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# Synopsis

# Introduction

During my vacation work I was placed at the Kwa-Zulu Natal branch of Tolplan Operations Ltd (TPO) situated in Village Park, Kloof. Here I was an assistant to the Resident Electronic Engineer, Mr Seekandar Mahomed.

TPO is a consulting firm whose main business in South Africa is for SANRAL. TPO’s main focus is to ensure that the toll system is running smoothly and report back and forth between their Client (SANRAL) and their many contractors (Tolcon, Intertoll , SceniVision, etc.). SANRAL contracts companies such as Tolplan Operations Ltd (TPO) to mediate the development, operations and maintenance of these Toll systems. Tolplan has been responsible for the following services at more than 30 mainline and 40 ramp toll plazas in South Africa, Hungary, Greece, Malaysia, Brazil, Mozambique, Swaziland and New Zealand.

The company’s core members consist of one managing director, four directors, five technical directors and eight associates. Their qualifications range from civil, electronic, electrical engineering and transportation to project and business management. Due to the nature of work done and the separate duties of the employees the company has a fairly linear structure between directors and associates. Major decisions are taken in consultation with directors, associates, the client (SANRAL), and the various operators.

Mr Seekandar Mahomed, the resident engineer and an associate, is in charge of the N2 north tolls up to Mvoti and the N2 south and Mariannhill.

Toll Systems rely heavily on electronic systems to carry out processes and therefore TPO requires a residential electronic engineer. The duties of the resident electronic engineer begins with converting the client’s (SANRAL) requirements into high-level specifications for the tender documents. Later he/she assess tenders received with a team to decide the tender awardee. Once awarded it becomes the engineer’s job to approve, over-see the designing, restrictions and implementation of the proposed system and award fees when milestones are achieved. These systems implemented are property of the client (SANRAL) therefore it becomes TPO’s (the resident engineer’s) responsibility to inspect and report the condition and functionality of these systems. Finally at the end of the contract period a comprehensive asset register is to be complied for the client in preparation for the next contractor and hence the cycle repeats from the beginning.

While at Tolplan Operations I was fortunate to be exposed to the intricate infrastructure that is not noticed when driving through a toll plaza. During my work period I received first-hand experience working with many electronic systems. These include the Automated Vehicle Classification (AVC) controller which use treadle sensors to determine the classification of a vehicle in terms of number of axles. The Toll Collector Computer (TCC) used for classification of vehicles by the toll collector. As well as Intelligent Transport System (ITS) which marries multiple sectors such as transportation engineering, financial analysis, electronic engineering and information technology to provide a comprehensive free flowing toll system.

Working as an assistant to a consulting engineer has made me realise that the scope of work done by an engineer in industry does not confine to the qualification that has been attained. As an engineer you have to be able to quickly adapt to fields outside your specific degree and have a holistic approach to each task. Engineers must also be able to adapt to working with financial and managerial situations.

# Outline of work

My First task was to familiarize myself with the toll industry, how it operates and the different systems and measures involved by reading the tender documents.

I then went on to compile Bi-monthly “Toll operations and maintenance” reports for the N2 North, N2 South and Mariannhill Toll Plazas. I was responsible for documenting events and their progress at each of the toll plazas for the client (South African National Road Agency Ltd). This helped me understand the practical workings of the terminologies and terms and conditions I read in the tender documents.

Due to logistical reasons all of my duties out of office duties were at the Mariannhill Toll Plaza on the N3 route in Pinetown.

This toll consists of eighteen lanes. There are eight South Bound, 8 North Bound and two emergency lanes. Each direction has a dedicated eTag lane known as the “Shesha” Lane and an automated accepts cards only. The rest are manual lanes were a toll operator collects payment.

The Mariannhill contract was awarded to the Tolcon Group. Their duties includes operation of toll plaza facilities and comprises traffic management - including all systems and maintenance of the plaza building and lane area. In addition, tolling design, supply, installation and maintenance is included.

Scenivision (Pty) Ltd is a South African based toll system designer, supplier, integrator & maintainer. Scenivision’s core business is developing systems tailored to the needs of each toll operation as well as maintaining them. They are a sub company of Tolcon.

The operation at the toll plaza is to collect payment as accurately as possible. When a vehicle drives into a manual lane the toll operator classifies the vehicle based on the number of axles and wheels as per the government gazette (Apendx it). The collector selects the class on the Toll Collector Computer (TCC). This is specially designed computer that’s allows for classification of a vehicle, processes the payment, controls traffic light for the land and boom gate which also comprises of a height sensor. While this takes place a system specially designed by Scenivision to determine the class of a vehicle is in operation name Automated Vehicle Classification (AVC). The AVC uses an entry loop, axle detector, double wheel detector and exit loop to identify the class. The axle detector uses a horizontal treadle sensors and counts each axle as a pulse. Double wheel detectors make use of two treadle sensors placed diagonally in a “V” shape. The AVC is a security measure to prevent fraud. Along with the AVC cameras are placed in each lane. All this information is then transferred to the “Back Office” which is in the control room of the main building and later transferted to the Intelligent Transport System (ITS).

The Toll plaza and assets are divided into subsections. “Civil, Build, Structure”, “Computer Equipment (Hardware)”,”Computer Equipment (Software)” and ”Electrical and Mechanical”. These are further split into sub sections “Lane” and “Building” except for “Electrical and Mechanical” which is general for the whole plaza.

I was given the responsibility of inspecting the condition of all the assets that fell under the “Computer Equipment (Hardware)”, “Computer Equipment (Software)” and “Electrical and Mechanical” Categories. The results of my inspection was documented and then sent to the client and operator.

The contract period at Mariannhill had been completed and therefore an asset register had to be complied for the client. It became my responsibility to verify the assets at the plaza and snag any issues. From this an updated asset register was compiled and handed to the client and operator.

# Details of work

Tolling is an essential tool used by South African National Road Agency Ltd (SANRAL) to generate funds. These funds allows for maintaining and building of infrastructure on South African roads efficiently. SANRAL contracts companies such as Tolplan Operations Ltd (TPO) to mediate the development, operations and maintenance of these Toll systems. Tolplan has been responsible for the following services at more than 30 mainline and 40 ramp toll plazas in South Africa, Hungary, Greece, Malaysia, Brazil, Mozambique, Swaziland and New Zealand.

Tolplans duties include:

* Drawing up high level System requirements and tender documents that the Operator needs to fulfil.
* Tender documents and tender Adjudication
* Evaluating and testing low level designs solutions for the required system.
* Evaluating and testing the implantation of the system.
* Monitoring the operation of the toll plaza and other assets of the client(SANRAL)
* Awarding of milestone and operational fees as well as penalties when conditions of the tender documents have been violated.
* System and forensic audits
* Overall project management