Response to Comment on "Environmental Assessment of Used Oil Management Methods"

Our paper (*1*) presents a balanced life-cycle comparison of used oil management methods in California based on the assumption of no air pollution control for heavy metals from used oil fuel combustion. The goal of the paper was for readers to become more aware of the potential for environmental harm considering the large scale of the used oil management system and specific management methods employed. The California focus of the study and the assumption of no emissions control are clearly noted in the paper. Extending the paper's results to the United States does require knowledge of the uses of used oil derived fuels in the United States. One should ascertain the level of air pollution control before drawing conclusions. It is clear from the paper that heavy metal emissions would need to be over 99% controlled before the management methods become equivalent from the life-cycle assessment perspective.

Extension to the United States was not made in the paper even though fuel use, re-refining, and distillation management methods comprise the same relative proportions in the United States as in California. The paper could have reviewed the used oil fired systems currently used in the United States; however, there are very few facilities in California burning used oil derived fuels. According to the API, asphalt plants are the leading consumers of used oil fuels in the United States (*2*). These facilities as well as kilns and blast furnaces may provide adequate air pollution control; however, these facilities were not studied. No end users of used oil fuels were modeled because the majority of California generated used oil is shipped overseas. The end use of that used oil fuel and the extent of air pollution control is unknown. The assumption of no emissions control for California generated used oil fuels was made to provide context of scale to help determine if the magnitude should be of concern. By shipping used oil fuel offshore, any control over the ultimate use is lost, and we may have to live with the resulting emissions impacts. Hence, the context of the potential scale of the net emissions becomes very important. Because of the California focus, the paper does not provide a context of scale for the United States.

The assessment *was* done using the characteristics of the combined California used oil waste stream. Data for fuel oil cutter stock shipped from permitted facilities in 2002 to the fuel market were used for modeling the fuel management method. Hence, the data used are also up to date in reference to the reformulations in motor oil cited by Gressell (*3*). Also, *only* California data were used in the assessment. The Vermont study presented emissions data from the use of crankcase oils in small used-oil fired heating systems and was only used to substantiate levels of heavy metal emissions from uncontrolled units (*4*). The paper draws a clear distinction between the Vermont and the California mixed used oil characteristics (see Table 2 in ref *1*).

Whether the emissions of a given technology are within given regulatory limits is immaterial to the conclusions of the paper. The authors did not seek to review the adequacy of regulatory oversight for used oil fuel combustion. It is important to note that some impacts included in LCA (such as climate change) are not captured in the current regulatory system. Also, externalities may account for a significant amount of the overall impacts from a given management method. Using LCA methodology allows one to look beyond facility boundaries and account for the complete impact of a management method. It also allows one to compare management methods on a balanced and holistic perspective. Given 99% emissions control at large facilities, consuming used oil as fuel may not be a benign process from this overall perspective. Hazardous or not, the impacts from management and disposal of fly ash and baghouse ash or other wastes could be significant but were not included in the paper.

According to API, over 110 million gal of used oil is consumed as fuel in small used oil fired heating systems each year in the United States (*2*). If the heavy metal emissions are 50% controlled for these units as Gressel states, the combined emissions of zinc from these units would be over 200 ton per year. For context, that amount equates to nearly 7% of the total zinc air emissions in the United States according to the U.S. EPA's Toxics Release Inventory (*5*) for 2001. These emissions coming from the 75 000 used oil fired heating systems in use today (*2*) would be dispersed over very large areas, primarily the northern half of the continental United States. We believe that an important function of the used oil management system is to ensure that the disposition of used oil leads to the lowest environmental and human health impacts. Considering the results of the Vermont study and our paper, the cumulative impacts on the environment from the large volumes of used oil managed today should be of great concern.

The conclusions reached herein are those of the authors and do not necessarily represent those of the State of California.

Literature Cited

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