EXECUTIVE SUMMARY

South Africa has four oil refineries processing approximately 19 million metric tons of crude oil per year, and two synfuel refineries processing 9 million "equivalent" tons per year. The oil re-refining industry is estimated to process 120 000 tons per year.

Using the year 1995 as a snapshot of the industry, the objectives of this project were to determine in the oil refining and re-refining industry:

* the volumes of water intake and discharge
* a breakdown of water use
* pollutant loads in the effluent generated

Using this data, recommendations were made for water and wastewater management in the oil refining and re-refining industry. The survey covered three crude oil refineries and one synthetic fuel refinery. In addition four re-refineries were surveyed.

Refineries in South Africa have a range of Specific Water Intake (SWI) between 0.51 and 0.67 m^3/t crude. The synfuel refinery has an average SWI of 2.90 m^3/t. The re-refineries showed much greater variation and have a range of SWIs between 0.06 and 7.20 m^3/t. For the crude refineries there is no clear correlation between refinery size and SWI. For the re-refineries the type of process used strongly influences the SWI.

The largest users of water in the oil refining industry are the boilers and cooling water circuits. Water saving measures in these areas will lead to more significant reduction in SWI values as compared to that which would be obtained by reducing the wash water used in the desalter.

It was found that for the crude refining industry the average Specific Effluent Volume (SEV) is 0.26 m^3/t crude, for the synthetic fuel refinery it is 1.32 m^3/t feed and for the re-refining industry it ranges between 0.13 and 5.76 m^3/t feed. For the crude refining industry the waste water discharged is approximately 46% of the water intake, whilst for the re-refining industry this can exceed 100%. The re-refining industry takes in large volumes of water together with their feedstock and this is subsequently discharged in the effluent. The synthetic fuel refinery also discharges 46% of its water intake as effluent.

The Specific Pollutant Load (SPL) for oil ranges between 2.5 and 4.7 g/t for the crude refining industry, 4.5 g/t for the synthetic fuel refinery and 110 g/t for the re-refineries. Despite the synthetic fuel process being inherently water intensive, their SPL for oil is comparable to the crude refining industry.

Recommendations for reducing pollution loads are given. These include aspects in the primary and secondary treatment of the effluent, the segregation of clean and dirty surface run-off, the segregation of different effluent streams, the reduction/limitation of surface water run-off, the reduction in volumes of process water requiring treatment and consideration of clean technologies.