Technology and Marketing Consultant
Wolf H. Koch, Ph.D.

The new math in vehicle refueling emissions (1+1≠2)

As often happens in the strange world of politics and special interests, common sense becomes the overlooked ingredient in a compromise solution. For more than two decades, the oil and auto industries have fought over the best way to recover vehicle refueling emissions. Oil companies argued that vehicles were the best place, especially since they already included provisions for evaporative emissions, while auto makers claimed that vehicular systems would be a safety hazard and refueling vapors should be captured at the service station.

When more equals less–While Stage II vapor recovery has been with us for two decades in California and three years in other non-attainment areas, vehicular vapor recovery will be introduced in a year, starting with the 1998 models. The irony is that the two systems operating together will be less effective than either system alone.

The Clean Air Act Amendments (CAAA) of 1990 required all states with non-attainment areas to file State Implementation Plans (SIPs) that included Stage II requirements. While implementation was phased in over 24 months, most stations required conversion to Stage II by November 1993. Of the two Stage II system types available (balance and assist), the great majority of conversions have been made to assist systems.

The implementation of vehicle Onboard Refueling Vapor Recovery (ORVR) is also required by CAAA, with the stipulation that safety concerns must be properly addressed. The National Highway Traffic Safety Administration (NHTSA) has deemed onboard systems to be safe, prompting the EPA to issue an implementation schedule for cars at 40 percent, 80 percent and 100 percent for the 1998, 1999 and 2000 model years, followed by light and heavier trucks between 2001 and 2006.

While most readers are familiar with Stage II technology, few have probably seen ORVR system designs. (See the May/June issue for my brief description of a patent of one ORVR design, page 42-43.)

System backfire–A major problem that has arisen is that assist systems are returning air to the underground tank instead of vapors from the vehicle tanks. The air becomes saturated with volatile organic compounds (VOCs), grows in volume and causes fugitive emissions. CARB has projected a worst-case scenario in which the returned air completely saturates and results in fugitive emissions at about 35 percent. Other studies project that this worst case is unlikely, and estimate additional emissions of between 2 and 10 percent.

While NHTSA has studied the safety of ORVR systems as part of the vehicle, recent data show that vapors in the fill pipe of ORVR cars, and in the underground tank, may be in the flammable range. Since air in the underground tank traverses through the flammable envelope as it saturates with hydrocarbons, a potential hazard exists; one which occurs constantly at every uncontrolled station. Flammable-range vapors in the vehicle fill pipe, on the other hand, must be addressed through proper designs that ensure electrical conductivity and eliminate potential static discharges.

Solving the problem–It is to this industry's credit that all stakeholders have been working hard with CARB to resolve all issues. CARB has formed four industry-wide committees, which include the automakers, API, PEI, regulators and equipment manufacturers. The committees are addressing safety, emissions, equipment compatibility and cost-effectiveness. CARB management has stated that the desired goal is a solution rather than a Band-Aid.

Most dispenser manufacturers have been working on proprietary solutions for modifying their dispensers. Other add-on devices address vent emissions and include membrane separators and thermal vent processors (burners). Final implementation of all solutions will need to be preceded by extensive testing, and will require CARB certification.

Expensive duplication–Our political and regulatory processes have given the consumer another double whammy: we will pay twice, plus some, for removing the same pollutants. While estimates vary substantially, Stage II costs have averaged about $3,500 per ton VOC and ORVR will run between $400-$900 per ton, with costs depending on the life of the vehicle and tax effects. While costs for dispenser retrofits or vent processors have not yet been announced, I estimate that they will range between $10,000 and $20,000 for an average station. I am unable to express these costs in terms of VOC reductions since they do not reduce real emissions.

Washington's follies, however, have resulted in a much improved relationship between our industry and CARB. Together, we are developing effective, practical solutions.

Wolf Koch is President and founder of Technology Resources International, Inc. in Batavia, Illinois. He provides services in technology planning, product development and testing and litigation support. He is an expert in retail service station technology, product distribution and natural gas vehicles and associated fueling systems.

Circle Reader Inquiry 27