BACKGROUND DOCUMENT

SECTION 4.7 TANK AND DRUM CLEANING

1.0 INTRODUCTION

The only document available for use in writing AP-42 Section 4.7, "Tank and Drum Cleaning," was Monsanto Research Corporation's Source Assessment: Rail Tank Car, Tank Truck, and Drum Cleaning - State of the Art (Reference 1).

2.0 TANK CAR AND TRUCK CLEANING EMISSIONS

With the exception of the emission factors for drum burning, Table 4.7-1 of Section 4.7 exactly reproduces Table 12 of Reference 1. The only explanation of the origin of the emission measurements from tank car and truck cleaning that appear in this table consists of the following text (Reference 1, p. 21):

> In order to achieve a practical, but representative, picture of these emissions, the organic chemicals hauled by the carriers were broken down into classes characterized by high, medium, and low viscosities and by high, medium, and low vapor pressures... After the classes of chemicals had been established, the selection of the particular chemical to be sampled for was dictated by the specific materials which were being cleaned during the sampling visits.

3.0 DRUM BURNING EMISSIONS

3.1 PARTICULATES

The emission factor for particulates from drum burning was derived by dividing the total emissions for each state listed in Table 17 of Reference 1 (in metric tons per year) by the number

of barrels burned annually in that state. In each case, a factor of approximately 12 grams per drum was obtained. This agrees with the factor obtained by dividing total emissions nationwide (119.6 metric tons per year) by total barrels burned (10.1 million).

The emission factor of 12 grams of particulate per drum burned is also calculated in Appendix A of Reference 1. This appendix states that the particulate emission factor for auto incineration with an afterburner is 0.68 kilograms per car, based on ~~112~~ kilograms of combustible material (CM) on a stripped car body (refer to AP-42, p. 2.2-1). Assuming 2 kilograms of combustible material per drum (refer to AP-40, p. 508) gives:

$$E_p = \frac{0.68 \text{ kg}}{\text{car}} \cdot \frac{\text{car}}{112 \text{ kg CM}} \cdot \frac{2 \text{ kg CM}}{\text{drum}}$$

$$= 0.012 \text{ kg/drum}$$

$$= 12 \text{ g/drum}$$

Performing this calculation using the particulate emission factor for uncontrolled auto incineration, namely 0.9 kilograms per car (refer to AP-42, p. 2.2-1), yields an emission factor of 16 grams of particulate per drum burned. The smaller value of 12 grams per drum was included in Table 4.7-1, however, because it is based on data from actual drum burning.

3.2 NITROGEN OXIDES

Employing the nitrogen oxides emission factor for auto incineration with an afterburner of 0.01 kilograms per car (refer to AP-42, p. 2.2-1), Appendix A of Reference 1 gives the following factor for NO_x emissions from drum burning:

$$E_{NO_x} = \frac{0.01 \text{ kg}}{\text{car}} \cdot \frac{\text{car}}{112 \text{ kg CM}} \cdot \frac{2 \text{ kg CM}}{\text{drum}}$$

$$= 1.8 \times 10^{-4} \text{ kg/drum}$$

$$= 0.018 \text{ g/drum}$$

But use of the NO_x emission factor for uncontrolled auto incineration of 0.05 kilograms per car (refer to AP-42, p. 2.2-1) yields a factor of 0.89 grams of NO_x emitted per drum burned. It is this uncontrolled emission rate that appears in Table 4.7-1.

It was not within the scope of the work assignment to examine the source documents used by the authors of Reference 1 or to contact them for the details of their sampling visits to tank car and truck cleaning operations.