

EXECUTIVE SUMMARY

STUDY TO DETERMINE THE FATE OF BENZENE PRECURSORS IN GASOLINE

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Exhaust emissions from five late model vehicles were measured to determine the effect of aromatic fuel components on benzene emissions. The purpose of the work was to determine if there are any fuel components that are major sources of benzene emissions. Reducing content of such components in the fuel could then be a means of reducing benzene levels in ambient air. Analyses of engine-out (before catalyst) and tailpipe-out (after catalyst) exhaust emissions were made to determine catalyst efficiency for reducing benzene emissions.

The results showed that all of the aromatic components included in this study were sources of benzene emissions. Benzene (in fuel) had a much greater effect on benzene emissions than did the other aromatic species on an equal volume basis. On average, the effect of the non-benzene aromatics (toluene, ethyl benzene, xylenes, and C₉+ aromatics) relative to that of benzene was about 0.08. The effect of ethyl benzene was not statistically significant.

Benzene reduction efficiency of the exhaust catalysts was about the same as total hydrocarbon reduction efficiency. Benzene emissions were reduced by 70 to 95% by the emission control system.

Equations relating benzene emissions to gasoline composition were developed using the results of this study. Although the equations did not accurately predict the absolute level of benzene emissions, they did reasonably well predict changes in benzene emission rates with changes in fuel composition. For the type of vehicles used in this study, the predictive equations can be used to estimate changes in benzene emissions as a function of changes in gasoline composition.

Recommendations

Determine the effects of other potential benzene precursors on benzene emissions. Specifically, measure the effects of naphthenes and olefins in gasoline on exhaust emissions of benzene.