

toxics emissions for any facility of a refiner or importer of conventional gasoline shall be determined as follows:

(1) The summer and winter baseline exhaust emissions of benzene, formaldehyde, acetaldehyde, 1,3-butadiene, and polycyclic organic matter shall be determined using the oxygenated individual baseline fuel parameter values for summer and winter (per § 80.91), respectively, in the appropriate complex model for each exhaust toxic (per § 80.45).

(2) The summer and winter baseline total exhaust toxics emissions shall be determined separately by summing the summer and winter baseline exhaust emissions of each toxic (per paragraph (d)(1) of this section), respectively.

(3) The annual average baseline exhaust toxics emissions of the facility shall be determined using the emissions values determined in paragraph (d)(2) of this section in the equation specified in paragraph (a) of this section.

(e) *Baseline NO_x emissions.* The annual average baseline NO_x emissions for any facility of a refiner or importer of conventional gasoline shall be determined as follows:

(1) The summer and winter baseline NO_x emissions shall be determined using the baseline individual baseline fuel parameter values for summer and winter (per § 80.91), respectively, in the appropriate complex model for NO_x (per § 80.45).

(2) The annual average baseline NO_x emissions of the facility shall be determined using the emissions values determined in paragraph (e)(1) of this section in the equation specified in paragraph (a) of this section.

(3) The requirements specified in paragraphs (e) (1) and (2) of this section shall be determined separately using the oxygenated and nonoxygenated individual baseline fuel parameters, per § 80.91.

(f) *Applicability of Phase I and Phase II models.* The requirements of paragraphs (d) and (e) of this section shall be determined separately for the applicable Phase I and Phase II complex models specified in § 80.45.

(g) *Calculation accuracy.* Emissions values calculated per the requirements of this section shall be determined to

four (4) significant figures. Sulfur, olefin and T90 values calculated per the requirements of this section shall be determined to the same number of decimal places as the corresponding value listed in § 80.91(c)(5).

[59 FR 7860, Feb. 16, 1994, as amended at 59 FR 36965, July 20, 1994]

§ 80.91 Individual baseline determination.

(a) *Baseline definition.* (1) The “baseline” or “individual baseline” of a refinery, refiner or importer, as applicable, shall consist of:

(i) An estimate of the quality, composition and volume of its 1990 gasoline, or allowable substitute, based on the requirements specified in §§ 80.91 through 80.93; and

(ii) Its baseline emissions values calculated per paragraph (f) of this section.

(2)(i) The quality and composition of the 1990 gasoline of a refinery, refiner or importer, as applicable, shall be the set of values of the following fuel parameters: benzene content; aromatic content; olefin content; sulfur content; distillation temperature at 50 and 90 percent by volume evaporated; percent evaporated at 200 °F and 300 °F; oxygen content; RVP.

(ii) A refiner, per paragraph (b)(3)(i) of this section, shall also determine the API gravity of its 1990 gasoline.

(3) The methodology outlined in this section shall be followed in determining a baseline value for each fuel parameter listed in paragraph (a)(2) of this section.

(b) *Requirements for refiners, blenders and importers—(1) Requirements for producers of gasoline and gasoline blendstocks.* (i) A refinery engaged in the production of gasoline blendstocks from crude oil and/or crude oil derivatives, and the subsequent mixing of those blendstocks to form gasoline, shall have its baseline fuel parameter values determined from Method 1, 2 and/or 3-type data as described in paragraph (c) of this section, provided the refinery was in operation for at least 6 months in 1990.

(ii) A refinery which was in operation for at least 6 months in 1990, was shut down after 1990, and which restarts

after June 15, 1994, and for which insufficient 1990 and post-1990 data was collected prior to January 1, 1995 from which to determine an individual baseline, shall have the values listed in paragraph (c)(5) of this section as its individual baseline parameters.

(iii) A refinery which was in operation for less than 6 months in 1990 shall have the values listed in paragraph (c)(5) of this section as its individual baseline parameters.

(2) *Requirements for producers or importers of gasoline blendstocks only.* A refiner or importer of gasoline blendstocks which did not produce or import gasoline in 1990 and which produces or imports post-1994 gasoline shall have the values listed in paragraph (c)(5) of this section as its individual baseline parameters.

(3) *Requirements for purchasers of gasoline and/or gasoline blendstocks.* (i) A refiner or refinery, as applicable, solely engaged in the production of gasoline from gasoline blendstocks and/or gasoline which are simply purchased and blended to form gasoline shall have its individual baseline determined using Method 1-type data (per paragraph (c) of this section) from every batch of 1990 gasoline.

(ii) If Method 1-type data on every batch of the refiner's or refinery's 1990 gasoline does not exist, that refiner or refinery shall have the values listed in paragraph (c)(5) of this section as its individual baseline parameters.

(4) *Requirements for importers of gasoline and/or gasoline blendstocks.* (i) An importer of gasoline shall determine an individual baseline value for each fuel parameter listed in paragraph (a)(2) of this section using Method 1-type data on every batch of gasoline imported by that importer into the United States in 1990.

(ii) An importer which is also a foreign refiner must determine its individual baseline using Method 1, 2 and/or 3-type data (per paragraph (c) of this section) if it imported at least 75 percent, by volume, of the gasoline produced at its foreign refinery in 1990 into the United States in 1990.

(iii) An importer which cannot meet the criteria of paragraphs (b)(4)(i) or (ii) of this section for baseline determination shall have the parameter val-

ues listed in paragraph (c)(5) of this section as its individual baseline parameter values.

(5) *Requirements for exporters of gasoline and/or gasoline blendstocks.* A refiner shall not include quality or volume data on its 1990 exports of gasoline blendstocks or gasoline in its baseline determination.

(c) *Data types—(1) Method 1-type data.* (i) Method 1-type data shall consist of quality (composition and property data) and volume records of gasoline produced in or shipped from the refinery in 1990, excluding exported gasoline. The measured fuel parameter values and volumes of batches, or shipments if not batch blended, shall be used except that data on produced gasoline which was also shipped shall be included only once.

(ii) Gasoline blendstock which left a facility in 1990 and which could become gasoline solely upon the addition of oxygenate shall be included in the baseline determination.

(A) Fuel parameter values of such blendstock shall be accounted for as if the gasoline blendstock were blended with ten (10.0) volume percent ethanol.

(B) If the refiner or importer can provide evidence that such gasoline blendstock was not blended per paragraph (c)(1)(ii)(A) of this section, and that such gasoline blendstock was blended with another oxygenate or a different volume of ethanol, the fuel parameter values of the final gasoline (including oxygenate) shall be included in the baseline determination.

(C) If the refiner or importer can provide evidence that such gasoline blendstock was not blended per paragraph (c)(1)(ii)(A) or (B) of this section, and that such gasoline blendstock was sold with out further changes downstream, the fuel parameter values of the original product shall be included in the baseline determination.

(iii) Data on 1990 gasoline purchased or otherwise received, including intracompany transfers, shall not be included in the baseline determination of a refiner's or importer's facility if the gasoline exited the receiving refinery unchanged from its arrival state.

(2) *Method 2-type data.* Method 2-type data shall consist of 1990 gasoline blendstock quality data and 1990

blendstock production records, specifically the measured fuel parameter values and volumes of blendstock used in the production of gasoline within the refinery. Blendstock data shall include volumes purchased or otherwise received, including intracompany transfers, if the volumes were blended as part of the refiner's or importer's 1990 gasoline. Henceforth in §§ 80.91 through 80.93, "blendstock(s)" or "gasoline blendstock(s)" shall include those products or streams commercially blended to form gasoline.

(3) *Method 3-type data.* (i) Method 3-type data shall consist of post-1990 gasoline blendstock and/or gasoline quality data and 1990 blendstock and gasoline production records, specifically the measured fuel parameter values and volumes of blendstock used in the production of gasoline within the refinery. Blendstock data shall include volumes purchased or otherwise received, including intracompany transfers, if the volumes were blended as part of the refiner's or importer's 1990 gasoline.

(ii) In order to use Method 3-type data, the refiner or importer must do all of the following:

(A) Include a detailed discussion comparing its 1990 and post-1990 refinery operations and all other differences which would cause the 1990 and post-1990 fuel parameter values to differ; and

(B) Perform the appropriate calculations so as to adjust for the differences determined in paragraph (c)(3)(ii)(A) of this section; and

(C) Include a narrative, discussing the methodology and reasoning for the adjustments made per paragraph (c)(3)(ii)(B) of this section.

(iii) In order to use post-1990 gasoline data, either of the following must be shown for each blendstock-type included in 1990 gasoline, excluding butane:

(A) The post-1990 volumetric fraction of a blendstock is within (\pm)10.0 percent of the volumetric fraction of that blendstock in 1990 gasoline. For example, if a 1990 blendstock constituted 30 volume percent of 1990 gasoline, this criterion would be met if the post-1990 volumetric fraction of the blendstock in post-1990 gasoline was 27.0–33.0 volume percent.

(B) The post-1990 volumetric fraction of a blendstock is within (\pm)2.0 volume percent of the absolute value of the 1990 volumetric fraction. For example, if a 1990 blendstock constituted 5 volume percent of 1990 gasoline, this criterion would be met if the post-1990 volumetric fraction of the blendstock in post-1990 gasoline was 3–7 volume percent.

(iv) If using post-1990 gasoline data, post-1990 gasoline blendstock which left a facility and which could become gasoline solely upon the addition of oxygenate shall be included in the baseline determination, per the requirements specified in paragraph (c)(1)(ii) of this section.

(4) *Hierarchy of data use.* (i) A refiner or importer must determine a baseline fuel parameter value using only Method 1-type data if sufficient Method 1-type data is available, per paragraph (d)(1)(ii) of this section.

(ii) If a refiner has insufficient Method 1-type data for a baseline parameter value determination, it must supplement that data with all available Method 2-type data, until it has sufficient data, per paragraph (d)(1)(iii) of this section.

(iii) If a refiner has insufficient Method 1- and Method 2-type data for a baseline parameter value determination, it must supplement that data with all available Method 3-type data, until it has sufficient data, per paragraph (d)(1)(iii) of this section.

(iv) The protocol for the determination of baseline fuel parameter values in paragraphs (c)(4)(i) through (iii) of this section shall be applied to each fuel parameter one at a time.

(5) *Anti-dumping statutory baseline.* (i) The summer anti-dumping statutory baseline shall have the set of fuel parameter values identified as "summer" in § 80.45(b)(2). The anti-dumping summer API gravity shall be 57.4 °API.

(ii) The winter anti-dumping statutory baseline shall have the set of fuel parameter values identified as "winter" in § 80.45(b)(2), except that winter RVP shall be 8.7 psi. The anti-dumping winter API gravity shall be 60.2 API.

(iii) The annual average anti-dumping statutory baseline shall have the following set of fuel parameter values:

Benzene, volume percent—1.60

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Aromatics, volume percent—28.6
Olefins, volume percent—10.8
RVP, psi—8.7
T50, degrees F—207
T90, degrees F—332
E200, percent—46
E300, percent—83
Sulfur, ppm—338
API Gravity, °API—59.1

(iv) The annual average anti-dumping statutory baseline shall have the following set of emission values:

Exhaust benzene emissions, simple model—6.45
Exhaust benzene emissions, complex model—33.03 mg/mile
Exhaust toxics emissions, Phase I—50.67 mg/mile
Exhaust toxics emissions, Phase II—104.5 mg/mile
NO_x emissions, Phase I—714.4 mg/mile
NO_x emissions, Phase II—1461. mg/mile

(d) *Data collection and testing requirements*—(1) *Minimum sampling requirements*—(i) *General requirements.* (A) Data shall have been obtained for at least three months of the refiner's or importer's production of summer gasoline and at least three months of its production of winter gasoline. When method 1 per batch RVP data is available, a month is considered equivalent to 4 weeks of seasonal data.

(1) Method 1, per batch, actual RVP data will be used to define that batch as either summer fuel or winter fuel. Summer fuel is defined as fuel produced and intended for sale to satisfy Federal summer volatility standards. When such per batch actual RVP data is not available, data is allocated per month as follows. A summer month is defined as any month during which more than 50 percent (by volume) of the gasoline produced by a refiner met the Federal summer gasoline volatility requirements. Winter shall be any month which could not be considered a summer month under this definition.

(2) The three months which compose the summer and the winter data do not have to be consecutive nor within the same year.

(3) If, in 1990, a refiner marketed all of its gasoline only in an area or areas which experience no seasonal changes relative to gasoline requirements, e.g., Hawaii, only 3 months of data are required.

(B) Once the minimum sampling requirements have been met, data collection may cease. Additional data may only be included for the remainder of the calendar year in which the minimum sampling requirements were met. In any case, all data collected through the date of collection of the last data point included in the determination of a baseline fuel parameter value must be utilized in the baseline determination of that fuel parameter.

(C) Less than the minimum requirements specified in paragraph (d)(1) of this section may be allowed, upon petition and approval (per § 80.93), if it can be shown that the available data is sufficient in quality and quantity to use in the baseline determination.

(ii) *Method 1 sampling requirements.* At least half of the batches, or shipments if not batch blended, in a calendar month shall have been sampled over a minimum of six months in 1990.

(iii) *Method 2 sampling requirements.* (A) Continuous blendstock streams shall have been sampled at least weekly over a minimum of six months in 1990.

(B) For blendstocks produced on a batch basis, at least half of all batches of a single blendstock type produced in a calendar month shall have been sampled over a minimum of six months in 1990.

(iv) *Method 3 sampling requirements*—(A) *Blendstock data.* (1) Post-1990 continuous blendstock streams shall have been sampled at least weekly over a minimum of six months.

(2) For post-1990 blendstocks produced on a batch basis, at least half of all batches of a single blendstock type produced in a calendar month shall have been sampled over a minimum of six months.

(B) *Gasoline data.* At least half of the post-1990 batches, or shipments if not batch blended, in a calendar month shall have been sampled over a minimum of six months in order to use post-1990 gasoline data.

(2) *Sampling beyond today's date.* The necessity and actual occurrence of data collection after today's date must be shown.

(3) *Negligible quantity sampling.* Testing of a blendstock stream for a fuel parameter listed in this paragraph

(d)(3) is not required if the refiner can show that the fuel parameter exists in the stream at less than or equal to the amount, on average, shown in this paragraph (d)(3) for that fuel parameter. Any fuel parameter shown to exist in a refinery stream in negligible amounts shall be assigned a value of 0.0:

Aromatics, volume percent—1.0
Benzene, volume percent—0.15
Olefins, volume percent—1.0
Oxygen, weight percent—0.2
Sulfur, ppm—30.0

(4) *Sample compositing.* (i) Samples of gasoline or blendstock which have been retained, but not analyzed, may be mixed prior to analysis and analyzed, as described in paragraphs (d)(4)(iii)(A) through (H) of this section, for the required fuel parameters. Samples must be from the same season and year and must be of a single grade or of a single type of batch-produced blendstock.

(ii) Blendstock samples of a single blendstock type obtained from continuous processes over a calendar month may be mixed together in equal volumes to form one blendstock sample and the sample subsequently analyzed for the required fuel parameters.

(iii)(A) Samples shall have been collected and stored per the method normally employed at the refinery in order to prevent change in product composition with regard to baseline properties and to minimize loss of volatile fractions of the sample.

(B) Properties of the retained samples shall be adjusted for loss of butane by comparing the RVP measured right after blending with the RVP determined at the time that the supplemental properties are measured.

(C) The volume of each batch or shipment sampled shall have been noted and the sum of the volumes calculated to the nearest hundred (100) barrels.

(D) For each batch or shipment sampled, the ratio of its volume to the total volume determined in paragraph (d)(4)(iii)(C) of this section shall be determined to three (3) decimal places. This shall be the volumetric fraction of the shipment in the mixture.

(E) The total minimum volume required to perform duplicate analyses to obtain values of all of the required fuel parameters shall be determined.

(F) The volumetric fraction determined in paragraph (d)(4)(iii)(D) of this section for each batch or shipment shall be multiplied by the value determined in paragraph (d)(4)(iii)(E) of this section.

(G) The resulting value determined in paragraph (d)(4)(iii)(F) of this section for each batch or shipment shall be the volume of each batch or shipment's sample to be added to the mixture. This volume shall be determined to the nearest milliliter.

(H) The appropriate volumes of each shipment's sample shall be thoroughly mixed and the solution analyzed per the methods normally employed at the refinery.

(5) *Test methods.* (i) If the test methods used to obtain fuel parameter values of gasoline and gasoline blendstocks differ or are otherwise not equivalent in precision or accuracy to the corresponding test method specified in § 80.46, results obtained under those procedures will only be acceptable, upon petition and approval (per § 80.93), if the procedures are or were industry-accepted procedures for measuring the properties of gasoline and gasoline blendstocks at the time the measurement was made.

(ii) Oxygen content may have been determined analytically or from oxygenate blending records.

(A) The fuel parameter values, other than oxygen content, specified in paragraph (a) of this section, must be established as for any blendstock, per the requirements of this paragraph (d).

(B) All oxygen associated with allowable gasoline oxygenates per § 80.2(jj) shall be included in the determination of the baseline oxygen content, if oxygen content was determined analytically.

(C) Oxygen content shall be assumed to be contributed solely by the oxygenate which is indicated on the blending records, if oxygen content was determined from blending records.

(6) *Data quality.* Data may be excluded from the baseline determination if it is shown to the satisfaction of the Director of the Office of Mobile Sources, or designee, that it is not within the normal range of values expected for the gasoline or blendstock

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sample, considering unit configuration, operating conditions, etc.; due to:

- (i) Improper labeling; or
- (ii) Improper testing; or
- (iii) Other reasons as verified by the auditor specified in § 80.92.

(e) *Baseline fuel parameter determination*—(1) *Closely integrated gasoline producing facilities.* Each refinery or blending facility must determine a set of baseline fuel parameter values per this paragraph (e). A single set of baseline fuel parameters may be determined, upon petition and approval, for two or more facilities under either of the following circumstances:

(i) Two or more refineries or sets of gasoline blendstock-producing units of a refiner engaged in the production of gasoline per paragraph (b)(1) of this section which are geographically proximate to each other, yet not within a single refinery gate, and whose 1990 operations were significantly interconnected.

(ii) A gasoline blending facility operating per paragraph (b)(3) of this section received at least 75 percent of its 1990 blendstock volume from a single refinery, or from one or more refineries which are part of an aggregate baseline per § 80.101(h). The blending facility and associated refinery(ies) must be owned by the same refiner.

(iii) For facilities determined to be closely integrated gasoline producing facilities and for which EPA has granted a single set of baseline fuel parameter values per this paragraph (e)(1)(i):

(A) All reformulated gasoline and anti-dumping standards shall be met by such closely integrated facilities on an aggregate basis;

(B) A combined facility registration shall be submitted under §§ 80.76 and 80.103; and

(C) Record keeping requirements under §§ 80.74 and 80.104 and reporting requirements under §§ 80.75 and 80.105 shall be met for such closely integrated facilities on an aggregate basis.

(2) *Equations*—(i) *Parameter determinations.* Average baseline fuel parameters shall be determined separately for summer and winter using summer and winter data (per paragraph (d)(1)(i)(A) of this section), respectively, in the applicable equation listed in paragraphs (e)(2) (ii) through (iv) of this section, except that average baseline winter RVP shall be 8.7 psi.

(ii) *Product included in parameter determinations.* In each of the equations listed in paragraphs (e)(2) (ii) through (iv) of this section, the following shall apply:

(A) All gasoline produced to meet EPA's 1990 summertime volatility requirements shall be considered summer gasoline. All other gasoline shall be considered winter gasoline.

(B)(1) Baseline total annual 1990 gasoline volume shall be the larger of the total volume of gasoline produced in or shipped from the refinery in 1990.

(2) Baseline summer gasoline volume shall be the total volume of low volatility gasoline which met EPA's 1990 summertime volatility requirements. Baseline summer gasoline volume shall be determined on the same basis (produced or shipped) as baseline total annual gasoline volume.

(3) Baseline winter gasoline volume shall be the baseline total annual gasoline volume minus the baseline summer gasoline volume.

(C) Fuel parameter values shall be determined in the same units and at least to the same number of decimal places as the corresponding fuel parameter listed in paragraph (c)(5) of this section.

(D) Volumes shall be reported to the nearest barrel or to the degree at which historical records were kept.

(iii) *Method 1.* Summer and winter Method 1-type data, per paragraph (c)(1) of this section, shall be evaluated separately according to the following equation:

$$X_{bs} = \sum_{g=1}^{p_s} \left(\frac{T_{gs}}{n_s} \times \frac{\sum_{i=1}^{n_{gs}} (X_{gis} \times V_{gis} \times SG_{gis})}{\sum_{i=1}^{n_{gs}} (V_{gis} \times SG_{gis})} \right)$$

where:

X_{bs} = summer or winter baseline value of fuel parameter X for the refinery
 s = season, summer or winter, per paragraph (d)(1)(i)(A)(I) of this section
 g = separate grade of season s gasoline produced by the refinery in 1990
 p_s = total number of different grades of season s gasoline produced by the refinery in 1990
 T_{gs} = total volume of season s grade g gasoline produced in 1990
 N_s = total volume of season s gasoline produced by the refinery in 1990
 i = separate batch or shipment of season s 1990 gasoline sampled

n_{gs} = total number of season s samples of grade g gasoline
 X_{gis} = parameter value of grade g gasoline sample i in season s
 V_{gis} = volume of season s grade g gasoline sample i
 SG_{gis} = specific gravity of season s grade g gasoline sample i (used only for fuel parameters measured on a weight basis)

(iv) *Method 2.* Summer and winter Method 2-type data, per paragraph (c)(2) of this section, shall be evaluated separately according to the following equation:

$$X_{bs}^m = \sum_{j=1}^{T_{js}} \left\{ \frac{1}{N_s} \times \left(\frac{\sum_{i=1}^{n_{ijs}} X_{ijs}}{n_{ijs}} + \frac{\sum_{i=1}^{p_{js}} (X_{ijs} \times V_{ijs} \times SG_{ijs})}{\sum_{i=1}^{p_{js}} (V_{ijs} \times SG_{ijs})} \right) \right\}$$

where

X_{bs} = Summer or winter baseline value of fuel parameter x for the refinery
 s = season, summer or winter, per paragraph (d)(1)(i)(A)(I) of this section
 j = type of blendstock (e.g., reformate, isomerate, alkylate, etc.)
 m_s = total types of blendstocks in season s 1990 gasoline
 T_{js} = total 1990 volume of blendstock j used in the refinery's season s gasoline
 N_s = total volume of season s gasoline produced in the refinery in 1990
 i = sample of blendstock j
 n_{ijs} = number of samples of season s blendstock j from continuous process streams

X_{ijs} = parameter value of sample i of season s blendstock j
 p_{js} = number of samples of season s batch-produced blendstock j
 V_{ijs} = volume of batch of sample i of season s blendstock j
 SG_{ijs} = specific gravity of sample i of season s blendstock j (used only for fuel parameters measured on a weight basis)

(v) *Method 3. (A) Post-1990 Blendstock.* Summer and winter Method 3-type data, per paragraph (c)(3) of this section, shall be evaluated separately according to the following equation:

$$X_{bs} = \sum_{j=1}^{m_s} \left(\frac{T_{js}}{N_s} \times \left(\frac{\sum_{i=1}^{n_{js}} X_{ijs}}{n_{js}} + \frac{\sum_{i=1}^{p_{js}} (X_{ijs} \times V_{ijs} \times SG_{ijs})}{\sum_{i=1}^{p_{js}} (V_{ijs} \times SG_{ijs})} \right) \right)$$

where

X_{bs} = Summer or winter baseline value of fuel parameter X for the refinery
 s = season, summer or winter, per paragraph (d)(1)(i)(A)(I) of this section
 j = type of blendstock (e.g., reformate, isomerate, alkylate, etc.)
 m_s = total types of blendstocks in season s 1990 gasoline
 T_{js} = total 1990 volume of blendstock j used in the refinery's season s gasoline
 N_s = total volume of season s gasoline produced in the refinery in 1990
 i = sample of post-1990 season s blendstock j
 n_{js} = number of samples of post-1990 season s blendstock j from continuous process streams

X_{ijs} = parameter value of sample i of post-1990 season s blendstock j
 p_{js} = number of samples of post-1990 season s batch-produced blendstock j
 V_{ijs} = volume of post-1990 batch of sample i of season s blendstock j
 SG_{ijs} = specific gravity of sample i of season s blendstock j (used only for fuel parameters measured on a weight basis)

(B) Post-1990 gasoline. Summer and winter Method 3-type gasoline data, per paragraph (c)(3) of this section, shall be evaluated separately according to the following equation:

$$X_{bs} = \sum_{g=1}^{p_s} \left(\frac{T_{gs}}{N_s} \times \frac{\sum_{i=1}^{n_{gs}} (X_{gis} \times V_{gis} \times SG_{gis})}{\sum_{i=1}^{n_{gs}} (V_{gis} \times SG_{gis})} \right)$$

where:

X_{bs} = Summer or winter baseline value of fuel parameter X for the refinery
 s = season, summer or winter, per paragraph (d)(1)(i)(A)(I) of this section
 g = separate grade of season s gasoline produced by the refinery in 1990
 p_s = total number of different grades of season s gasoline produced by the refinery in 1990
 T_{gs} = total volume of season s grade g gasoline produced in 1990
 N_s = total volume of season s gasoline produced by the refinery in 1990
 i = separate batch or shipment of post-1990 season s gasoline sampled
 n_{gs} = total number of samples of post-1990 season s grade g gasoline
 X_{gis} = parameter value of post-1990 grade g season s gasoline sample i
 V_{gis} = volume of post-1990 season s grade g gasoline sample i
 SG_{gis} = specific gravity of post-1990 season s grade g gasoline sample i (used only for

fuel parameters measured on a weight basis)

(3) *Percent evaporated determination.*

(i) Baseline E200 and E300 values shall be determined directly from actual measurement data.

(ii) If the data per paragraph (e)(3)(i) of this section are unavailable, upon petition and approval, baseline E200 and E300 values shall be determined from the following equations using the baseline T50 and T90 values, if the baseline T50 and T90 values are otherwise acceptable:

$$E200 = 147.91 - (0.49 \times T50)$$

$$E300 = 155.47 - (0.22 \times T90)$$

(4) *Oxygen in the baseline.* Baseline fuel parameter values shall be determined on both an oxygenated and non-oxygenated basis.

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(i) If baseline values are determined first on an oxygenated basis, per paragraph (e) of this section, the calculations in paragraphs (e)(4)(i) (A) through (C) of this section shall be performed to determine the value of each baseline parameter on a non-oxygenated basis.

(A) Benzene, aromatic, olefin and sulfur content shall be determined on a non-oxygenated basis according to the following equation:

$$UR = \left[BR - \left\{ \sum_{i=1}^n (OV_i \times OR_i) \right\} / 100 \right] / \left[\left\{ 100 - \sum_{i=1}^n OV_i \right\} / 100 \right]$$

where

UR = non-oxygenated RVP (baseline value)
 BR = oxygenated RVP
 i = type of oxygenate used in 1990
 n = total number of different types of oxygenates used in 1990
 OV_i = 1990 volume, as a percent of total production, of oxygenate i
 OR_i = blending RVP of oxygenate i

(C) Test data and engineering judgement shall be used to estimate T90, T50, E300 and E200 baseline values on a non-oxygenated basis. Allowances shall be made for physical dilution and distillation effects only, and not for refinery operational changes, e.g., decreased reformer severity required due to the octane value of oxygenate which would reduce aromatics.

(ii) If baseline values are determined first on a non-oxygenated basis, the

$$UV = [AV / (100 - OV)] \times 100$$

where

UV = non-oxygenated parameter value
 AV = oxygenated parameter value
 OV = 1990 oxygenate volume as a percent of total production

(B) Reid vapor pressure (RVP) shall be determined on a non-oxygenated basis according to the following equation:

calculations in paragraphs (e)(4)(ii) (A) through (C) of this section shall be performed to determine the value of each baseline parameter on an oxygenated basis.

(A) Benzene, aromatic, olefin and sulfur content shall be determined on an oxygenated basis according to the following equation:

$$AV = UV \times (100 - OV) / 100$$

where

AV = oxygenated parameter value
 UV = non-oxygenated parameter value
 OV = 1990 oxygenate volume as a percent of total production

(B) Reid vapor pressure (RVP) shall be determined on an oxygenated basis according to the following equation:

$$BR = \left\{ UR \times \left[100 - \sum_{i=1}^n (OV_i) \right] + \sum_{i=1}^n (OV_i \times OR_i) \right\} / 100$$

where

BR = oxygenated RVP
 UR = non-oxygenated RVP
 i = type of oxygenate
 n = total number of different types of oxygenates
 OV_i = 1990 volume, as a percent of total production, of oxygenate i
 OR_i = blending RVP of oxygenate i

(C) Test data and engineering judgement shall be used to estimate T90, T50, E300 and E200 baseline values on an oxygenated basis. Allowances shall be made for physical dilution and distillation effects only, and not for refinery operational changes, e.g., decreased reformer severity required due to the octane value of oxygenate which would reduce aromatics.

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(5) *Work-in-progress.* A refiner may, upon petition and approval (per §80.93), be allowed to account for work-in-progress at one or more of its refineries in 1990 in the determination of that refinery's baseline fuel parameters using Method 1, 2 or 3-type data if it meets the requirements specified in this paragraph (e)(5).

(i) Work-in-progress shall include:

(A) Refinery modification projects involving gasoline blendstock or distillate producing units which were under construction in 1990; or

(B) Refinery modification projects involving gasoline blendstock or distillate producing units which were contracted for prior to or in 1990 such that the refiner was committed to purchasing materials and constructing the project.

(ii) The modifications discussed in paragraph (e)(5)(i) of this section must have been initiated with intent of complying with a legislative or regulatory environmental requirement enacted or promulgated prior to January 1, 1991.

(iii) When comparing emissions or parameter values determined with and without the anticipated work-in-progress adjustment, at least one of the following situations results when comparing annual average baseline values per §80.90:

(A) A 2.5 percent or greater difference in exhaust benzene emissions (per §80.90); or

(B) A 2.5 percent or greater difference in total exhaust toxics emissions (per §80.90(d)); or

(C) A 2.5 percent or greater difference in NO_x emissions (per §80.90(e)); or

(D) A 10.0 percent or greater difference in sulfur values; or

(E) A 10.0 percent or greater difference in olefin values; or

(F) A 10.0 percent or greater difference in T90 values.

(iv) The requirements of paragraph (e)(5)(iii) of this section shall be determined according to the following equation:

$$\text{Percent Difference} = \frac{|\text{Unadjusted Value} - \text{Adjusted Value}|}{\text{Unadjusted Value}} \times 100$$

(v) The capital involved in the work-in-progress is at least:

(A) 10.0 percent of the refinery's depreciated book value as of the work-in-progress start-up date; or

(B) \$10 million.

(vi) Sufficient data shall have been obtained since reliable operation of the work-in-progress was achieved. Such data shall be used in the determination of the baseline value, due to the work-in-progress, of each of the fuel parameters specified in §80.91(a)(2)(i) and as verification of the effect of the work-in-progress.

(A) The baseline value, due to the work-in-progress, of each of the fuel parameters specified in §80.91(a)(2)(i) shall be used in the determination of the emissions specified in §80.90.

(B) The baseline values of sulfur, olefins and E300, due to the work-in-progress, shall be used in the deter-

mination of the emissions specified in §80.41(j)(3).

(vii) The annual average baseline values of exhaust benzene emissions, per §80.90(b) and §80.90(c), exhaust toxics emissions, per §80.90(d), and NO_x emissions, per §80.90(e), are the values resulting from the work-in-progress baseline adjustment, not to exceed the larger of:

(A) The unadjusted annual average baseline value of each emission specified in this paragraph (e)(5)(vii); or

(B) The following values:

(1) Exhaust benzene emissions, simple model, 6.77;

(2) Exhaust benzene emissions, complex model, 34.68 mg/mile;

(3) Exhaust toxics emissions, 53.20 mg/mile in Phase I, 109.7 mg/mile in Phase II;

(4) NO_x emissions, 750.1 mg/mile in Phase I, 1534. mg/mile in Phase II.

(viii) When compliance is achieved using the simple model, per § 80.41 and/or § 80.101, the baseline values of sulfur, olefins and T90 are the values resulting from the work-in-progress baseline adjustment, not to exceed the larger of:

(A) The unadjusted annual average baseline value of each fuel parameter specified in paragraph (e)(5)(viii) of this section; or

(B) The following values:

(1) Sulfur, 355 ppm;

(2) Olefins, 11.3 volume percent;

(3) T90, 349 °F; or

(C) An adjusted annual average baseline fuel parameter value for sulfur, olefins and T90 such that exhaust emissions of VOC, toxics, and NO_x do not exceed the complex model emission levels specified in paragraph (e)(5)(vii)(B) of this section. In the petition for a work-in-progress adjustment, the refiner shall specify sulfur, olefins and T90 values that meet these emission levels.

(ix) All work-in-progress adjustments must be accompanied by:

(A) Unadjusted and adjusted fuel parameters, emissions, and volumes; and

(B) A description of the current status of the work-in-progress (i.e., the refinery modification project) and the date on which normal operations were achieved; and

(C) A narrative describing the situation, the types of calculations, and the reasoning supporting the types of calculations done to determine the adjusted values.

(6) *Baseline adjustment for extenuating circumstances.* (i) Baseline adjustments may be allowed, upon petition and approval (per § 80.93), if a refinery had downtime of a gasoline blendstock producing unit for 30 days or more in 1990 due to:

(A) Unplanned, unforeseen circumstances; or

(B) Non-annual maintenance (turn-around).

(ii) Fuel parameter and volume adjustments shall be made by assuming that the downtime did not occur in 1990.

(iii) All extenuating circumstance adjustments must be accompanied by:

(A) Unadjusted and adjusted fuel parameters, emissions, and volumes; and

(B) A description of the current status of the extenuating circumstance and the date on which normal operations were achieved; and

(C) A narrative describing the situation, the types of calculations, and the reasoning supporting the types of calculations done to determine the adjusted values.

(7) *Baseline adjustments for 1990 JP-4 production.* (i) Baseline adjustments may be allowed, upon petition and approval (per § 80.93), if a refinery produced JP-4 jet fuel in 1990 and all of the following requirements are also met:

(A) Refinery type.

(1) The refinery is the only refinery of a refiner such that it cannot form an aggregate baseline with another refinery (per § 80.101(h)); or

(2) The refinery is one refinery of a multi-refinery refiner for which all of the refiner's refineries produced JP-4 in 1990; or

(3) The refinery is one refinery of a multi-refinery refiner for which not all of the refiner's refineries produced JP-4 in 1990.

(B) No refinery of a given refiner produces reformulated gasoline. If any refinery of the refiner produces reformulated gasoline at any time in a calendar year, the compliance baselines of all the refiner's refineries receiving a baseline adjustment per this paragraph (e)(7) shall revert to the unadjusted baselines of each respective refinery for that year and all subsequent years.

(C) 1990 JP-4 to gasoline ratio.

(1) For a refiner per paragraph (e)(7)(i)(A)(1) of this section, the ratio of its refinery's 1990 JP-4 production to its 1990 gasoline production must be greater than or equal to 0.15.

(2) For a refiner per paragraph (e)(7)(i)(A)(2) of this section, the ratio of each of its refinery's 1990 JP-4 production to its 1990 gasoline production must be greater than or equal to 0.15.

(3) For a refiner per paragraph (e)(7)(i)(A)(3) of this section, the ratio of the refiner's 1990 JP-4 production to its 1990 gasoline production must be greater than or equal to 0.15, when determined across all of its refineries. Such a refiner must comply with its

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anti-dumping requirements on an aggregate basis, per § 80.101(h), across all of its refineries.

(ii) Fuel parameter and volume adjustments shall be made by assuming that no JP-4 was produced in 1990.

(iii) All adjustments due to 1990 JP-4 production must be accompanied by:

(A) Unadjusted and adjusted fuel parameters, emissions, and volumes; and

(B) A narrative describing the situation, the types of calculations, and the reasoning supporting the types of calculations done to determine the adjusted values.

(8) Baseline adjustments due to increasing crude sulfur content.

(i) Baseline adjustments may be allowed, upon petition and approval (per § 80.93), if a refinery meets all of the following requirements:

(A) The refinery does not produce reformulated gasoline. If the refinery produces reformulated gasoline at any time in a calendar year, its compliance baseline shall revert to its unadjusted baseline for that year and all subsequent years;

(B) Has an unadjusted baseline sulfur value which is less than or equal to 50 parts per million (ppm);

(C) Is not aggregated with one or more other refineries (per § 80.101(h)). If a refinery which received an adjustment per this paragraph (e)(8) subsequently is included in an aggregate baseline, its compliance baseline shall revert to its unadjusted baseline for that year and all subsequent years;

(D) Can show that installation of the refinery units necessary to process higher sulfur crude oil supplies to comply with the refinery's unadjusted baseline would cost at least \$10 million or be greater than or equal to 10 percent of the depreciated book value of the refinery as of January 1, 1995;

(E) Can show that it could not reasonably or economically obtain crude oil from an alternative source that would permit it to produce conventional gasoline which would comply with its unadjusted baseline;

(F) Has experienced an increase of greater than or equal to 25 percent in the average sulfur content of the crude oil used in the production of gasoline in the refinery since 1990, calculated as follows:

$$\frac{(CSHI - CS90)}{CS90} \times 100 = CS\%CHG$$

where:

CSHI = highest annual average crude sulfur (in ppm), of the crude slates used in the production of gasoline, determined over the years 1991-1994;

CS90 = 1990 annual average crude slate sulfur (in ppm), of the crude slates used in the production of gasoline;

CS%CHG = percent change in average sulfur content of crude slate;

(G) Can show that gasoline sulfur changes are directly and solely attributable to the crude sulfur change, and not due to alterations in refinery operation nor choice of products.

(ii) The adjusted baseline sulfur value shall be the actual baseline sulfur value, in ppm, plus 100 ppm.

(iii) All adjustments made pursuant to this paragraph (e)(8) must be accompanied by:

(A) Unadjusted and adjusted fuel parameters and emissions; and

(B) A narrative describing the situation, the types of calculations, and the reasoning supporting the types of calculations done to determine the adjusted values.

(9) Baseline adjustment for low sulfur and olefins.

(i) Baseline adjustments may be allowed if a refinery meets all of the following requirements:

(A) The unadjusted annual average baseline sulfur value of the refinery is less than or equal to 30 parts per million (ppm);

(B) The unadjusted annual average baseline olefin value of the refinery is less than or equal to 1.0 percent by volume (vol%).

(ii) Adjusted baseline values.

(A) The adjusted baseline shall have an annual average sulfur value of 30 ppm, and an annual average olefin value of 1.0 vol%.

(B) The adjusted baseline shall have a summer sulfur value of 30 ppm, and a summer olefin value of 1.0 vol%.

(C) The adjusted baseline shall have a winter sulfur value of 30 ppm, and a winter olefin value of 1.0 vol%.

(f) *Baseline volume and emissions determination*—(1) *Individual baseline volume.*

(i) The individual baseline volume of a refinery described in paragraph (b)(1)(i)

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of this section shall be the larger of the total gasoline volume produced in or shipped from the refinery in 1990, excluding gasoline blendstocks and exported gasoline, and including the oxygenate volume associated with any product meeting the requirements specified in paragraph (c)(1)(ii) of this section.

(ii) Gasoline brought into the refinery in 1990 which exited the refinery, in 1990, unchanged shall not be included in determining the refinery's baseline volume.

(iii) If a refiner is allowed to adjust its baseline per paragraphs (e)(5) through (e)(7) of this section, its individual baseline volume shall be the volume determined after the adjustment.

(iv) The individual baseline volume for facilities deemed closely integrated, per paragraph (e)(1) of this section, shall be the combined 1990 gasoline production of the facilities, so long as mutual volumes are not double-counted, i.e., volumes of blendstock sent from the refinery to the blending facility should not be included in the blending facility's volume.

(v) The baseline volume of a refiner, per paragraph (b)(3) of this section, shall be the larger of the total gasoline volume produced in or shipped from the refinery in 1990, excluding gasoline blendstocks and exported gasoline.

(vi) The baseline volume of an importer, per paragraph (b)(4) of this section, shall be the total gasoline volume imported into the U.S. in 1990.

(2) *Individual baseline emissions.* (i) Individual annual average baseline emissions (per § 80.90) shall be determined for every refinery, refiner or importer, as applicable.

(ii) If the baseline fuel value for aromatics, olefins, and/or benzene (determined per paragraph (e) of this section) is higher than the high end of the valid range limits specified in § 80.42(c)(1) if compliance is being determined under the Simple Model, or in § 80.45(f)(1)(ii) if compliance is being determined under the Complex Model, then the valid range limits may be extended for conventional gasoline in the following manner:

(A) The new high end of the valid range for aromatics is determined from the following equation:

$$\text{NAROLIM} = \text{AROBASE} + 5.0 \text{ volume percent}$$

where

NAROLIM = The new high end of the valid range limit for aromatics, in volume percent

AROBASE = The seasonal baseline fuel value for aromatics, in volume percent

(B) The new high end of the valid range for olefins is determined from the following equation:

$$\text{NOLELIM} = \text{OLEBASE} + 3.0 \text{ volume percent}$$

where

NOLELIM = The new high end of the valid range limit for olefins, in volume percent

OLEBASE = The seasonal baseline fuel value for olefins, in volume percent

(C) The new high end of the valid range for benzene is determined from the following equation:

$$\text{NBENLIM} = \text{BENBASE} + 0.5 \text{ volume percent}$$

where

NBENLIM = The new high end of the valid range limit for benzene, in volume percent

BENBASE = The seasonal baseline fuel value for benzene, in volume percent

(D) The extension of the valid range is limited to the applicable summer or winter season in which the baseline fuel values for aromatics, olefins, and/or benzene exceed the high end of the valid range as described in paragraph (f)(2)(ii) of this section. Also, the extension of the valid range is limited to use by the refiner whose baseline value for aromatics, olefins, and/or benzene was higher than the valid range limits as described in paragraph (f)(2)(ii) of this section.

(E) Any extension of the Simple Model valid range limits is applicable only to the Simple Model. Likewise any extension of the Complex Model valid range limits is applicable only to the Complex Model.

(F) The valid range extensions calculated in paragraphs (f)(2)(ii)(A), (B), and (C) of this section are applicable to both the baseline fuel and target fuel for the purposes of determining the compliance status of conventional gasolines. The extended valid range limit represents the maximum value for that parameter above which fuels cannot be

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evaluated with the applicable compliance model.

(G) Under the Simple Model, baseline and compliance calculations shall subscribe to the following limitations:

(1) If the aromatics valid range has been extended per paragraph (f)(2)(ii)(A) of this section, an aromatics value equal to the high end of the valid range specified in § 80.42(c)(1) shall be used for the purposes of calculating the exhaust benzene fraction.

(2) If the fuel benzene valid range has been extended per paragraph (f)(2)(ii)(C) of this section, a benzene value equal to the high end of the valid range specified in § 80.42(c)(1) shall be used for the purposes of calculating the exhaust benzene fraction.

(H) Under the Complex Model, baseline and compliance calculations shall subscribe to the following limitations:

(1) If the aromatics valid range has been extended per paragraph (f)(2)(ii)(A) of this section, an aromatics value equal to the high end of the valid range specified in § 80.45(f)(1)(ii) shall be used for the purposes of calculating emissions performances.

(2) If the olefins valid range has been extended per paragraph (f)(2)(ii)(B) of this section, an olefins value equal to the high end of the valid range specified in § 80.45(f)(1)(ii) shall be used for the target fuel for the purposes of calculating emissions performances.

(3) If the benzene valid range has been extended per paragraph (f)(2)(ii)(C) of this section, a benzene value equal to the high end of the valid range specified in § 80.45(f)(1)(ii) shall be used for the target fuel for the purposes of calculating emissions performances.

EDITORIAL NOTE: At 62 FR 68207, Dec. 31, 1997, § 80.91 was amended by adding paragraph (f)(2)(ii); however, (f)(2)(ii) already exists. The recently added subparagraph appears below.

(ii) [Reserved]

(iii) Facilities deemed closely integrated, per paragraph (e)(1) of this section, shall have a single set of annual average individual baseline emissions.

(iv) Aggregate baselines (per § 80.101(h)) must have the NO_x emissions of all refineries in the aggregate determined on the same basis, using ei-

ther oxygenated or non-oxygenated baseline fuel parameters.

(3) *Geographic considerations requiring individual conventional gasoline compliance baselines.* (i) Anyone may petition EPA to establish separate baselines for refineries located in and providing conventional gasoline to an area with a limited gasoline distribution system if it can show that the area is experiencing increased toxics emissions due to an ozone nonattainment area opting into the reformulated gasoline program pursuant to section 211(k)(6) of the Act.

(ii) If EPA agrees with the finding of paragraph (f)(4)(i) of this section, it shall require that the baselines of such refineries be separate from refineries not located in the area.

(iii) If two (2) or more of a refiner's refineries are located in the geographic area of concern, the refiner may aggregate the baseline emissions and sulfur, olefin and T90 values of the refineries or have an individual baseline for one or more of the refineries, per paragraph (f)(3) of this section.

(4) *Baseline recalculations.* Aggregate baseline exhaust emissions (per § 80.90) and baseline sulfur, olefin and T90 values and aggregate baseline volumes shall be recalculated under the following circumstances:

(i) A refinery included in an aggregate baseline is entirely shutdown. If the shutdown refinery was part of an aggregate baseline, the aggregate baseline emissions, aggregate baseline sulfur, olefin and T90 values and aggregate volume shall be recalculated to account for the removal of the shutdown refinery's contributions to the aggregate baseline.

(ii) A refinery exchanges owners.

(A) All aggregate baselines affected by the exchange shall be recalculated to reflect the addition or subtraction of the baseline exhaust emissions, sulfur, olefin and T90 values and volumes of that refinery.

(B) The new owner may elect to establish an individual baseline for the refinery or to include it in an aggregate baseline.

(C) If the refinery was part of an aggregate of three or more refineries, the remaining refineries in the aggregate from which that refinery was removed

will have a new aggregate baseline. If the refinery was part of an aggregate of only two refineries, the remaining refinery will have an individual baseline.

(g) *Inability to meet the requirements of this section.* If a refiner or importer is unable to comply with one or more of the requirements specified in paragraphs (a) through (f) of this section, it may, upon petition and approval, accommodate the lack of compliance in a reasonable, logical, technically sound manner, considering the appropriateness of the alternative. A narrative of the situation, as well as any calculations and results determined, must be documented.

[59 FR 7860, Feb. 16, 1994, as amended at 59 FR 36966, July 20, 1994; 60 FR 6032, Feb. 1, 1995; 60 FR 40008, Aug. 4, 1995; 62 FR 9883, Mar. 4, 1997; 62 FR 68207, Dec. 31, 1997; 67 FR 8737, Feb. 26, 2002]

EDITORIAL NOTE: At 62 FR 68207, Dec. 31, 1997, § 80.91 was amended by revising paragraph (e)(1)(iii); however, (e)(1)(iii) did not exist in the 1997 edition of this volume.

§ 80.92 Baseline auditor requirements.

(a) *General requirements.* (1) Each refiner or importer is required to have its individual baseline determination methodology, resulting baseline fuel parameter, volume and emissions values verified by an auditor which meets the requirements described in this section. A refiner or importer which has the anti-dumping statutory baseline as its individual baseline is exempt from this requirement.

(2) An auditor may be an individual or organization, and may utilize contractors and subcontractors to assist in the verification of a baseline.

(3) If an auditor is an organization, one or more persons shall be designated as primary analyst(s). The primary analyst(s) shall meet the requirements described in paragraphs (c) (2) and (3) of this section and shall be responsible for the baseline audit per paragraph (f) of this section.

(b) *Independence.* The auditor, its contractors, subcontractors and their organizations shall be independent of the submitting organization. All of the criteria listed in paragraphs (b) (1) and (2) of this section must be met by every individual involved in substantive aspects of the baseline verification.

(1) *Previous employment criteria.* (i) None of the auditing personnel, including any contractor or subcontractor personnel, involved in the baseline verification for a refiner or importer shall have been employed by the refiner or importer at any time during the three (3) years preceding the date of hire of the auditor by the refiner or importer for baseline verification purposes.

(ii) Auditor personnel may have been a contractor or subcontractor to the refiner or importer, as long as all other criteria listed in this section are met.

(iii) Auditor personnel may also have developed the baseline of the refiner or importer whose baseline they are auditing, but not as an employee (per paragraph (b)(1)(i) of this section). Those involved only in the development of the baseline of the refiner or importer need not meet the requirements specified in this section.

(2) *Financial criteria.* Neither the primary analyst, nor the auditing organization nor any organization or individual which may be contracted or subcontracted to supply baseline verification expertise shall:

(i) Have received more than one quarter of its revenue from the refiner or importer during the year prior to the date of hire of the auditor by the refiner or importer for auditing purposes. Income received from the refiner or importer to develop the baseline being audited is excepted; nor

(ii) Have a total of more than 10 percent of its net worth with the refiner or importer; nor

(iii) Receive compensation for the audit which is dependent on the outcome of the audit.

(c) *Technical ability.* All of the following criteria must be met by the auditor in order to demonstrate its technical capability to perform the baseline audit:

(1) The auditor shall be technically capable of evaluating a baseline determination. It shall have personnel familiar with petroleum refining processes, including associated computational procedures, methods of product analysis and economics, and expertise in conducting the auditing process, including skills for effective data gathering and analysis.