2013 amended, 40 CFR part 63, subpart CC, *National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries (MACT[2] CC).* Section 63.654 in MACT CC requires periodic monitoring (monthly or quarterly) of heat exchangers in organic hazardous air pollutant (HAP) service within the heat exchange system for leaks of organic gases, unless:

- the minimum pressure on the cooling water side is at least 35 kilopascals (5.1 psi or 10 inches of mercury) greater than the maximum pressure on the process side, or
- if an intervening fluid containing less than 5 percent by weight of organic HAP is employed between the process fluids and cooling water (provided the intervening fluid is used solely to isolate the process fluids & cooling water and is not is not sent through the cooling tower or discharged).

MACT CC requires leaks to be repaired as soon as practicable after they are discovered.[3] But, not all cooling towers are subject to the monitoring, leak, and repair requirements of MACT CC.[4]

[1] Cooling tower water frequently contains additives such as biocides, anti-foaming agents and anti-scaling agents, any of which could be emitted as particulate matter

[2] "MACT" stands for Maximum Achievable Control Technology, which is the level of control that the emission standards regulation is intended to achieve.

[3] … but no later than 45 days after detecting the leak, unless the repair is not feasible.

[4] Applicability criteria can be found in Section 63.654.

Emissions

There are five large-scale petroleum refineries within the Air District's jurisdiction that operate a total of 34 permitted cooling towers. The number of cooling towers per facility varies. One refinery has only one cooling tower while another has 13 permitted cooling towers. Based on the 2013 Air District emissions inventory, the cooling towers collectively emitted approximately 1.6 tons per day (TPD) of organic gases, estimated using AP-42 emission factors.[5]

Regulatory Concepts and Proposed Regulations

Cooling Tower Emissions have been addressed by the Texas Commission on Environmental Quality (TCEQ). The TCEQ developed Chapter 115 – Control of Air Pollution from Volatile Organic Compounds, SUBCHAPTER H: HIGHLY-REACTIVE VOLATILE ORGANIC COMPOUNDS to address Highly Reactive Volatile Organic Compound (HRVOCs) emissions from industrial cooling towers. As part of its strategy to better control HRVOC emissions, the TCEQ modified a water sampling technique known as the Texas El Paso Method, now referred to as the Modified El Paso Method (MEPM), and required Texas petroleum refineries to use the MEPM to detect strippable hydrocarbons from leaking cooling tower heat exchange systems.[6]

The Texas El Paso Method, developed in the 1970's employs a "dynamic" or "flow-through" system for air stripping a sample of cooling tower water and analyzing the resultant off-gases for VOCs using a common flame ionization detector (FID) analyzer. The TCEQ developed the MEPM to concentrate on the measurement of strippable hydrocarbons, compounds with lower molecular weights and boiling points that are generally lost when sampled for purge/trap analyses. When the MEPM is applied, a continuous stream of water is sampled directly into an air stripping column apparatus. Air flowing countercurrent to the water strips HRVOCs from the water for analysis.

The Air District's staff is concerned about the MEPM sampling method's ability provide representative hydrocarbon emissions data on a consistent basis. Staff prefers continuous hydrocarbon analysis as a method of acquiring cooling tower water emissions data. Such a device is already in use in at least one Bay Area refinery. However, Air District staff will consider MPEM and other methods if the refineries are able to demonstrate that they provide comparable data and consistent results. Staff is seeking comment on this issue.

Regulation 8, Rule 2, Section 114 states that "Emissions from cooling towers, railroad tank cars, marine vessels and crude oil production operations are exempt from this Rule, provided best modern practices are used." Regulation 1, Section 207 defines *best modern practices* in general as **"**The minimization of emissions from equipment and operations by the employment of modern maintenance and operating practices used by superior operators of like equipment and which may be reasonably applied under the circumstances."

Regulation 11, Rule 10 is now proposing a cooling tower-specific definition. In the draft rule, Staff has compiled examples of best practices from several sources. Air District staff recognizes that some of the proposed "best modern practices" could be redundant in cases where a cooling tower has a continuous hydrocarbon analyzer installed.

[5] AP-42, *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources*, Fifth Edition, January, 1995, Table 5.1-2

[6] The MEPM is the basis for the monitoring required by U.S. EPA in § 63.654.

Elements to be added to Regulation 11, Rule 10 are as follows:

1. THC leak monitoring, repair and minimization requirements for petroleum refinery cooling towers will be incorporated into an existing regulation that was adopted in 1989 to limit hexavalent chromium emissions from all Bay Area cooling towers that were subject to the provisions of the rule. The regulation's description will be modified to include THC emissions from petroleum refinery cooling towers.
2. Regulation 8, Organic Compounds, Rule 2: *Miscellaneous Operations* exempts cooling tower emissions provided Best Modern Practices are used. Regulation 11, Rule 10 will define Best Modern Practices and will require refinery staff to take steps to ensure heat exchanger equipment is kept corrosion free and in good working order; to make visual and odor inspections on a regular basis; to perform surrogate testing, such as residual chlorine measurements every shift, and to track the amount of biocide added to cooling tower water on a daily basis to maintain water chemistry. As mentioned above, staff welcomes comments on how to best craft this particular provision to avoid redundancy while ensuring timely detection and repair of heat exchanger leaks.
3. The regulation will also require each cooling tower to use parametric monitors to measure cooling tower water hydrocarbon concentrations on an ongoing basis. Refineries must comply with applicable requirements for parametric monitors specified in Regulation 1, Section 523, unless an alternative sampling method has been approved by the APCO.
4. The regulation will include a THC concentration standard of 84 ppb (by weight) in the water of existing cooling towers and a 42 ppb concentration for new cooling towers. When either of these THC standards is exceeded, a leak action response will be required.
5. The refinery shall be required to minimize the leak within 5 calendar days and shall repair the leak within 21 days.
6. Regulation 11, Rule 10 would also include detailed recordkeeping requirements.

Staff proposes that the new requirements in Regulation 11, Rule 10 go into effect on July 1, 2016

Control Mechanisms

No additional controls are proposed, only additional monitoring and more frequent repair.

Costs and Emissions Reductions

Estimated emission reductions are based on implementing a total hydrocarbon concentration standard (for hydrocarbons in cooling tower water) equivalent to the EPA controlled emission factor of 0.7 lbs of hydrocarbons emitted for every million gallons of recirculated water. The table below lists the estimated total amortized cost (over ten years), total annual cost (capital plus operating), and emission reductions for each petroleum refinery to purchase and install continuous hydrocarbon analyzers for their cooling towers.

Capital costs in the table above do not include a probable discount for the cost to purchase multiple analyzers nor does do the costs include the savings refineries will incur from saving product that would have otherwise escaped during drift loss from the cooling tower. The figure for saved product is yet to be calculated. Therefore, the costs stated in the table are likely somewhat conservative.

Facility	Emission Reduction (tpy)	Capital Cost ($/yr)	Total Annualized Cost ($ M)
Chevron	239.4	$35,000	$59,000
Shell	227.6	$14,000	$26,000
Tesoro	36.3	$60,000	$99,000
Phillips 66	4.3	$35,000	$56,000
Valero	9.3	$35,000	$38,000

Request for Comments

On May 26, 2015, Air District staff published a Request for Comments to solicit comments on our initial regulatory concepts that comprise Phase 1 of the Refinery Strategy, including for this draft rule.

Staff received one comment letters dated June 19, 2015 on this rule and the associated concept paper from Guy Bjerke representing the Western States Petroleum Association (WSPA).

Staff's responses to the comments are shown below.

Comment: *Page E:3 of the concept paper identifies that "The Air District's staff is concerned about the MEPM sampling method's ability to provide representative hydrocarbon emissions data on a consistent basis", but provides no detail with regard to why they have these concerns. WSPA would like to understand these concerns, and potentially have the opportunity to identify the situations in which the MEPM (or EPA Method 624) is sufficiently accurate and could be used on a regular basis.*

Staff Response: The District is concerned that samples collected through the Modified El Paso Method (MEPM) would not be sufficiently representative of the hydrocarbon content of the cooling water to be useful for establishing technically sound emission limits. The MEPM contains too many variables within the method itself that have the potential to be unreliable when used on a routine basis. The Air District is open to possible use of the MEPM to detect heat exchanger leaks if it is demonstrated to be as reliable as other methods (such as continuous monitoring or lab testing of samples).

Comment: *The statements on page E:3 that "Staff prefers continuous hydrocarbon analysis as a method of acquiring cooling tower water emissions data. Such a device is already in use in...two Bay Area refiners: Chevron and Shell." The monitoring systems at both companies have detection limits that are higher than the 84 ppbw limit that the District has identified, and both companies have also experienced technical issues with those monitors.*

Comment: *The District identifies that they prefer continuous hydrocarbon monitors that two refineries have for their cooling tower water; but both of these refineries identified:*

- *Technical issues with continuous monitors utilized at those facilities*
- *The District significantly underestimated costs (associated with both installation and operation, including preventive maintenance and calibration);*
- *Monitoring levels are higher than the District's proposed action level of 84 ppbw (0.084 ppmw); and*
- *Monitors may not be capable of accurately measuring concentrations at 84 ppbw.*

Staff Response: Before this letter, Air District staff was unaware of any technical issues that have been identified by the two refineries. We presume therefore that these issues did not impede the refineries' ability to comply with applicable regulations/permit conditions. Nonetheless, we are interested in details on technical issues and will consider those when drafting the next version of the regulation.

Staff is also interested in receiving cost estimates for the installation, operation, preventive maintenance, and calibration of the continuous THC monitors. Please include the make and model of the continuous THC monitors you have evaluated and provide vendor/manufacturer information that substantiates the limitations of the devices to measure THC concentrations below 84 ppbw.

Comment: *The concept paper seems to imply that what is being proposed has been achieved in practice in the Bay Area, however, the proposal merely combines different monitoring practices and leak levels included in different refinery permits without sufficient research into whether or not the conditions all work together. In addition to the fact that the existing continuous monitors' detection limits are nowhere near the 84 ppbw level, we are only aware of the 84 ppbw limit being applied to one refinery, where it is applied to the difference between the concentrations in the return water and supply water (not just the return water), and compliance is based on monthly (not continuous) sampling and laboratory analysis (rather than monitoring). WSPA believes that monitoring once a month is much more feasible and would be consistent with EPA "Maximum Achievable Control Technology" (MACT) standards [40 CFR 63.654(c)4].*

Staff Response: Regulation 11-10 is intended to be independent of the MACT CC. It is applicable to more cooling towers, and can be more stringent in other ways. The 84 ppbw action level in the draft Regulation 11-10 was derived from the controlled VOC emission factor in EPA's method for calculating emissions from controlled and uncontrolled cooling towers (AP-43, Table 5.1-2). The draft Regulation 11-10-204 will be amended to state that the above action level applies to the inlet upstream of the cooling tower (hot side). The Air District is open to discussing other methods that will reliably and quickly identify leaks in heat exchangers. A monthly sampling routine could allow for a leak to go undetected for weeks.

Comment: *The 84 ppbw limit is being applied at only one refinery, where it is applied to the difference between the concentrations in the return water and supply water (not just the return water), and compliance is based on monthly (not continuous) sampling and laboratory analysis (rather than monitoring). WSPA believes that monitoring once a month is much more feasible and would be consistent with EPA "Maximum Achievable Control Technology" (MACT) standards [40 CFR 63.654(c)4]. Subsection 11-10-305.2 of the rule language allows 3 calendar days for leak minimization (which is too short) and up to 14 calendar days for repair of a leak (which is also very aggressive). WSPA believes that the 45-day repair time in the EPA MACT standard [40 CFR 63.654(d)] is more reasonable. The contingency provisions of Subsection 11-10-305.2 do not make sense; it states that if repair is not technically feasible within 14 calendar days, the owner/operator needs to substantiate their findings to the APCO's satisfaction within 5 calendar days from the day the leak was initially detected. The facility will likely try to make every effort to make the repair within 14 calendar days, and likely will not know whether it is technically feasible to repair the leak within 14 calendar days until the 14th day. The requirement in Subsection 11-10-305.3 to obtain the detailed drawings, signatures, etc. and conduct a root cause analysis is in five day is not feasible; nor does it seem necessary. Once a leak is found, personnel efforts need to be directed towards isolating where it is and fixing it, rather than preparing a root cause analysis of what caused it (which in most cases is likely to not even be knowable).*

Staff Response: Air District staff has amended the time periods in Regulation 11-10-305 as follows:

- Replace 3-calendar days with 5-calendar days and replace 14-calendar days with 21-calendar days.

For example, if a leak were detected on July 24, 2015 the above amendments would require that the leak be minimized by July 29, 2015; and, be repaired by August 14, 2015 The Air District has removed the option for facilities to request an extension to minimize and/or repair leaks. Facilities can apply for a variance if they choose to.

Comment: *Page E:3 of the concept paper identifies that the Regulation 1, Section 207 definition of "best modern practices" is "too generic of a definition for cooling tower operations", yet the exact same definition is proposed for Section 11-10-201. The District identifies more specific "best modern practices" in Section 11-10-306, but provides no support for this listing in the concept paper.*

Staff Response: As part of its review of refinery Title V permits in 2004, EPA Region IX had requested the District to provide justification as to why cooling towers were exempt from Regulation 8-2-301. The District determined that at least one (or more) Bay Area refineries were employing the majority of the Best Modern Practices (BMP) listed in Regulation 11-10-306. The District addressed EPAs comment by including the BMPs found in the above section in the Statement of Basis for Bay Area refinery Title V permits. Codifying in Regulation 11-10 the specific monitoring methods required to achieve BMP for cooling towers provides clarity.

Comment: *Section 11-10-207.2—in some situations, repairing a leak by "changing the pressure so that water flows into the process fluid"—will be problematic from a safety perspective.*

Staff Response: Air District staff is extremely concerned with safety and wishes to ensure that regulatory development does not pose potential safety conflict. In light of our shared concern, we are very interested in learning the nature of any potential safety conflicts and would be happy to discuss them with refinery representatives. Regulation 11-10-207.2 is a suggested action to mitigate a leak that refineries may use, but are not required to use. It is up to each refinery to decide whether to use or not use the above option.

Comment: *Separately, it is unclear whether this rule is targeting total hydrocarbon emissions (as identified in the title of the draft rule above the table of contents, and the majority of the rule language) or non-methane organic carbon emissions (as identified in the title of the draft rule on page 11-10-2).*

Staff Response: The target pollutant of draft amendments to Rule 11-10 is total hydrocarbons (THC). The Air District will amend the THC definition in Rule 11-10-213 as shown below:
"Any compound of carbon excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate."

References to "non-methane organic carbon" in the draft amendments to Rule 11-10 will be replaced with "Total Hydrocarbon".

REGULATION 11
HAZARDOUS POLLUTANTS
RULE 10
HEXAVALENT CHROMIUM AND TOTAL HYDROCARBON EMISSIONS FROM PETROLEUM REFINERY COOLING TOWERS

11-10-100 GENERAL

11-10-101 Description
~~11-10-102 Exemption, Discontinued Chromate Treatment~~
11-10-103 Exemption, Fin-Fan Coolers and HVAC Systems
11-10-104 Limited Exemption, Failure To Use Best Modern Practice

11-10-200 DEFINITIONS

11-10-201 Continuous Hydrocarbon Analyzer
11-10-~~201~~202 Cooling Tower
11-10-~~202~~203 Hexavalent Chromium/Chromate
11-10-204 Leak Action Level
11-10-205 Leak Repair
11-10-206 Petroleum Refinery
11-10-207 Petroleum Refinery Cooling Tower Heat Exchange System
11-10-208 Petroleum Refinery Cooling Tower Heat Exchanger
11-10-209 Petroleum Refinery Owner Operator
11-10-210 Responsible Manager
11-10-211 Total Hydrocarbon
11-10-~~203~~212 Water Treatment Chemicals
11-10-213 Cooling Tower Return Line

11-10-300 STANDARDS

11-10-301 Hexavalent Chromium Removal
~~11-10-302 Circulating Water Concentration-Wooden Cooling Towers~~
~~11-10-303 Circulating Water Concentration-Non-Wooden Cooling Towers~~
11-10-304 Leak Action Requirement

11-10-400 ADMINISTRATIVE REQUIREMENTS ~~(Not Included)~~

11-10-401 Petroleum Refinery Cooling Tower Reporting Requirements
11-10-402 Best Modern Practices

11-10-500 MONITORING AND RECORDS

~~11-10-501 Reporting-General~~
~~11-10-502 Monitoring-General~~
~~11-10-503 Monitoring-Wooden Cooling Towers~~
11-10-504 Operating Records

11-10-600 MANUAL OF PROCEDURES

11-10-601 Determination of Hexavalent Chromium in Circulating Water
11-10-602 Determination of Hydrocarbon in Water

REGULATION 11
HAZARDOUS POLLUTANTS
RULE 10
HEXAVALENT CHROMIUM AND TOTAL HYDROCARBON EMISSIONS FROM PETROLEUM REFINERY COOLING TOWERS

(Adopted November 15, 1989)

11-10-100 GENERAL

11-10-101 Description: The purpose of this Rule is to reduce emissions of hexavalent chromium from all cooling towers and reduce total hydrocarbon emissions from petroleum refinery cooling towers ~~by eliminating chromium based circulating water treatment programs~~.

~~**11-10-102 Exemption, Discontinued Chromate Treatment**: Sections 11-10-502 and 503 do not apply to cooling tower operators who have not used hexavalent chromium for water treatment since March 1, 1989.~~

11-10-103 Exemption: Fin-Fan Coolers and HVAC Systems are exempt from the requirements of this rule.

11-10-104 Limited Exemption: Petroleum refinery cooling towers that do not use best modern practices specified in this rule are limited to 300 ppm and 15 lbs/day hydrocarbon.

11-10-200 DEFINITIONS

11-10-201 Continuous Total Hydrocarbon Analyzer: An Air District-approved parametric monitoring device that measures the total hydrocarbon concentration in cooling tower water to detect leaks in the heat exchange system.

11-10-~~201~~202 Cooling Tower: ~~Any open water recirculation device that uses fans or natural draft to draw or force air to contact and cool water by evaporation.~~ A device used to shed waste heat to atmosphere using evaporative cooling.

11-10-~~202~~203 Hexavalent Chromium/Chromate: Hexavalent chromium is a cancer-causing toxic substance existing as part of various inorganic chromate compounds, for example, sodium dichromate or lead chromate.

11-10-204 Leak Action Level: A total hydrocarbon concentration of greater than 84 ppbw as measured by a District-approved continuous total hydrocarbon analyzer upstream of the cooling tower sump (hot side) at the cooling water return line on existing cooling towers that were in operation prior to July 1, 2016. New or modified cooling towers operated after this date are subject to a total hydrocarbon leak action level of 42 ppbw. The leak action level is the absolute total hydrocarbon concentration measured upstream of the cooling tower sump (hot side).

11-10-205 Leak Repair: A leak repair shall reduce the concentration of hydrocarbon in cooling tower water to comply with the applicable leak action level and may include but is not limited to the following actions:

205.1 Permanent physical repair of leaking equipment, replacement of equipment, and/or blocking or plugging equipment.

205.2 Replacing the heat exchanger or heat exchanger bundle; or permanently isolating, bypassing, or otherwise removing the leaking heat exchanger from service until it is otherwise repaired.

11-10-206 Petroleum Refinery: A facility that is located on one or more contiguous or adjacent properties, and under common control, that processes crude oil to produce products such as gasoline, diesel fuel, aviation fuel, lubricating oils, asphalt or petrochemical feedstocks.

11-10-207 Petroleum Refinery Cooling Tower Heat Exchange System: A heat transfer system using evaporative cooling.

11-10-208 Petroleum Refinery Cooling Tower Heat Exchanger: A heat transfer device utilizing cooling water.

11-10-209 Petroleum Refinery Owner/Operator: Any person who owns, operates, or exercises operational control over the majority of operations at a petroleum refinery. The refinery owner/operator is responsible for compliance with this rule for the entirety of the petroleum refinery, including any refinery processes or auxiliary facilities that may be separately owned or operated. Any person who owns, operates, or exercises operational control over a portion of a petroleum refinery that is less than a majority of the total refinery operations must provide the Owner/Operator with information sufficient to allow the owner/operator to comply with this rule, and must make that information available to the APCO upon request.

11-10-210 Responsible Manager: An employee of the facility or corporation who possesses sufficient authority to take the actions required for compliance with this rule.

11-10-211 Total Hydrocarbon: Any compound of carbon excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate.

11-10-~~203~~212 Water Treatment Chemicals: Any combination of chemicals added to cooling tower water including tracers, corrosion inhibitors, antiscalants, dispersants, biocides.

11-10-213 Cooling Tower Return Line: Water flowing into the cooling tower sump from heat exchanger(s) upstream of the cooling tower sump (hot side).

11-10-300 STANDARDS

11-10-301 Hexavalent Chromium Removal: Effective March 1, 1990, a person shall not operate any cooling tower that uses hexavalent chromium chemicals.

~~**11-10-302 Circulating Water Concentration-Wooden Cooling Towers:** Effective March 1, 1990, a person shall not operate a wooden cooling tower in the District unless the following requirements are met:~~

~~302.1 March 1, 1990 to September 1, 1990: Hexavalent chromium levels in the circulating water are not to exceed 8 milligrams/liter of circulating water~~

~~302.2 After September 1, 1990: Hexavalent chromium levels in the circulating water are not to exceed 0.15 milligrams/liter of circulating water.~~

~~**11-10-303 Circulating Water Concentration-Non-Wooden Cooling Towers:** Effective March 1, 1990, a person shall not operate a non-wooden cooling tower unless the hexavalent chromium levels do not exceed 0.15 milligrams/liter of circulating water~~.

11-10-304 Leak Action Requirement: Effective July 1, 2016, if cooling tower water contains hydrocarbon concentrations greater than the applicable leak action level, the owner/operator shall minimize the leak as soon as practicable or within 5-calendar days,and repair the leak and/or remove the defective piece of equipment from service within 21-calendar days of first detecting the leak.

11-10-400 ADMINISTRATIVE REQUIREMENTS

11-10-401 Petroleum Refinery Cooling Tower Reporting Requirements: When the sampling of cooling tower water triggers a leak action level the owner/operator shall:

401.1 Within one calendar day, notify the APCO of the hydrocarbon, pH, iron and chlorine concentration in the cooling water at time and date of leak discovery. List all of the heat exchangers that are served by this cooling tower.

401.2 Within five calendar days, notify the APCO how and where the repair was made, cause of the leak, hydrocarbon speciation and if further repair or replacement is required at next turnaround.

11-10-402 Best Modern Practices: Effective July 1, 2016, the owner/operator shall minimize total hydrocarbon (THC) emissions from cooling tower equipment and operations by employing best modern practices that shall include but is not limited to:

402.1 Use of an Air District approved continuous total hydrocarbon analyzer in the cooling tower return line to measure THC concentration in cooling tower water prior to exposure to air;

402.2 Close examination of all heat exchangers upstream of the cooling tower during turnaround for corrosion/damage and back flushing;

402.3 Repassivation of the steel contained in the heat exchangers during turnaround;

402.4 Seal tubes within the heat exchangers if there is evidence of corrosion or pitting during turnaround;

402.5 Perform daily visual observations, at least once every eight (8) hours, of the cooling water to detect any changes in the appearance of the water that could indicate hydrocarbon contamination and confirm presence of microbial growth such as turbidity or algae growth below the water line;

402.6 Monitor cooling tower decks daily, at least once every eight (8) hours, if access to the decks is possible, to detect any unexpected odors from the water via olfactory system;

402.7 Perform a visual check upstream from cooling tower, at least one time each shift, for changes in water color and/or water levels in hydrocarbon box installed for each heat exchanger system;

402.8 Measure the residual chlorine in the cooling tower water once every eight (8) hours;

402.9 Use hand-held monitors, such as or FIDs, once every eight (8) hours, to detect the presence of total hydrocarbons in the air above the cooling tower water;

402.10 Measure the oxidation reduction potential in the cooling tower water with hand-held monitors a least once every shift;

402.11 Track and record the amount of chlorine (or biocide) added to the cooling tower water on a daily basis;

402.12 Measure the pH and iron concentration in the cooling tower water with hand-held monitors on a daily basis.

11-10-500 MONITORING AND RECORDS

~~**11-10-501 Reporting-General:** By December 1, 1989, any owner/operator of a cooling tower shall notify the District in writing regarding the following information about the cooling tower. After December 1, 1989, any operator/owner of any newly constructed cooling water tower shall provide the APCO with the following information at least 90 days before the tower is operated.~~

~~1) Where the cooling tower is located.~~

~~2) Who is the owner/operator of the cooling tower.~~

~~3) Cooling tower type and materials of construction.~~

~~4) Whether hexavalent chromium based treatment chemicals were used in the cooling tower.~~

~~5) If hexavalent chromium based chemicals were previously used, when they were discontinued.~~

~~6) A description of the alternate treatment program chosen, as well as the circulating water monitoring plan.~~

~~**11-10-502 Monitoring-General:** Effective March 1, 1990, any person subject to Sections 11-10-302 and 303 shall test the circulating water at least once every six calendar months to determine the concentration of hexavalent chromium. The first test shall be performed during March, 1990. Testing may be discontinued when two consecutive required tests show hexavalent chromium concentrations less than 0.15 milligrams per liter of circulating water. The APCO reserves the right to require testing of the circulating water at any time, if the District has reason to believe the water may contain hexavalent chromium.~~

~~**11-10-503 Monitoring-Wooden Cooling Towers:**~~

~~503.1 March 1, 1990 until September 1, 1990: Any person subject to Section 11-10-302.1 shall test the circulating water at least once every calendar month to determine the concentration of hexavalent chromium.~~

~~503.2 After September 1, 1990: Any person subject to Section 11-10-302.2 shall test the circulating water at least once every six calendar months to~~

~~determine the concentration of hexavalent chromium. Testing may be discontinued when two consecutive required tests show hexavalent chromium concentrations less than 0.15 milligrams per liter of circulating water. The APCO reserves the right to require testing of the circulating water at any time, if the District has reason to believe the water may contain hexavalent chromium.~~

11-10-504 Operating Records: Refinery owner/operators subject to the provisions of Sections 301, 401, 402, 601 and 602 shall retain records of all required data on site for at least five years from the date of entry ~~Any person subject to Sections 11-10-302 and 303 shall maintain records of the results of all required tests of circulating water for two years and give them to the District when requested~~.

11-10-600 MANUAL OF PROCEDURES

11-10-601 Determination of Hexavalent Chromium in Circulating Water: Samples of circulating water shall be analyzed for hexavalent chromium as prescribed by American Public Health Method 312B or an equivalent method, as approved by the APCO.

11-10-602 Determination of Hydrocarbon in Water: Effective July 1, 2016, the owner/operator of a petroleum refinery cooling tower shall install an Air District-approved total hydrocarbon analyzer in each cooling tower return line to continuously measure the total hydrocarbon concentration in the cooling tower water prior to exposure to air, or, at each heat exchanger exit line for each heat exchanger or group of heat exchangers within that heat exchanger system. The location of the analyzer installation shall be subject to APCO approval. The analyzer sensitivity shall respond to the compounds being processed.The analyzer shall be maintained and operated in accordance with Regulation 1, Section 523. The petroleum refinery owner/operator may request APCO approval, in writing, of an alternative hydrocarbon monitoring system if the petroleum refinery owner/operator can demonstrate equivalency.