

**REDUCING THE POTENTIAL FOR ACCIDENTS AND THE
ASSOCIATED ENVIRONMENTAL IMPACTS ARISING FROM
ROAD TANKERS TRANSPORTING PETRO-CHEMICAL
SUBSTANCES**

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ABSTRACT

Petroleum products, which are required to keep the `wheels` of industry and commerce turning, are distributed from the various refineries to their destinations throughout the country on a daily basis and the mode and extent of transportation or conveyance of these products is varied. This distribution activity predominantly takes place by means of road tanker, pipeline as well as rail tanker and quantities during transit could vary from a few hundred litres to many thousands of litres per trip.

Road tanker transportation is considered to be the most vulnerable form of distribution means and this poses a high risk in terms of the potential for being involved in an accident.

The risk potential associated with the road transportation of these fuels, from an environmental point of view, is aggravated due to:

- The conveyance of bulk loads,
- non-roadworthiness of many vehicles,
- inconsistency in vehicle condition checking systems and in the application of safety systems,
- poor road conditions,
- driver fatigue,
- hi-jacking threats,
- the level of incompetence or unsuitability of drivers,
- the inconsistency in driver training programs,
- the vulnerability of the tankers being subject to collision and accidents.

The potential exists for road tankers involved in accidents to leak or spill large quantities of petroleum products which in turn could result in catastrophic environmental consequences (such as leaking large quantities of fuel into sewers, plantations, rivers and streams thus causing much ground and water pollution). Also, during an accident the fuel leaking from a road tanker may ignite causing it to burn for several hours before it is finally brought under control and extinguished. This may result in much air pollution as well as damage to the surrounding ecological systems. Subsequent explosions could further result in severe loss of life and associated fires which in turn could cause more environmental degradation and damage.

For the purpose of this dissertation, focus was specifically placed on the introduction of internal company control measures that a “supplier” company (such as Natref (Pty) Ltd) could implement to check whether petroleum product distributors are complying with pre-determined criteria aimed at reducing the potential for accidents involving road tankers. The measuring of how these controls have an effect in the bigger scheme of things in terms of reducing accidents and environmental degradation was very difficult to determine because it was not possible to extract from the distributors how many of their vehicles were actually involved in incidents during the study period. As a result it was not possible to determine whether the improved control measures had an effect on the number of accidents incurred by the vehicles that were effected by the improved application of the standards.

The study thus focused primarily on the effect that the implementation of an inspection system could have in progressively reducing the number of defects found on road tankers wanting to gain access to Natref’s site as well as measuring whether an improvement in compliance to standards actually took place. This study was conducted over a period of 22 months and involved the development and implementation of a new procedure and training course, implementation of an inspection checklist, improved reporting methods as well as improved the overall environmental awareness of the employees involved in the checking and inspection process. It is however assumed that the implementation and ongoing enforcement of the company standards has assisted in contributing towards minimising the potential for pollution exposures arising from accidents and in so doing minimising environmental degradation to a larger or lesser extent.

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CHAPTER 1

INTRODUCTION

1.1. Introduction

Vast quantities of hazardous substances are being transported on South African roads on a twenty four-hour basis by many road tankers and the ownership of these road tankers is not limited to a single company but they are owned by many different persons and organisations.

Many industries could not operate without regular deliveries of petroleum products. The uses of petroleum products in everyday life are many and varied and their demand has led to a well developed, highly regulated industry responsible for the transport of products from manufacturer to user.

A concern of the petro-chemical industry is to try and ensure that nothing goes wrong during the transporting of the products that it has produced. However, because some of the petro-chemical companies do not own the means by which these products are transported their impact on implementing controls associated with vehicle roadworthiness and driver fitness and suitability is limited. As a result accidents occur.

Frequently, in excess of 50 000 litres of highly flammable liquids can be transported by a single road tanker and during an accident highly flammable and/or toxic product can leak from a damaged tank into sewers, plantations, rivers and streams causing much ground and water pollution.

During an accident the substance leaking from a tanker may also ignite causing it to burn for several hours before it is finally brought under control and extinguished. This may result in much air pollution being given off and subsequent explosions could result in severe loss of life and also cause other associated fires.

To implement effective road tanker accident prevention as well as minimise the potential for harm to the environment it must holistically be seen as a management controllable function. Management's committed role in the control of risk can improve the well being and value of its service providers, distributors, physical property, the community, the environment, profits and the image of the company and its stakeholders.

Some of the management tools at a company's disposal to prevent road tanker incidents are:

- The identification of pre-determined standards to which vehicles and drivers must comply,

- providing employees with clearly defined checking and control procedures,
- implementing a monitoring process to determine whether procedures are being followed,
- developing training modules and providing training to those employees that are expected to implement the procedures or systems, as well as
- developing and implementing checking and inspection processes and follow-up actions to ensure adherence to standards.

Natref (Pty) Ltd is an oil refinery and its business and scope is explained briefly in Chapter 2, Section 2.1. An important factor regarding Natref's situation is that it does not own any of the transportation facilities that are used for the distribution of the finished petro-chemical product to its customers (i.e. the pipeline distribution network is managed by Petronet, the rail tankers are owned by Spoornet and the road tankers are owned by over 90 different private concerns. Annexure 1 provides a list of all the road tanker distribution companies who load petro-chemical products at Natref).

One of the goals of this study was to implement and evaluate the successfulness of the road tanker checking system at Natref, so as to determine whether the sustained implementation of such a system would have an effect on road tanker owners and drivers in complying with the required standards.

During this study the relevant supportive and associated safety management systems were evaluated and improved to enable:

- More participative structures,
- emphasis placed on the need for environmental awareness, organisational learning and appropriate training, as well as
- product stewardship principles to be integrated into systems in order to assist in minimising the impact that industrial activities have on the environment.

A first requirement was to close the gap between professed (or intended) environmental goals and the actual results and practices as perceived by management. As a company that does not own the vehicles that are used for the distribution of the petroleum product that it produces it was necessary for Natref (Pty) Ltd to acknowledge that they still have a role to fulfill in implementing systems that could have an effect in influencing the occurrence of accidents from which large environmental impacts can occur.

Lessons learnt here-from would indicate that management must be receptive to new ideas and implement systems to assist in being able to control those aspects that they have control over even if this is just fulfilling a perceived small contribution towards the larger overall need to ensure environmental well being.

It also became evident that certain roles of the safety, security, quality and environment functionaries overlapped and the need existed for environmental, safety and security professionals to realise that the intertwining of their tasks required them to support each others efforts as part of a multi-disciplinary approach in pursuing and achieving similar objectives.

In this study focus is placed on the implementation of a checking and inspection process to control road tanker site access as well as to place emphasis on the role that a company can fulfill in ensuring that road tankers adhere to certain standards. In particular, Natref looks at their own specific role that they can fulfill in minimising the potential for accidents involving road tankers albeit in a rather confined and limited capacity. In so doing, meaningful pro-active measures of performance and control of risks can contribute towards preventing environmental degradation and damage.

1.2. Problem statement

Natref's ability to implement safety management controls to regulate and manage, in particular, road tankers was considered to be very limited. This posed a challenge to determine what could be implemented within the confines of Natref's span of control to minimise the potential for road tankers to be involved in an accident and thus minimise the potential for associated environmental degradation that may result therefrom.

1.3. General goals and objectives

The following general goals and objectives were expected to be derived from the proposed research:

- To implement improved internal checking and monitoring controls that can assist in minimising the possibility of road tanker accidents and related environmental impacts and degradation,
- to determine the effectiveness of Natref's improved checks and monitoring controls for road tankers in ensuring safety compliance (i.e. to observe a decrease in the number of road tanker deficiencies),
- to investigate whether the company's internal training programs have improved the overall awareness and competency of all the security employees involved in the road tanker checking process (i.e. improved accuracy in checking and filling in the checklists),

- to contribute towards increasing owner accountability as it will encourage them to ensure that their vehicles are in an acceptable roadworthy condition in order to continue conducting business,
- to create company peace of mind in ensuring that the necessary checks were done that could possibly contribute towards minimising the number of accidents involving road tankers transporting petro-chemical substances.

1.4. Hypothesis

The basic hypothesis and expectation was to see a noticeable decrease in the number of safety deficiencies (i.e. an increased level of desired compliance) on road tankers visiting Natref after a period of at least 22 months after implementing the improved checking and monitoring system.

It was assumed that through Natref implementing improved vehicle safety compliance standards and checks that:

- Road tanker owners will ensure that their vehicles are in an acceptable roadworthy condition in order to continue conducting business with Natref, but more importantly, to ensure that they have taken all reasonable measures to ensure that their vehicles are not the cause of environmental degradation and damage.
- Natref will have peace of mind in ensuring that the necessary checks were done that could possibly contribute towards minimising the number of accidents involving road tankers transporting petro-chemical substances. This contribution will be towards minimising the potential for incidents occurring and, in so doing, minimise the potential for air, water and ground pollution to occur.

1.5. Research questions

Based hereon, two research questions arose that were considered significant to add value, engender meaningful research, motivate new development and continual improvement as well as ensure the testing of adherence to implemented standards. These questions are:

- Were any vehicles that did not comply with the Natref safety standards permitted to enter Natref over a period of at least 22 months subsequent to the implementation of the checking system?
- Did the level of compliance to the improved Natref road tanker inspection standards decrease or increase over a period of at least 22 months

subsequent to the implementation of the improved road tanker safety checking standards?

CHAPTER 2

THEORETICAL RESEARCH

2.1. Petroleum refining

Miller (2002:335) states that petroleum, or crude oil (oil as it comes out of the ground), is a thick liquid consisting of hundreds of combustible hydrocarbons along with small amounts of sulphur, oxygen, and nitrogen impurities. This fossil fuel is produced by the decomposition of dead organic matter from plants and animals that were buried under lake and ocean sediments hundreds of millions of years ago and subjected to high temperatures and pressures over millions of years as part of the carbon cycle.

Once the crude oil has been extracted, it is transported to an oil refinery where it is heated and distilled in gigantic columns to separate it into components with different boiling points. Some of the products of oil distillation, called petrochemicals, are then distributed by means of rail, road, or pipeline where they are further used as raw materials in industrial organic chemicals, pesticides, plastics, synthetic fibres, paints, medicines, and many other products.

2.2. Location and company business profile

National Petroleum Refiners of South African (Pty) Ltd (Natref) is an oil refinery located in Sasolburg, Free State Province, 100 kilometres south west of Johannesburg, 200 kilometres west of Secunda and 600 kilometres from Durban to which it is connected by a crude oil import pipeline. Natref was constructed in 1969 on a 2000-hectare site and came into operation during 1971.

Natref is one of four crude oil refineries in South Africa, the others being Genref (Engen, Durban), Sapref (Shell and BP, Durban) and Calref (Caltex, Cape Town). It furthermore has a refining capacity in crude oil distillation of 103 000 barrels per day (i.e. 16 376m³ or 16.5 million litres).

The business focus of Natref is to refine crude oil to fuels. The company is owned by Sasol (63.64% shareholding) and Total South Africa (36.36% shareholding). Currently, Sasol Synthetic Fuels (Secunda) supplies about 35% of all petrol and diesel that is consumed in South Africa, and Natref about 12%. The balance is produced by the other refineries, including PetroSA, which produces fuel from gas.

As Natref is the only inland crude oil refinery in South Africa, it is strategically located to supply petroleum products to the inland market and especially to Gauteng where approximately 50% of South Africa's fuel is consumed.

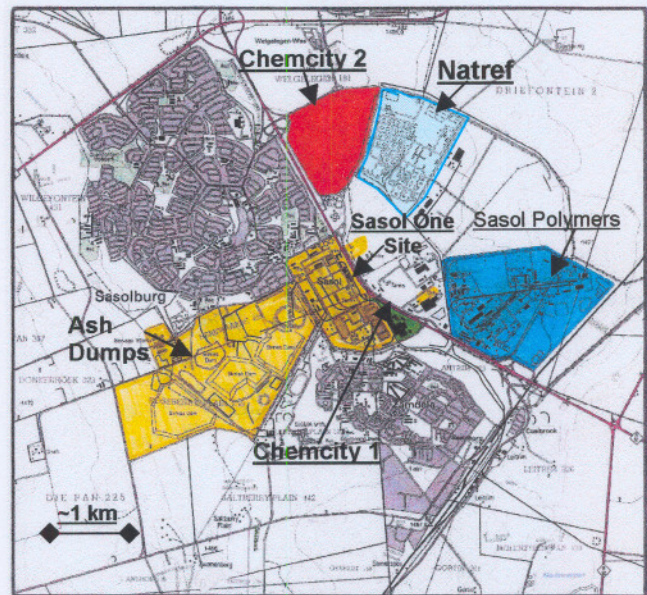
Crude oil is imported by pipeline to the Natref site in Sasolburg from the Natcos terminal in Durban. The Natref refinery employs 580 permanent personnel as well as 100 contractors who are only generally employed to provide specialist services and for major revamps and turnarounds

The National map below left details the location (Figure 2). The local area map, below right, shows the location of the refinery site (turquoise) with respect to the other Sasol facilities in the Sasolburg area. It also shows the locations of the towns of Sasolburg (south-west) and Zamdela (south-east). These are the grey shaded areas on the map (Figure 3).

Figure 1 – Sasolburg National Location



Figure 2 – Sasolburg Local Area Map



The refinery management vision is to be a pacesetter refinery. The management philosophy is based on good corporate governance, competence in all areas, retention of specialist skills, prevention of adverse influences on the business and continuous improvement. The operation is carried out 24 hours per day, 7 days per week, 365 days per year by an experienced operations department working a 2 x 12-hour shift system. For operating purposes the refinery operation (process plants, off-sites and tank farm) are split into 4 areas each controlled from a separate console in the central, blast resistant control building. Each section has a shift supervisor, a panel operator and plant operators.

Natref produces a full range of liquid fuels for the local market and these are all sold under Sasol, Total or other brand names. Natref does not market products under their own brand name. Quality control of products follows normal oil company standards and Natref's bitumen and fuel oil blending are certified to an ISO 9001:2000 Quality Management System. Aviation gas turbine fuels are produced and these are distributed by pipeline (to Johannesburg International Airport) and by road tanker (to other airports).

Environmental liability is always a concern in an operation of this type and Natref's installed treatment plants and the controls that are in place effectively minimise this exposure. The company's Environmental Management System has been ISO 14001 certified since 1997 and Natref was the first refinery in South Africa to obtain this certification.

Figure 3 - Aerial view of Natref



2. 3. Product distribution

Products at Natref are distributed by pipeline (80%), rail (16%) and road (4%), with pipeline distribution predominating (to distribution terminals in the main urban areas). Although the percentage of product transported by road is only 4% of the total product distributed it nevertheless is considered to pose the greatest threat in terms of risk to the environment as explained in paragraph 2.4.

Rail and pipeline distribution is arguably the least hazardous means of distribution of Natref's petroleum products. One of the reasons for this is because there is only one owner in South Africa for each of these means of distribution,

namely, Petronet (pipeline conveyance) and Spoornet (rail transportation). As a result, central ownership assists that these companies maintain strict uniform standards, specifications, maintenance programs and safety controls to ensure maximised pipeline as well as rail tanker safety and integrity. Rail transportation is used less than pipeline conveyance, one reason being that the rail network is much smaller than the road and pipe network, and relatively few factories have direct access to railway facilities.

2. 4. Road distribution

According to Welford (1997:14) road transportation is a major cause of ecological problems. This type of petroleum conveyance is considered to be the most vulnerable and high risk in terms of the potential for being involved in an accident for the following reasons:

- The general condition of road tankers varies from owner to owner depending on financial availability, degree and standard of safety management systems and their level of genuine concern to ensure ongoing roadworthiness (i.e. There exists varying standards of roadworthiness and the condition of some road tanker vehicles being used daily in South Africa is very poor and constitutes a risk),
- the condition of roads in some areas is very poor making the bulk road transportation of petroleum fuels risky and vulnerable thus increasing the potential for an accident to occur,
- the threat of a road tanker being hijacked in South Africa is very real and as a result hereof a fully laden tanker could fall into the hands of an untrained person. This makes the potential for an environmental disaster even greater and increases the potential for large scale pollution due to a tanker related incident arising from a hi-jacking,
- thousands of road tankers (of varying shapes, sizes and degrees of roadworthiness) are travelling throughout South Africa daily. It is not unlikely that many drivers of these road tankers do not have valid drivers licences and to compound the matter even further they are travelling on varying standards of road conditions. This coupled with the high accident rate in South Africa (often caused by the indiscretion and incompetence of other road users, fatigue as well as the misjudgment of drivers) further increases the likelihood for road tankers to be involved in accidents,
- in some instances the competency of the road tanker drivers who are expected to transport petro-chemical substances is questionable and the level and standard of training provided to these drivers also varies from training institution to training institution (In some instances no training has been attended by the driver at all or training certificates have been forged). As a

result, the ability of these drivers to deal with emergency situations involving their hazardous load is also questionable,

- there is also a difference in the standards relating to medical examinations establishing whether drivers are physically and intellectually capable of performing the functions of a road tanker driver and in certain instances the health status of some drivers is a concern (i.e. drivers employed having poor eyesight, poor hearing and/or possessing other physical handicaps),
- in some instances drivers are on the road conveying dangerous substances for prolonged periods of time and as a result they are subject to fatigue. Driver fatigue and strict control of working hours within acceptable limits are not always monitored by their employers. This is aggravated even further with the provision of an incentive for drivers who are paid additional remuneration from their employers for working long overtime hours,
- language barriers and differences in the application of safety standards exist from country to country which especially has an impact during cross border transit activities,
- drivers do not always possess the correct details of the dangerous loads that they are conveying and thus the ability of the emergency services to timeously and effectively deal with an incident at an early stage is severely hampered, and
- the companies supplying the petro-chemical product to the drivers may not all have standardised vehicle checks and controls in place to monitor and screen vehicle conditions or driver suitability.

As a result of the above, the susceptibility for accidents to occur involving road tankers is increased and coupled to this is the increase in the potential for environmental impact and degradation due to oil and petro-chemical spills.

According to Miller (2002:670) between 1999 and 2025, the number of motor vehicles in the world is expected to increase from about 550 million to almost 1 billion. With the increase in road traffic comes an increase in the transportation of hazardous substances by road. Coupled with this is the inevitable proportional increase in road tanker accidents and associated spillages which can result in severe ground, water and air pollution.

2. 5. Road tanker related accidents

Figures 4, 5, 6, 7, 8 and 9 below is an example of an accident where a petro-chemical road tanker lost control and left the N3 national road just outside Warden in the Free State during 2001. The vehicle rolled and the tank shell then ruptured causing its product to escape and ignite resulting in much ground

contamination, ecological damage as well as air pollution. The damage to surrounding vegetation is evident in the figures however ground seepage of the spilled product also occurred but is not clearly visible.

Figure 4



Figure 5



Figure 6



Figure 7



Figure 8



Figure 9



In another accident that occurred on the 18th November 2002 a petrol tanker overturned and burst into flames causing both air and ground pollution. Annexure 2 provides details of this accident which occurred on the M1 South Motorway near the Empire Road off-ramp in Johannesburg (Thale, 2002).

It was thought that the driver lost control of the vehicle in wet conditions. It then overturned while going around a corner and crashed into a barrier. The barrier pierced the storage tank on the back of the vehicle and petrol spilled onto the road and ignited. This resulted in large plumes of smoke bellowing into the air which continued until the fire was eventually extinguished. Also, much spilled petroleum product was washed away from the accident location as a result of water that was used during the fire fighting operations. It is suspected that this contaminated water may have found its way into nearby drains and sewers.

Miller (2002:336) states that even with the best technology and a fast response by well-trained people, scientists estimate that no more than 12 to 15 % of the oil from a major spill can be recovered. According to Welford (1997:14) oil spills are all too visible, so the need for action is apparent however the physical symptoms, in the form of ecological damage, may take many years to detect.

Petroleum contaminated run-off from roads pollutes groundwater, rivers and the sea. According to Clarke (1991:146) disasters are probably less serious, worldwide, than the daily runoff into the sea of oil washed off streets and from industrial factory premises as well as petroleum related transportation accidents. Clarke (1991:146) further states that a US National Research Council survey estimated in 1985 that the equivalent of 21 million barrels (3 339 million litres) of oil enter the sea annually. It is estimated that in excess of 1633 million litres of oil is spilled down the drain annually out of a total estimated spillage of 3177 million litres (i.e. 51.42%).

According to Lees (1996:23/6) the transportation of petro-chemical substances may present a hazard to, (i) the vehicles crew (ii) the public, and (iii) the environment.

These hazards include:

- Fire,
- explosion,
- toxic release,
 - conventional toxic substances,
 - ultra-toxic substances.

The most serious hazards arise from loss of containment and if the product is toxic then the release of the substance may result in a toxic gas cloud. According

to Lees (1996:23/6) transport accidents are particularly liable to cause pollution, since material spilled is often not recovered but is dispersed into the environment. The events which can give rise to hazards include particularly, (i) container failure, (ii) accident impact, and (iii) loading and unloading operations.

The bulk of hazardous materials transported by road are carried as liquids or liquefied gases in road tankers. The main types of road accidents associated with these are leaks due to tank puncture resulting from a collision or overturning or due to failure or mal-operation of the tank equipment. Other causes of loss of containment are tank rupture due to overfilling, overheating or defect as well as due to fire.

According to Lees (1996:23/21) the number of road tankers involved in accidents in Great Britain in 1986 was nearly 15000. Lees (1996:23/82) further states that in the United States of America the historical record shows that the transportation of petro-chemical products in 1990 contributed towards 39 % of accidents and 27% of all the transportation accidents where fatalities had occurred. Road transportation in particular contributed towards 30% of all transportation accidents as well as 30% of all accidents where fatalities had occurred. Human error was the most likely accident cause in transportation incidents. These transportation related incidents almost all involved fuels, mainly petroleum, fuel oil, or propane.

2. 6. Accident causation

According to Heinrich et al (1980:21) an accident is an unplanned and uncontrolled event in which the action or reaction of an object, substance, person, or radiation results in personal injury or the probability thereof. This definition could just as well also include such an event resulting in environmental damage.

The causes of accidents are many and varied. There are both indirect and direct causes of accidents as well as indirect and direct results of accidents. In view of the claim made in paragraph 2.5 that human error was the most likely cause for transportation accidents, a study of the various theories of accident causation according to Stranks (1994a:74-87) indicated the following human factors as being significant, but not necessarily in any order of significance:

- Physical and psychological stressors,
- environmental stressors,
- lack of alertness,
- lack of individual control over situations,

- unsafe acts and conditions,
- lack of management supervision and control,
- personal factors, such as attitude, motivation and perception,
- information processing defects,
- various job-related factors,
- the perceived benefits of a particular course of action.

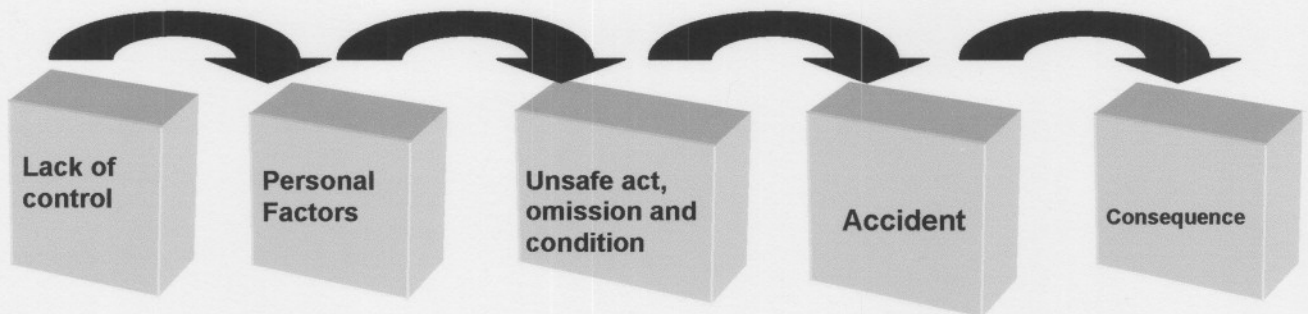
Although this statement is not substantiated it is not unlikely that most of these factors could be applicable as possible reasons attributed to the cause of many road tanker related accidents.

According to Denis (1997:81) the domino theory explains the accident process in terms of five factors:

- Lack of control by management, permitting,
- basic causes (personal and job factors), that lead to,
- immediate causes (substandard practices/conditions/errors), which are the proximate causes of,
- the accident, which results in,
- the loss or consequence (minor, serious or catastrophic).

The factors are of a fixed and logical order. Each one is dependent on the one immediately preceding it, so that if one is absent, no consequence can occur. The theory can be visualized as five standing dominoes and the behavior of these dominoes is studied when they are subjected to a disturbing force.

When the first, lack of control, falls, the other four automatically follow, unless one of the factors has been corrected, i.e. removed, thereby creating a gap in the required sequence for producing an accident.



In view hereof it was determined that Natref can fulfill an important role in preventing an accident by implementing systems that would improve management control and thus ensure that the first `domino` remains stable and does not influence the other factors.

2. 7. Road tanker design and operating standards

By law, road tankers carrying hazardous substances must be:

- Designed and built to resist hazards posed by the cargo and the impact of accidents
- regularly examined, tested and certified by an expert
- loaded and unloaded with care, and
- never be over-filled.

If, for example, a tanker is to carry a corrosive cargo like an acid, all the materials of which it is built such as steel, aluminium and rigid plastics, are selected and treated to resist damage. Tank fittings such as man-lids, valve outlets, pump connections must be protected as necessary and always be securely closed.

In accordance with South Africa (1996) various articles are contained in the Road Traffic and Road Transport Act (93/1996) which prescribes the requirements to which a vehicle transporting petroleum products must comply. It also refers to the training requirements and medical condition monitoring of the driver. Reference is also made in this legislation to numerous operational and design standards that must be adhered to by petroleum product transporters.

Despite the existence of design and operating standards, it does however occur that many road tankers being used for the transportation of petroleum products either do not comply with the minimum design standards or may have previously complied with the design criteria but eventually have deteriorated in condition over time. This is mainly due to reasons mentioned previously in paragraph 2. 4.

Some of the measures that the petro-chemical industry has implemented in their attempt to ensure safe product transportation is to create safe road tanker integrity and improve driver competency. According to Lees (2002:23/13) a road tanker is divided into two main components, the mechanical horse engine driven component and the mobile tank container. While the safety and integrity features of the horse engine driven component is generally dictated by the heavy vehicle manufacturing industry, the mobile tank container component requires careful specialist attention to ensure that safety is integrally incorporated into the design.

Basically the mobile tank container has a shell construction made of a suitable metallic material which is resistant to brittle fracture and stress corrosion cracking between -20°C and 50°C, except where another temperature range is prescribed for a particular class of substance. The usual material of construction for the shell is mild steel while lined mild steel is also used. The usual linings are plastic and rubber and these are maintained carefully, especially at the joints.

According to Lees (2002:21/13) the tank shell, and its fastenings, are required to withstand the following forces:

- In the direction of travel: twice the total mass,
- at right angles to the direction of travel: the total mass,
- vertically upwards: the total mass,
- vertically downwards: twice the total mass.

Tank equipment is provided on the shell of a tank vehicle and this includes shut-off devices on bottom discharge shells and pressure relief devices.

A bottom discharge is usually provided and this is equipped with two mutually independent shut-off devices. The first device is usually an internal stop valve fixed directly to the shell and the second device is a sluice valve, or equivalent device, mounted in series, one at each end of the discharge pipe socket. In addition, the openings of shells are also capable of being closed by screw-threaded plugs, blank flanges or equivalent devices.

The internal shut-off valve is usually operable from above or below, and its setting (whether open or closed), is normally verifiable from the ground. The valve continues to be effective in the event of damage to the external control.

Lees (2002:23/13) states that a shell for carriage of a liquid with a vapor pressure exceeding 1.1 at 50°C should either be fitted with a pressure relief safety valve or be hermetically sealed. A hermetically sealed shell is one with hermetically closed openings and without a safety valve, bursting disc or similar device, or one fitted with a safety valve preceded by a bursting disc.

The tank shell should further be fitted with various arrangements to reduce the accident rate, such as high quality suspension, anti-skid devices, anti-jack-knife systems, fuel cut-off devices, additional fire protection, and the provision of high quality head lights and fog lights.

According to Lees (2002:23/13) the driver should further be well trained and be provided with the information which he requires. The driver training should cover loading and unloading operations, including precautions against overfilling and measures to secure closures as well as handling of emergencies (including dealing with both a spillage and fire).

Despite the existence of many regulations governing road tanker design, construction as well as driver training accidents still happen causing much environmental pollution and degradation.

2. 8. Need for Control Measures

According to Welford (1997:4) the effort of describing, explaining, and prescribing actions for organisations in the context of the natural environment is gathering momentum. Welford (1997:8) claims that modern organisations strive to consider all of the relevant dimensions of organisational reality in their efforts to place environmental concerns in the context of the operations of a business. Welford (1997:23) further states that companies which are really serious about environmental issues need to relate their environmental strategy to an underlying ecological theory and an analysis of ecological, human and social systems. He further states that often, business views its environmental problems as insurmountable and then chooses to do nothing or to make some piecemeal changes in order to look as if they are trying.

In view hereof, it is important for an organisation that is producing a potentially hazardous product to fully grasp the significance of Welford's statements. The petroleum industry in particular needs to understand that they have a huge responsibility towards ensuring environmental well being. In particular, it is necessary for them to comprehensively promote a `cradle to grave` approach in ensuring that serious ecological/environmental considerations are made throughout the life cycle of a product. This includes all stages of the life cycle from the acquisition of the raw product through to its final disposal. It is further necessary for the petroleum industry to realise that their business sustainability depends on manifesting responsible environmental and safety programs to cater for effective product stewardship and responsible care.

In support of Welford's statements Denis (1997:183) mentions that industrial ecology redefines the relationship between industry and the environment. The distribution of a product such as petroleum and petro-chemicals, is only one of

the stages in the products life cycle but for which much careful planning and consideration is required.

According to Denis (1997:180) when finally disposed of, hazardous products may end up almost anywhere, in any country, in a modern landfill, by the side of the road, or in a lake that supplies drinking water and as such industry should have an obligation to be involved at all stages of mitigating the environmental consequences of an incident involving a product that they may have produced.

As stated previously in paragraph 1. 1, Natref produces petroleum products on behalf of Sasol Oil as well as Total SA and does not own the product and neither the means by which it is transported. According to Glazewski (2000:181) the responsible person liable for a road tanker related accident could implicate three categories of persons. i.e. Any person who:

- (i) Is responsible for the incident,
- (ii) owns any hazardous substance involved in the incident, or
- (iii) was in control of any hazardous substance involved in the incident at the time of the incident.

In view hereof it was apparent that Natref did not fit into any of these categories, however, despite this, Natref still accepted that they had a responsibility in terms of their commitment to instill product stewardship controls that could contribute towards the prevention of accidents. Natref acknowledged that upstream control measures could still be implemented in checking and monitoring road tankers wishing to enter their premises. They realised that they could further prevent road tankers from entering their premises if they did not comply with the pre-identified standards and this could be seen as further strengthening their commitment towards promoting product stewardship and responsible care. Natref management realised that it had a responsibility to ensure that precautionary controls were put in place to prevent accidents from occurring as well as in dealing with the consequences of accidents should they occur.

As a result, it was confirmed that for the purpose of this dissertation focus be specifically placed on the introduction of internal company control measures that a "supplier" company (such as Natref) could implement to help reduce the potential for accidents involving road tankers conveying petroleum substances. Emphasis was placed on implementing factors that would contribute towards minimising the potential for pollution exposures of such incidents on the environment.

After monitoring the standard of the road tanker checking system that was in place at the time of commencing with this project it became apparent that the standard of checks done on road tankers wanting to gain access onto Natref's

premises was not being performed thoroughly and that a minimal and insufficient list of checking criteria was being used to monitor and control road tanker movement through the Natref weigh-bridge area.

CHAPTER 3

METHODOLOGY AND EMPIRICAL RESEARCH

3. 1. Advantages of implementing an inspection checklist system

Based upon the information acquired during the theoretical research it became evident that:

- From a product stewardship perspective, Natref could fulfill a more meaningful role in implementing internal control systems that could assist to prevent accidents involving road tankers. In view hereof, it became evident that Natref could make a contribution in the aforementioned regard by implementing improved internal road tanker safety checks and controls. These could, in turn have an impact upon minimising the potential for accidents to occur involving road tankers conveying petro-chemical substances to other destinations throughout the country.
- road tankers, and in particular owners of road tankers, needed to comply to specific safety criteria that would assist in improving roadworthy standards. Despite this, accidents still occurred as some road tankers did not comply, others may have complied initially but a lack of ongoing maintenance combined with wear and tear may have caused their condition to deteriorate. Still others may also have fully complied with specific safety criteria but were still involved in accidents caused by driver incompetence, error and misjudgment of other road users, poor road conditions and pedestrian indiscretion.
- a comprehensive road tanker inspection checklist system was necessary to check compliance to specific criteria prior to being permitted access onto Natref's premises.

As mentioned previously in paragraph 2.8, when the previous Natref control systems were examined it was discovered that the checking system was very superficial. Security employees would perform only a visual informal check for certain less environmentally significant security related criteria and without recording the findings. In certain instances they would still permit road tankers to enter Natref despite them not complying to safety standards. In view hereof it was determined that the management controls required improvement and that the implementation of effective formal internal control measures could assist to establish whether:

- Vehicles are suitably equipped and maintained to minimise the potential for road tanker related incidents,
- checks are in place to monitor the condition of road tanker roadworthiness,

- drivers for fuel distributors have adequate controls, equipment and training in place to ensure that they are competent to operate the vehicle and that emergency incidents are dealt with effectively and professionally,
- adequate training and monitoring programs exist for the Natref security employees for them to determine if vehicle drivers are competent and medically fit to perform the task for which they are employed in the safest possible manner, and
- drivers possess the correct details of the dangerous loads that they are conveying and that these are correctly displayed on a Hazchem sign and Tremcard.

The identification and implementation of improved internal checking controls required determining the range of criteria that needed to be checked. In so doing it was intended to focus on criteria that could effect the vehicles safety as well as to improve the degree of thoroughness in checking these criteria. Emphasis was also placed on applying the standards consistently in performing all future road tanker inspections.

Although it was virtually impossible to determine on a macro basis to what extent the implementation of the improved internal control systems would reduce the total number of road accidents involving road tankers, it was however possible to survey the effectiveness of the control system as follows:

- After the control systems were implemented, no vehicle wanting to enter Natref's premises was able to do so if either the vehicle or the driver did not fully comply with the specific criteria. The expectation in this regard was that if a road tanker owner wanted to acquire petro-chemical products from Natref then they needed to comply with the required safety standards. Also, checks were done to determine the effectiveness of system i.e. whether any vehicles had entered the Natref site that did not comply with our minimum standards,
- It was anticipated that the implementation of control systems should, over a period of time, have a positive impact upon the owners of road tankers. It was hoped that it would serve as an educational and development opportunity thus positively influencing their degree of willingness to adhere to the minimum standards enforced by Natref.

It was expected that upon implementation of the new checking system the actual standard and level of adherence to the Natref criteria would initially be low, however, the intention was to bring about an improvement in levels of conformance over time. i.e. a reduction in the number of deficiencies noted on road tankers over a period of at least 22 months subsequent to implementing the system. Ideally this would mean that once the system had been

implemented that a decrease in deficiencies would be observed over a period of time. It was presumed that this in turn would also contribute towards putting precautionary and preventative measures into place that would reduce the potential for accidents, loss of life and environmental degradation.

3.2. Sequence of implementation

A systematic approach was followed in implementing the inspection system. Briefly, the steps involved in the process included:

- Identifying standards as well as checking and defining the range of criteria to put into the checklist,
- designing the checklist,
- performing security employee task analysis,
- developing a procedure,
- developing a training module based upon the procedure,
- developing a test to determine degree of comprehension,
- providing training to security guards,
- testing the security employees level of comprehension and competence,
- notifying road tanker owners of intended implementation of the new checking system,
- implementing the inspection system and procedure as per annexure 3,
- checking the security employee performance levels and performing on-site practical appraisals to monitor the degree of thoroughness in their application of the procedure,
- checking and recording daily defects and levels of compliance,
- identifying the range of defects causing the refusal of road tankers from entering Natref and highlighting the significant contributors,
- notifying road tanker owners of significant areas for improvement and co-operation required to achieve the desired standards,
- monitoring whether there is a decline or increase in levels of compliance with the required standards.

3.2.1. Identifying the criteria to be incorporated into a checklist

The SABS (1997) stipulates certain criteria that the driver and road tanker owner need to check to ensure conformance to legislation. These inspection requirements prescribe that the following items and components of road tankers be checked:

- Vehicle tank,
- valves,
- gaskets,
- dangerous goods permit,
- tyres,
- brakes,
- clutch,
- steering,
- reflectors,
- oil/fuel and water leaks,
- guages,
- warning lights,
- handbrake,
- foot pedals,
- steering column fittings,
- switches,
- horn,
- hazard warning lights,
- headlights,

- wipers,
- mirrors,
- windscreen,
- battery, battery box mounting, cables and connections,
- fire extinguishers,
- spare wheel,
- suspension, and
- a visual check of the tanker shell, mountings and frame for deterioration due to exposure to chemicals.

It was acknowledged that in terms of South Africa (1996) the checking of this criteria was the responsibility of the road tanker owner and driver. Although Natref did not want to duplicate these checks on behalf of the legally designated responsible persons it was however considered necessary that some of the obligatory inspection criteria also be integrated into their checklist.

In developing the revised road tanker checking system Natref integrated certain quality principles in addressing the environmental management concerns. As discussed by Denis, (1997:31) the approach was to incorporate leadership, measurement and participation into the design and implementation of the system. The objective in using this approach was to apply continual improvement through statistical tracking of objectively defined upstream measures of performance. In doing this Natref attempted to shift the focus from just dealing with the consequences of poor compliance to rather improving the system itself and thereby positively influencing the downstream performance or end result. One of the eventual outcomes of the intended implementation of the new checking system was to create an effective safety, security and environmental risk management tool.

According to Saunders (1992:18) the development of a checklist requires the determination of standards that serve as a benchmark against which performance is measured and this was the intention of the Natref road tanker inspection checklist. Also, apart from incorporating just the safety related components into the checklist it was further realised that security issues as well as operational criteria relating to control of orders and loading could also be incorporated into a combined integrated checklist so as to avoid duplication of time and effort in simultaneously checking other business criteria.

Arising from the information contained in the numerous acts, regulations and codes of practice that govern the transportation of dangerous goods by road the following specific questioning criteria was considered to be important for inclusion into an internal road tanker inspection checklist:

(i) What the driver must conform to:

- Has the driver got his identity document available? (It is important for cross-reference purpose to check that the details on the persons training and driving certificates match the details in the drivers' identity document. It is further important to check that the photo in the drivers identity document matches the person producing the document),
- has the driver got a drivers licence for the class of vehicle which he is driving? (This licence is not to include any endorsements so as to ensure that there are no restrictions or problems associated with his previous driving history),
- does the driver have a copy of his medical fitness certificate?
- according to the medical certificate is the driver medically fit to operate the road tanker?
- is the medical certificate still valid? (i.e. has it been signed by a medical practitioner within the last 12 months),
- has the driver got a copy of a certificate of training from an accredited training organisation? (i.e. Drivers must by law attend a training course at a government-approved centre. At the end of this course they must pass an exam to obtain a vocational training certificate, enabling them to drive vehicles containing hazardous substances. This certificate provides proof that they have attended comprehensive theoretical and practical training relevant to the type of vehicle and substances to which they have been assigned. This training includes safety requirements regarding the transportation of hazardous substances, emergency procedures and the use of a fire extinguisher),
- has the driver got a valid permit to drive document? (i.e. a Professional Driving Permit for Dangerous Goods – PrDP-D). This driving permit authorises the driver to drive a vehicle conveying dangerous substances,
- does the driver have a suitable means of communication? (i.e. a cellular phone or radio),
- does the driver appear to be intoxicated?

- has the driver been provided with a Tremcard? (Drivers of vehicles carrying dangerous loads must carry details of what to do in an emergency. This information is often provided in the form of Transport Emergency Cards - or Tremcards as they are usually known. The information they contain is laid out in consistent order. The cards are always in the driver's cab in the driver's native language. The card identifies the chemical and describes the nature of the hazard. The purpose hereof is for the driver to always know exactly what substance is being carried as well as the immediate actions to be taken in the event of an accident),
- does the driver have the correct transportation documents? (i.e. order/loading request),
- does the order/loading request documents have the original company logo and are they typed and signed?
- are the transportation documents as per the provided/stipulated example?
- are the details of the vehicle on the approved list?
- is the name of the driver on the approved list?
- does the information on the order/loading request match the details on the:
 - Drivers identity document?
 - registration plates on the vehicle, trailer and tub?
 - licence disks on the windscreen, trailer and tub?
- does driver have Personal Protective Equipment? (i.e. overalls, safety goggles/glasses, visor, helmet, gloves, safety shoes/boots).

(ii) What the vehicle must conform to:

- Is the general appearance of the vehicle good? (i.e. does it look structurally and mechanically sound?),
- is a fire extinguisher available?
- is the fire extinguisher in a good condition and has it been serviced over the past 12 months?
- are the Hazchem signs and appropriate hazard warning panels/compartments labels in place? (The Hazchem sign is carried on road and rail tankers

carrying dangerous products. Using a code, called the Hazchem Emergency Action Code, it provides information which the emergency services can quickly check and understand. It tells them how to deal with a spillage, leak or fire. The diamond tells the emergency services and the public what the primary hazard is,

The sign also includes a United Nations substance identification number, which informs the emergency services and others of the product contained in the vehicle. A telephone number is also provided, which the emergency services can call for expert information if they have a special problem. The Hazchem sign was originally a voluntary practice implemented by the Chemical Industries Association. However, as with so many other sections of the comprehensive safety system built up over the years by the industry and working together with the emergency services, it has become law. (Figure 10 below indicates the format of a typical Hazchem sign positioned on a tank),

Figure 10 : Hazchem Sign



- does the information contained in the Tremcard match the Hazchem sign?
- are the headlights, flickers and brake-lights working?
- is the date on the licence disk on the windscreen still valid? (This indicates that the vehicle has a Certificate of Roadworthy),
- has the date on the vehicle licence disk expired by more than 21 days?
- are all the valves closed with no visible leaks?
- are the hoses in a good visual condition?
- is the rear chevron in place?
- are warning triangles available?

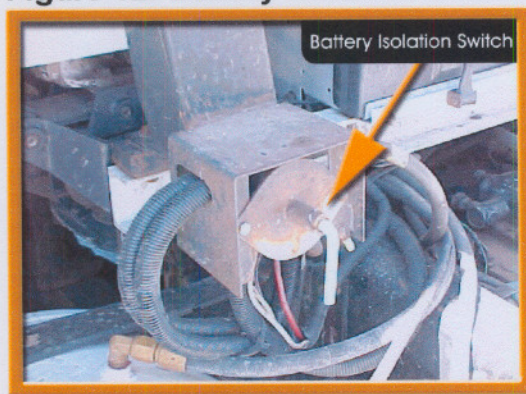
- is the orange danger warning diamond available? (Figure 11 indicates the positioning of the orange warning diamond. This diamond is displayed on the front of vehicles that are used for the transporting of dangerous substances),

Figure 11: Warning diamond



- do the tyres comply with the regulatory requirements? (i.e. is the tread depth 5mm or more and are the tyres in a good condition?),
- are there cooking gas cylinders on the road tanker? (If gas cylinders for cooking purposes are present then these must be taken into safe custody by security while the vehicle is on our premises and returned when it leaves the site),
- is there a battery electrical isolation switch present? (Figure 12),

Figure 12: Battery Isolation Switch



(iii) Checks to be done before loading:

Check that the truck is correctly positioned on the weigh-bridge.

(iv) Checks to be done after loading:

- Check for leaks,
- check for Natref equipment,
- check if the vehicle is correctly positioned on the scale,
- are the transport clearance documents in order?
- is the vehicle load restriction not overloaded/exceeded? (i.e. the delta between the flow and scale readings to be not more than 200kg).

(v) Optional additional criteria to be checked:

- Is a fully stocked first aid box available?
- are wheel chocks available on the vehicle?
- is a shovel available on the vehicle?

Figures 10 to 12 clearly depict certain items included on the checklist that were not previously required to be checked.

A checklist was then developed incorporating the above criteria and integrated into the procedure (Annexure 3). This served as the standard against which road tankers were checked as well as which prompted security employees to check for adherence to specific safety related criteria.

3.2.2. Assigning responsibility and determining the experimental subjects and participants

The experimental subjects and participants in this study were defined as being:

- The actual road tankers (i.e. specifically regarding the checks that needed to be done on them to determine suitability, safety and roadworthiness),
- drivers of road tankers (i.e. in order to acquire relevant information that can be used towards the findings of the study. i.e. proof of medical fitness and training),
- Natref security employees (i.e. for the actual checking of every road tanker and driver wanting to enter Natref). As security employees work a continuous twenty four-hour period it was decided that they be tasked with performing the checking function as well as a number of other security

related tasks that were also incorporated into their checking responsibilities.

3.2.3. Developing a procedure and providing training to employees

3.2.3.1. Procedure and Training

A thorough task analysis was carried out of each security employees job and a detailed description of their tasks was integrated into a procedure (annexure 3). This procedure was developed specifically for security and weigh-bridge employees and it describes the scope, definition, responsibilities as well as the procedures to be followed. It also contains the inspection checklist used by security employees (appendix 7.2 of annexure 3).

In developing the training course content it was decided to use the material contained in the procedure as the basis for instruction and to test the employees level of comprehension by having them complete a test after the training course (annexure 4). Natref adopted the principles proposed by Saunders (1992:228) in taking a systematic approach to training by following four important steps:

- The diagnosis of the training needs,
- the objective setting phase,
- the design of the training program, and
- evaluation of the safety training program.

In view of the above, the diagnosis of the training needs at Natref included taking into consideration the number of people that required training, the critical issues that needed to be stressed during the training process as well as the resources and shift constraints that could impact upon the training roll-out. Factors considered in the objective setting phase included placing an emphasis on ensuring that security employees be competent in being able to check a vehicle against prior agreed upon standards and to be able record their findings in a readable manner in the inspection checklist forms.

Also, it was necessary to ensure that security employees be equipped to use the information arising from the inspections in order to take the necessary action, if required, to prevent a road tanker from entering the Natref site.

The training of security staff was done according to a systematic approach to ensure that a consistently high standard of competency was achieved in performing the desired checks and monitoring. It also provided the opportunity to focus on the ecological connections of the company's activities creating a personal concern among participants regarding the impacts of the business on

the natural environment. According to Welford (1997:84) the need to generate commitment to change and capacity for innovation through learning requires a more participatory approach than command and control practices. It was through encouraging participation and involvement in the training of the Natref security employees that commitment to change and capacity for innovation could be achieved. In view hereof, security employees received training on the procedure to familiarise themselves with the standards that had to be applied in checking road tankers.

Improving the competency of the security employees was an important step in ensuring that the improved checking and monitoring system was effectively implemented. In providing this training cognisance was taken of the statement made by Stranks (1994b:74) that employees bring personal habits, attitudes, skills, personality and other factors to their jobs that, in relation to task demands, may be strengths or weakness.

As stated by Stranks (1994b:77) it was recognised that training would produce an employee capable of working without close supervision, confident to take on responsibility and perform effectively. It was considered important that security employees see the point of participating in the training as well as in the implementation of the procedure for them to acknowledge the importance of achieving both security and environmental objectives. Training was aimed at giving all individuals the skills and know-how to enable them to understand the checking procedure and the standards that had to be applied.

3.2.3.2. Monitoring of performance

An evaluation process was then built into the system whereby employees were evaluated in their workplace by the Security Shift Control Officer to determine whether they were following the procedure, whether the training achieved its objectives and whether the training that was provided had satisfied the training need. According to Armstrong et al (1960:189) routinization tends to beget unimaginative routine performance that "merely goes around the motions." Supervision, therefore, must be continually alert to detect the signs of this and other lapses in the inspection work. Monitoring of the security personals performance as well as providing appropriate feed back to them on the acceptability of their performance level took place on a regular basis by the Security Shift Control Officer and the Chief Security Officer to ensure a consistent application of the required standards. According to Saunders (1992:248) without performance measures, employees at every level will have no basis for:

- Knowing what is expected of them,
- monitoring their own performance and generating their own feedback,

- identifying their own performance improvement areas.

3.2.3.3. Fitness for work and health surveillance

As the security employees had to fulfill their responsibilities in an area where many road tankers were traveling through on a frequent basis, their level of exposure to carbon monoxide was high. As a result, occupational hygiene surveys were carried out in their workplace to ensure that the level of exposures were minimised to the greatest extent reasonably possible. Also, all security employees underwent an annual medical check and periodic health surveillance.

3.2.4. Informing the transporters of Natref's intentions to implement the new system

It was considered important not to surprise the transporters by suddenly implementing the new system which could have significant financial consequences upon them in terms of being refused entry to Natref as a result of an identified deficiency.

In view hereof, during March 2001 a letter was drawn up and sent to each of the vehicle owners warning them of the intended implementation (annexure 5 indicates a copy of the letter that was distributed to all transport companies that are mentioned in annexure 1).

3.3. Implementation

The system was implemented on the 1st May 2001 after all the security employees had received training and found to be of the desired competence (i.e. passed the test as per annexure 5 with a 100% pass mark). Upon implementation of the checking system security employees were requested to fill in a checklist for every vehicle that was checked and to strictly prevent vehicles that do not comply from gaining access onto Natref's premises.

At first the adoption of the principles underlying the changes and the implementation of the new checking system were resisted by members of the security team. According to Welford (1997:80) "in many organizations the environmental change process begins with resistance, followed by a period of unfreezing, where unlearning old assumptions and routines which exclude the environment will be important. As learning progresses, new organizational practices emerge, principles are adopted and the cultural shift becomes profound, with organisational members developing new commitment to ecological improvements". The situation at Natref was no different where initial resistance to the improved system was experienced amongst the security employees. This resistance then progressively led to understanding, acceptance and then commitment as the reasons and principles regarding the change became better understood. The environmental emphasis in embarking upon the

development and implementation of systems designed to improve commitment to product stewardship at Natref was as a result of an evolving learning process resulting in employees developing a 'new' commitment to ecological concerns and improvements.

CHAPTER 4

RESULTS AND RECOMMENDATIONS

4.1. Data processing and analysis

Arising from the implementation of the checklist system the following method was implemented to ensure that the available information was in a format from which meaningful deductions and results could be attained:

- As from 1st May 2001 every road tanker wanting to enter Natref to fill up with fuel was checked according to the procedure and using the checklist (appendix 7.2 in annexure 3). The findings were recorded on the checklist and those not complying with the predetermined standard were not permitted access onto the site,
- the checklists were scrutinised daily by the Security Shift Control Officer and the significant findings were arranged to indicate those that complied and those that did not comply for each month over the 22 month study period,
- from the information provided on the checklists a report was drawn up each month to indicate the number of defects (per type of criteria checked) that caused entry refusal from 1st May 2001 to 28th February 2003. This was in order to identify which criteria was the most problematic in terms of frequency that it was identified as a defect (annexure 6). The purpose hereof was to use this information to identify the main contributors towards road tankers being refused entry to Natref. It also assisted in providing relevant information to the transporters so as to increase their awareness as to what they needed to focus on in order to improve their vehicles road safety condition.

This report was forthcoming from the information that was recorded by the security employees in the road tanker vehicle checklists,

- from the data provided in annexure 6 a list was drawn up indicating the total number of defects per criteria type over the 22 month study period (annexure 7). These were arranged in order of the largest number of defects to the lowest number of defects per criteria type that was found to be problematic over the 22 month study period,
- a summary was also made in annexure 8 indicating the number of vehicles inspected and the number of major defects identified per month for the 22 month study period.

Based upon the results indicated in the monthly reports an analysis was done to determine whether the improved safety controls brought about any improvement in safety adherence and compliance.

4. 2. Interpretation of results

- Based upon the results recorded in annexure 7 a total of 52127 road tankers were checked between 1st May 2001 and 28th February 2003. During this period the 8 main reasons why road tankers were refused entry into Natref are:
 - Smooth tyres (42),
 - expired medical certificate (36),
 - transporter details not on the system (29),
 - expired professional drivers permit (29),
 - no fire extinguisher (23),
 - no Tremcard (21),
 - no personal protective equipment (21), and
 - licence expired (20).
- Four of the eight above-mentioned frequently identified defects that resulted in road tankers being refused entry to Natref are considered serious enough to be able to contribute towards an accident taking place.

These defects are:

- Smooth tyres are regarded to be a high risk and can certainly contribute towards accidents occurring especially during wet conditions,

- expired medical certificates are an indication that the driver has not attended a medical examination to determine his degree of fitness to drive and operate a road tanker during the past 12 months. During this time the driver could have become physically disabled seriously hampering his competency and ability to drive and operate a road tanker,
 - an expired professional drivers permit also indicates that the ability of the driver to operate a road tanker has not been tested or determined within the predetermined time-frame indicating that the driver may not be competent to drive or operate the road tanker for which he is responsible,
 - an expired licence may indicate an unroadworthy vehicle.
- The other significant defects that form part of the most frequently identified deficiencies include:
 - No fire extinguisher,
 - no Tremcard, and
 - no personal protective equipment.

These defects can severely restrict a driver and emergency workers from reacting immediately in taking prompt action to deal with an accident involving the road tanker and thus not be able to minimise the extent of spillage or fire resulting therefrom.

- From annexure 7, other less frequently identified, yet serious, defects that could have contributed towards an accident or environmental degradation occurring were:
 - Defective hoses and valves (8 were detected over the 22 month study period). This could have resulted in the spillage of petro-chemical product as well as accidents and fires,
 - expired training certificate (2 were detected over the 22 month study period). No proof of training could mean that the proficiency of the driver may be seriously hampered in driving and operating the road tanker.

Without a training certificate there is no proof of the competency of the driver,

- driving under the influence of alcohol (1 was detected over the 22 month study period). It was re-assuring that during the study period only 1 driver tested positive for being under the influence of alcohol.
 - Road tanker not having Hazchem signs (5 were detected over the 22 month study period). The impact in this regard is the same as for not having a Tremcard, mentioned previously.
-
- In accordance with the information contained in annexure 8, it is apparent that four months after the implementation of the new checking system the number of vehicles that were declined from entering Natref due to defects had reduced from 22 to 7. This however appears to have been proportional with the number of vehicles visiting Natref each month (i.e. this number declined from 2800 during May 2001 to 1705 during August 2001).
 - On average, between September 2001 to March 2002, the number of defects resulting in road tankers being refused entry to Natref increased in proportion to the number of road tankers that attempted to gain access.
 - The number of road tankers visiting Natref reached a peak in March 2002 (3253) in order to stock up on fuel on the lower price after the announcement of an imminent fuel price increase. A proportional increase in the number of defects was observed (44). This was the highest number of road tankers as well as number of defects identified during a month since the study commenced. It is presumed that with the imminent fuel price increase the road tanker owners tried to make use of every available mobile container so as to capitalise on the profits that could be gained by purchasing fuel at the old price.
 - Security employees were again sent on training during March 2002 and a meeting was held with most of the representatives from the various transporting companies to again request their cooperation. It is apparent that after this awareness drive the number of defects noticeably declined.
 - As from July 2002 the number of defects decreased to single figure numbers and it remained as such to the end of February 2003.

4. 3. Conclusion and recommendations

4.3.1. Conclusions relating to the research questions

Arising from the results mentioned in annexure 8, and with reference to the research questions referred to in paragraph 1.4, the following conclusions can be made:

- No vehicles that did not comply with the Natref safety standards, as specified in the checklist, were permitted to enter Natref since the implementation of the new road tanker inspection system,
- it is apparent from analysing annexure 8 that 12 months after the implementation of the system the number of defects on road tankers per month had declined from 22 to 14. Nine months thereafter (i.e. until 28th February 2003) the number of defects had further declined to 4. Since July 2002 until February 2003 the number of defects identified each month did not rise above 4. This indicated an increase in the level of compliance to the required Natref standards and a decrease in the number of defects over the 22 month study period.

4.3.2. Conclusions regarding the general goals and objectives

The general goals and objectives of the study referred to in paragraph 1.2 were achieved in terms of the following perspective:

- The integrity of the Natref road tanker checking system was improved in comparison to the previous monitoring process,
- a decrease was seen in the number of road tanker deficiencies over a 22 month period since the implementation of the new checking system,
- the company's internal training programs improved the overall awareness and competency of all the security employees involved in the road tanker checking process (i.e. there was an improved accuracy and thoroughness in checking and filling in the checklists),
- in observing the decrease in defects it is deduced that the degree of owner accountability to ensure safer road tankers was increased. It appears as if the entry refusal of road tankers with defects created an increased owner awareness. As the study period evolved it appears as if the owners progressively ensured that their vehicles were in an acceptable roadworthy condition in order to continue conducting business with Natref,

- company peace of mind was created by ensuring that the necessary checks were done that could potentially have contributed towards minimising the number of accidents involving road tankers transporting petro-chemical substances from their premises.

4.3.3. Assumptions

Arising from the above-mentioned conclusions the following assumptions can be made:

- The implementation of the checking and monitoring system at Natref brought about a decrease in the number of safety deficiencies (i.e. an increased level of desired compliance) on road tankers visiting Natref. This contributed towards increasing the safety of the specific vehicles that were inspected, the safety of each driver as well as creating an increase in the level of road safety where these vehicles traveled,
- this further contributed towards decreasing the number of accidents that these specific road tankers potentially could have been involved in,
- this in turn could also have prevented environmental degradation of which the degree of influence was difficult to measure within the scope of this study,

4.4. Recommendations for future research

This study was limited to the management controls and systems that a specific company can implement within the constraints of its span of control in order to improve road tanker safety and thereby reduce the potential for accidents. Other related opportunities identified for further research include:

- Determining whether the design standards of road tankers serve the purpose for which provision is made in codes of practice as well as making recommendations for improvements if considered necessary,
- determining the extent to which road tanker owners ensure that drivers of their vehicles are competent and fit to fulfill their tasks and to make proposals on how to improve upon any identified shortcomings,
- determining the extent of environmental degradation and ecological damage caused by road tanker activities and accidents along a specific route over a specified period of time and providing recommendations that can be implemented to improve any identified shortcomings.

ANNEXURE 1 – LIST OF FUEL PRODUCT ROAD TANKER TRANSPORTERS

TRANSPORTERS LIST

TRANSPORTERS CROSSBORDER

Afnet	
Africa Super Trucking	Botswana
Afrox	
Air Products	
Arrow Bulk	
BA Carriers	
Vosveld	
Brydeane Vervoer	
Bothma en Seun	
BP	
Bulcomex	
Caltex	
Concisto Carriers	
Connected Carriers	Zambia
Concrete Structure	
D Coetzee Transport	
Cargo Carriers	
Engen	
Exel	
Edgo Tankers	
Freight Dynamics	
Fred van Eeden	
FFS	
Feulogic	
Henroy	Zimbabwe and Zambia
Jumbo transport	
Javelin	
Lobtrans	
Heinal Transport	
Leeukop fuels	
Longhaul	
Kafco	
Mogas	Mozambique
M&M transport	
Mams transport	
Nick s transport	
Megatrans haulers	
Meicle transport	
Petrochem bulk	
Puregas	
Noeth vervoer	
Quebeck marketing	
Nyans transport	Zambia
Roadhog	
Reef Tankers	
Reef Petroleum	
Rustgold Transport	
Samack Haulage	Zimbabwe
Sasol Polymers	
Space oil	
Sasfuels & Chemicals	

Springbok Vervoer	
Suntrans	
Sabot Touch Tone trading	
Tepco	
Truck Africa	Botswana
Total	
Topstar	
Transport Logistics	
TCS Freight	Zimbabwe
United Bulk	
Unitrans	
Wargra Transport	
Vaal Petroleum	
Wardens Cartage	
WM logistics	
Wemer Logistics	
Zimbulk	Zimbabwe
Cantona	
Campbell Transport	
CH & M	
CJ Carriers	
Crossmoor Transport	
Colyns Transport	
Denby Transport	Zambia
DJ Jacobs Transport	
Frans Transport	
G.I.T.	Zimbabwe
Haulking	
Intrnational Bitumen Emulsions	
L.T.S.	
Madinda Speedy Services	
N.S.A. Carriers	
Peterson Brother Transport	
Paul s Logistics	
Rocket Trading	
Roadspray	Botswana
Trevors Trucking	
Senatar	Zimbabwe
Tiran transport	
Van der vent Transport	
Tosas	
Sasol Oil	
Bulk Trans	
B.S.S.	

Annexure 2 – INTERNET ARTICLE OF A ROAD TANKER ACCIDENT



Damaged City Road Partially Closed. (Main Johannesburg routes still closed after tanker fire) – T. Thale.

November 18, 2002, 19:30

Firemen hard at work after the accident

Johannesburg's M1 freeway and Empire Road remained closed this evening after a petrol tanker overturned and burst into flames. Connel MacKay, Metro police spokesperson, said the fire had been extinguished, but engineers were still assessing the damage done to the M1 bridge over Empire Road by the fire.

He said motorists should use alternative routes into the city centre.

The tanker overturned on the M1 South near the Empire Road off ramp around 4pm. MacKay said it was thought the driver had lost control of the vehicle in the wet conditions after the rain. The truck then overturned while going around a corner and crashed into the barrier. The barrier pierced the storage tank on the back of the vehicle and petrol spilled onto the road and caught fire.

MacKay said petrol had been traced up to a kilometre away on the roads and thus there was still a danger of more fires breaking out. He said the roads would only be reopened once the petrol had been cleaned up. No one was injured in the accident although MacKay said that subsequent accidents had occurred as a result of the initial accident and fire.

The burnt out tanker had been dragged to the side of the road and would be removed.

http://www.johannesburg.gov.za/nov_2002/nov19_road.stm [Date of access: 11 Feb. 2003].

Annexure 3 – PROCEDURE (Pages 50 – 65)

**SECURITY AND WEIGHBRIDGE CHECKS RELATING TO ROAD TANKER
PRODUCT ORDERS AND LOADING REQUESTS**

Revision 0

Doc Id : SECURITY CHECKS AT WEIGHBRIDGE_PROC_DOC-REV 0

Tree: F:\users\protective services\PROC86 – SECURITY CHECKS AT

REV	DATE	AUTHORISED BY	SECTION AND NATURE OF REVISION
1	04/09/2001	P Stroebe	Annexures 7.2 and 7.3 Security and Operations Check List

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1 PURPOSE

To establish a working procedure for the control over inspection of road tankers and loading and removal of petro-chemical products from Natref site.

2 SCOPE

The elements contained in this procedure, flow diagrams and checklists contain those issues that are considered critical to:

- Prevent sub-standard vehicles from entering Natref's site,
- prevent loss of product, and
- to ensure that effective controls are in place to prevent downstream incidents and/or irregularities.

3 DEFINITIONS AND ABBREVIATIONS

3.1 *Road Tanker* – Any vehicle being used to transport products from Natref premises to external destinations.

3.2 *Registered driver* – A driver who has satisfied all of Natref's as well as legal requirements regarding competency in driving and operating a road tanker as well as the loading and transportation of product. It is mandatory for every competent driver to be logged onto the Natref information system.

3.3 *PPE* – Personal Protective Equipment

3.4 *MSDS* – Material Safety Data Sheet

3.5 *PrDP-D* – Professional Driving Permit for Dangerous Goods

4 REFERENCES

4.1 The Road Traffic Act and Road Transport Act, 1996 (Act 93 of 1996),

4.2 SABS 0231:2000 (Transportation of dangerous goods. Inspection requirements for road vehicles)

4.3 Hazardous Substances Act, 1973 (Act 15 of 1973)

4.4 Environmental Conservation Act, 1989 (Act 73 of 1989)

4.5 National Environmental Management Act, 1998 (Act 107 of 1998)

5 RESPONSIBILITIES

5.1 The SHERQ Manager is responsible for developing this procedure,

5.2 The Chief Security Officer as well as the Divisional Manager responsible for Off-sites are responsible to ensure that this procedure is amended and adhered to.

5.3 The Engineering Manager is responsible for approving this procedure.

6 PROCEDURE

6.1 Pre-placed and non pre-placed orders/loading requests (See attached flow diagram Annexure 7.1)

6.1.1. Order placed with Sasol Oil on the SOCS System (if a pre-placed order)

6.1.2. Vehicle arrives at Natref gate.

6.1.3. Upon arrival of each truck the driver must park his truck in the forecourt where security staff check the following by means of Annexure 7.2;

- The driver must be in possession of his identification book and a check must be made to ensure that the holder of the identity document is the person whose photo appears thereon.

- The driver must be in possession of a valid drivers licence for the class of vehicle that he is driving

- The driver must have a valid medical fitness certificate stating that he has been found by a recognised/qualified medical practitioner to be medically fit to be driving a vehicle transporting hazardous substances. This examination must have taken place within the last 12 months and the certificate must be signed by the examining medical practitioner.

- The driver must have a copy of his certificate of training for the transportation of hazardous substances.

- A check must be done to see whether the driver shows signs of being intoxicated.
- A check must be done to see whether the driver has been issued with PPE.
- Other items/criteria which the security employees must check are; whether the vehicle is visibly in a good mechanical condition, whether the correct hazchem signs are in place, whether all the valves are closed, whether the hoses are in a good condition, whether a rear chevron is in place, whether warning triangles are available, whether the vehicle tyres comply with regulatory requirements, whether the vehicle has an electrical isolation switch and whether gas cylinders (meant for cooking) are on the vehicle. If a gas cylinder is on the vehicle then it must be taken and kept by security in a safe place until the vehicle leaves Natref's premises.
- A check must be done to see whether the driver is in possession of a Tremcard and a product MSDS. It must be determined whether the information on the Tremcard refers to the product on the MSDS. It must also be ascertained whether the information in the Tremcard and MSDS refers to the information on the Hazchem sign on the mobile tanker/trailer.
- A check must be done to determine whether the driver has got the correct transportation documents. i.e. the name of the driver that appears on the order/loading request must also appear on the list of approved drivers, the details of the driver as described in the order/loading request must correspond with the details in his identity document, according to the discretion of the security personnel, the transportation documents must look authentic and the details on the order/loading request must be checked. The documents must be typed, however, the details concerning the driver and the truck may be hand written (Any concerns in this regard must be brought to the attention of the weigh-bridge employees). The documents must also be signed in coloured ink and no numbers/details must have been altered on the documents.
- The Dispatch Security Controller will do daily checks to ensure that the registration numbers on the order/loading requests appear on the approved vehicle list as well as to determine whether the drivers names appears on the approved Natref driver list. He will

also check from time to time with the traffic authorities that the registration numbers correspond with the make of vehicles.

- A check must also be done to ensure that the registration numbers on the order/loading request corresponds with the numbers on the vehicle as well as on the licence disks (for the horse, trailer and tub). Security employees must also check where possible that the vehicle is not provided with false registration plates. All licence disks must be valid and any vehicle whose licence is expired by more than 21 days will be refused entry, regardless.

 - Security employees should always take into consideration that the order received may be falsified and must use their discretion to determine what a valid order/loading request should look like.
- 6.1.4. If problems are encountered relating to either the order/loading request, the details of the driver or the condition of the truck then the driver must be refused entry and be informed of the reason why entry has been refused. The weigh-bridge staff are to be notified immediately and they in turn will notify Sasol Oil and/or the relevant oil company for further action and instructions.
- 6.1.5. If no problems are encountered relating to either the order/loading request, the details of the driver or the condition of the truck then the security employee and the driver signs the checklist and the driver is provided with the completed checklist which now serves as the clearance permit. This document also has an indemnity clause contained therein. The driver then takes this clearance permit with the transport documentation to the weigh-bridge employees who then do a further documentation check.
- 6.1.6. Whilst at the weigh-bridge the original order/loading request documents are provided by the driver to the weigh-bridge staff who check their validity and the authenticity of signatures. The weigh-bridge employees must check the driver's identity document when he enters the weigh-bridge offices. The weigh-bridge employees must check that the driver and truck details are registered with Natref. If not registered with Natref then the driver will be refused entry and Sasol Oil and/or the weigh-bridge employees will notify the applicable Oil Company. The weigh-bridge employees must check and verify the following on the transportation documentation:

- order number (for pre-placed orders)
- driver name and surname clearly printed
- driver identity number
- customers name.
- product name
- product quantity (in litres)
- vehicle registration numbers (including horse, trailer and tub)
- that all documentation is signed in colored ink by the authorized person (check for authenticity of signature)
- that the documentation has no changes thereon
- that it is the original documentation
- that pre-placed orders are accompanied by a screen dump of the actual order and signed by the authorized person in colored ink
- that the date of pick-up is clearly indicated
- **note:** All orders/loading requests older than 3 days must be questioned on the first working day with the relevant authorised person (loading can however continue if everything else is in place)

6.1.7. If the validity/authenticity of the documentation is suspect/not correct then Sasol Oil and/or the applicable Oil Company will be notified and further instructions requested.

- 6.1.8. If the documentation is found to be valid and the weigh-bridge checks are in order then the driver will be instructed to bring his vehicle onto the weigh-bridge. The security employees must ensure that the driver parks the truck on the weigh-bridge correctly. The vehicle is weighed and the driver is permitted entry to the loading area to continue with the loading process.
- 6.1.9. After loading, security performs a check for leaks as well as for any Natref equipment. The vehicle must be weighed again at the same weigh-bridge and any incidental records/documentation checked. It is important for security to check that the vehicle is correctly positioned on the weigh-bridge. Security then checks the weigh-bridge printout to ensure that the vehicle load restriction has not been exceeded (delta between flow and scale readings to be not more than 200kg). If all is in order the drivers identity document is then returned by the weigh-bridge staff after which the vehicle then leaves the premises. (copies of the checklist/clearance permit must be returned to security and be kept on record)

6.2 General

- 6.2.1 Vehicles with licence disks that have expired must be permitted 21 days from the date of expiry to renew the licences after which Natref will then prevent them from loading product.
- 6.2.2 Natref must be informed in writing 24 hours in advance of any new truck, trailer and tub details prior to the vehicle(s) being permitted entry onto Natref premises. In this case a written notice signed by an authorised person will be accepted at the weigh-bridge but only in case of the emergency replacement of a vehicle. Weigh-bridge staff must check the validity of the registration of this vehicle with the respective company on the first working day thereafter.
- 6.2.3 No changes to the original documents will be permitted and no documentation will be accepted that is not signed in coloured ink by an authorised person.
- 6.2.4 Confirmation of any changes relating to driver or truck details will be done telephonically. The weigh-bridge operator will call the authorised person to ensure that the changes are authorised. No changes will be accepted by the weigh-bridge operator if contact cannot be made with the

authorised person or if he is contacted by someone other than the authorised person to make such changes.

6.2.5 Quantity changes will only be permitted if it is a lesser amount and only after confirmation with an authorised person.

6.2.6 Companies will provide Natref in advance and on a monthly basis with a list indicating:

- Name of company and haulier
- truck, trailer and tub registration numbers
- full names of their drivers and their identity numbers.

These lists must be formally reviewed by the weigh-bridge employees on a monthly basis. Only drivers whose names are on the Natref Renaissance Information Data System will be permitted to enter Natref.

6.2.7 Any road tanker not meeting the required specifications will be denied entry to Natref premises.

6.2.8 Record should be kept by security of all trucks that attempt to gain entry without proper authorisation and action to be taken where necessary.

6.2.9 Companies (including Sasol oil) must also provide to Natref the full names of authorised persons, their telephone numbers during office hours, their telephone numbers after hours as well as proof signatures of those persons who are authorised to place the orders/requests for loading product. These must be available to the weigh-bridge operators as well as to security.

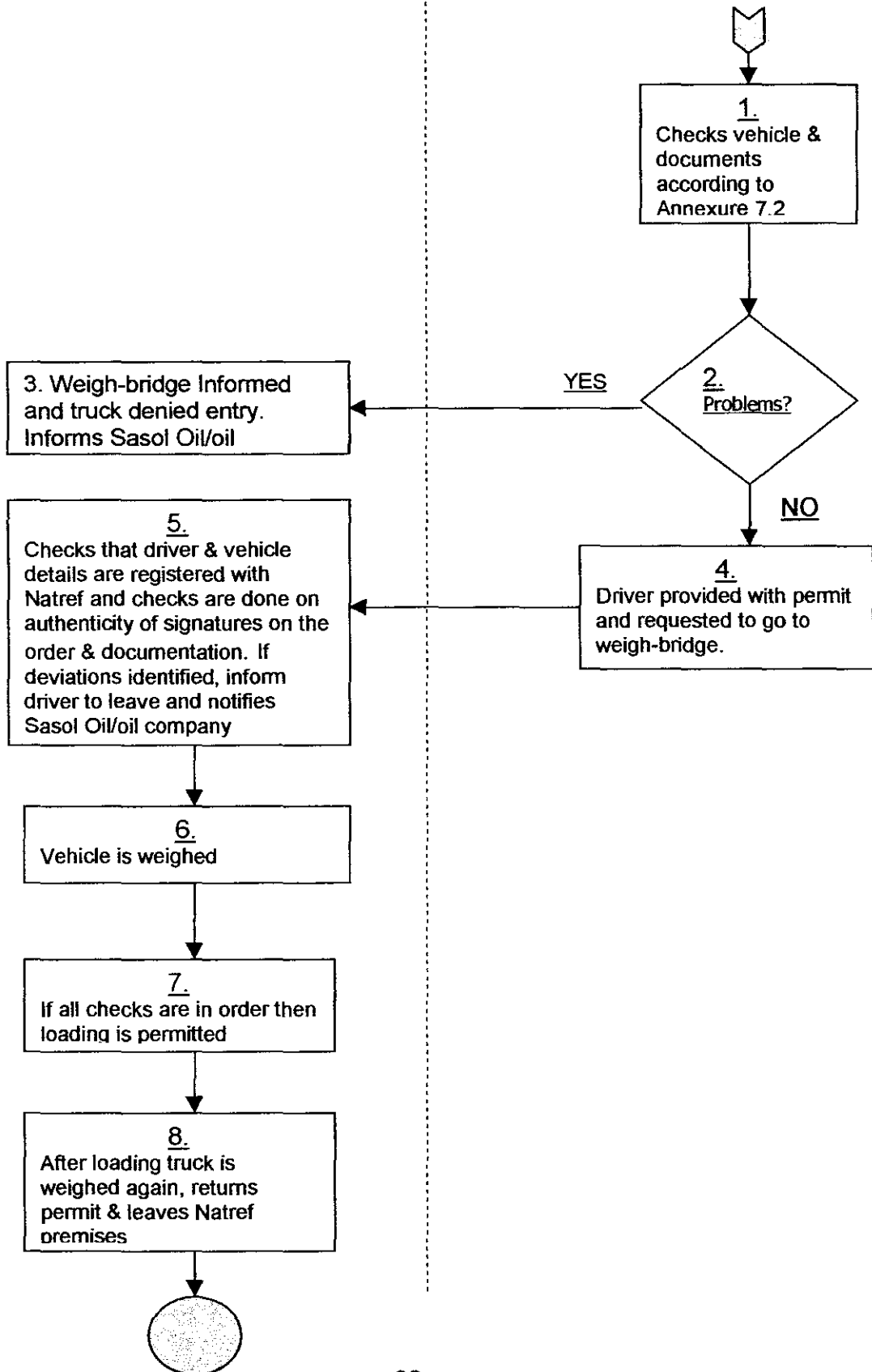
6.2.10 The forecourt area will become very busy from time to time and thus it is important for the security employees to call for additional assistance from the main gate if considered necessary.

6.2.11 No other persons other than the drivers of the respective trucks are permitted onto Natref premises (all other family members/encumbrances are to wait outside the Natref premises whilst the loading process is taking place).

APPENDIX 7.1 – PRE-PLACED AND NON PRE-PLACED ORDERS

Weigh-bridge staff

Security



ANNEXURE 7.2 : SECURITY AND OPERATIONS CHECKLIST

1 DETAILS:

Date: _____ Time in: _____
 Driver name: _____ Identification number: _____
 Contractor: _____ Shift: _____
 Horse registration no: _____ Semi Trailer Reg no _____
 Pup Trailer reg no: _____ On account of: _____ P/No: _____

2 CHECKLIST

ITEM	YES	NO	COMMENTS
A DRIVER (Security to check)			
• ID document, licence card required			
• Valid driver's licence for class of vehicle and PrDP-D permit (SABS 0231)			
• Valid medical fitness certificate available (Check expiry date) (SABS 0231) – Is the driver medically fit?			
• Valid certificate of training (Hazardous Substance Act, Act 15 of 1973) (SABS 0231)			
• Signs of suspected intoxication			
• PPE: Hard hat, safety shoes, overalls, safety goggles (Bitumen – face shield) (SABS 0231)			
Checked by: _____			
Signed: _____			
B WEIGHBRIDGE OFFICIAL / BEFORE LOADING			
Loading orders valid:			
• Company order			
• Screendump (not applicable for all companies except for Tepco)			
• Order number on computer system			
• Driver registration on computer system			
• Order signed with driver name , ID number and vehicle registration on (compare with Company file)			
• Screendump signed with driver name, ID number and vehicle registration number in (Not applicable for Oil Companies except for Tepco)			

• All vehicle registration numbers on computer system			
Checked			
by: _____		Signed: _____	
C VEHICLE (Security to check)			
General appearance of the vehicle (Is the vehicle roadworthy?)			
1 Identification			
• Is the licence disk available and valid?			
• Is the date on the licence disks on windscreen and on mobile tankers valid? (i.e. are they not expired by more than 21 days?)			
2 Road Safety			
• Are head lights, indicators and brake lights working?			
• Are fuel & oil leaks evident?			
• Is the rear chevron in place?			
• Are warning triangles available? (SABS 0231)			
• Are mudguards on all wheels?			
• Is the under-run bar in place? (SABS 1518)			
• Tyres comply with the requirements			
• Is a battery electrical isolation switch present? (Where applicable – before loading)			
• Are gas cylinders on the vehicle?			
• Is a first aid box available?			
• Are wheel chocks available?			
• Is a shovel available?			
• Is the orange warning diamond in place? (SABS 0231)			
3 Product Safety			
• Check for leaks			
• Is at least one fire extinguisher available? (sealed, 9 kg, pressure, expiry date) (SABS 1398)			
• Is the fire extinguisher serviced and in a good condition?			
• Check truck is correctly positioned/parked on weigh-bridge			
Checked			
by: _____		Signed: _____	
D WEIGHBRIDGE IN (Operation)			
• Check that vehicle is parked correct on weigh-bridge electronically.			
• Weigh vehicle			

• Create transaction (only if all in B is correct)			
Checked			
by:	Signed:		
E DUTIES OF THE LOADING PROCESS CONTROLLER			
Check that the following is done:			
• Earth cables connected correctly			
• Stop block placed correctly			
• Battery isolation switch is off position			
• Loading pump is started			
• Loading meter set correctly			
• Give permission to Driver to load			
• Report any deviations			
F BEFORE LOADING (Loading operator)			
• The following steps must be taken:			
• Are all valves in a good condition, closed and no visible leaks?			
• Hoses in a good visual condition			
• Driver must be trained (see driver test document)			
• Park the tanker at the correct loading bay			
• Apply the vehicle's hand brake and switch off engine			
• Fit PPE before leaving cab			
• Physically isolate battery from electrical system with the battery isolation switch			
• Battery cover / shielded (SABS 1398)			
• Manhole covers and gasket checked (SABS 1398)			
• Place stop block in front of wheel			
• Connect earth cable			
• Connect the required loading pipe			
G DURING LOADING (Loading operator)			
• Start required loading pump			
• Get meter for required volume			
• Request permission to load from process controller			
• Open valves on tanker			
• Each compartment to be loaded separately			
H AFTER LOADING (Loading operator)			
• On completion remove the loading pipe			
• Remove the earth cable			
• Remove the stop block			
• All valves closed			
• Report any deviation immediately			
• Check for leaks			

• Completed spill report for every spill.			
Checked by: _____ Signed: _____			
I WEIGHING OUT (Operations)			
• Confirm that vehicle is parked correctly on weigh-bridge			
• Check vehicle for over weight (not exceeding 56 000 kg) (SABS 0231)			
• Weigh vehicle out			
• Capture order			
• Complete loading transaction			
• Check for valid Tremcard			
Checked by: _____ Signed: _____			
J WEIGHING OUT (Security)			
• Check for Natref equipment (theft)			
• Check if vehicle is correctly positioned on scale			
• Are the transport clearance documents in order?			
• Is the vehicle load restriction not overloaded, exceeded? (Delta between flow and scale readings to be not more than 200 kg)			
• Is the Hazchem sign in place? (Dangerous Goods Placard)			
• Is the driver in possession of the correct Tremcard and MSDS? (i.e. does the information on the Tremcard match the information on the Hazchem sign?)			
• Elevated temperature Placard (if applicable)			
Checked by: _____ Signed: _____			

3 INDEMNITY

I, the undersigned, hereby declare that I am aware and know of the potential dangers and risks associated with the operations of Natref and that I voluntary accept that I may be exposed to any potential dangers and risks during my visit to the plant area.

I hereby indemnify Sasol, Natref and Total and their employees and do not hold them responsible for any claims of whatever nature which I, third parties or my

dependants may wish to bring against them arising from any incident or exposure occurring during my presence on the premises.

I undertake to conform to the stipulations of the Occupational Health and Safety Act, Act 85 of 1993 and the regulations thereunder as well as any rules, regulations or procedures provided by Natref with special reference to environmental, health and safety measures that need to be adhered to.

I hereby undertake to obey any lawful instruction given by a Natref official. I also hereby authorise any employee empowered by Natref to search my vehicle, the contents thereof, any container, parcel or object in my possession and/or my person and clothing at any time.

INDEMNITY CLAUSE FOR DRIVERS LOADING BITUMEN TANKERS:

I hereby accept that bitumen loaded into our vehicle complies with the grade specified on the order and with SABS standards for that grade. However, due to our vehicle-containing product other than that specified on order, we do not hold Natref responsible for any off-grade claims made on this load of bitumen.

We guarantee that the residual bitumen in the vehicle will not cause priming with the grade to be loaded and that the vehicle's valves are in good condition and will not leak when loaded.

Signed Driver: _____ **Date** _____

Signed Security: _____ **SAP** _____ **Date** _____

CHECKED BY: _____ **SAP** _____ **Date** _____
SENIOR SECURITY OFFICER

_____ **SAP** _____ **Date** _____
CHIEF SECURITY OFFICER

**ANNEXURE 4 - SECURITY CHECKS AT THE WEIGHBRIDGE: TRAINING
COMPETENCY QUESTIONNAIRE (Pages 66 – 69)**

1. **What is considered to be the main purpose of security checks at the weigh-bridge?**
 - A To ensure a speedy movement of tankers through the gates.
 - B To provide a thorough inspection of road tankers according to PROC86 to ensure that; the transportation documents is in order, the possibility of fraud is minimised and that the vehicle is in a safe condition. ***
 - C Control over movement of products onto or out of Natref. *
 - D to count the number of tankers moving through the gates.

2. **Who is considered to be a registered driver?**
 - A A permanent employee of an Oil Company?
 - B A driver who has been logged onto the Natref system. ***
 - C A person who has satisfied all the Natref's requirements. ***
 - D A person who is found to be sober and has a valid driver's license. *
 - E Answer B, C & D. *

3. **What does the letters "MSDS" means?**
 - A Material Source Data Sheet.
 - B Management Security Driver System.
 - C Material Safety Data Sheet. ***

4. **The checklist "Annexure 7.2" is to be completed:**
 - A When a new tanker has been bought by an Oil Company.
 - B Every time a tanker driver wishes to gain access within 24 hours.
 - C The first time a tanker wishes to gain access during a period of 24 hours.

- D** The first time a tanker wishes to gain access during that shift.
-
5. When will a driver be instructed to bring his vehicle onto the scale?
- A** When the documentation is found to be valid. *
- B** When the weigh-bridge checks are in order. *
- C** When requested by the weigh-bridge employee.
- D** When a number of tankers are waiting outside the weigh-bridge.
6. The number of the registration plate must be checked against the corresponding registration number on the license disc as well as the registration numbers indicated on the transport documents. This applies to the horse, trailer and cub. The purpose of this is to:
- A** Check that the license is valid.
- B** Check that the vehicle is registered.
- C** Check that the registration plates match with the number on the licenses and that the registration numbers on the registration plates as well as on the licenses match with the information on the transportation documents. *
7. True or False?
- The weigh-bridge employees must ensure that the driver parks his vehicle on the weigh-bridge correctly. **(False)**
8. True or False?
- Only family members of drivers are permitted onto Natref premises. **(False)**
9. True or False?
- The registration number of a trailer is not important. **(False)**
10. True or False?
- A driver under the influence of alcohol may enter Natref with permission from the Chief Security Officer. **(False)**

11. True or False?

A driver without a Tremcard and/or MSDS will be denied access. **(True)**

12. True or False?

The name, surname and identity number of all drivers must appear on a approved list. **(True)**

13. True or False?

All drivers must be in possession of an identity document and a valid medical certificate. **(True)**

14. True or False?

All drivers must have a valid drivers license for the type of vehicle they are driving. **(True)**

15. True or False?

It is expected of all drivers to present a valid training certificate when access is requested. **(True)**

16. True or False?

Inspection of a tanker may be done without the driver being present. **(False)**

17. True or False?

Valves on a tanker must be leaking. **(False)**

18. True or False?

During day time access will be granted if the lights of a tanker are not in working order. **(False)**

19. True or False?

Access will be denied if a slight engine oil leak is observed. **(False)**

20. True or False?

Hazchem signs and a fire extinguisher on tankers are essential. **(True)**

21. True or False?

Chevron plates at the back of tankers/trailers are not compulsory. **(False)**

22. True or False?

Portable gas cylinders are allowed onto site providing they are securely closed and not used when on the premises. **(True)**

23. True or False?

The information stipulated on the Tremcard must correspond with information on the MSDS. **(True)**

24. True or False?

Access must be denied when the date on a license disc has expired. **(True)**

25. True or False?

It's important to ensure that tankers are parked on the scale correctly. **(True)**

26. True or False?

An inspection is not needed when a tanker leaves Natref. **(False)**

27. True or False?

Checks must be done to ensure that the photo on the drivers license matches with the driver and that the details in the drivers identity book corresponds with the information on the transportation documents. **(True)**

ANNEXURE 5 - LETTER TO TRANSPORTERS.

Natref letterhead

COMPLIANCE WITH NATREF SECURITY CHECKLIST REQUIREMENTS

Natref Security Services will soon implement a road tanker inspection checklist at the dispatch/weigh-bridge area. Up to now this checking process has not been vigorously enforced. Recently this checking system was revised in terms of legal compliance requirements and security staff were instructed and trained to more check adherence to the required standards more strictly.

The purpose of this checklist is fourfold, namely:

- To avoid losses from accidents caused by unsafe vehicles or untrained drivers,
- to avoid the potential for off-site accidents,
- ensure compliance with legislative and Natref safety standards, as well as
- to assist weigh-bridge staff in preventing theft.

In view hereof I wish to make a copy of this checklist available for your perusal to enable your company to ensure future compliance therewith. Please note that vehicles may in future be refused entry should they not adhere to these required standards.

Your attention is also drawn to the Hazardous Substances Act, Act 15 of 1973, The Road Traffic Act and Road Transport Act, 1996 (Act 93 of 1996) as well as SABS 0231: 2000 regarding requirements pertaining to vehicles transporting hazardous substances.

Your assistance and co-operation in complying with these standards as per this checklist will be much appreciated.

Yours sincerely

J de Villiers

ANNEXURE 6 – DEFECTS THAT CAUSED ENTRY REFUSAL: MONTHLY SUMMARY (pages 71 – 92)

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 MAY 2001 TO 31 MAY 2001	TOTAL NUMBER OF VEHICLES	2800
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	6	0.22
No PPE	0	0
False license disk	2	0.07
Photo copy of order	0	0
Expired PDP	4	0.14
Expired Medical Certificate	2	0.07
Expired Training Certificate	0	0
No Tremcard	3	0.11
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	0	0
Driver particulars not on system	5	2
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 JUNE 2001 TO 30 JUNE 2001	TOTAL NUMBER OF VEHICLES	2094
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	1	0.05
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	7	0.33
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	1	0.05
Expired Medical Certificate	0	0
Expired Training Certificate	1	0.05
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	14	0.67
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 JULY 2001 TO 31 JULY 2001	TOTAL NUMBER OF VEHICLES	1501
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	4	0.27
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	1	0.07
Expired Medical Certificate	2	0.13
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	1	0.07
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	2	0.13
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 AUGUST 2001 TO 31 AUGUST 2001	TOTAL NUMBER OF VEHICLES	1705
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	2	0.12
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	1	0.05
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	1	0.05
Expired Medical Certificate	1	0.05
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	2	0.12
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 SEPTEMBER 2001 TO 30 SEPTEMBER 2001	TOTAL NUMBER OF VEHICLES	2119
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	1	0.05
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	5	0.24
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	0	0
Expired Medical Certificate	3	0.14
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	1	0.05
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	0	0
Vehicle particulars not on system	1	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 OCTOBER 2001 TO 31 OCTOBER 2001	TOTAL NUMBER OF VEHICLES	2302
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	3	0.13
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	0	0
No PPE	4	0.02
False license disk	0	0
Photo copy of order	0	0
Expired PDP	1	0.04
Expired Medical Certificate	0	0
Expired Training Certificate	0	0
No Tremcard	3	0.13
Unsigned order	0	0
No fire extinguisher	2	0.09
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	0	0
Vehicle particulars not on system	5	0
No driver's license	0	0.22
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	2	0.09
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 NOVEMBER 2001 TO 30 NOVEMBER 2001	TOTAL NUMBER OF VEHICLES	2300
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	2	0
License expired (21 days plus)	4	0.09
Registration number not corresponding with disc	0	0.17
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	5	0
No PPE	0	0.22
False license disk	0	0
Photo copy of order	0	0
Expired PDP	3	0
Expired Medical Certificate	0	0.13
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	3	0
No Hazchem signs	0	0
Driver particulars not on system	0	0.13
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 DECEMBER 2001 TO 31 DECEMBER 2001	TOTAL NUMBER OF VEHICLES	2342
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	2	0
License expired (21 days plus)	0	0.08
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	6	0.26
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	0	0
Expired Medical Certificate	3	0.13
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	3	0.13
No Hazchem signs	1	0.43
Driver particulars not on system	0	0
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 FEBRUARY 2002 TO 29 FEBRUARY 2002	TOTAL NUMBER OF VEHICLES	2661
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	1	0.04
License expired (21 days plus)	0	0
Registration number not corresponding with disc	1	0.04
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	4	0.15
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	0	0
Expired Medical Certificate	3	0.11
Expired Training Certificate	0	0
No Tremcard	2	0.08
Unsigned order	0	0
No fire extinguisher	1	0.04
No Hazchem signs	0	0
Driver particulars not on System	0	0
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 MARCH 2002 TO 31 MARCH 2002	TOTAL NUMBER OF VEHICLES	3253
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	5	0.15
Registration number not corresponding with disc	0	0
Truck without orange diamond	3	0.09
Smooth tyres (Less than 1 mm)	0	0
No PPE	6	0.18
False license disk	0	0
Photo copy of order	0	0
Expired PDP	0	0
Expired Medical Certificate	8	0.25
Expired Training Certificate	0	0
No Tremcard	7	0.22
Unsigned order	0	0
No fire extinguisher	2	0.06
No Hazchem signs	4	0.12
Driver particulars not on system	0	0
Transporter particulars not on system	5	0.15
Vehicle particulars not on system	0	0
No driver's license	1	0
Under influence of alcohol	0	0.03
No registration plates	0	0
No stop blocks	1	0
No triangles	2	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 APRIL 2002 TO 30 APRIL 2002	TOTAL NUMBER OF VEHICLES	2788
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	3	0.11
Defective hoses & valves	1	0.04
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	0	0
No PPE	3	0.11
False license disk	0	0
Photo copy of order	0	0
Expired PDP	4	0.14
Expired Medical Certificate	0	0
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	3	0.11
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 MAY 2002 TO 31 MAY 2002	TOTAL NUMBER OF VEHICLES	2824
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	2	0.07
Smooth tyres (Less than 1 mm)	0	0
No PPE	2	0.07
False license disk	0	0
Photo copy of order	0	0
Expired PDP	0	0
Expired Medical Certificate	4	0.14
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	2	0.07
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	1	0.0354107 65
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	1	0.0354107 65
No triangles	1	0.0354107 65
Defect battery switch	1	0.0354107 65

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 JUNE 2002 TO 30 JUNE 2002	TOTAL NUMBER OF VEHICLES	2655
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	2	0.08
License expired (21 days plus)	2	0.08
Registration number not corresponding with disc	0	0
Truck without orange diamond	1	0.04
Smooth tyres (Less than 1 mm)	0	0
No PPE	2	0.08
False license disk	0	0
Photo copy of order	0	0
Expired PDP	2	0.08
Expired Medical Certificate	0	0
Expired Training Certificate	0	0
No Tremcard	1	0.04
Unsigned order	0	0
No fire extinguisher	2	0.08
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	3	0.11
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	1	0.04
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 JULY 2002 TO 31 JULY 2002	TOTAL NUMBER OF VEHICLES	2600
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	1	0.04
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	2	0.08
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0.01
Expired PDP	1	0.04
Expired Medical Certificate	3	0.12
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 AUGUST 2002 TO 31 AUGUST 2002	TOTAL NUMBER OF VEHICLES	2479
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	0	0
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	1	0.04
Expired Medical Certificate	2	0.08
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	1	0.04
Driver particulars not on system	0	0
Transporter particulars not on system	1	0.04
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 SEPTEMBER 2002 TO 30 SEPTEMBER 2002	TOTAL NUMBER OF VEHICLES	1987
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	0	0
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	1	0.05
Expired Medical Certificate	1	0.05
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 OCTOBER 2002 TO 31 OCTOBER 2002	TOTAL NUMBER OF VEHICLES	2130
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	0	0
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	1	0.04
Expired Medical Certificate	2	0.09
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	0	0
Driver particulars not on system	1	0.04
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 NOVEMBER 2002 TO 30 NOVEMBER 2002	TOTAL NUMBER OF VEHICLES	2346
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	1	0.04
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	0	0
Expired Medical Certificate	2	0.09
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	0	0
Driver particulars not on system	0	0
Transporter particulars not on system	0	0
Vehicle particulars not on system	1	0.04
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 DECEMBER 2002 TO 31 DECEMBER 2002	TOTAL NUMBER OF VEHICLES	1827
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	0	0
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	0	0
Expired Medical Certificate	0	0
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	0	0
Driver particulars not on system	1	0.05
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 JANUARY 2003 TO 31 JANUARY 2003	TOTAL NUMBER OF VEHICLES	1798
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	0	0
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	0	0
Expired Medical Certificate	0	0
Expired Training Certificate	1	0.06
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	0	0
Driver particulars not on system	1	0.06
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	1	0.06
Defect battery switch	0	0

Defects that caused entry refusal: Monthly Summary

DEFECTS THAT CAUSED ENTRY REFUSAL 1 FEBRUARY 2003 TO 28 FEBRUARY 2003	TOTAL NUMBER OF VEHICLES	2198
TYPE OF DEFECT	NUMBER OF DEFECTS	% OF TOTAL
Oil Leaks (extensive)	0	0
Defective hoses & valves	0	0
License expired (21 days plus)	0	0
Registration number not corresponding with disc	0	0
Truck without orange diamond	0	0
Smooth tyres (Less than 1 mm)	1	0.05
No PPE	0	0
False license disk	0	0
Photo copy of order	0	0
Expired PDP	2	0.09
Expired Medical Certificate	0	0
Expired Training Certificate	0	0
No Tremcard	0	0
Unsigned order	0	0
No fire extinguisher	0	0
No Hazchem signs	0	0
Driver particulars not on system	1	0.05
Transporter particulars not on system	0	0
Vehicle particulars not on system	0	0
No driver's license	0	0
Under influence of alcohol	0	0
No registration plates	0	0
No stop blocks	0	0
No triangles	0	0
Defect battery switch	0	0

ANNEXURE 8 - MONTHLY RECORD OF MAJOR DEFECTS ON VEHICLES INSPECTED (1 MAY 2001 TO 28 FEBRUARY 2003)

Month	Number of vehicles inspected	Major defects (Entry refused)
May 2001	2800	22
June 2001	2094	24
July 2001	1501	10
August 2001	1705	7
September 2001	2119	11
October 2001	2302	20
November 2001	2300	17
December 2001	2342	15
January 2002	2518	26
February 2002	2661	12
March 2002	3253	44
April 2002	2788	14
May 2002	2824	14
June 2002	2655	16
July 2002	2600	7
August 2002	2479	5
September 2002	1987	2
October 2002	2130	4
November 2002	3246	4
December 2002	1827	1
January 2003	1798	3
February 2003	2198	4

SUMMARY

REDUCING THE POTENTIAL FOR ACCIDENTS AND ASSOCIATED ENVIRONMENTAL IMPACTS ARISING FROM ROAD TANKERS TRANSPORTING PETRO-CHEMICAL SUBSTANCES

The problem being investigated in this study is the risk that petro-chemical road tankers impose upon the environment and how potential accidents and the impact of associated environmental damage can be reduced. The adherence to road tanker related safety standards differs between vehicle owners and the medical fitness and competency of drivers are not all on the same level. As a result, it is presumed that the potential is high for an accident to occur involving road tankers transporting petro-chemical products. A need was identified to implement a system that will ensure the consistent adherence to safety standards and the monitoring thereof so as to reduce the risk of accidents and environmental impacts.

The aim of this study is to implement an inspection system as well as safety standards that will obligate owners of road tankers to comply with the requirements before they can conduct business with company's who produce and supply petro-chemical products. By means of the implementation of such a system it was expected that the degree of compliance to safety standards would be increased and hence it would reduce the potential for an accident involving petro-chemical road tankers.

The literature study covered: the various methods of transporting petro-chemical products, research done on the extent of the risks associated with road tankers, the consequences and causes of accidents, design requirements, the existence and need to comply with safety standards as well as considering the South African legislation to which road tankers, drivers and owners of road tankers must comply.

As part of the empirical study it was determined that road tankers, drivers, road tanker owners as well as Natref security employees would be involved as the experimental subjects and participants. The empirical study further involved:

- Evaluating the level of previous safety and inspection standards that were applied to check road tankers at Natref (National Refineries of South Africa),
- evaluating the advantages of implementing an inspection checklist system, the identification of the criteria that must be incorporated into an inspection checklist as well as the development of the inspection checklist and the associated procedure,
- development of a road tanker inspection training course and test, the provision of training to security employees and testing their competence,

- providing a written pre-implementation warning to road tanker owners to inform them of the imminent implementation of the inspection system,
- the implementation of the procedure and inspection checklists as well as the monitoring of compliance and recording of results.

The results emanating from this study indicate that the degree of compliance to the safety standards improved and the number of safety defects on road tankers reduced over the study period. None of the vehicles with safety defects were permitted access to Natref's premises. The assumption arising here-from is that the improvement in adherence to the safety standards contributed towards preventing accidents and thus reducing the potential for the occurrence of environmental damage.

Keywords

Implementation of control measures, inspection system, training, reduction of environmental damage, reduction in safety defects, adherence and compliance to safety standards.

- opstel van 'n padwaterker inspeksie opleidingskursus en toets, die verskaffing van opleiding aan die sekuriteitswerknemers en die toets van hulle bekwaamheidsvlakke,
- voorafwaarskuwing aan die eienaars van padwaterkers dat 'n inspeksie stelsel ge-implenteer gaan word,
- implementasie van die prosedure en inspeksielyste en die monitering van voldoening en resultate.

Die resultate wat uit hierdie studie voortvloei is dat die mate van voldoening aan veiligheidstandaarde verbeter het as gevolg van die implementering van verhoogde standaarde en 'n inspeksiestelsel. Die hoeveelheid veiligheidsdefekte het dus verminder oor die duur van die navorsing. Geen padwaterker met 'n defek kon toegang tot Natref verkry na die implementering van die inspeksie sisteem. Die aanname is gemaak dat die verbetering in die voldoening aan veiligheidstandaarde daartoe bygedra het om ongelukke te voorkom en sodoende potensiele omgewingskade te beperk.

Sleutelwoorde

Implementasie van kontrole maatreels, inspeksiestelsel, opleiding, vermindering van omgewingskade, vermindering van veiligheidsdefekte, toepassing en voldoening aan veiligheidstandaarde