CHAPTER 5

Conclusions and recommendations

VOC controls can take many forms and the type of control method used will be determined by the characteristics of the VOC emissions. Minimisation techniques, such as the lowering of RVP, can be implemented but only to a certain degree, as there is a lower limit with regard to petrol volatility. Vapour recovery is the preferred technique for the control of VOC emissions from petrol storage and distribution systems. This also has the added advantage of monetary savings from recovered petrol vapour. There are various VOC treatment techniques, but this must only be used in situations were other control options are not viable.

The analytical VOC concentration results obtained from samples 1 to 4 were very low compared to literature values, but the average molecular weight for these samples were high compared to the European value. This was because the thermal tubes used for sampling were good at adsorping heavier hydrocarbons (VOCs) but not as effective for lower molecular weight VOCs. Thermal tubes are also commonly used to sample ambient air samples, therefore at much lower concentrations, and it was found that the breakthrough of these tubes could explain the low results.

The VOC concentration results from the analysis on the glass samples (samples 5 to 8) were higher, but still low compared to literature values. The average molecular weight of these samples were, however, in the same range as the European value. The VOC concentration could not be determined accurately as the samples were taken from the vapour header where the relevant composite sample of different vapours from the different tankers were measured and the preloading vapour specifics (petrol, diesel or kerosene) were unknown. The results from the sample analysis were much lower than expected and it was

concluded that the vapour samples contained mixtures of petrol and other fuel vapour (such as diesel), where the VOC concentration of the diesel vapour were known to be much lower.

The theoretical and experimental results in Chapter 4 show that the filling emission (expressed as a percentage of the volume petrol loaded) from the Engen facility was in the order of 0,08% compared to the value of 0,05% derived for European conditions. This can mainly be ascribed to the higher temperatures of the petrol loaded at the Engen facility and the relatively high RVP.

The main operational problem was the overfilling of the road tankers due to overfill sensors not working. This resulted in the wastage of liquid product. For vapour recovery to work effectively and efficiently, the equipment supporting it, must also be in good working order. The use of the vapour collection equipment by the road tanker drivers was generally good. The control of VOC emissions must be approached holistically and the people using the collection equipment must be informed of the benefits of the system. As the road tankers are not usually the property of the facilities, in this case the Engen facility, the owners of these tankers must ensure that they are in good working order. This must be enforced by the management of the facility.

Although there are guidelines with regard to fugitive VOC emissions, that includes emissions from the storage and distribution of petrol in South Africa, there is no legislation governing the control measures that must be implemented to minimise these emissions. Air pollution issues are, however, becoming more important with the possibility of new air pollution legislation. Internationally vapour recovery has been included in legislation, and it is expected that this will also be the case in South Africa in the future. Bulk storage and loading facilities are coming under increased pressure to control emissions as they are situated close to communities. When the new air quality legislation comes into force, the standards set out in the legislation will determine the emission control measures that will be taken by various industries. The degree of enforcement of the new

legislation will also determine the rate at which control measures, such as vapour recovery systems, will be implemented.

The VOC emissions from the filling of road tankers only form part of emissions from the total storage and distribution system. As stated in Chapter 2 the total emissions are equal to 0,56% under European conditions. The results in Chapter 4 show that the filling emission was higher than the European value and therefore it can be concluded that VOC emissions at all the other stages of storage and distribution will also be higher, and therefore the total emission will be higher than the 0,56% stated for Europe.

It is recommended that additional vapour samples from the road tankers loading petrol and diesel respectively, must be analysed to determine the VOC concentrations of both. Other recommendations with regard to future studies are as follows:

- determine the experimental VOC emissions from Stage Ib operations;
- compare VOC vapour concentrations for vapour from diesel and other heavier fuels with that of petrol;
- determine the vapour collection efficiency at the facility and the possibility of improvements that could be made; and
- investigate the development of regulations to enforce the use of vapour recovery systems.

The following actions are recommended for the general control of VOC emissions at the Engen facility:

- ensure that the overfill sensors on the road tankers are in working order and enforce this by not allowing tankers to load if this is not the case;
- train road tanker driver and facility personnel on the benefits of the vapour recovery system with regard to their health and wellbeing; and
- lower the RVP during the warmer months in South Africa to minimise VOC emissions.