

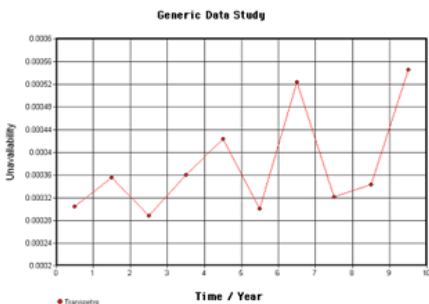
## Crude Oil Terminal and Pipeline Transportation Network Availability, Reliability and Maintainability (ARM) Study Transpetro

Transpetro is the wholly owned subsidiary of the Brazilian state oil company Petrobras. The company is responsible for operation and maintenance of the crude oil and products infrastructure (terminals and pipelines) network in Brazil. Transpetro commissioned Entec to undertake an availability, reliability and maintainability (ARM) study of the TEBAR-OSVAT crude oil transportation network. This network handles 50% of the Brazilian national import of crude oil and consequently it is strategically very important for the company as well as the country.

Crude oil is imported from the Campos Basin in the southern Atlantic Ocean to the Terminal Admiral Barossa (TEBAR). The terminal at Saõ Sebastião has over 20 crude oil storage tanks each having a capacity of 80,000m<sup>3</sup> and it is strategically one of the most important both for Transpetro and for the country. One of the functions of the terminal is to transfer the crude oil along 275km of the OSVAT system pipelines to the refineries at REVAP and REPLAN.



### Assessing crude oil infrastructure in Brazil



The study was to investigate the current system configuration and alternative configurations for optimisation and evaluate them for their impact on reliability, availability and cost/benefit ratio. The study investigated international performance and benchmarks against Transpetro system performance. To allow this to be undertaken a database of generic failure rates was compiled. Failure rates for pipelines were included as a Weibull probability of failure distribution.

The reliability software AvSim+ was used to build a reliability block diagram of the whole network. Key inputs to the blocks are the failure rate data of individual components including mean time to fail (MTTF) and mean time to repair (MTTR).

The study identified some important features of the system including some common cause failures that have the

potential to shut down the network.

The study was able to determine the impact of these failures and what increased reliability can be obtained from the system if improvements were made. It was able to compare the costs and benefits of different options. The study evaluated the use of additional pumps to increase the system capacity, as well as duplication of some key equipment items that were less expensive.

The reliability model developed allowed an evaluation of the current and potential future performance of the system using different configurations. The approach allows a critical assessment of the system and provides an important element into the decision making process for upgrading and future assessment of the terminal and pipeline network.

