CAPABILITY OF PRODUCERS TO MANUFACTURE BIODIESEL AND BUYER-READINESS FOR BIODIESEL USE

A research proposal submitted

By

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ABSTRACT

The purpose of this research project is twofold. Firstly to establish whether South African biodiesel producers can profitably manufacture biodiesel on a commercial scale. Secondly to understand the readiness of owners of passenger vehicles to use biodiesel. Buyers pass through six stages before purchasing a new product, namely awareness, knowledge, liking, preference, conviction, and finally purchase.

Based on the literature review, five research questions were developed to understand the capability of producers to commercially manufacture biodiesel. In this qualitative research section a series of face-to-face, semi-structured interviews were conducted with the current major players in the biodiesel industry. The data from each of these interviews was analysed to assess the producers' capability to commercially manufacture biodiesel. Six research hypotheses were developed to understand the readiness of buyers to use biodiesel. In this quantitative research section a Likert scale questionnaire was presented in person to respondents at petroleum fuel stations. The data from each questionnaire was analysed to assess the buyer-readiness of passenger vehicle owners.

An investigation revealed that there is currently only one producer commercially manufacturing biodiesel. South African producers have the capability to manufacture biodiesel on a commercial scale however sustainable feedstock supply is concerning. The producers claim that they can manufacture biodiesel to quality standards. No facility in South Africa can however test the full spectrum of the SANS 1935 quality standard. The industry requires additional encouragement and support from the South African government.

Vehicle owners are at a Conviction buyer-readiness stage. Only 2.8% of the consumers have used biodiesel before. This is probably due to the commercial unavailability of biodiesel fuels. It is further identified that different age groups are at the same buyer-readiness stage. Marketers and sellers should however know that vehicle owners agree that biodiesel is better for their vehicle engines than petroleum diesel. Sellers should be sensitive to the fact that consumers are not prepared to pay a higher price for biodiesel than for petroleum diesel.

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DECLARATION

I declare that this research project is my own, unaided work. It is submitted in partial fulfilment of the requirements of the degree of Master of Business Administration for the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other university.

…… Date: ……

Ruben Roach

DEDICATION

To my wife, Verina and my son, Rohan who sacrificed many weekends and holidays to allow me to fulfil this report. Thank you for the endless supply of treats, quiet time and love which kept me motivated.

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ACKNOWLEDGEMENTS

I wish to express my sincere thanks to:

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- My mother who admirably assisted me in presenting the buyer-readiness questionnaires.
- Our MBA group who kept me motivated throughout the year and gladly shared their knowledge, experience and expertise.
- To Shell South Africa and the petroleum fuel station owners who allowed me to present the questionnaires at the Middelburg and Midrand Shell Ultra Cities.
- All participants in the research for their willingness and time to share their thoughts and insights.
- To my fiends and work colleagues for their continuous support.

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CHAPTER 1. DEFINITION OF THE PROBLEM

1.1 INTRODUCTION

Much of our civilization depends on energy. Without energy, advanced economies cannot sustain their standard of living. Without energy, developing and emerging economies will never attain the growth and quality of life to which they aspire and to which they are entitled (Conn, 2006).

One of the major sources of energy is oil, a naturally occurring fossil fuel which, when processed can produce energy in different forms, however Pahl (2005: p1) states that we are running out of oil. “This is an undeniable fact. The only remaining question is not *if* but *when*”. He further argues that depleting the global oil barrel is not the immediate problem. The more looming danger is what happens when demand exceeds supply: dramatic price increases for oil. Currently the annual demand for oil, which is continually increasing, is four times greater than the volume of new oil reserves discovered. The U.S. Department of Energy maintains one of the most optimistic views by stating that oil production won’t peak until 2037. Colin Cambell, the renowned petroleum geologist, however estimates that global oil extraction will peak before 2010 (Pahl, 2005).

Growth in energy demand, limited oil reserves, supply security and environmental constraints compel countries to evaluate their policies and perspectives towards energy production and consumption (Conn, 2006).

The South African government understands these key drivers of the energy future and consequently has set a target of 10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013 (Department of Minerals and Energy, 2003).

1.2 MOTIVATION FOR RESEARCH

The Worldwatch Institute’s recent annual report, *State of the World 2004* as cited in Pahl (2005: p5), states that “even though technology allows for greater fuel

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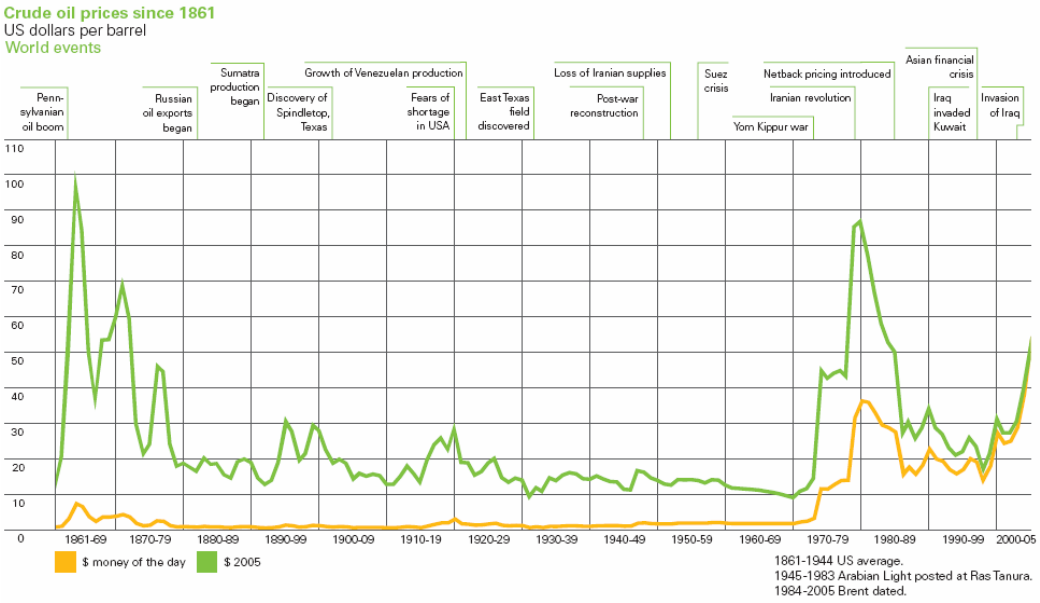
efficiency than ever b ansportation account for nearly 30 percent of world energy use and 95 percent of global oil consumption". Pahl (2005: p5) further motivates the use of biodiesel when he states that "There is only one liquid fuel that is both renewable and can be used in a wide range of vehicles without any modification to the engines. That fuel is biodiesel".

Biodiesel is seen as a renewable energy resource that can mitigate the risk of international crude oil price fluctuations and alleviate South Africa's dependency on petroleum diesel.

As the price of crude oil and thus petroleum diesel rises, biodiesel as a substitute for petroleum diesel becomes more viable. Figure 1-1 gives a descriptive view of world crude oil prices since 1861.

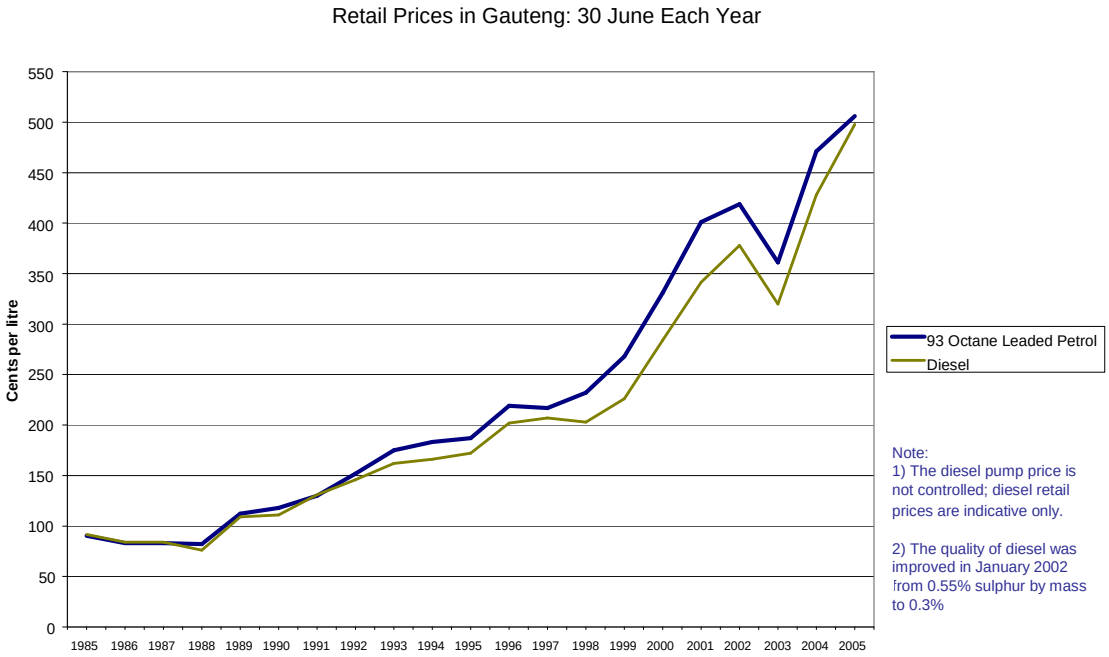
Figure 1-1: Crude Oil Prices Since 1861



(Source: BP, 2006)

Figure 1-2 below illustrates the rising petroleum diesel price for the past nine years as made available by the South African Petroleum Industry Association (SAPIA, 2006).

Figure 1-2: Diesel Prices from end 1985 to end 2005



(Source: SAPIA, 2006)

Data from SAPIA (2006) further indicate that in Rand value, the transport sector account for 64% of the total diesel market for 2005. The size of the diesel transport market is over R5,162 million. The mining and construction sectors account for a further 12% of the diesel market.

International studies have shown the benefits of biodiesel production and perceptions of biodiesel consumers (Tyson, Hamilton and Finnell, 1998). Yet it is uncertain whether South Africa is equipped to process biodiesel on a commercially viable scale and whether South Africa's petroleum diesel consumers are ready to change to biodiesel. South African research on the biodiesel topic has mostly been limited to the farming potential of biodiesel raw materials and potential job creation.

1.3 RESEARCH AIM

The aim of the proposed research is twofold. Firstly to determine whether South African producers is equipped to commercially manufacture biodiesel, namely whether the biodiesel producers have the required resources, capacity,

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experience, skills, and biodiesel. Face-to-face interviews will be done with key stakeholders in South Africa who are commercially manufacturing biodiesel or who intend to commercially manufacture biodiesel in the near future. Findings on the capability of the organisations to commercially manufacture biodiesel will be made from the analysed qualitative data.

Secondly to determine whether vehicle owners are aware of, ready and willing to use biodiesel, namely those owners of passenger vehicles who would normally use petroleum diesel. Buyer-readiness questionnaires will be completed at selected petroleum fuel stations. The questionnaires will be administered to test the readiness of vehicle owners to use biodiesel. Analyses of this quantitative data will provide an objective view on the readiness of the sample.

1.4 THE REPORT STRUCTURE

Chapter 1 provides the context of the research by providing an overview of the importance of energy as driving force of economies as well as the imminent danger of increasing oil demands. The role of biodiesel as a possible solution is motivated and parameters for the research are provided.

Chapter 2 covers the literature as it relates to the future of energy, the South African context and the advantages of renewable energy solutions such as biodiesel. An overview of biodiesel production, biodiesel feedstock and potential benefits in a South African context is provided. The buyer-readiness theory is reviewed and discussed from the point of view that biodiesel is an innovation that must be adopted by the regular diesel fuel users.

Chapter 3 deals with the questions which the research seeks to answer as well as the hypotheses that must be evaluated based on the literature review, and evidence of the problem.

Chapter 4 describes the research methodology followed, the population and sample selection criteria used, and the methodology used for content analysis of the data.

Chapter 5 contains the findings of the data collection process. The categories and themes which were elicited from the semi-structured interviews are highlighted for each question. The findings of the hypotheses based on the buyer-readiness of consumers to use biodiesel are included in this chapter.

In Chapter 6 the research results are discussed opposite the research questions and research hypotheses posed.

The final chapter, Chapter 7, outlines the significance of the research and its limitations. The chapter concludes with recommendations for future research.

CHAPTER 2. THEORY AND LITERATURE REVIEW

2.1 INTRODUCTION

Extensive research has been conducted internationally on the broad topic of energy, biodiesel production, biodiesel fuel and performance characteristics, regulatory and legislative activities, economic and environmental impact and commercialisation activities.

The literature review seeks to sketch a picture of our global energy economy and the role biodiesel can play in especially the fuel economy. The literature review and theory base further seeks to identify the different models of innovation adoption and thus the different stages of readiness of buyers who wishes to consume biodiesel as alternative fuel to normal (fossil) diesel.

2.2 ENERGY IN OUR GLOBAL ECONOMY

Conn (2006) identifies four key drivers of our energy future, which are:

- The growing demand for energy.
- Stability of supply.
- Sustained energy supply.
- Environmental constraints we must consider.

These key drivers will be discussed next with the focus on oil as an energy source and source of petroleum fuels.

2.2.1 DEMAND GROWTH

BP (2006) states that “global oil consumption grew by 1.3% in 2005 which is below the 10-year average and a marked slowdown from the strong growth (+3.6%) seen in 2004”.

Figure 2-1 below graphically shows the increase in the annual consumption of oil by area. It is interesting to note especially the growth in

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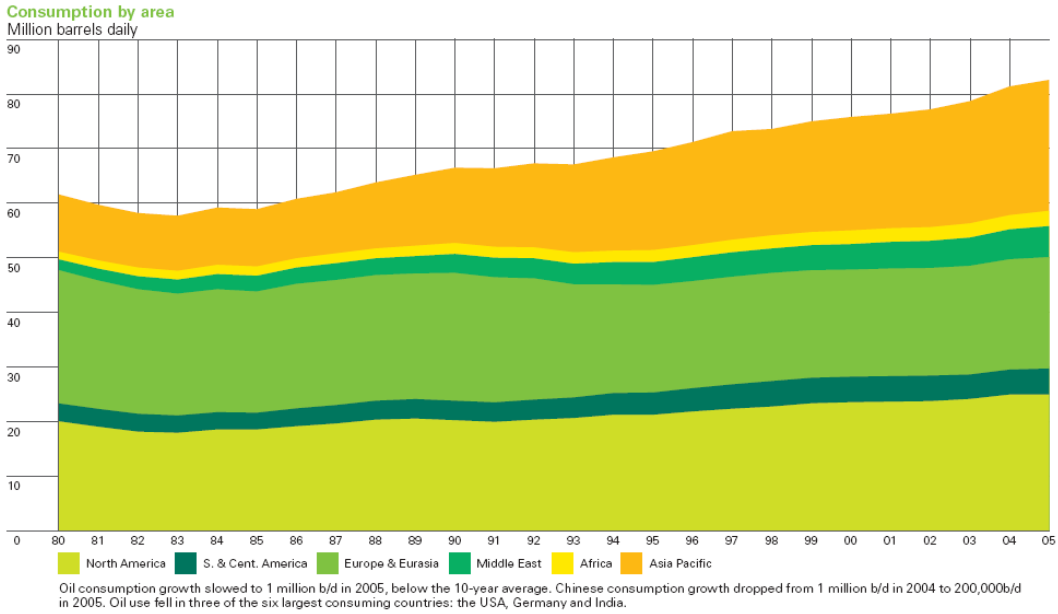
consumption in period compared to the other regions.

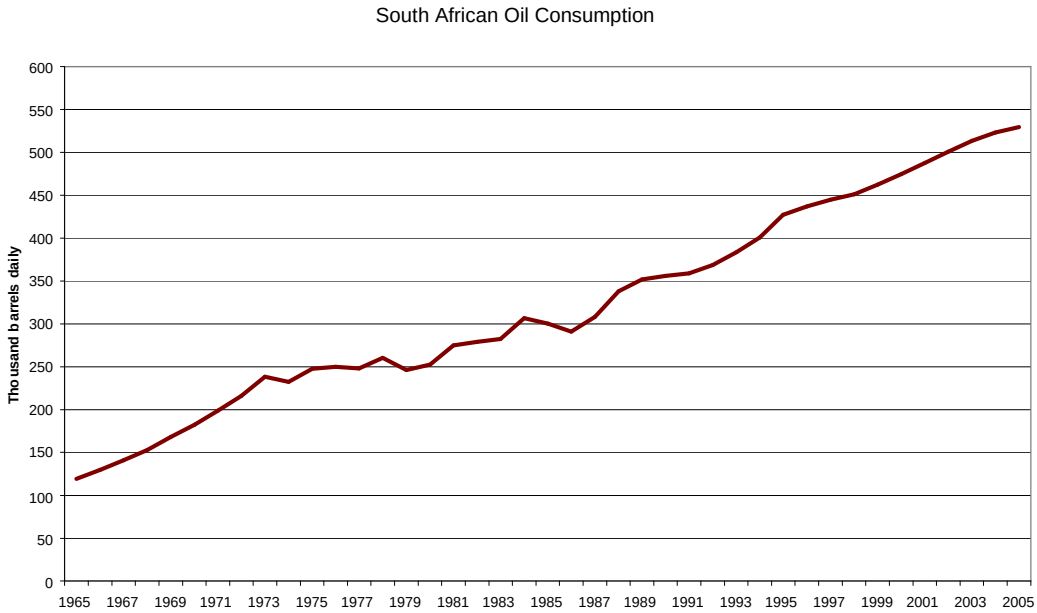
Figure 2-1: Oil Consumption by Area



(Source: BP, 2006)

Figure 2-2 below indicates the steady increase of South Africa's oil consumption for the period 1965 to 2005.

Figure 2-2: South African Oil Consumption

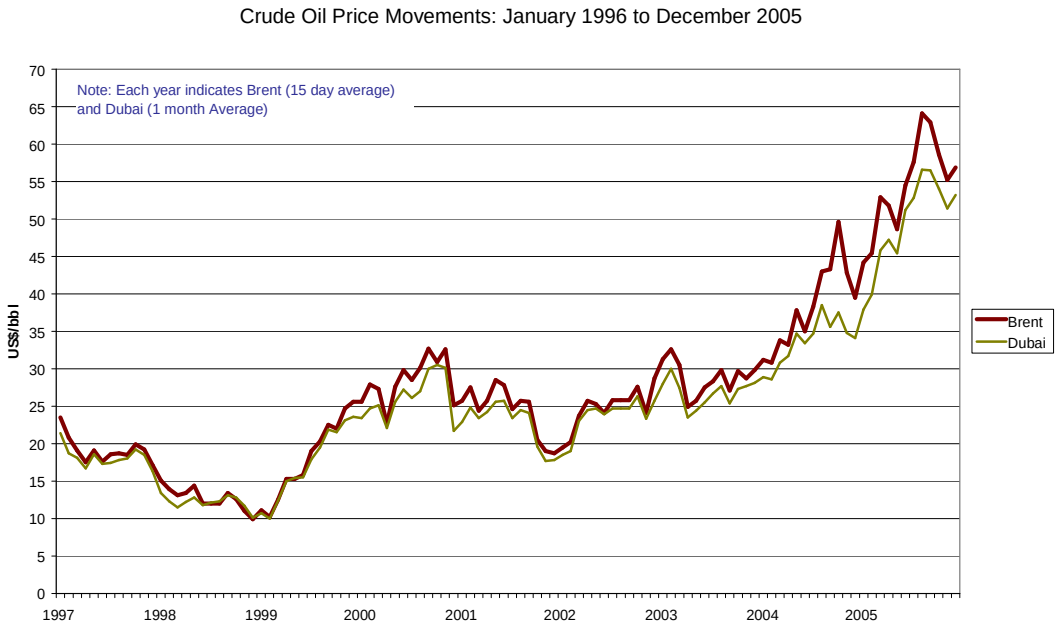


(Source: BP, 2006)

For the last te ption grew by more than 24%. During the period from 2004 to 2005 South Africa's oil consumption showed a slight increase of 0.6% from 24.8 million tonnes to 24.9 million tonnes. For 2005 this represents a 0.6% share of the 3,836.8 million tonnes of oil globally consumed (BP, 2006).

Figure 2-3 below shows the steep increase in oil price over the period 1997 to 2005.

Figure 2-3: Crude Oil Price Movements

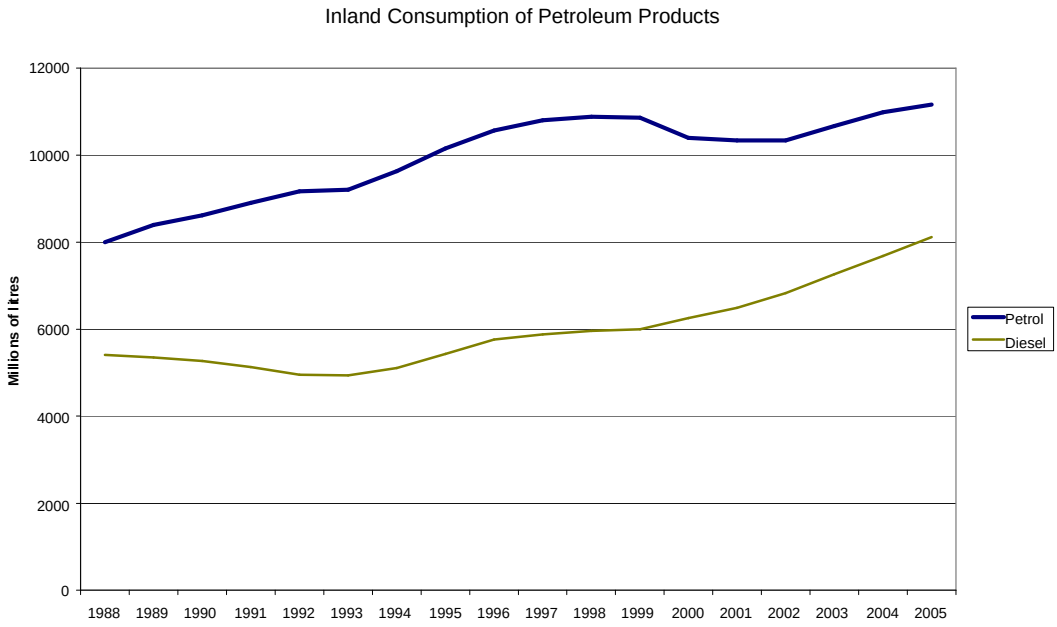


(Source: SAPIA, 2006)

BP (2006: p1) announced that "the Brent dated oil price averaged $ 54.52 per barrel in 2005, more than 40% above the 2004 average. Prices exceeded $60 per barrel for the first time in early August 2005".

Figure 2-4 below illustrates the increase in inland demand for petroleum fuels, petrol and diesel, in millions of litres. For the last ten years it represents a 10% increase in petrol consumption and a significant increase of 49% in diesel consumption. For the period from 1988 it represents an increase in consumption of 40% and 50% respectively.

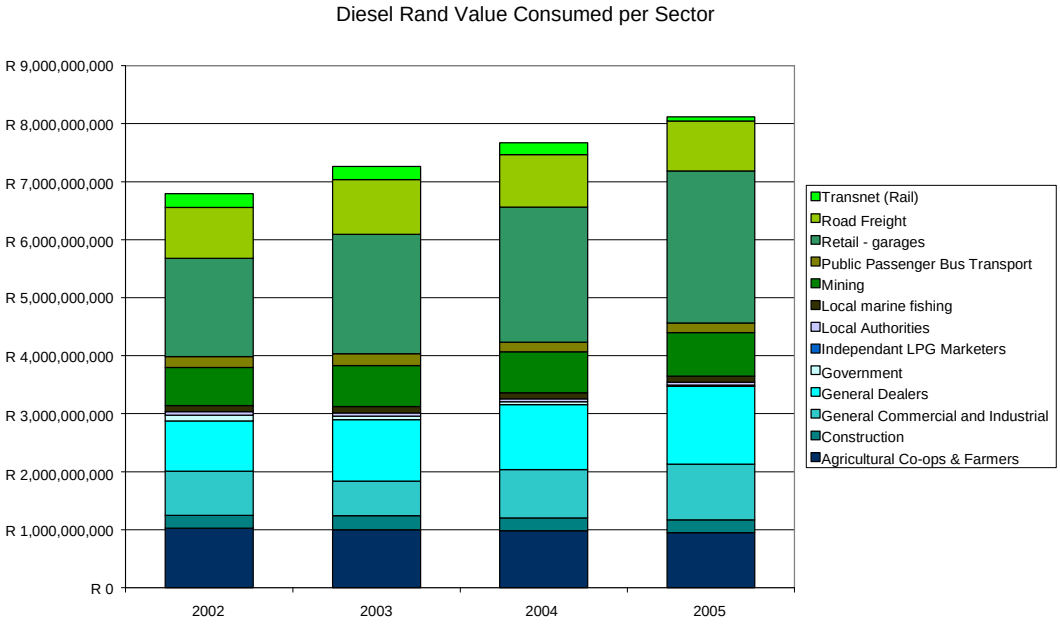
Figure 2-4: Inlan



(Source: SAPIA, 2006)

Figure 2-5 below illustrates the growth in consumption of specifically the diesel market in Rand value during the previous four years.

Figure 2-5: Diesel Rand Value Diesel Consumed per Sector



(Source: SAPIA, 2006)

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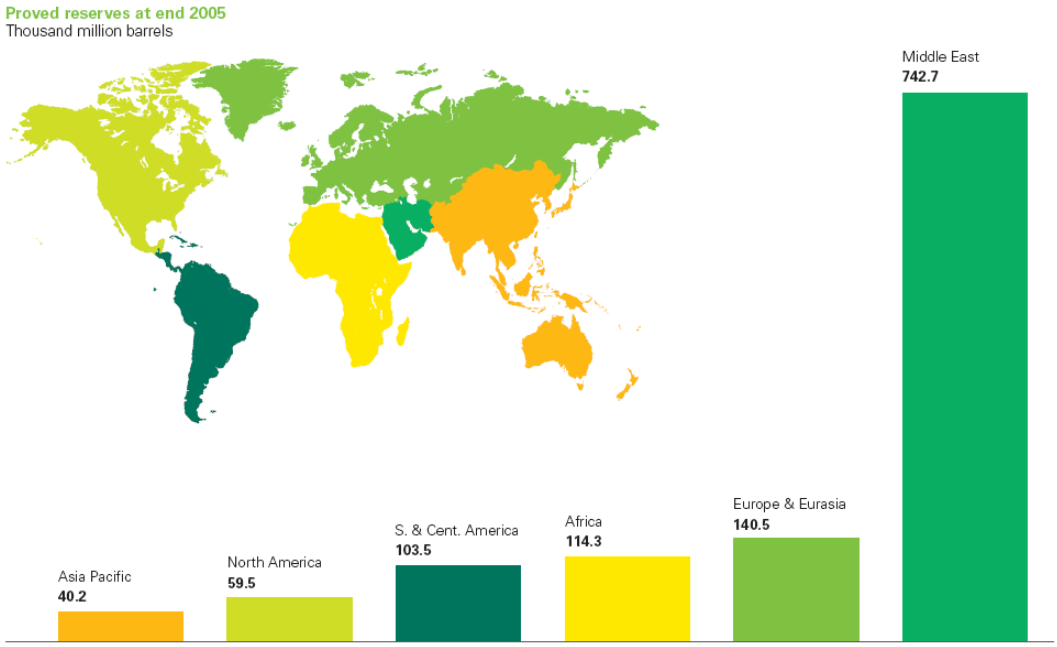
This represents stry worth R 6,794 million in 2002 to R 8,117 million in 2005. The retail garage industry grew by a significant 54% from an industry worth R 1,698 million to R 2,618 million.

The figures above illustrate the significant growth in demand for energy and specifically oil and diesel during the last few years.

2.2.2 SECURITY OF SUPPLY

"As more evidence comes out daily of the ties between the leaders of petroleum producing countries and terrorists, the incentive for finding an alternative to petroleum rises higher and higher" (Briggs, 2004: p1).

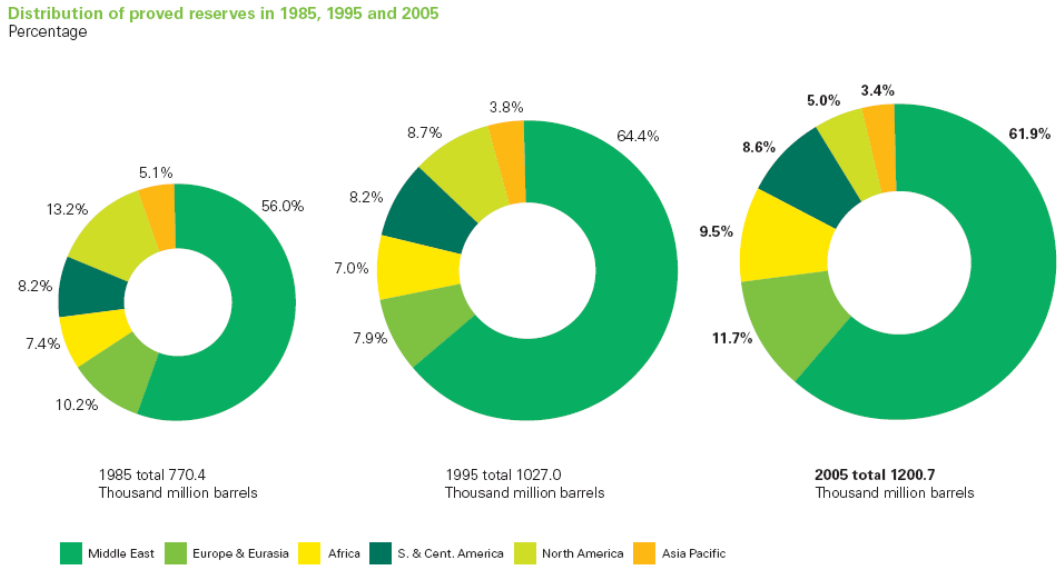
Figure 2-6: Proven Oil Reserves end 2005



(Source: BP, 2006)

Figure 2-6 above and Figure 2-7 below gives a clear picture of the global proved oil reserves. North America only has 59.5 thousand million barrels compared to the 742.7 thousand million barrels of the Middle East. The global dispersion of oil reserves raises the concern of stability of oil supply for many countries (BP, 2006).

Figure 2-7: Prove

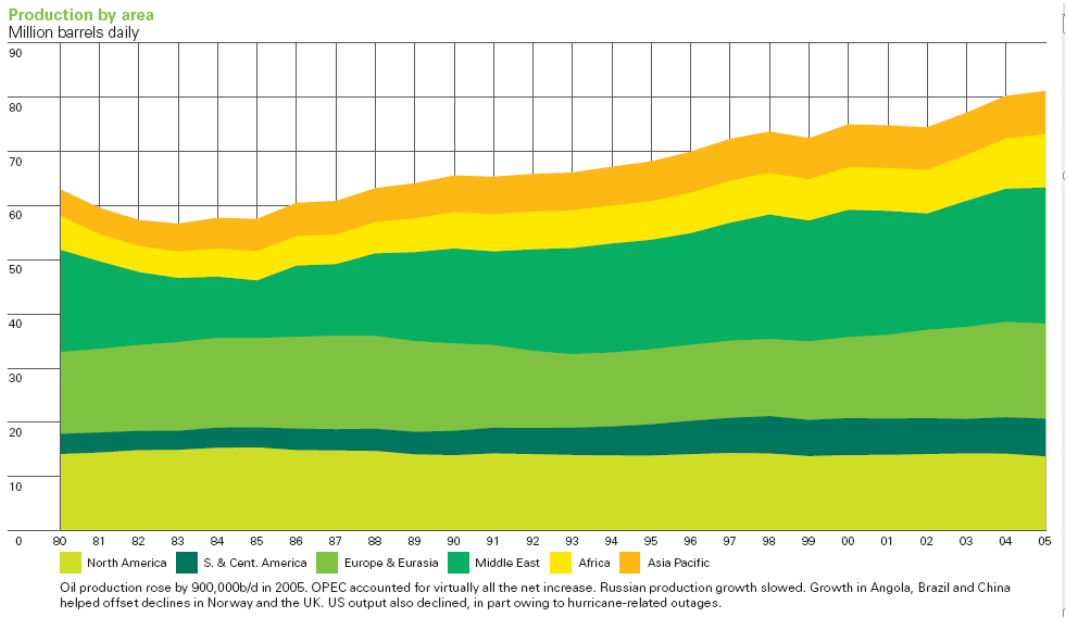


(Source: BP, 2006)

2.2.3 SUPPLY CHALLENGES

The third driver of our global energy economy is the challenges forcing the supply of the global energy demand. It is critical that production of oil is maintained to fulfil the requirements. Figure 2-8 below shows the increase in oil production from 1980 to 2005 in million barrels of oil per day.

Figure 2-8: Oil Production by Area



(Source: BP, 2006)

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The Group Ch BP Statistical Review of World Energy in June 2006 that the concern about energy security is widespread. He further stated that the capacity in most segments of the energy industry remains constrained and perceptions of geopolitical risk have increased (BP, 2006).

2.2.4 ENVIRONMENTAL CONSTRAINTS

In February 2004, a secret Pentagon study warned about the possible consequences of sudden climate change caused by global warming. The study further depicted a terrifying view of a global tragedy costing millions of lives due to wars and natural disasters (Pahl, 2005).

Conn (2006: p18) states that over the last century, "atmospheric concentrations of CO2 have risen to their highest levels for over 400,000 years and is materially due to our use of fossil fuels. Global temperatures have also been rising". There is still uncertainty over the precise linkage between these two effects, but there is a clear sense that we must take decisions now to mitigate the risks.

The atmospheric concentration of carbon dioxide (CO2) was 280 parts per million (ppm) before the Industrial Revolution, but is now about 380 ppm. This rise is due to fossil fuel use as discovered through an analysis of the isotopic ratios of the carbon. For the last 140 years the global temperature has also been increasing and the Arctic ice thinning (Conn, 2006).

Conn (2006) indicates that the reality of current energy demand projections suggests that we will double our use of energy by 2050. The imperative of climate change however requires that total emissions in 2050 must be the same as today. He further states that in such a scenario we must halve the carbon intensity of the world's energy by 2050.

The Energy Information Administration (EIA, 2004) states that since 1970, South Africa has consistently consumed the most energy and emitted the

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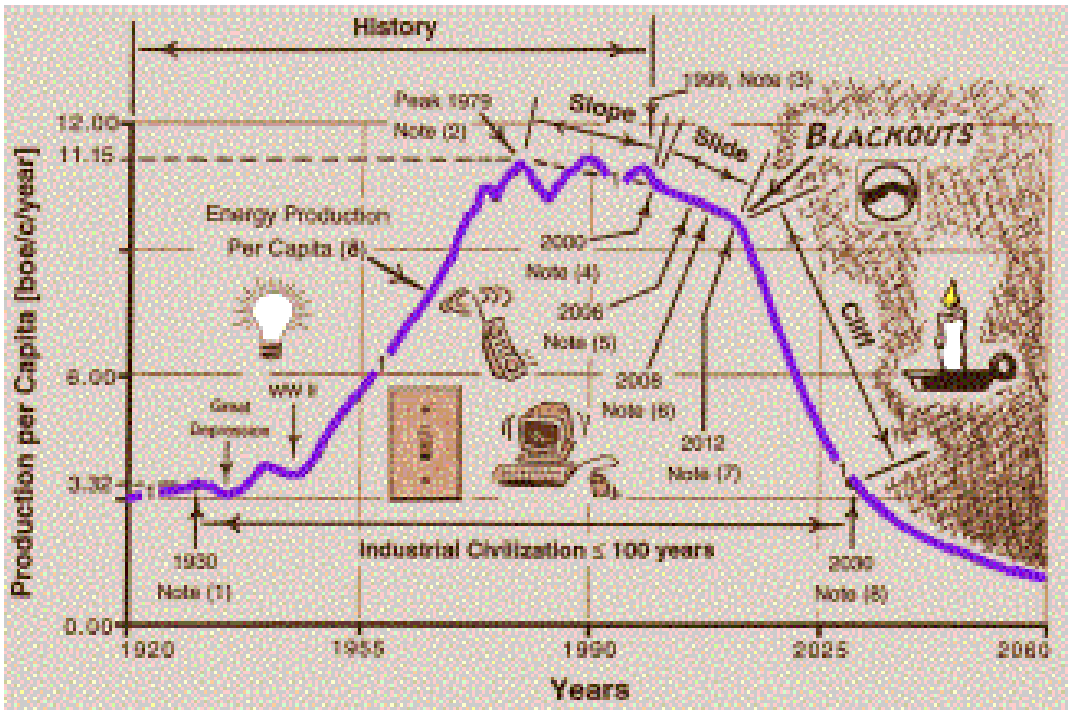
most carbon d major countries in Africa. South Africa's energy intensity surpasses that of several other rapidly industrialising countries, such as India and China, as well as the United States. This high carbon dioxide intensity is largely due to the country's heavy use of coal.

2.2.5 FUTURE SCENARIOS

Studies of energy and the utilisation of energy resources by industrial societies during the last few decades show that the period of cheap, abundant energy has ended (Heinberg, 2005). The Olduvai Theory, as illustrated in Figure 2-9 below, further states that the life expectancy of industrial civilisation is approximately 100 years: circa 1930 – 2030 (Duncan, 2000 and Duncan, 2001).

Figure 2-9: The Olduvai Theory



(Source: Duncan, 2000)

Global economies must recognise their vulnerability to potential energy shortages. Addressing future energy resources should be a priority of

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humankind. E chnologies, methods and means for the generation of renewable energy resources.

Pahl (2005) present scenarios of peak oil production such as the optimistic view of the U.S. Department of Energy who states that we will only see the peak around 2037. Colin Cambell, the renowned petroleum geologist, however estimates that global oil extraction will peak before 2010 and Geophysicist Kenneth Deffeyes says the date for maximum production was in 2004.

Pahl (2005) warns us that no matter who turns out to be right about the timing of oil's tipping point, "most middle-aged people probably will live to see the consequences. Unquestionably oil prices will increase after the tipping point is reached which will further lead to higher food prices and disruption in food distribution, ultimately affecting millions of people, particularly in struggling emerging markets.

2.3 BIODIESEL AS ALTERNATIVE SOLUTION

2.3.1 INTRODUCTION

Pahl (2005: p23) gives the visionary words of Rudolf Diesel in a speech he made on 13 April 1912, when he went on to say, "The use of vegetable oils for engine fuels may seem insignificant today, but such oils may become, in the course of time, as important as petroleum and the coal-tar products of the present time…. Motive power can still be produced from the heat of the sun, always available, even when the natural stores of solid and liquid fuels are completely exhausted".

The source of energy contained in biodiesel is solar energy captured by feedstock plants during the process of photosynthesis (Pahl, 2005).

"Biodiesel is a renewable fuel that can be produced from vegetable oils, animal fats, used cooking oil, and waste from the pulp and paper industry. It can be used in its neat form, or as a blend with conventional diesel fuel,

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in diesel engir ce biodiesel is produced from renewable, domestically grown feedstock, it can reduce the use of petroleum based fuels and possibly lower the overall greenhouse gas emissions from the use of internal combustion engines" (Prakash, 1998: p1).

The South African Revenue Service (SARS) gives the following definition of biodiesel: "Biodiesel is normally sourced from vegetable or animal fats or oils sourced from a variety of animal or vegetable products. Biodiesel is a product which, either alone, or blended with diesel from a normal refinery producing fossil fuels, can be used as a fuel in compression ignition engines" (SARS, 2006).

Pahl (2005), Prasad and Visagie (2005), and Prakash (1998) give some of the benefits of biodiesel:

- It is more biodegradable than sugar, less toxic than table salt, essentially contains no sulphur and aromatic contents and promises to reduce particulate and toxic emissions.
- It is an attractive fuel for use in environmentally sensitive applications such as urban buses, mines, marine areas, and national parks.
- Biodiesel when mixed with diesel fuel, in small quantities, also seems to improve the fuel lubricity, extend engine life, and reduce fuel consumption.
- Development of biodiesel production in remote rural areas should be given priority because it leads to poverty alleviation by creating jobs, better livelihoods and rural development.

2.3.2 BIODIESEL FEEDSTOCK

The outstanding feature of the transesterification process is that it can use a wide range of feedstocks to produce the same basic biodiesel end product. Feedstock examples are; virgin vegetable oils, used fryer oil, animal fats, even pond algae. The ability to use locally grown feedstocks

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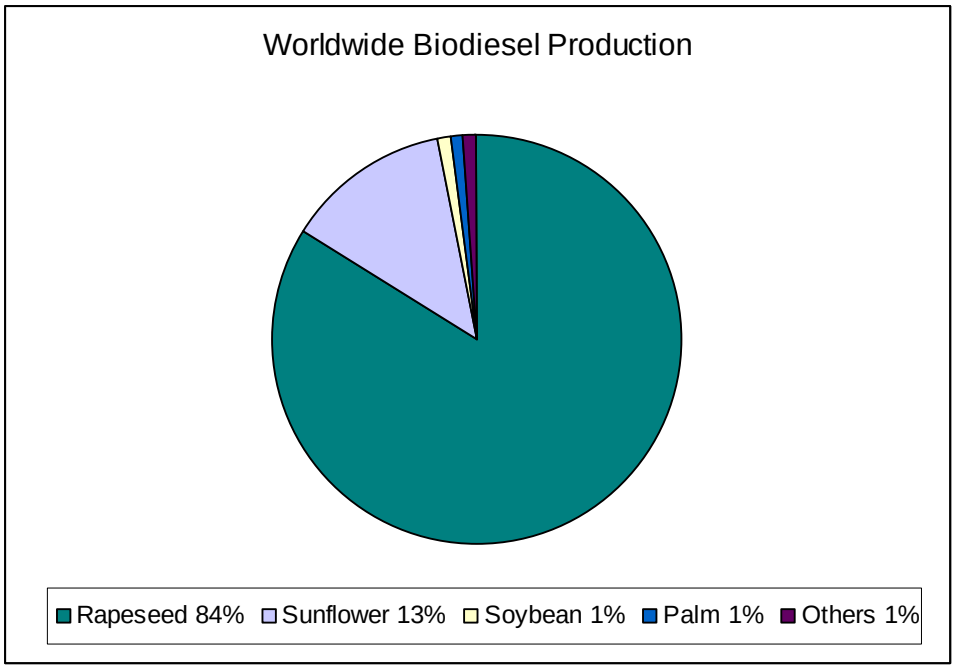
within a few m triking advantages (Pahl, 2005).

There is a vast number of different feedstocks which can be used for biodiesel production. Figure 2-10 below gives a global view of the type of feedstock mostly used for biodiesel production.

Figure 2-10: Percentage Worldwide Feedstock for Biodiesel Production



(Source: Pahl, 2005)

It is clear that worldwide, rapeseed is generally used as feedstock for biodiesel production. The type of feedstock used depends however on local availability, price, climate conditions, etc. In the following section the main feedstocks used for biodiesel production will be described.

(a) Coconut

Coconut is the third most produced oil annually with a remarkably high oil yield of 2,689 litres per hectare. Many products are made from various parts of the coconut tree such as; rope, mattress padding, mats, rugs, brushes, charcoal filters, vinegar, soaps, lubricants, paints and margarine.

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It is believed in South America but is found in many tropical areas around the world (Pahl, 2005).

(b) Corn (Maize)

Corn, a staple cereal food in Central and South America and throughout Africa, is believed to have originated in Mexico. The oil produced from corn gives the lowest yield of the oil producing spectrum at 172 litres per hectare. Corn is more renowned as feedstock for the production of Ethanol (Pahl, 2005).

(c) Jatropha

Pahl (2005) describes Jatropha as a versatile bush or tree which is used to make lamp oil, soap, candles, poisons, and a wide range of folk remedies. Jatropha produces an annual yield of about 1,590 litres per hectare. The plant is found in countries such as Brazil, Fiji, India, Jamaica, Mexico and much of Africa. Presently Jatropha presents a minor source of biodiesel.

(d) Mustard

Mustard seeds can produce about 572 litres of mustard oil per hectare. The seeds are used in a wide range of products such as commercial mustards, lubricants and hair oil. Mustard is grown in many countries and considered a weed in some locations. At the present time mustard seed oil is not widely used as biodiesel feedstock (Pahl, 2005).

(e) Oil Palm

Pahl (2005) states that the African oil palm is one of the best performing oil-producing plants with a yield of about 5,950 litres of oil per hectare per year. Palm oil is mostly used in the manufacturing of soaps, candles, margarine and cooking oils. The African palm can be found along the coast of West Africa and eastward to the Indian Ocean islands of Zanzibar

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and Madagasc oil is less desirable than other feedsock types due to the high cloud point of palm oil biodiesel. Palm oil biodiesel is less desirable in colder climates as a result of wax crystals forming in the biodiesel. Despite the excellent oil yield of palm oil, it represents only 1 percent of worldwide biodiesel production.

(f) Peanut

Edible oil is produced from peanuts that can be used for cooking, in margarines, salad dressings and breads. Peanut oil is further used for the manufacturing of pharmaceuticals, soaps and lubricants. Peanuts are native to South America and produce about 1,059 litres of oil per hectare (Pahl, 2005).

(g) Rapeseed/Canola

Rapeseed is commonly grown in Europe as forage feed for live-stock and as a source of rapeseed oil with an annual yield of about 1,190 litres per hectare. In North America rapeseed oil is known as canola oil. Rapeseed is the principle feedstock for biodiesel production in Europe (Pahl, 2005).

(h) Safflower

Pahl (2005) states that safflower seeds produce edible oil that yields about 779 litres per hectare safflower oil. It is used in salads, margarine and cooking oils, in paints, varnishes and candles. Safflower is believed to have originated in Asia and had been cultivated in China, India, Persia, and Egypt for centuries. Safflower is now grown in the same areas that favour the growth of wheat and barley.

(i) Soybean

Pahl (2005: p50) says that “the soybean is one of the world’s most important sources of oil and protein” and yields around 466 litres per hectare of edible oil. The oil is used in salads, in margarines, paints,

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printing inks, s[illegible]oducts. The soybean has been grown in East Asia for thousands of years and is currently the most commonly raised crop in the United States. Pahl (2005) further argues that although most biodiesel in the United States is made from soybean oil, it is not the best crop for oil production.

(j) Sunflower

"Sunflower is cultivated mainly for its seed, which yields the world's second-most-important type of edible oil, and it produces around 952 litres per hectare" (Pahl, 2005: p49). Sunflower oil is used for cooking, in margarine and salad dressings, in lubricants, soaps and a variety of paints and varnishes. The sunflower is native to North America, but now grows in many countries around the world. Sunflowers represent 13 percent of worldwide feedstock for biodiesel production.

(k) Algae

The feedstock that possibly dwarfs all other feedstocks in terms of production yield is algae. From 1978 to 1996, the U.S. Department of Energy's Office of Fuels Development funded the Aquatic Species Program (or ASP). The aim of the programme was to develop renewable transportation fuels, such as biodiesel, from algae. The high lipid-content algae were grown in ponds, utilizing waste CO2 from coal fired power plants. During the programme three thousand strains of algae were collected and catalogued. Efforts were made to understand the feasibility of large-scale open pond production sites for algae. (Sheehan, Dunahay, Benemann and Roessler, 1998).

A large-scale pond site was built near Rosswell, New Mexico. The facility consisted of a series of 1,000 square-meter ponds with floating algae. Each pond produced up to 50 grams of algae per square meter daily. With oil concentrations of between 30 and 40 percent it equates to an annual yield of about 60,000 litres per hectare (Pahl, 2005).

(l) Anima

Pahl (2005: p57) argues that "animal fat, a by-product of the animal rendering process, is the least expensive feedstock currently available for biodiesel production. He further stresses however that biodiesel made from animal fat has poor cold weather properties compared with biodiesel made from other virgin oils.

(m) Used Cooking Oil

Most restaurants and other businesses that use cooking oil must pay a service fee to a third party to dispose of their used cooking oil. Used cooking oil is however a great low-cost supply for making biodiesel. The oil also requires additional treatment before and after the transesterification process due to the inferior quality of the used oil (Pahl, 2005).

The feedstocks identified above are not the only crops that yield vegetable oil. Table 2-1 below illustrates the yields of various oil producing crops.

Table 2-1: Annual Yields of Oil Producing Feedstocks

Feedstock	Yield (litres oil / hectare	Feedstock	Yield (litres oil / hectare
Algae	60,000	Camelina	583
Oil Palm	5,950	Mustard	572
Coconut	2,689	Coriander	536
Avocado	2,638	Pumpkin	534
Brazil nuts	2,392	Euphorbia	524
Macadamia	2,246	Hazelnuts	482
Jatropha	1,892	Linseed	478
Jojoba	1,818	Coffee	459
Pecan nuts	1,791	Soya	446
Castor Beans	1,413	Hemp	363
Olives	1,212	Cotton	325
Rapeseeds	1,190	Calendula	305
Groundnuts	1,059	Kenaf	273
Sunflower	952	Lupine	232
Tung Oil Tree	940	Oats	217
Rice	828	Cashew	176
Safflower	779	Maize	172
Sesame	696		

Biodiesel yield ≡ oil yield 0.8

(Source: Wilson, et al., 2005; Pahl, 2005)

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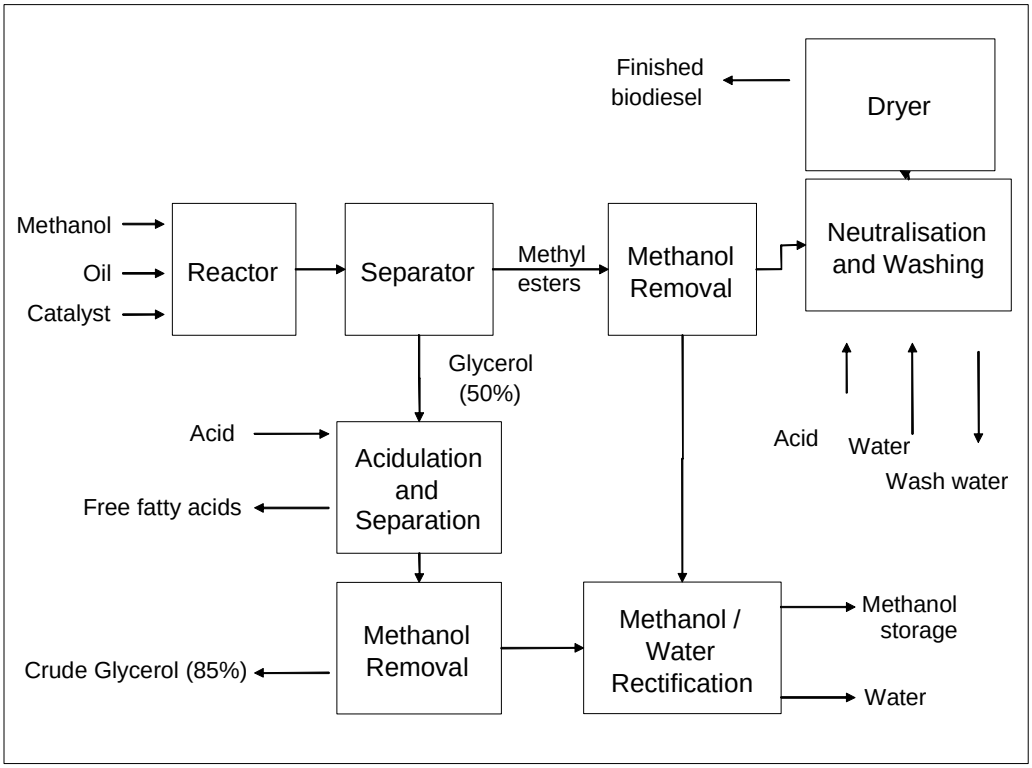
2.3.3 PRODUCTS OF BIODIESEL

Many early experiments, such as those in South Africa in the 1980's, showed that using straight vegetable oil as a fuel substitute was not good for the engines (Pahl, 2005). Better performance is achieved by converting vegetable oils to a more suitable fuel for diesel engines.

Biodiesel is a diesel fuel substitute produced from renewable sources such as vegetable oils, animal fats, and recycled cooking oils. Chemically, it is defined as the mono alkyl esters. Biodiesel is typically produced through the reaction of a vegetable oil or animal fat with methanol or ethanol in the presence of a catalyst to yield glycerine and biodiesel (Zhang, Dubea, McLean, and Kates, 2002). This process which most researchers and organisations select is called transesterification (Pahl, 2005).

A process flow of biodiesel production can be seen in Figure 2-11 below:

Figure 2-11: Process Flow Schematic of Biodiesel Production



(Source: Van Gerpen, 2005)

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Biodiesel is th be used directly in any existing, unmodified diesel engine, because of its similar properties to petroleum diesel (Marlim, 2006). Biodiesel can be used alone or mixed in any ratio with petroleum diesel. The most common blend is a mix of 20% biodiesel with 80% petroleum diesel.

Zhang, Dubea, McLean, and Kates (2002) recommend using biodiesel as a substitute for petroleum-based diesels because it is renewable, has environmentally friendly emissions and is readily biogradable.

Biodiesel has excellent lubrication properties that increases the life of diesel engines, favourable emissions (78 percent reduction in carbon dioxide emissions), and has a higher cetane number (indicating better ignition properties). The energy content of biodiesel is however 10 to 12 percent lower than that of petroleum diesel. This is offset by increased combustion efficiency (Pahl, 2005).

Pahl (2005: p57) further states that “biodiesel is free of lead, contains virtually no sulphur or aromatics, and results in substantial reductions in the release of unburned hydrocarbons, carbon monoxide, and particulate matter (soot), which has been linked to respiratory disease, cancer, and other adverse health affects”.

As cited in Pahl (2005) the U.S. Department of Energy and U.S. Department of Agriculture undertook a study that found a 96 percent lower overall life-cycle production of hazardous solid waste from biodiesel than from petroleum diesel.

The *energy efficiency ratio* is “a numerical figure that represents the energy stored in the fuel compared to the total energy required to produce, manufacture, transport, and distribute the fuel”, (Pahl: 2005: p58). The energy efficiency ratio for both biodiesel and petroleum diesel is similar. The *fossil* energy efficiency ratio indicates however that biodiesel is four times as efficient as petroleum diesel in utilising fossil energy. “Biodiesel

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has a positive to 1. Petrodiesel, on the other hand, has a negative fossil energy efficiency ratio of 0.83 to 1" (Pahl, 2005: p58).

2.3.4 REQUIREMENTS FOR PROFITABLE MANUFACTURING

Van Gerpen (2004: p196) in his report Business Management for Biodiesel Producers states that "to make a profit in business today, businesses have to be more efficient, make a quality product, and be better than the competition". He further states that there are some basic principles, called Generally Accepted Business Principles, which must be followed for a successful business start-up, namely.

1. Thorough research of the biodiesel business: Knowledge and understanding of the biodiesel industry and the manufacturing process must be gained. This includes the cost of construction, design, feedstock supply and constraints, and all other facets of entering the industry.
2. Investigation of financing the business: The cost of starting the business must be determined as well as the sources of capital. A thorough understanding of the pricing structure of the industry and the selling price of the products will be critical to the success of the business.
3. Understanding the markets: Requirements for penetrating the market must be assessed. An understanding of the local, regional, national and global market for biodiesel must be gained. (Where the markets for the by-products of the manufacturing process are; where the consumers are and what is the future potential.)
4. Meeting all regulation and permit requirements: In each country and region requirements for the production and management of biodiesel can differ. Expert advice should be gained to ensure that the business complies with all these requirements.

5. Write a plan forces management to think of al areas and requirements to ensure the success of the business.

Van Gerpen (2004) identifies the following six steps to business success:

1. Entrepreneurial spirit – the entrepreneurial spirit has to start with top management and filter down the organisation. An entrepreneurial spirit is what makes a good company great. Foster trying new ideas without fear of reprisals.
2. Productivity – throughput, the rate at which the system generates money through sales, is a measure of profitability and productivity. Continued productivity improvements will allow the business to become more profitable. "Widespread and large-scale implementation of biodiesel blends with normal (fossil) diesel will require a stable and secure supply of biodiesel. Petroleum marketers will not want to start and stop selling biodiesel when there are large price swings due to product cost or scarcity" ((S&T)2 Consultants Inc. and Meyers Norris Penny LLP, 2004: p32). Biodiesel production costs are dominated by the cost of feedstock. Reduction in total cost of production might be possible in the future through experience gained but these will be small. (S&T)2 Consultants Inc. and Meyers Norris Penny LLP (2004: 32) further states that "biodiesel will need significant financial incentives to be cost competitive with diesel fuel".
3. Quality – the operation has to ensure that a quality product is produced. The larger issue for the biodiesel industry will be to ensure that all product that is sold meets quality specifications. (S&T)2 Consultants Inc. and Meyers Norris Penny LLP (2004) states that the increase of small biodiesel operations or co-ops is a potential issue in that the small operations may not be able to afford the costs of full quality control testing. These small operations are also usually based on lower quality feedstocks such as used cooking oil. Engine problems that are caused by low quality

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biodiese et back the marketing of the product.

4. Management – it is important that management has the required knowledge and skills to run the operations profitably.
5. Innovation – use innovative management philosophies to optimise the business. Time and resources have to be devoted to innovative thinking and technology and process research.
6. Employees – responsibilities have to be delegated to employees. This will allow them to take ownership and feel part of the business. Employees are the most valuable resource of any business. Management has to invest in the training and development of their employees to ensure that they are equipped for their jobs.

2.3.5 BIODIESEL ADDRESSES OUR FUTURE ENERGY CONCERNS

(a) Demand Growth

As the demand for biodiesel increases, the demand for normal (fossil) diesel should decrease. According to the National Biodiesel Board (2006), the U.S. uses approximately 20 million barrels of oil a day, more than half of which is imported. By 2025 their demand is expected to rise to 26 million barrels a day. China's rising oil demand plays a major role in world oil markets today. In 2004, China's consumption reached 6.5 million barrels a day, of which 2.9 million barrels a day are imported.

(b) Security of Supply

The National Biodiesel Board (2006) states that biodiesel provides a substantial opportunity to immediately address our energy security issues. They support this with the following reasoning; "because biodiesel can be manufactured using existing industrial capacity, and used with conventional equipment".

Further, biodiesel helps preserve and protect natural resources. For every one unit of energy needed to produce biodiesel, 3.24 units of energy are

gained. The N tes that this is the highest energy balance of any fuel and therefore can greatly contribute to domestic energy security.

The barriers to entry such as infrastructure and technology requirements are very low in comparison to other possible solutions such as hydrogen as fuel source (Briggs, 2004).

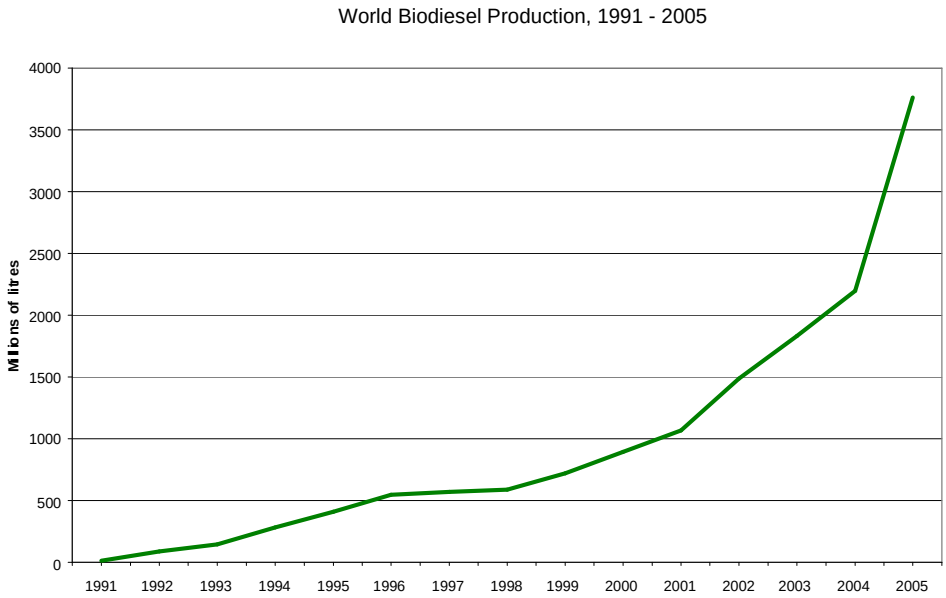
(c) Supply Challenges

Pahl (2005) explains that the global output of biodiesel is approaching 2 million metric tons annually. In Germany where 40 percent of passenger vehicles have diesel engines, 1,800 filling stations offer biodiesel at a price competitive to that of regular diesel.

With the positive energy efficiency ration of biodiesel (of 3.2 to 1), it means that every litre of biodiesel we use has the potential to displace four litres of imported petroleum diesel. In addition to being a domestically produced, renewable alternative fuel for diesel engines, biodiesel has positive performance attributes such as increased cetane, high fuel lubricity, and high oxygen content, which may make it a preferred blending stock with future ultra-clean diesel. (National Biodiesel Board, 2006).

Figure 2-12 below indicates to what extent biodiesel production has increased over the last five years. Biodiesel annual production from 2001 to 2005 has increased by 252% from 1068 million litres to 3762 million litres. For the period 2004 to 2005 biodiesel production has increased by a significant 71% (Worldwatch Institute, 2006). More and more biodiesel is replacing diesel as preferred fuel source.

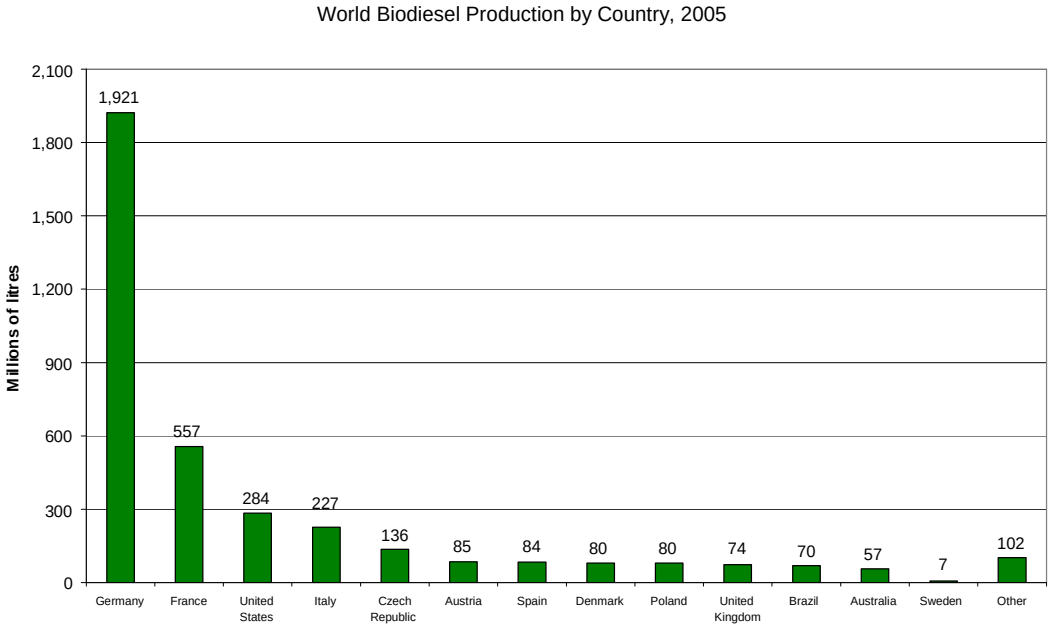
Figure 2-12: Wor



(Source: Worldwatch Institute, 2006)

Figure 2-13 below gives the world biodiesel production by country for 2005. Germany's production is the highest with 1921 million litres per year with the United States only producing 284 million litres per year.

Figure 2-13: World Biodiesel Production by Country



(Source: Worldwatch Institute, 2006)

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No biodiesel p for South Africa. This is probably related to the fact that South Africa's first commercial biodiesel producer, De Beers Fuel, only started production this year. According to the South African Revenue Service (SARS) a biodiesel company must produce in excess of 300000 litres per year to be licensed as a commercial biodiesel producer (SARS, 2006). Hendy Schoonvee of Biodiesel Refinery, a company responsible for the marketing, selling and franchising of the De Beers Fuel's plants, said that they have the capacity to produce 3.6 million litres biodiesel a month. SARS stated that four additional biodiesel producers are in the process of registering for commercial biodiesel licenses (Business Day, 2006).

(d) Environmental Constraints

Van Gerpen (2005: p1098) states that "Since the carbon in the oil or fat originated mostly from carbon dioxide in the air, biodiesel is considered to contribute much less to global warming than fossil fuels."

Pahl (2005: p58) states that when measuring biodegradability (up to four times better than petroleum diesel) and toxicity, biodiesel is by far the winner and that it is not harmful to humans or the environment. "One hundred percent biodiesel is as biodegradable as sugar and up to ten times less toxic than table salt."

"Research has shown that biodegradation of biodiesel in aqueous solution is much faster than for diesel fuel. Even B20 blend degrades twice as fast as conventional diesel. This attribute of biodiesel is especially attractive for marine application in environmentally sensitive waters. Due to its lower particulates and toxic emissions potential, biodiesel is also considered a desirable fuel for diesel engines in underground mines. Because biodiesel is produced from renewable feedstocks it should result in a net reduction of carbon dioxide emissions (Prakash, 1998)"

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Biodiesel is mu ın petroleum diesel. One factor that contributes to this is biodiesel's high flash point (ignition temperature). The flash point of biodiesel is 126 ^{o}C in comparison to the flash point of 52 ^{o}C for petroleum diesel (Pahl, 2005).

The National Biodiesel Board (2006) states that the ozone forming potential of the hydrocarbon emissions of pure biodiesel is nearly 50% less than that of petroleum diesel and reduce the net amount of carbon dioxide in the biosphere. They further state that a study by the US Department of Energy has found that biodiesel production and use, in comparison to petroleum diesel, produces 78.5% less CO2 emissions.

2.3.6 BIODIESEL IN SOUTH AFRICA

(a) Introduction

Pahl (2005) explains that biodiesel research in South Africa is a tale of missed opportunities. Early experiments prior to World War II using vegetable derived fuels were abandoned in favour of synthetic derived fuels from coal. Around 1980 the idea of using vegetable derived fuels was revived at the Council of Scientific and Industrial Research (CSIR) in Pretoria, South Africa.

The CSIR research project began to investigate the use of straight sunflower oil. The experiments soon showed problems such as improper fuel vaporisation and the leaking of fuel into the lubricating oil inside the engine. Lourens du Plessis, now a semi retired special research scientist in the food science group at CSIR, recalls that, "The whole issue at the time was for the agriculture sector to completely produce the diesel fuel" (Pahl, 2005: p37). The idea was for the agricultural community to become independent of the world oil supply and increasing oil prices. Du Plessis further goes on to say that, despite the progress made and promise the research showed, around 1984 or '85 the South African Department of

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Agriculture br e for it was no longer economically feasible.

(b) Position of the Government

Today there is a new effort in strengthening the industry. Communications by government has shown that South Africa understands the key drivers of our energy future. According to the Department of Minerals and Energy (DME), the government has set a target of 10,000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013 (DME, 2003). This drive will bring about the following advantages:

- Add about 1.667MW new renewable energy capacity, with a net impact on GDP as high as R1.071-billion a year;
- Create additional government revenue of R299-million;
- Stimulate additional income that will flow to low-income households by as much as R128-million, creating just over 20 000 new jobs; and
- Contribute to water savings of 16.5-million kilolitres, which translates into a R26.6-million saving.

A just transition to sustainable energy in South Africa is a real possibility if it is initiated in the short term. Reduction of our dependence on conventional energy is inevitable over the long term, but will be at far greater cost and with little prospect of a just distribution of costs and benefits, if South Africa does not plan for it (Banks and Schäffler, 2005).

The vision of the DME is to make adequate and affordable energy available to developing communities by providing a mix of alternative energy resources at a reasonable cost. The majority of the population in South Africa live in rural areas. To supply energy to these areas the DME has embarked on several programmes, namely: biofuels systems; hybrid systems; hydro systems; solar energy systems; and wind energy systems (DME, 2006).

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The Departme is participating with the Department of Science and Technology (DST), National Treasury and stakeholders in a Joint Implementation Committee tasked with advising government and stakeholders on the creation of a market environment for biofuels. It is supporting the South African Bureau of Standards (SARS) in testing South African plant oils to the European biodiesel standard. This should ensure high-standard biodiesel for blending which motor manufacturers also accept (DME, 2006).

Further, in a speech during the launch of the National Energy Regulator of South Africa in November 2005, Deputy President Phumzile Mlambo-Ngcuka said that Cabinet had approved a proposal by the departments of Minerals and Energy, Agriculture and Science and Technology to explore biofuels as an important component of the energy mix (Du Preez, 2005). Following a review of international practice and to encourage a domestic biodiesel industry, government has already announced two tax incentives applicable to local biodiesel production: accelerated depreciation and a 40% reduction in the general fuel levy (Manuel, 2006)

(c) Southern African Biofuels Association

The Southern African Biofuels Association (SABA) is a non-profit organisation who aims to facilitate the establishment of a viable biofuels industry in Southern Africa. SABA wants to implement infrastructure to market biofuels as excellent quality fuels, as well as a framework of laws and regulations that is favourable to the biofuels sector. Further to create a network of companies for discussion and interaction purposes (SABA, 2006).

(d) Target Markets

Many studies describe biodiesel market opportunities and potential barriers (Weber and Johannes, 1996). In South Africa the potential

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biodiesel mark l market is divided into various general diesel consumption sectors:

- Agricultural Co-ops & Farmers
- Construction
- General Commercial and Industrial
- General Dealers
- Government
- Independent LPG Marketers
- Local Authorities
- Local marine fishing
- Mining
- Public Passenger Bus Transport
- Retail - garages
- Road Freight
- Transnet (Rail)

All these sectors can make use of biodiesel as an alternative to petroleum diesel. The transport sector alone, based on Rand consumption of petroleum diesel, has increased from R4,000 million in 2002 to R5,100 million in 2005 (SAPIA, 2006).

2.4 BUYER-READINESS FOR BIODIESEL

2.4.1 INTRODUCTION

As explained in the previous section, the world biodiesel industry is beginning to grow. Despite this growth, many people only have a vague idea of what biodiesel is, whether they will use biodiesel as transport fuel or even what benefits biodiesel offer.

Consumers vary on many dimensions and often can be grouped according to one or more characteristics. Schiffman and Lazar Kanuk (1994) states that for a long time consumer researchers believed that all consumers passed through a complex series of mental and behaviour stages in

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arriving at a p ranged from awareness (exposure to information), of evaluation (preference, attitude formation), to behaviour (purchase), to final evaluation (adoption or rejection).

Schiffman and Lazar Kanuk (1994), and Kotler and Keller (2005) state that a number of models were developed over the years to express the same notion of sequential processing of information by consumers. Table 2-2 below group these different models from cognitive stage to affective stage and finally behavioural stage. These stages are also commonly known as buyer-readiness stages.

Table 2-2: Purchasing Decision Models

Hierarchy Models

Stages	AIDA[a]	Hierarchy Of Effects[b]	Innovation Adoption Model[c]	Innovation Decision Process[d]	Communications Model[e]
Cognitive Stage	Attention	Awareness Knowledge	Awareness	Knowledge	Exposure Reception Cognitive response
Affective Stage	Interest Desire	Liking Preference Conviction	Interest Evaluation	Persuasion	Attitude Intention
Behavioural Stage	Action	Purchase	Trail Adoption	Decision Implementation Confirmation	Behaviour

[a]Strong, E.K. (1925). *The Psychology of Selling*. New York: McGraw-Hill.

[b]Lavidge, R.J. & Steiner, G.A. (1961). *A Model of Predictive Measurement of Advertising Effectiveness*. Journal of Marketing. October 1961: 61

[c]Rogers, E.M. (1962). Diffusion of Innovation. New York: The Free Press. pp 79-86.

[d]Rodgers, E.M. (1995). Diffusion of Innovation. New York: The Free Press. pp 161-203

[e]Various sources

(Source: Adapted from Kotler & Keller, 2005 and Schiffman & Lazar Kanuk, 1994)

In the following sections, the innovation-decision process and innovation-adoption model will be explained in more detail. In conclusion the hierarchy of effects model, which is selected for this research, will be explained.

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2.4.2 THE IN S

"An innovation is an idea, practise, or object that is perceived as new by an individual or other unit of adoption. It matters little, so far as human behaviour is concerned, whether or not an idea is objectively new as measured by the lapse of time since its first use or discovery. The perceived newness of the idea for the individual determines his or her reaction to it. If the idea seems new to the individual, it is an innovation" (Rodgers, 1995). Biodiesel is such an innovation.

(a) Characteristics of Innovation

Innovations are adopted by individuals at different rates. The characteristics of innovations help to explain this behaviour (Rodgers, 1995 and Schiffman & Lazar Kanuk, 1994).

1. Relative advantage – the degree to which an innovation is perceived as better than the idea it supersedes.
2. Compatibility – the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters.
3. Complexity – the degree to which an innovation is perceived as difficult to understand and use.
4. Trailability – the degree to which an innovation may be experimented with on a limited basis.
5. Observability – the degree to which the results of an innovation are visible to others.

The following characteristics are included to the list as observed by Sheth, Mittal and Newman (1999) and by Hawkins, Best and Coney (1995).

1. Fulfilment of a felt need – the degree to which the innovation satisfies an obvious need.
2. Perceived risk – the degree to which relative advantage will accrue or whether unanticipated harm will occur.

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Innovations th ater relative advantage, compatibility, trailability, observability and less complexity will be adopted more rapidly than other innovations (Rodgers, 1995).

(b) The process

Rodgers (1995) explains that "the innovation-decision process is the process through which an individual passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation and use of the new idea, and to confirmation of this decision". The five main steps of the innovation-decision process are:

1. Knowledge – occurs when an individual learns of the innovation's existence and gains some understanding of how it functions.
2. Persuasion – occurs when an individual forms a favourable or unfavourable attitude towards the innovation.
3. Decision – occurs when an individual engages in activities that lead to a choice to adopt or reject the innovation.
4. Implementation – occurs when an individual puts an innovation into use.
5. Confirmation – occurs when an individual seeks reinforcement of an innovation-decision that has already been made, but the individual may reverse this previous decision if exposed to conflicting messages about the innovation.

Figure 2-14 below illustrates a model of the stages of the innovation-decision process.

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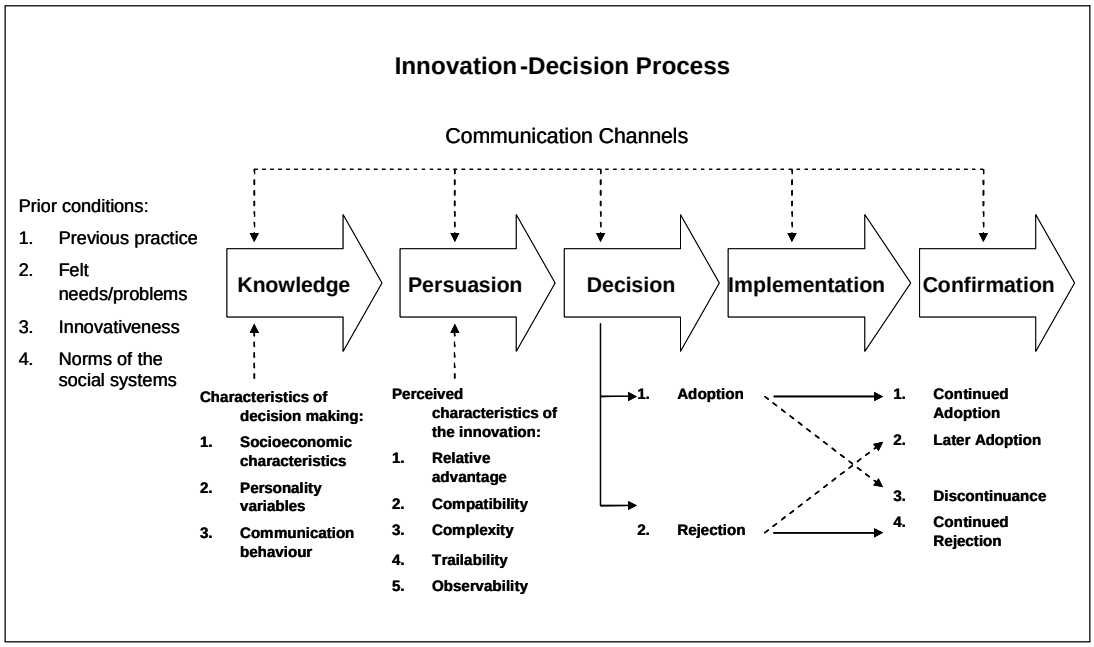
Figure 2-14: Moc ı Process



(Source: Rodgers, 1995)

2.4.3 INNOVATION-ADOPTION MODEL

Van den Bulte (2001) states that probably the best-known sequence for innovation adoption is the one proposed by Rogers (1962, p81-86), mostly based on work in rural contexts. Other such as Sheth, Mittal & Newman (1999) and Hawkins, Best & Coney (1995) and Schiffman & Lazar Kanuk (1994) have also explained the same process.

This conceptualisation of the innovation-adoption model consists of five stages:

1. Awareness – at this stage, the buyer gains knowledge of the existence of the innovation, but may not fully comprehend the innovation nor be motivated to seek further information.
2. Interest – at this stage, the buyer becomes interested in the innovation but has not yet judged its utility in terms of the buyer's own situation and seeks additional information about it.
3. Evaluation – at this stage, the buyer assesses the appeal of the innovation to his or her own present and anticipated future situation, and decides whether to try it or not.

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4. Trial – (nnovation into use on a small scale to further determine its utility in the actor's own situation.
5. (Sustained) adoption – this stage is the continued full use of the innovation.

2.4.4 HIERARCHY-OF-EFFECTS

"The notion of a hierarchy of communication effects is that an individual usually must pass from knowledge change to overt behaviour change in a cumulative sequence of stages that are generally parallel to the stages in the innovation-decision process" and the other models as in Table 2-2 above (Rodgers, 1995: p84).

By understanding at what buyer-readiness stage a consumer is, marketers will be better prepared and know where to focus their communication strategy (Kotler and Keller, 2005). The hierarchy-of-effects model's stages are as follows:

1. Awareness – degree of observation of the existence of the product or service.
2. Knowledge – degree of familiarity with the product or service.
3. Liking – degree of favour for the product or service.
4. Preference – degree of preference of the product or service to substitute products or services by comparing quality, value, performance and other features.
5. Conviction – degree of deployment of a conviction or passion to buy the product or service.
6. Purchase – final action to buy the product or service.

2.4.5 BUYER-READINESS CONCLUSION

Knowledge of the buyer-readiness stage of the potential consumers of biodiesel will give producers, distributors and sellers of biodiesel a better perspective of what can be expected from their target market.

Marketers will l adopt the new innovation and where to focus the communication strategies. The assumption made is that the owners of passenger vehicles, the potential consumers of biodiesel, will have a choice whether to use biodiesel or not.

In a scenario where petroleum producers are forced by the government to readily mix normal (fossil) diesel with a percentage of biodiesel, the consumer might not even be aware of the percentage biodiesel used. Currently consumers do not have to be made aware when normal (fossil) diesel is mixed with biodiesel up to a ratio of five percent biodiesel.

2.5 CONCLUSION

The majority of published South African studies on the topic of biodiesel focus on farming of raw materials for biodiesel processing and potential poverty alleviation. One of the few South African studies has undertaken a case study research on various renewable energy technologies with the aim of providing the benefits and potential barriers of each technology (Prasad and Visagie, 2005).

In South Africa, no published research reports measuring the capability of producers to process biodiesel or the buyer-readiness stage of potential biodiesel consumers could be found. This study is intended to address this void on the viability of biodiesel processing and consumption in South Africa.

CHAPTER 3. RESEARCH QUESTIONS AND HYPOTHESES

3.1 INTRODUCTION

As mentioned in Chapter 2, a great deal of research has been conducted globally on the broad topic of energy, biodiesel production, biodiesel fuel and performance characteristics, regulatory and legislative activities, economic and environmental impact, potential poverty alleviation and commercialisation activities of biodiesel. However, very little research has been undertaken to understand whether South Africa has the capability to process biodiesel on a commercial scale, and whether consumers are ready to use biodiesel as an alternative to normal diesel as fuel for their vehicles (i.e. at what buyer-readiness stage the consumers are). The buyer-readiness stages are; awareness, knowledge, liking, preference, conviction and purchase.

To address this shortcoming the following research questions sets out to address investigate the capability of producers to manufacture biodiesel on a commercially viable scale and the research hypotheses sets out to evaluate the buyer-readiness of consumers to use biodiesel as an alternative to normal (fossil) diesel..

3.2 CAPABILITY TO COMMERCIALLY MANUFACTURE BIODIESEL

3.2.1 RESEARCH QUESTION 1

Are there organisations in South Africa that process biodiesel on a commercial scale?

- South African commercial biodiesel producers, process annually more than 300,000 litres.

3.2.2 RESEARCH QUESTION 2

Do South African organisations that process biodiesel have adequate capacity to successfully and profitably process biodiesel on a commercial scale?

- Producti
- Industry knowledge and research.
- Consumer market.
- Feedstock resources and access.
- Financial support.
- Future expansion and growth.

3.2.3 RESEARCH QUESTION 3

Do South African organisations that process biodiesel have adequate experience and skills to enable them to process biodiesel on a commercial scale?

- Experience and skills.
- Training and skills development.

3.2.4 RESEARCH QUESTION 4

Do South African organisations that process biodiesel have adequate government support to enable them to process biodiesel on a commercial scale?

3.2.5 RESEARCH QUESTION 5

What are the benefits and constraints of biodiesel?

3.3 BUYER-READINESS FOR BIODIESEL USE

3.3.1 RESEARCH HYPOTHESIS 1

Owners of passenger vehicles are at least at a Preference buyer-readiness stage for biodiesel.

- For respondents with a score of 70% or higher for the Awareness and Knowledge section of the questionnaire; the spontaneous group
- For respondents with a score of 70% or lower for the Awareness and Knowledge section of the questionnaire; the prompted group.

3.3.2 RESEARCH HYPOTHESIS 2

Both female and male owners of passenger vehicles are at the same stage of buyer-readiness for biodiesel.

3.3.3 RESEARCH HYPOTHESIS 3

Owners of passenger vehicles of different age groups are at the same stage of buyer-readiness for biodiesel.

3.3.4 RESEARCH HYPOTHESIS 4

Owners of passenger vehicles do not agree that biodiesel is more beneficial than petroleum diesel for the engines of their vehicles.

3.3.5 RESEARCH HYPOTHESIS 5

Owners of passenger vehicles are prepared to pay more on a Rand per litre basis for biodiesel than for petroleum diesel.

CHAPTER 4. PROPOSED RESEARCH METHODOLOGY

4.1 THE RESEARCH METHODOLOGY

The purpose of the research project is twofold. Firstly to establish whether South African biodiesel producers can profitably manufacture biodiesel on a commercially viable scale. To identify whether there are producers who commercially process biodiesel currently and whether they have the capacity, ability and skills to do so profitably. Further, to investigate whether these producers receive the required support from government to establish a biodiesel production industry. Explorative, qualitative research was done to assess this research.

The second aim of the report was to investigate the readiness of owners of passenger vehicles to use biodiesel. The buyer-readiness stages for adoption of innovations are; awareness, knowledge, liking, preference, conviction and purchase. Assessing the buyer-readiness for biodiesel consumption as vehicle fuel was done by means of quantitative research.

4.1.1 QUALITATIVE RESEARCH METHODOLOGY

Morse (1991) reports the following characteristics of a qualitative research problem as cited in Creswell (2003):

- The concept is “immature” due to a conspicuous lack of theory and previous research.
- There is a notion that the available theory may be inaccurate, inappropriate, incorrect or biased
- A need exists to explore and describe the phenomena and to develop theory.
- The nature of the phenomena may not be suited to quantitative measures.

Semi-structured, face-to-face interviews were conducted with at least one senior representative of each of the biodiesel producers in what appears

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to be a fairly s elman and Kruger (2001), this approach offers a versatile way of collecting data. This approach allows for spontaneous development of the interaction between the interviewer and the research participant. Page and Meyer (2003, p112) also states that in semi-structured interviews, "… some structured items are asked of all participants, and there are completely open-ended questions with no limitations on how the participant can respond". Welman and Kruger (2001, p161) further highlight that semi-structured interviews, "… allow the interviewer to use probes with a view to clearing up vague responses, or to ask for elaboration of incomplete answers".

(a) Semi-Structured Interviewing

Gillham (2005: p71) states that it could be argued that "the semi-structured interview is the most important way of conducting a research interview because of its flexibility balanced by structure, and the quality of the data so obtained". One of the strengths of the semi-structured interview is that it facilitates a strong element of discovery, while its structured focus allows an analysis in terms of commonalities.

Gillham (2005) provides the following positives and negatives of semi-structured interviews.

Positives

- Provides a balance between structure and openness.
- With the use of prompts, roughly equivalent coverage can be achieved.
- Analysis is facilitated by the level of structure.

Negatives

- Costly in time (interview plus transcription plus analysis plus writing up).
- Question/topic development a lengthy phase.
- Skill/practice required to achieve adequate performance.

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4.1.2 QUAN OLOGY

Assessing the buyer-readiness for biodiesel use as vehicle fuel was conducted by means of quantitative research. Quantitative research methods are more useful in hypothesis-testing (Welman and Kruger (2001) and places value upon information that can be numerically manipulated in meaningful ways.

A questionnaire was developed with questions that assessed each stage of buyer-readiness. The questionnaire consisted of four main sections. Two of the sections were designed to collect descriptive statistics of the respondents, one section was based on True/False questions and the last section was based on Likert scale questions. The questionnaire was administered at various Shell Ultra Cities. Welman and Kruger (2001, p150) argue that the Likert scale is at present the most popular type of attitude measurement scale. "Its popularity stems from the fact that it is easier to compile than any of the other attitude scales". Each respondent was asked to honestly complete the questionnaire.

(a) Survey Questionnaire

Creswell (2003: p153) states that "a survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population"

Survey questionnaires are used to obtain the following types of information Welman and Kruger (2001):

- Biographical particulars.
- Typical behaviour.
- Opinions, beliefs and convictions about a specific topic.
- Attitudes towards a specific topic.

Welman and Kruger (2001: p148) state that "more satisfactory response rates are usually obtained from special target populations"

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To conclude, (ɔ asses the capability of producers to commercially process biodiesel and quantitative research was chosen to asses the buyer-readiness of vehicle owners to consume biodiesel as vehicle fuel.

4.2 POPULATION OF RELEVANCE

The population of relevance for assessing the capability of producers to commercially process biodiesel consisted of all commercial biodiesel producers in South Africa, namely those that currently process or intend to process biodiesel on a commercial scale. Individuals who process biodiesel for their personal use were excluded. The size of the population of relevance is unknown since the data is unavailable. SARS states that De Beers Fuel is currently the only licensed commercial biodiesel producers. Four other producers are currently in the process of applying for a commercial biodiesel license (Business Day, 2006). The population of relevance included:

- Producers who processed biodiesel but not yet on a commercial scale.
- Companies who have made it publicly known that they intend to process biodiesel on a commercial scale.
- Producers who currently focus on the production of feedstock for biodiesel production but intend to process biodiesel on a commercial scale in the near future.

The population of relevance on the buyer-readiness side of the research consists of all consumers who are owners of passenger vehicles and would normally use petroleum diesel. The size of the population is unknown.

4.3 PROPOSED SAMPLING

4.3.1 QUALITATIVE RESEARCH SAMPLING

Non-probability purposive sampling techniques which relied on the judgement, insight and skill of the researcher were adopted for the study on the capability of producers to process biodiesel commercially. Page

and Meyer (2 ental sample consists of respondents who, in the judgement of the researcher, will best supply the necessary information". According to Leedy (1993), non-probability sampling is used when certain members of the population have no chance at all of being included in the sample i.e. when there is no statistical method of verifying whether the sample is representative of the population. Welman and Kruger (2001: p63) argue that the advantage of non-probability sampling is that it is less complicated and more economical than probability samples. Purposive sampling in turn "relies on the experience, ingenuity and/or previous research findings to deliberately obtain units of analysis in such a manner that the sample they obtain may be regarded as being representative of the relevant population".

Companies were identified via the degree and relevance of their visibility in the biodiesel industry. During the course of this research, companies were asked to identify suitable interview candidates based on their biodiesel production capacity and time in the biodiesel industry i.e. in this way snowball sampling was incorporated into the methodology in order to obtain a relevant and expert sample.

The problem with this method of sampling is that researchers obtain such a sample in different ways which makes it hard to evaluate the extent to which the sample is representative of the relevant population. The biodiesel industry is a new industry in South Africa. The sample size was therefore very small and consisted of almost the entire population of relevance. At the time of the research, only two of the respondents in the sample were processing biodiesel. The list of respondents is provided in Appendix B, Table B-1.

4.3.2 QUANTITATIVE RESEARCH SAMPLING

Non-probability accidental sampling where the "most convenient collection of members of the population that are near and readily available for research purposes" was selected for the research on the readiness of

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buyers to cons [illegible]er, 2001: p62). Page and Meyer (2003) argue that accidental sampling is probably the most common form of non-probability sampling. Subjects were selected purely on the basis of availability. Researchers should however only use accidental sampling if they have no other option (Welman and Kruger, 2001).

The sample was selected based on accidental sampling by requesting potential respondents to participate in a questionnaire for an MBA research project. It was explained by the researcher and his assistant that the purpose of the research was to explore alternative vehicle fuels. The sample was selected from two Shell Ultra Cities; the Middelburg Shell Ultra City (east bound and west bound) and the Midrand Shell Ultra City (north bound and south bound). The questionnaire was presented on five different days.

During the period a total sample of 349 potential respondents was selected, however 33 potential respondents declined to participate in the research. The sample for the buyer-readiness section included 316 vehicle owners (both normal (fossil) diesel vehicles and petrol vehicles).

4.4 PROPOSED DATA COLLECTION

4.4.1 QUALITATIVE DATA COLLECTION

As indicated in Section 4.1.1, primary data was collected by interviewing key representatives of identified organisations who commercially process biodiesel or intend to process biodiesel commercially in the near future. Each respondent was contacted telephonically and/or via e-mail and the objectives of the research were explained. This initial contact was followed up by an e-mail which sought to place the research in context, and provide a set of broad categories to be explored during the interview. All respondents, with the exception of one, were interviewed at their place of work. All interviews were tape-recorded and the key aspects

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transcribed. In d to test the respondents' perceptions and ensure that relevant data was received during the interviews. Appendix B, Table B-2, gives a list of prompts for each research question.

4.4.2 QUANTITATIVE DATA COLLECTION

As indicated in Section 4.1.2, primary data to research the buyer-readiness of consumers to use biodiesel as vehicle fuel was collected by presenting questionnaires at various petroleum fuel stations. Shell South Africa gave the researcher and his assistant permission to personally present the questionnaires at a Shell Ultra City in Mpumalanga and a Shell Ultra City in Gauteng. Before the final questionnaire was administered, a draft questionnaire was tested for completeness and understanding by administering the questionnaire to a smaller sample.

(a) Questionnaire Design

The questionnaire consisted of a general section for details on the presenter of the questionnaire, the Shell Ultra City where the questionnaire was administered, and the date and the time of day when the specific questionnaire was presented. The questionnaire further consisted of four main sections that will be explained in the following sections. See Appendix C, Table C-1, for the Buyer-Readiness Questionnaire.

Section A

In Section A, the respondents were requested to complete their biographical information. This included the following information:

1. Age.
2. Gender.
3. Race.
4. Residing Province.

Section B

Section B asked the respondent to provide details of the vehicle used by the respondent. The following details were asked:

1. Does the respondent own a vehicle.
2. Vehicle make.
3. Vehicle model.
4. Model year of the vehicle.
5. Fuel type used by the vehicle.

Section C

The purpose of Section C was to test the respondents' awareness and knowledge of biodiesel. This section consisted of seven True/False questions with a third option of Not Sure. The answer to all the questions was true except for question 5 and question 6. Section C's questions and that of Section D, which will be explained next, addressed the different buyer-readiness stages. The questions for each relevant buyer-readiness stage can be seen in Appendix C, Table C-2.

Section D

In Section D the respondents were asked to assume that they were driving diesel powered vehicles to eliminate the chance that the respondents might misinterpret the questions. In addition, a definition of biodiesel was introduced to allow those respondents who were less aware and knowledgeable on biodiesel the opportunity to give their response to the respective questions. This further allowed the researcher the opportunity to analyse the questions in this section between the respondents who were spontaneously aware and knowledgeable on biodiesel i.e. those who answered more than 70% of the questions correctly in Section C and those who were prompted on the use and benefits of biodiesel i.e. those who answered less than 70% of the questions in Section C correctly.

The definition of biodiesel that was used as a prompt was: "Biodiesel is a diesel fuel substitute produced from renewable sources such as vegetable

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oils, animal fat thus a 'greener' fuel that could make our fuel economy less dependent on oil".

All the questions except question 16 and question 18 were asked positively towards biodiesel. A Likert scale ranging from; strongly disagree, disagree, neutral, agree and strongly agree was used for the questions. Question 19 which was based on the Purchase buyer-readiness stage was a True/False question.

4.5 PROPOSED DATA ANALYSIS

4.5.1 QUALITATIVE DATA ANALYSIS

In order to create structure and make sense of the data collected in the interviews, objective categorisation was undertaken using transcribed notes. Page and Meyer (2003, p123) states that, "objective categorisation and analysis are particularly difficult tasks to accomplish, given that the data represents subjective perceptions of respondents, which are then interpreted according to the subjective perceptions of the researcher". The primary data collected during the interviews was analysed and major categories and themes extracted with the purpose of answering the questions posed in Chapter 3.

Content analysis involves, "analysing text with respect to its content, with the factors of interest most often relating to meaning, or how many times particular phrases/terms appear" (Page and Meyer, 2003, p 129). The constructs and major themes were transferred onto an excel spreadsheet under the heading of each research questions. A table of the constructs from all the interviews was then prepared and the categories under each research question ranked in order of frequency and importance. The tables are presented in Chapter 5.

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4.5.2 QUAN

The quantitative data from the Buyer-Readiness Questionnaire was statistically validated to test the hypotheses as explained by Welman and Kruger (2001). For identification purposes, numbers were assigned to the bibliography data as well as for the True/False and Likert scale questions prior to analysis. Descriptive statistics were used to summarise the data obtained for the group of respondents. These include values for each variable such as its mean, average and variability.

Section C of the questionnaire allowed the researcher to divide the sample into those who were spontaneously aware and knowledgeable on biodiesel i.e. those who answered more than 70% of the questions correctly and those who were prompted on the use and benefits of biodiesel i.e. those who correctly less than 70% of the questions correctly. This in turn allowed the researcher to validate whether either group were at a Preference buyer-readiness stage or not (as assessed for Hypothesis 1). For the rest of the hypotheses, the complete sample was used.

(a) NCSS – Statistical Analysis Tool

NCSS was used as the statistical tool to validate each of the hypotheses. For purposes of this research, NCSS was used for three different test scenarios. The different test scenarios and the steps taken for each test are explained below.

Test scenario 1 – comparing a single group to a target value

In the first scenario the data of a single group, namely all the respondents, was compared against a target value, such as the neutral value of 3 for the Likert scale section. The steps for this test are:

1. Run the One-Sample T-Test programme in NCSS.
2. Evaluate the data for normality by considering the plots.
3. Evaluate the data for normality by considering the numerical values in the Test for Assumptions section.

4. Determi
    a. Normal data – use the T-Test section.
    b. Non-normal data – use the Wilcoxon Rank-Sum Test.
5. Interpret the findings.

Test scenario 2 – comparing two population groups

In the second scenario the data of two population groups (females and males) was compared. The steps for this test were:

1. Run the Two-Sample T-Test programme in NCSS.
2. Evaluate the data for normality and equal variance by considering the plots.
3. Evaluate the data for normality by considering the numerical values in the Test for Assumptions section.
4. Evaluate the data for equal variance by considering the Equal Variance Test.
5. Determine which statistical test to use.
    a. Normal data with equal variances – use the Equal Variance T-Test section.
    b. Normal data with unequal variances – use the Unequal Variance T-Test section.
    c. Non-normal data with equal variances – use the Mann-Whitney U or Wilcoxon Rank-Sum Test.
    d. Non-normal data with unequal variances – use the Kolmogorov-Smirnov Test.
6. Interpret the findings

Test scenario 3 – comparing more than two population groups

In the third scenario the means of two or more groups were compared to determine if at least one group's mean was different from the others. An example is to compare the data for the different age groups. The steps for this test were:

1. Run the One-Way Analysis of Variance programme in NCSS.

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2. Evaluate [illegible] variance by considering the plots.
3. Evaluate the data for normality by considering the numerical values in the Test for Assumptions section.
4. Evaluate the data for equal variance by considering the Equal Variance Test.
5. Determine which statistical test to use.
    a. Normal data with equal variances – use the Analysis of Variance section.
    b. Normal data with unequal variances – use the Unequal Variance T-Test section for two groups at a time.
    c. Non-normal data with equal variances – use the Kruskal-Wallis Test.
    d. Non-normal data with unequal variances – use the Kolmogorov-Smirnov Test for each pair of groups at a time.
6. Interpret the findings

4.6 POTENTIAL LIMITATIONS

The research conducted in this paper has the following limitations:

- There are a small number of producers in South Africa who are ready to commercially process biodiesel.
- Buyer-readiness for biodiesel was only conducted in a selected area of South Africa at a small number of petroleum diesel fuel stations. Although the sample size might be large, the geographical location of the sample might not be representative of all owners of passenger vehicles who consume petroleum diesel. The sample consisted of owners of passenger vehicles, diesel powered or petrol powered, who were asked in Section D of the questionnaire to assume they were driving diesel powered vehicles.
- Owners of passenger vehicles are just one of the many sectors in the petroleum diesel industry. No assessment is done on the buyer-readiness of the other sectors, such as, agricultural, mining, marine, construction and road freight.

CHAPTER 5. RESEARCH FINDINGS

The purpose of the research project is twofold. Firstly, to establish whether South African biodiesel producers can profitably manufacture biodiesel on a commercial scale. The first step is to identify whether there are producers who commercially manufacture biodiesel and whether they have the capability to do so profitably. The second aim of the research is to understand the readiness of owners of passenger vehicles to use biodiesel. Buyers pass through the following stages before purchasing a new product; awareness, knowledge, liking, preference, conviction, and finally the purchase stage.

The following sections provide the findings of the research project. Section 5.2 provides the results of the research questions that are based on the capability of producers to commercially manufacture biodiesel. Section 5.3 presents the results of the research hypotheses that indicate the degree of readiness of consumers to use biodiesel. For Section 5.3, NCSS was used as a statistical tool to evaluate the hypotheses. Section 4.5.2 describes in detail the different NCSS tests that were used under each specific scenario.

5.1 CAPABILITY OF PRODUCERS TO MANUFACTURE BIODIESEL

5.1.1 INTRODUCTION

Since nothing has been published on the biodiesel production capability of producers in South Africa and since it is a new industry, the seven respondents interviewed were drawn from a fairly small population of organisations who commercially manufacture biodiesel or who have made it publicly known that they aim to manufacture the product commercially in the near future. As stated in Section 4.3.1 the sample was selected based on judgemental sampling. Only two of the respondents currently process biodiesel and only one of them on a commercial scale. Table 5-1 provides a breakdown of the types of organisations, sector and biodiesel production capacity or project status from which the sample was drawn.

Table 5-1: Business Sector and Processing Capacity of the Sample Population

Type of organisation	Sector	Biodiesel Capacity / Project Status	No. of respondents
Public Enterprise	Fuel and chemical production	Project at feasibility stage	1
Private Enterprise	Commercial biodiesel production	Annual production > 300,000 litres	1
		Plant to be commissioned in 2007	2
	General biodiesel production	Annual production < 300,000 litres	1
	Biodiesel feedstock production	Feedstock plantations	2
		Total	7

As indicated in Section 4.5.1, the content of each interview was analysed to extract the major themes from the data and cluster these under the broad headings of the five research questions. A table of the constructs from all the interviews was then prepared and the categories under each research question ranked in order of frequency and importance.

5.1.2 RESEARCH QUESTION 1

For organisations to be licensed by SARS as a commercial biodiesel producer, they must produce in excess of 300,000 litres biodiesel per year. That equate to more than 25,000 litres per month. Only one of the respondents is currently registered with SARS as a commercial biodiesel producer and has an annual capacity to manufacture over 200 million litres. Table 5-2 below gives the production capacity for each of the respondents.

Table 5-2: Comm

Organisation	Annual Production	Commercial Producer (Yes/No)
Respondent 1	Not yet producing biodiesel	No, 3,500 – 5,000 ha feedstock plantations with capacity to increase to 45,000 ha
Respondent 2	Not yet producing biodiesel	No, 3500 ha feedstock plantations with capacity to increase to 15,000 ha
Respondent 3	Less than 300,000 litres per year	No, but has the production capacity to be a commercial producer.
Respondent 4	100,000 litres	No, project is at a feasibility stage
Respondent 5	200 million litres	Yes, the only licensed producer
Respondent 6	8 – 9 million litres	Yes, when plant is commissioned end 2006
Respondent 7	10 million litres initially to increase to 30 million litres	Yes, when plant is commissioned in 2007

5.1.3 RESEARCH QUESTION 2

To assess whether South African organisations can profitably process biodiesel, the categories that deals with the capability of the producers to profitably process biodiesel were listed in order of importance. The main categories are:

- Industry knowledge.
- Consumer markets.
- Biodiesel manufacturing knowledge and technology.
- Feedstock supply.
- Financing and profits.
- Quality assurance and
- Business plans.

Table 5-3 below provides the findings.

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Table 5-3: Proce

Category	Recorded frequency
Industry knowledge and research	
Manufacturing biodiesel	7
Feedstock production	4
Consumer market and biodiesel requirement is extensive	7
Profit Margin	
Profit margin in biodiesel processing is adequate	7
Profit margin depends on exchange rate and oil price	7
Adequate financing resources	6
Ability to meet quality assurance standards	6
Technology	
Ability to run and optimise the processing technology	5
Don't need processing technology knowledge, will buy technology	4
Will use their own technology	3
Must be large scale	2
Wrote a business plan	5
Feedstock	
There is not enough feedstock	4
Rising feedstock prices might be problematic (market price)	4
There is enough feedstock available for processing	3
Plant their own feedstock	3
Must use non-edible feedstocks	3
Might initially import feedstock	2

5.1.4 RESEARCH QUESTION 3

It is essential that the commercial biodiesel manufacturing industry has the required knowledge, skill and experience for sustained growth and success of the young industry. Both management and the workforce must be equipped to commercially manufacture biodiesel. Table 5-4 below gives the findings from the sample on their opinion of whether the industry players have the required knowledge, skills and experience to commercially manufacture biodiesel.

Table 5-4: Knowledge and Skill for Commercial Manufacture Requirements

Category	Recorded frequency
Skills and experience	
Management	6
Workforce	6
Not enough technical expertise	2
Training and skills development	
Extensively done in-house	3
Will be done by technology provider	2

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5.1.5 RESEA

In a new industry such as biodiesel processing, it is essential that the industry receives much needed support to ensure growth and sustainability. Government plays a vital role in ensuring that frameworks, structures, incentives and financial support are in place. Table 5-5 below provides the respondents' views on the degree of government supports.

Table 5-5: Industry Support by the Government

Category	Recorded frequency
Government support not adequate	
Generally not good enough	4
Biodiesel manufacturing incentives not enough	4
More support is received from neighbouring countries	3
Not enough support on feedstocks development	3
Not enough support for emerging farmers	1
Government support adequate	
Framework in place	3
Government is extremely helpful	1

5.1.6 RESEARCH QUESTION 5

Table 5-6 below provides the respondents views on the benefits and constraints of biodiesel.

Table 5-6: Biodiesel Benefits and Constraints

Category	Recorded frequency
Benefits	
Renewable energy source	5
Good for the environment	5
Great for economic development (employment opportunities)	4
Better for vehicle engine than normal diesel	4
Biodiesel process is easy	3
Socio-economical	1
Regular blending with normal diesel	1
Decentralised fuel source	1
Business opportunity (carbon credits)	1
Constraints	
Negative impact on food prices	3
Will not make economy independent of oil	3
Impact / Contribution not as great as would like	2
Feedstock supply not sustainable	1
Biodiesel has a shorter shelf live	1
Impact on vehicle warrantees	1

5.1.7 CONC

(a) Research Question 1

- There is currently only one commercially licensed biodiesel producer in South Africa.
- One of the respondents expects to manufacture biodiesel on a commercial scale by the end of 2006.
- Another respondent expects to manufacture biodiesel on a commercial scale by the middle of 2007

(b) Research Question 2

- All the respondents state that South African organisations have adequate industry knowledge to commercially manufacture biodiesel.
- All the respondents agree that the consumer market, and therefore the demand for biodiesel, is extensive.
- All the respondents indicate that the profit margin in the biodiesel manufacturing industry is adequate, but that it greatly depends on the exchange rate, price of feedstocks and the international oil price.
- The sustainability of the feedstock supply and quality standards are however a concern.

(c) Research Question 3

- Six out of the seven respondents indicated that South African organisations have the required skills and expertise to commercially manufacture biodiesel.
- Two respondents however indicate that South Africa currently has a shortage of technical expertise.

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(d) Resea

- Four of the respondents indicated that the government must implement more incentives should they wish to see growth in the biodiesel industry.
- Only one respondent stated that the government is extremely helpful in all aspects.

(e) Research Question 5

- Five respondents stated that biodiesel is a renewable energy source and beneficial to the environment.
- The greatest constraint on biodiesel use is the possible negative impact on food prices.

The findings of the research hypotheses that investigate the readiness of consumers to use biodiesel will be presented next.

5.2 BUYER-READINESS TO USE BIODIESEL

5.2.1 INTRODUCTION

As stated in Section 4.3.2 the sample was selected based on accidental sampling by presenting the Buyer-Readiness Questionnaire in person to the respondent by the researcher and his assistant. The questionnaire was presented on five different days at two Shell Ultra Cities; the Middelburg Shell Ultra City (east and west bound) and the Midrand Shell Ultra City (north and south bound).

Table 5-7 below provides some of the biographical data of the respondents.

Table 5-7: Age, Gender and Race of all Respondents

Count of Respondents		**Gender**		
Age Group	**Race**	**Female**	**Male**	**Grand Total**
18 to 34	Black	9	9	**18**
	White	16	88	**104**
	Coloured		1	**1**
	Indian		6	**6**
	Other		1	**1**
	(blank)		2	**2**
18 to 34 Total		**25**	**107**	**132**
35 to 44	Black	6	4	**10**
	White	9	74	**83**
	Coloured		3	**3**
	Indian		1	**1**
	(blank)		1	**1**
35 to 44 Total		**15**	**83**	**98**
45 and above	Black	2	2	**4**
	White	6	68	**74**
	Coloured		2	**2**
	Indian		1	**1**
	Other		1	**1**
	(blank)		1	**1**
45 and above Total		**8**	**75**	**83**
(blank)	Black		2	**2**
	White		1	**1**
(blank) Total			**3**	**3**
Grand Total		**48**	**268**	**316**

The researcher and his assistant asked the potential respondents in a friendly manner whether they would like to participate in an MBA research

project on alte estionnaire. Most of the questionnaires were completed in the parking bay areas of the Shell Ultra Cities. In total 33 people made it known to the researcher and his assistant that they would not like to participate in the research. In total 316 respondents participated in the research. A significant response rate of 91% was achieved.

Table 5-8 provides the number of respondents per gender group and the location where they completed the questionnaires.

Table 5-8: Venue for Administered Questionnaire

Count of Respondents	Gender		
Where	**Female**	**Male**	**Grand Total**
Middelburg Shell Ultra City East Bound	1	3	**4**
Middelburg Shell Ultra City West Bound	9	27	**36**
Midrand Shell Ultra City North Bound	17	99	**116**
Midrand Shell Ultra City South Bound	21	139	**160**
Grand Total	**48**	**268**	**316**

Table 5-9 below gives data of the residing province for each respondent and the type of fuel used in their vehicles (which is a factor of the type of vehicle they drive or own).

Table 5-9: Residing Province and Vehicle Fuel used for all Respondents

Count of Respondents	Fuel Type			
Residing Province	**Diesel**	**Petrol**	**(blank)**	**Grand Total**
Northen Cape		1		**1**
Eastern Cape		1		**1**
Kwazulu Natal	1		2	**3**
Free State	2	5		**7**
Gauteng	59	212	7	**278**
Mpumalanga	4	6		**10**
North West Province		1		**1**
Limpopo	3	3		**6**
Other	2	3	3	**8**
(blank)			1	**1**
Grand Total	**71**	**232**	**13**	**316**

Eleven of the thirteen respondents who gave no indication of the type of fuel used in their vehicles didn't own a vehicle. In total 23.3% of the respondents who own vehicles, drive a normal (fossil) diesel vehicle.

As stated in f the Buyer-Readiness Questionnaire measured the respondents' awareness and knowledge on biodiesel. The questions were asked True/False questions. Section D of the questionnaire started with a clear definition of biodiesel to give the respondents who were not aware and knowledgeable on biodiesel a better understanding on what biodiesel is. This gave them the opportunity to complete Section D. A Likert scale ranging from; strongly disagree, disagree, neutral, agree and strongly agree was used for the questions in Section D. Question 19 which measured the Purchase stage was a True/False question.

This allowed the researcher to divide the analysis of each hypothesis between the respondents who were spontaneously aware and knowledgeable on biodiesel and those respondents who were aware and knowledgeable on biodiesel after reading the definition of biodiesel. It is assumed that those respondents who were spontaneously aware and knowledgeable on biodiesel received an average score of 70% or higher on Section C of the Buyer-Readiness Questionnaire. It is thus further assumed that those respondents who received an average score lower than 70% on Section C of the Buyer-Readiness Questionnaire where prompted and made aware and knowledgeable on biodiesel after reading the definition of biodiesel in Section D of the Buyer-Readiness Questionnaire.

As shown in Figure 5-1 below, in total 127 respondents were spontaneously aware and knowledgeable on biodiesel and 189 respondents were prompted on biodiesel and its benefits.

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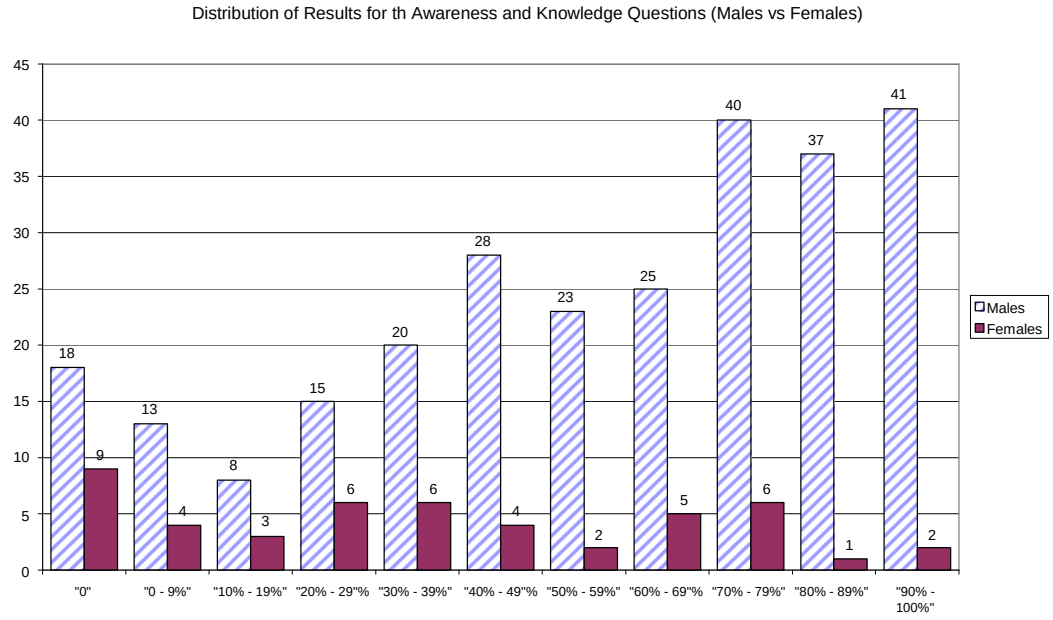
Figure 5-1: The F uestions



The results for the hypotheses of the research are presented next.

5.2.2 RESEARCH HYPOTHESIS 1

Owners of passenger vehicles are at a “preference” or higher stage of buyer-readiness for biodiesel.

The results are provided for both groups as identified above namely those who spontaneously knew about biodiesel and those who were prompted. Each of the buyer-readiness stages were analysed to see at what stage of buyer-readiness the respondents were. First the Liking stage was analysed and if it was realised that the respondents were at the Liking stage then only those respondents who scored an average above 3 on the Liking stage could be tested if they were at a Preference stage. If the respondents did not score an average score above 3 for the Liking stage, it was assumed that they could not possibly be at the Preference stage. This methodology was followed for testing of the following stages. If the new sample was found to be at a Preference stage, only those in the sample who scored above 3 were selected to validate whether they were at a Conviction stage or not.

NCSS was us e data. As described in Section 4.5.2, Test scenario 1 where a single group is compared to a target value, was used for evaluating Hypothesis 1.

Table 5-10 below gives the average values received for each buyer-readiness stage's questions in total and between the spontaneous and prompted groups. Data for the Purchase stage is excluded because it was a True/False question.

Table 5-10: Average Scores per Buyer-Readiness Stage

AWARE & KNOWLEDGEABLE	Data	Total
Prompted	Average of LIKING	3.95
	Average of PREFERENCE	3.45
	Average of CONVICTION	3.51
Spontaneous	Average of LIKING	4.35
	Average of PREFERENCE	3.64
	Average of CONVICTION	3.58
Total Average of LIKING		4.11
Total Average of PREFERENCE		3.53
Total Average of CONVICTION		3.54

(a) Spontaneous Aware and Knowledgeable Group

Liking stage

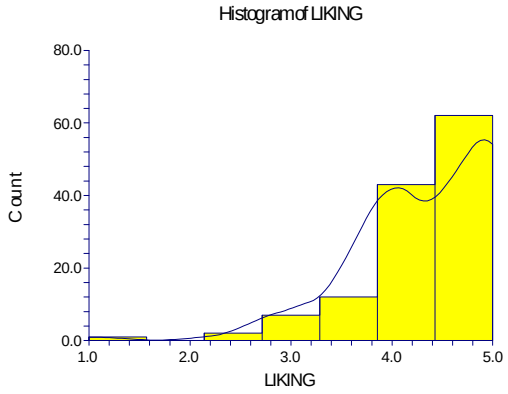
Table 5-11: (H1) Liking stage – descriptive statistics (spontaneous)

Count	Mean	Standard Deviation	Standard Error	90% LCL of Mean	90% UCL of Mean
127	4.354331	0.7148563	0.063433	4.249219	4.459442

Table 5-12: (H1) Liking stage – test findings (spontaneous)

NCSS Report	One Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Rejected
Final test used	Wilcoxon Signed-Rank Test
Significance level	10%
p-value	0.0

Figure 5-2: (H1) I)



The respondents' median result for the Liking stage is significantly greater than the neutral value of 3. The respondents are thus definitely at a Liking stage. The test to see if the respondents who scored above 3 for the Liking stage are at a Preference stage or not follow:

Preference Stage

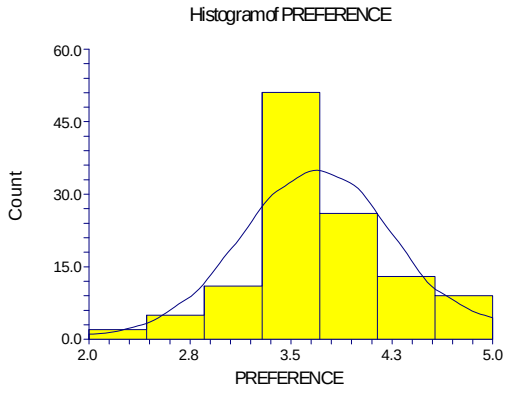
Table 5-13: (H1) Preference stage – descriptive statistics (spontaneous)

Count	Mean	Standard Deviation	Standard Error	90% LCL of Mean	90% UCL of Mean
117	3.703704	0.5703024	0.0527245	3.616282	3.791126

Table 5-14: (H1) Preference stage – test findings (spontaneous)

NCSS Report	One Sample T-Test
Normality test – plots	Cannot be rejected
Normality test – numerical	Cannot be rejected
Final test used	T-Test
Significance level	10%
p-value	0.0

Figure 5-3: (H1) Preference stage – histogram (spontaneous)



The responde ıce stage is significantly greater than the neutral value of 3. The respondents are thus definitely past a Liking stage and at a Preference stage.

Next will be tested if the respondents who scored above 3 for the Liking stage, including above 3 for the Preference stage, are at a Conviction stage or not.

Conviction

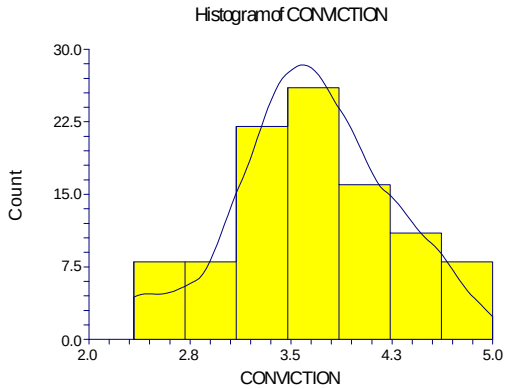
Table 5-15: (H1) Conviction stage – descriptive statistics (spontaneous)

Count	Mean	Standard Deviation	Standard Error	90% LCL of Mean	90% UCL of Mean
99	3.653199	0.5830547	0.0585992	3.555892	3.750506

Table 5-16: (H1) Conviction stage – test findings (spontaneous)

NCSS Report	One Sample T-Test
Normality test – plots	Cannot be rejected
Normality test – numerical	Cannot be rejected
Final test used	T-Test
Significance level	10%
p-value	0.0

Figure 5-4: (H1) Conviction stage – histogram (spontaneous)



The respondents' mean result for the Conviction stage is significantly greater than the neutral value of 3. The respondents are thus definitely past a Liking stage, past a Preference stage and at a Conviction stage.

Next will be te ed above 3 for the Liking stage, including above 3 for the Preference stage, including above 3 for the Conviction, are at a Purchase stage or not.

Purchase stage

Table 5-17: (H1) Respondents at Purchase stage (spontaneous)

AWARE & KNOWLEDGEABLE	Spontaneous

Count of Respondents				
LIKING > 3	PREFERENCE > 3	CONVICTION > 3	PURCHASE	Total
Yes	Yes	Yes	Have purchased BD	5
		Yes Total		5
	Yes Total			5
Yes Total				5
Grand Total				5

Table 5-17 above shows that only 5 respondents of the 99 respondents who are at a Conviction stage have actually purchased biodiesel. That is 5.1% of the respondents that are at a Conviction stage. The respondents are therefore not at a Purchase stage.

This is not a valid conclusion as biodiesel is not commercially available and many respondents may be willing to purchase it, but have not as they can not obtain the product.

(b) Prompted to be Aware and Knowledgeable Group

Liking Stage

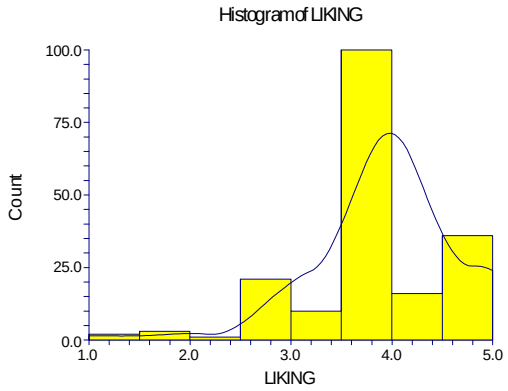
Table 5-18: (H1) Liking stage – descriptive statistics (prompted)

Count	Mean	Standard Deviation	Standard Error	90% LCL of Mean	90% UCL of Mean
189	3.952381	0.7142351	0.051953	3.866503	4.038259

Table 5-19: (H1) L

NCSS Report	One Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Rejected
Final test used	Wilcoxon Signed-Rank Test
Significance level	10%
p-value	0.0

Figure 5-5: (H1) Liking stage – histogram (prompted)



The respondents' median result for the Liking stage is significantly greater than the neutral value of 3. The respondents are thus definitely at a Liking stage.

Next will be tested if the respondents who scored above 3 for the Liking stage are at a Preference stage or not.

Preference Stage

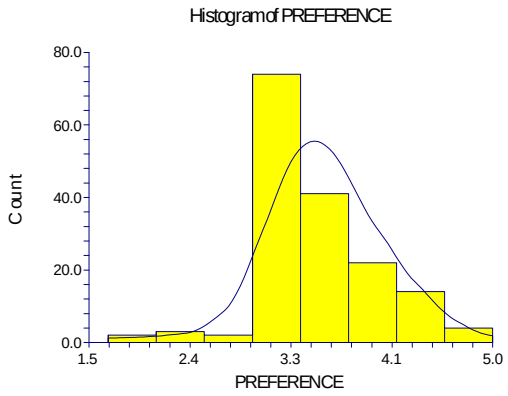
Table 5-20: (H1) Preference stage – descriptive statistics (prompted)

Count	Mean	Standard Deviation	Standard Error	90% LCL of Mean	90% UCL of Mean
162	3.54321	0.5106038	0.0401168	3.476842	3.609578

Table 5-21: (H1) Preference stage – test findings (prompted)

NCSS Report	One Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Rejected
Final test used	Wilcoxon Signed-Rank Test
Significance level	10%
p-value	0.0

Figure 5-6: (H1) I d)



The respondents' median result for the Preference stage is significantly greater than the neutral value of 3. The respondents are thus past a Liking stage and at a Preference stage.

Next will be tested if the respondents who scored above 3 for the Liking stage, including above 3 for the Preference stage, are at a Conviction stage or not.

Conviction Stage

Table 5-22: (H1) Conviction stage – descriptive statistics (prompted)

Count	Mean	Standard Deviation	Standard Error	90% LCL of Mean	90% UCL of Mean
135	3.639506	0.5151951	0.0443409	3.566064	3.712948

Table 5-23: (H1) Conviction stage – test findings (prompted)

NCSS Report	One Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Cannot be rejected
Final test used	Wilcoxon Signed-Rank Test
Significance level	10%
p-value	0.0

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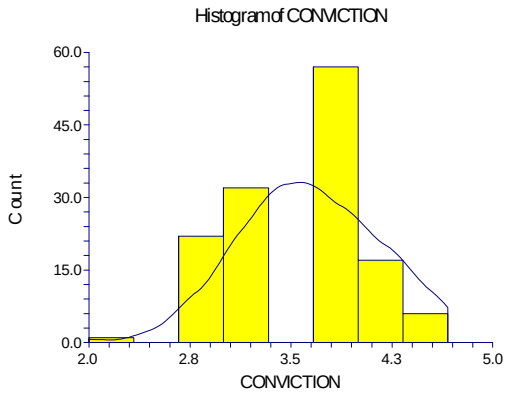
Figure 5-7: (H1) (d)



The respondents' median result for the Conviction stage is significantly greater than the neutral value of 3. The respondents are thus past a Liking stage, past a Preference stage and at a Conviction stage.

Next will be tested if the respondents who scored above 3 for the Liking stage, including above 3 for the Preference stage, including above 3 for the Conviction, are at a Purchase stage or not.

Purchase Stage

Table 5-24: (H1) Respondents at Purchase stage (prompted)

AWARE & KNOWLEDGEABLE	Prompted

Count of Respondents				
LIKING > 3	PREFERENCE > 3	CONVICTION > 3	PURCHASE	Total
Yes	Yes	Yes	Have purchased BD	2
		Yes Total		2
	Yes Total			2
Yes Total				2
Grand Total				2

Table 5-24 above shows that only 2 respondents of the 135 respondents who are at a Conviction stage have actually purchased biodiesel. That is 1.5% of the respondents that are at a Conviction stage. The respondents are therefore not at a Purchase stage.

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This is not a v ɔt commercially available and many respondents may be willing to purchase it, but have not as they can not obtain the product.

5.2.3 RESEARCH HYPOTHESIS 2

Both female and male owners of passenger vehicles are at the same stage of buyer-readiness for biodiesel.

As described in Section 4.5.2, Test scenario 2 where two population groups are compared (males and females), was used for evaluating Hypothesis 2.

Awareness Stage

The statistics below are based on a percentage score each respondent received for the questions based on the Awareness stage. Table 5-25 provides the mean percentage score of both the females and males. The females received a very low percentage of 37.5% for the Awareness stage. The males scored better at 61.9%.

In Figure 5-8 below group G1 represents the female group and G2 represents the male group.

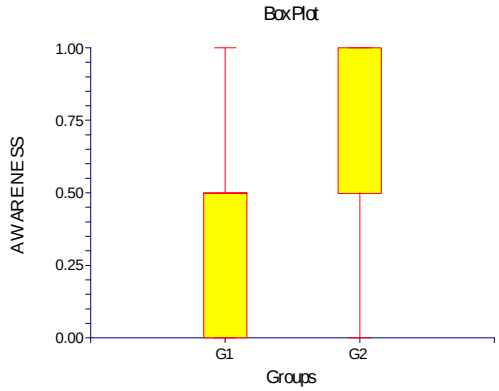
Table 5-25: (H2) Awareness stage – descriptive statistics

Gender	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Female	48	0.375	0.3927535	0.0566891	0.2609563	0.4890437
Male	268	0.619403	0.4021436	0.0245648	0.5712568	0.6675492

Table 5-26: (H2) Awareness stage – test findings

NCSS Report	Two Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Rejected
Equal variance	Cannot be rejected
Final test used	Mann-Whithney U or Wilcoxon Rank-Sum Test
Significance level	5%
p-value	0.000147

Figure 5-8: (H2) A



There is a significant difference in the means between the females and the males for the Awareness stage. The females and males are not equally aware of biodiesel. The males are significantly more aware.

Knowledge Stage

The statistics below are based on a percentage score each respondent received for the questions based on the Knowledge stage. Table 5-27 provides the mean percentage score of both the females and males. The females received a very low percentage of 36% for the Knowledge stage. The males scored better at 53.8%.

In Figure 5-9 below group G1 represents the female group and G2 represents the male group.

Table 5-27: (H2) Knowledge stage – descriptive statistics

Gender	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Female	48	0.3602083	0.2729078	0.0393909	0.2809642	0.4394525
Male	268	0.5384328	0.2785163	0.0170131	0.5050878	0.5717779

Table 5-28: (H2) I

NCSS Report	Two Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Rejected
Equal variance	Cannot be rejected
Final test used	Mann-Whithney U or Wilcoxon Rank-Sum Test
Significance level	5%
p-value	0.000063

Figure 5-9: (H2) Knowledge stage – box plot

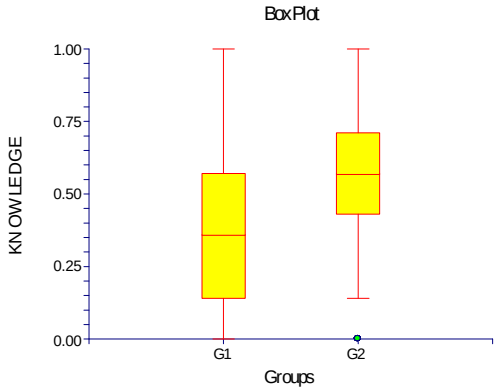
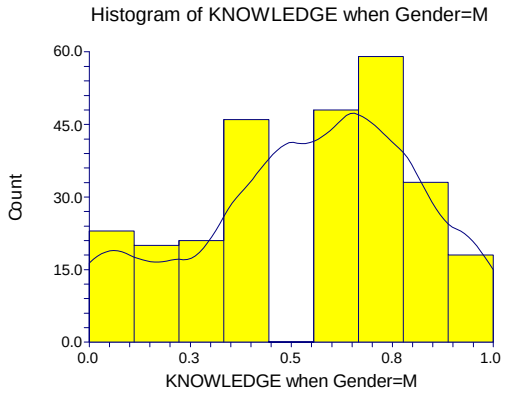


Figure 5-10: (H2) Knowledge stage – histogram



There is a significant difference in the means between the females and the males for the Knowledge stage. The females and males are not equally knowledgeable on biodiesel. The males are significantly more knowledgeable.

Liking Stage

The statistics below are based on a Likert scale value between 1 and 5 (strongly disagree to strongly agree) for the questions based on the Liking stage.

In Figure 5-11 below group G1 represents the female group and G2 represents the male group.

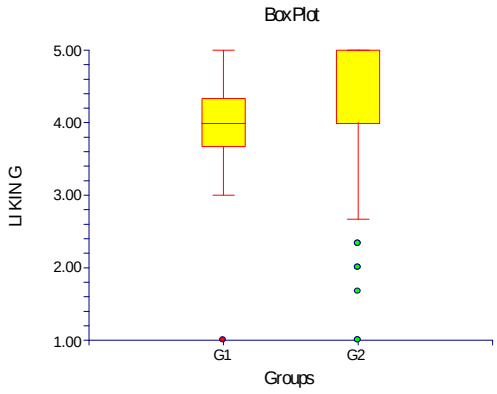
Table 5-29: (H2) Liking stage – descriptive statistics

Gender	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Female	48	3.972083	0.7104837	0.1025495	3.76578	4.178386
Male	268	4.139403	0.7437392	0.0454311	4.05036	4.228446

Table 5-30: (H2) Liking stage – test findings

NCSS Report	Two Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Rejected
Equal variance	Cannot be rejected
Final test used	Mann-Whithney U or Wilcoxon Rank-Sum Test
Significance level	5%
p-value	0.160399

Figure 5-11: (H2) Liking stage – box plot



There is not a significant difference in the means between the females and the males for the Liking stage. The females and males are both equal in their liking of biodiesel as vehicle fuel.

Preference St

The statistics below are based on a Likert scale value between 1 and 5 (strongly disagree to strongly agree) for the questions based on the Preference stage.

In Figure 5-12 below group G1 represents the female group and G2 represents the male group.

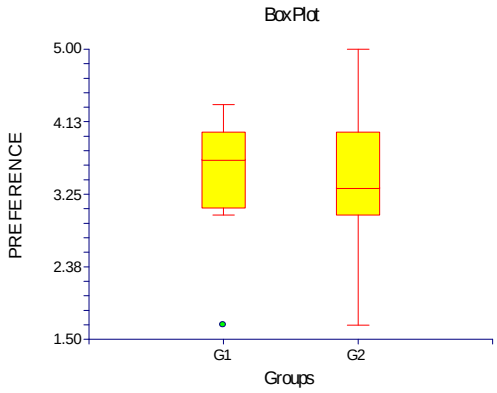
Table 5-31: (H2) Preference stage – descriptive statistics

Gender	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Female	48	3.561875	0.5415999	0.078173	3.404611	3.719139
Male	268	3.519701	0.5844072	0.035698	3.449734	3.589669

Table 5-32: (H2) Preference stage – test findings

NCSS Report	Two Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Rejected
Equal variance	Cannot be rejected
Final test used	Mann-Whithney U or Wilcoxon Rank-Sum Test
Significance level	5%
p-value	0.531508

Figure 5-12: (H2) Preference stage – box plot



There is not a significant difference in the means between the females and the males for the Preference stage. The females and males are both equal in their preference for biodiesel as vehicle fuel.

Conviction St

The statistics below are based on a Likert scale value between 1 and 5 (strongly disagree to strongly agree) for the questions based on the Conviction stage.

In Figure 5-13 below group G1 represents the female group and G2 represents the male group.

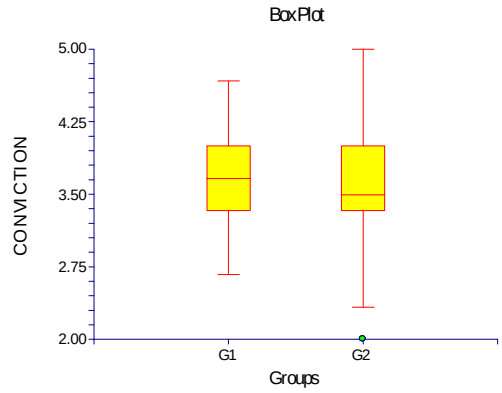
Table 5-33: (H2) Conviction stage – descriptive statistics

Gender	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Female	48	3.638542	0.4994124	0.072084	3.493527	3.783556
Male	268	3.518619	0.5626216	0.034368	3.45126	3.585979

Table 5-34: (H2) Conviction stage – test findings

NCSS Report	Two Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Cannot be rejected
Equal variance	Cannot be rejected
Final test used	Mann-Whithney U or Wilcoxon Rank-Sum Test
Significance level	5%
p-value	0.153337

Figure 5-13: (H2) Conviction stage – box plot



There is not a significant difference in the means between the female group and the male group for the Conviction stage. The female group and male group are equal in their conviction to use biodiesel as vehicle fuel. It is however interesting to note that the mean of the female group falls outside the 95% upper confidence level of the male group.

Purchase Stage

The statistics below are based on a True/False question on whether the respondents have used biodiesel before. The value 1 depicts a True and the value 2 depicts False.

In Figure 5-8 below group G1 represents the female group and G2 represents the male group.

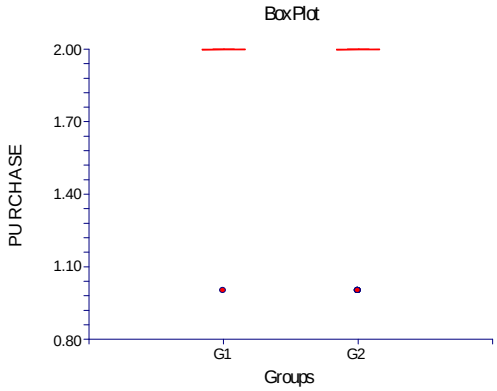
Table 5-35: (H2) Purchase stage – descriptive statistics

Gender	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Female	48	1.979167	0.1443376	0.020833	1.937255	2.021078
Male	268	1.970149	0.1704938	0.010415	1.949737	1.990561

Table 5-36: (H2) Purchase stage – test findings

NCSS Report	Two Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Rejected
Equal variance	Cannot be rejected
Final test used	Mann-Whithney U or Wilcoxon Rank-Sum Test
Significance level	5%
p-value	0.729846

Figure 5-14: (H2) Purchase stage – box plot



There is not a significant difference in the medians between the female group and the male group for the Purchase stage. Both the female group and the male group are comparable in that they have not purchased biodiesel before.

5.2.4 RESEA

Owners of passenger vehicles of all ages are at the same stage of buyer-readiness for biodiesel.

As described in Section 4.5.2, Test scenario 3 where the means of two or more age groups are compared to determine if at least one group's mean is different from the other group, was used for evaluating Hypothesis 1.

In this section A, B and C represents the age group 18 to 34, 35 to 44, and 45 and above respectively.

Awareness Stage

The statistics below are based on a percentage score each respondent received for the questions based on the Awareness stage. Table 5-37 provides the mean percentage score of each age group.

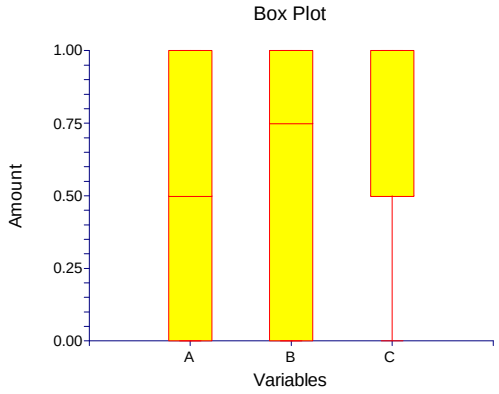
Table 5-37: (H3) Awareness stage – descriptive statistics

Age Group	Count	Mean	Standard Error	Effect
ALL	313	0.5878595		0.596226
A – 18 to 34	132	0.5378788	0.035384	-0.058347
B – 35 to 44	98	0.6122449	0.041066	0.016019
C – 45 & up	83	0.6385542	0.0.04462	0.043283

Table 5-38: (H3) Awareness stage – test findings

NCSS Report	One-Way Analysis of Variance
Normality test – plots	Rejected
Normality test – numerical	Rejected
Equal variance	Cannot be rejected
Final test used	Kruskal-Wallis Test
Significance level	5%
p-value	0.148228
Chi-square	3.818012

Figure 5-15: (H3)



The medians of all the age groups are equal. All age groups are equally aware of biodiesel.

Knowledge Stage

The statistics below are based on a percentage score each respondent received for the questions based on the Awareness stage. Table 5-39 provides the mean percentage score for each age group.

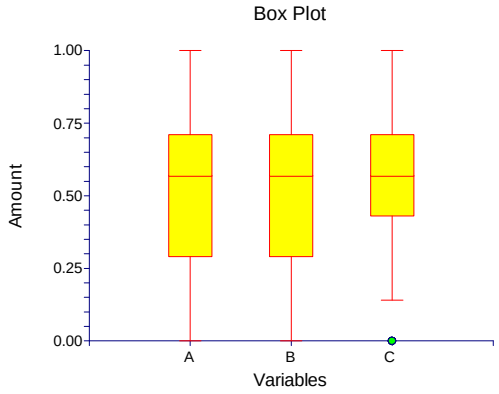
Table 5-39: (H3) Knowledge stage – descriptive statistics

Age Group	Count	Mean	Standard Error	Effect
ALL	313	0.5149201		0.5191527
A – 18 to 34	132	0.4931061	0.0246834	-0.0260467
B – 35 to 44	98	0.5159184	0.028647	-0.003234
C – 45 & up	83	0.5484337	0.0311281	0.0292810

Table 5-40: (H3) Knowledge stage – test findings

NCSS Report	One-Way Analysis of Variance
Normality test – plots	Rejected
Normality test – numerical	Rejected
Equal variance	Cannot be rejected
Final test used	Kruskal-Wallis Test
Significance level	5%
p-value	0.395400
Chi-square	1.855713

Figure 5-16: (H3)



The medians of all the age groups are equal. All age groups are equally knowledgeable on biodiesel.

Liking Stage

The statistics below are based on a Likert scale value between 1 and 5 (strongly disagree to strongly agree) for the questions based on the Liking stage.

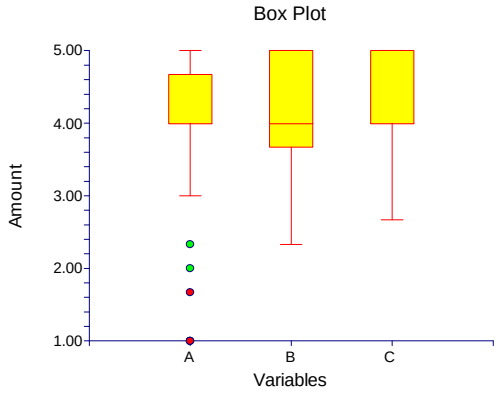
Table 5-41: (H3) Liking stage – descriptive statistics

Age Group	Count	Mean	Standard Error	Effect
ALL	313	4.124664		4.133318
A – 18 to 34	132	4.078182	0.0638081	-0.055136
B – 35 to 44	98	4.132857	0.0740541	-0.000461
C – 45 & up	83	4.188916	0.080468	0.055597

Table 5-42: (H3) Liking stage – test findings

NCSS Report	One-Way Analysis of Variance
Normality test – plots	Rejected
Normality test – numerical	Rejected
Equal variance	Cannot be rejected
Final test used	Kruskal-Wallis Test
Significance level	5%
p-value	0.807557
Chi-square	0.4274841

Figure 5-17: (H3)



The medians of all the age groups are equal. All age groups are equal in their liking of biodiesel as a vehicle fuel.

Preference Stage

The statistics below are based on a Likert scale value between 1 and 5 (strongly disagree to strongly agree) for the questions based on the Preference stage.

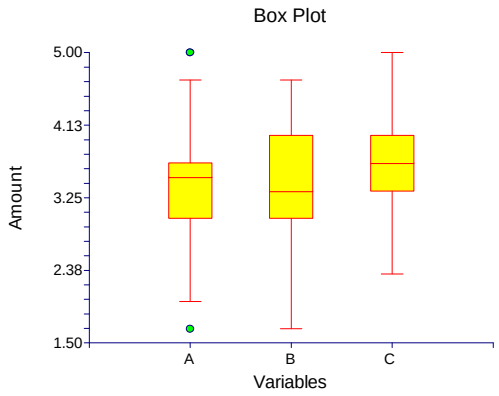
Table 5-43: (H3) Preference stage – descriptive statistics

Age Group	Count	Mean	Standard Error	Effect
ALL	313	3.533291		3.547894
A – 18 to 34	132	3.462121	0.0495371	-0.085773
B – 35 to 44	98	3.523367	0.0574916	-0.024526
C – 45 & up	83	3.658193	0.062471	0.110299

Table 5-44: (H3) Preference stage – test findings

NCSS Report	One-Way Analysis of Variance
Normality test – plots	Rejected
Normality test – numerical	Rejected
Equal variance	Cannot be rejected
Final test used	Kruskal-Wallis Test
Significance level	5%
p-value	0.151449
Chi-square	3.775013

Figure 5-18: (H3)



The medians of all the age groups are equal. All age groups equally prefer biodiesel as vehicle fuel.

Conviction Stage

The statistics below are based on a Likert scale value between 1 and 5 (strongly disagree to strongly agree) for the questions based on the Conviction stage.

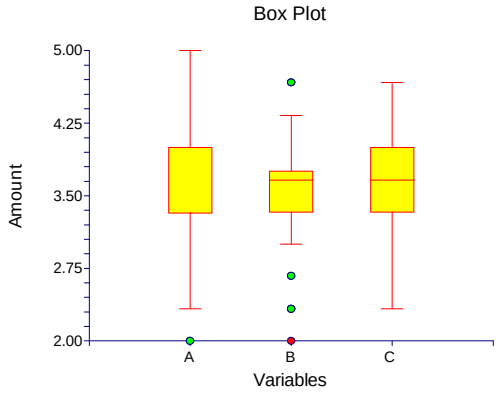
Table 5-45: (H3) Conviction stage – descriptive statistics

Age Group	Count	Mean	Standard Error	Effect
ALL	313	3.543035		3.550896
A – 18 to 34	132	3.504924	0.0481601	-0.045972
B – 35 to 44	98	3.537041	0.055893	-0.013855
C – 45 & up	83	3.610723	0.060734	0.059827

Table 5-46: (H3) Conviction stage – test findings

NCSS Report	One-Way Analysis of Variance
Normality test – plots	Rejected
Normality test – numerical	Cannot be rejected
Equal variance	Cannot be rejected
Final test used	Kruskal-Wallis Test
Significance level	5%
p-value	0.520932
Chi-square	1.304273

Figure 5-19: (H3)



The medians of all the age groups are equal. All age groups are equal in their conviction to use biodiesel as vehicle fuel.

Purchase Stage

The statistics below are based on a True/False question of whether the respondent has used biodiesel before. The value 1 depicts a True and the value 2 depicts False.

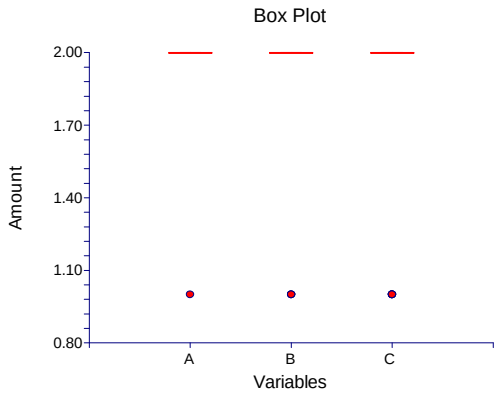
Table 5-47: (H3) Purchase stage – descriptive statistics

Age Group	Count	Mean	Standard Error	Effect
ALL	313	1.971246		1.96719
A – 18 to 34	132	1.992424	0.0144966	0.0252339
B – 35 to 44	98	1.969388	0.0168244	0.002197
C – 45 & up	83	1.939759	0.0182816	-0.027431

Table 5-48: (H3) Purchase stage – test findings

NCSS Report	One-Way Analysis of Variance
Normality test – plots	Rejected
Normality test – numerical	Rejected
Equal variance	Cannot be rejected
Final test used	Kruskal-Wallis Test
Significance level	5%
p-value	0.079564
Chi-square	5.062385

Figure 5-20: (H3)



There is not a significant difference in the medians between the three age groups for the Purchase stage. All age groups are equal in that they have not purchased biodiesel before.

5.2.5 RESEARCH HYPOTHESIS 4

Owners of passenger vehicles agree that biodiesel is more beneficial than petroleum diesel for the engines of their vehicles.

As described in Section 4.5.2, Test scenario 1 (where a single group is compared to a target value) was used for evaluating Hypothesis 4.

Question 15

Table 5-49 below provides the mean values for question 15.

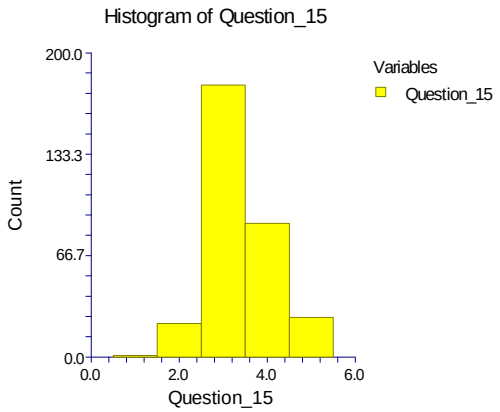
Table 5-49: (H4) – descriptive statistics

Count	Mean	Standard Deviation	Standard Error	90% LCL of Mean	90% UCL of Mean
316	3.367089	0.746245	0.0419796	3.298038	3.436139

Table 5-50: (H4) – test findings

NCSS Report	One Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Rejected
Final test used	Wilcoxon Signed-Rank Test
Significance level	10%
p-value	0.0

Figure 5-21: (H4)



The respondents' median result for Question 15 is significantly greater than the neutral value of 3. The respondents are thus of the opinion, and agree that biodiesel is more beneficial for their vehicle engines than petroleum diesel.

5.2.6 RESEARCH HYPOTHESIS 5

Owners of passenger vehicles are prepared to pay more on a Rand per litre basis for biodiesel than for petroleum diesel.

As described in Section 4.5.2, Test scenario 1 where a single group is compared to a target value, was used for evaluating Hypothesis 5.

Question 14

Table 5-51 below provides the mean values for question 14.

Table 5-51: (H5) – descriptive statistics

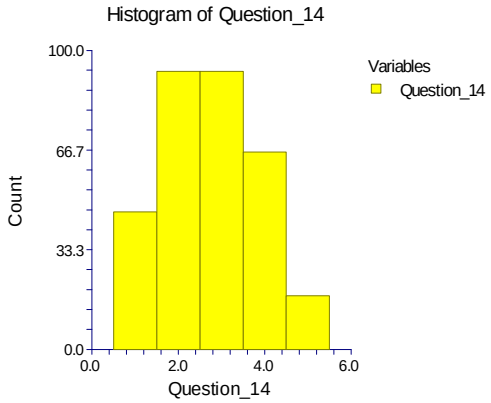
Count	Mean	Standard Deviation	Standard Error	90% LCL of Mean	90% UCL of Mean
316	2.737342	1.117252	0.06285	2.633962	2.840721

Table 5-52: (H5) – test findings

NCSS Report	One Sample T-Test
Normality test – plots	Rejected
Normality test – numerical	Rejected
Final test used	Wilcoxon Signed-Rank Test
Significance level	10%
p-value	0.999969

The histogram data is close to having a normal distribution.

Figure 5-22: (H5) – box plot



The respondents' median result for the Question 14 is significantly smaller than the neutral value of 3. The respondents are thus of the opinion, and agree that they are not prepared to pay more for biodiesel than for petroleum diesel.

5.2.7 CONCLUSION

(a) Research Hypothesis 1

- The respondents in the spontaneous group (awareness and knowledge score greater than 70%) are past a Liking stage, past a Preference stage and at a Conviction stage.
- The respondents in the prompted group (awareness and knowledge score less than 70%) are past a Liking stage, past a Preference stage and at a Conviction stage.

(b) Research Hypothesis 2

- The females and males are not equally aware of biodiesel. Males are significantly more aware of biodiesel.

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- The fe[illegible]ially knowledgeable on biodiesel. The males are significantly more knowledgeable on biodiesel.
- The females and males are both equal in their liking of biodiesel as vehicle fuel.
- The females and males are both equal in their preference for biodiesel as vehicle fuel.
- The females and males are both equal in their conviction to use biodiesel as vehicle fuel.
- The females and males are both comparable in that they have not purchased biodiesel before.

(c) Research Hypothesis 3

- All age groups are equal in their awareness of biodiesel.
- All age groups are equally knowledgeable on biodiesel.
- All age groups are equal in their liking of biodiesel as vehicle fuel.
- All age groups are equal in their preference for biodiesel as vehicle fuel.
- All age groups are equal in their conviction to use biodiesel as vehicle fuel.
- All age groups are comparable in that they have not purchased biodiesel before.

(d) Research Hypothesis 4

- The respondents agree that biodiesel is more beneficial for their vehicle engines than petroleum diesel.

(e) Research Hypothesis 5

- The respondents agree that they are not prepared to pay more for biodiesel than for petroleum diesel.

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CHAPTER 6. DISCUSSION OF RESULTS

In the following sections the findings of Chapter 5 will be discussed. Firstly in Section 6.1 the results on the capability of producers to manufacture biodiesel on a commercial scale will be discussed. This will be followed by Section 6.2 discussing the results on the buyer-readiness of consumers to use biodiesel as vehicle fuel.

Both Section 6.1 and Section 6.2 will close with conclusions that describe the discussions that took place.

6.1 CAPABILITY OF PRODUCERS TO MANUFACTURE BIODIESEL

6.1.1 INTRODUCTION

Seven respondents were interviewed from a fairly small population of producers who commercially process biodiesel or who have made it publicly known that they aim to process biodiesel commercially in the future. Only two of the respondents currently process biodiesel with one doing it on a commercial scale.

In the following sections, the key constructs or categories established under each research question in Chapter 3 are discussed in the context of the literature reviewed in Chapter 2. The findings and answers to the research questions posed will be explained.

6.1.2 RESEARCH QUESTION 1

Research question 1 sought to establish whether there are organisations in South Africa that process biodiesel on a commercial scale. A producer has to annually process in excess of 300,000 litres of biodiesel to be licensed by SARS as a commercial biodiesel producer (SARS, 2006). The researcher could not find reputable data of South African biodiesel producers and their processing capacity. It was only known that De Beers

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Fuel was the ucer licensed by SARS (Business Day, 2006).

Each respondent was asked to provide details of their biodiesel processing capacity. As shown in Table 5-2, only two of the respondents currently process biodiesel. The one producer limits their actual production to below the annual 300,000 litre threshold to eliminate the cost of acquiring a commercial processing license. Their locally build batch processing plant however has capacity to process 2,000 litres biodiesel per day. When completely utilised the plants' annual production capacity is greater than 300,000 litres.

The second producer is currently the only commercial biodiesel producer with processing capacity of 18 million litres per month. This equates to over 200 million litres per year. The producer has however only started full production in April 2006 and has yet to run their locally built batch processing plant at full capacity for a twelve month period.

Two of the respondents indicated that they will be producing biodiesel on a commercial scale when their plants are commissioned. The one producer foresees that their continuous processing plant will be operational by the end of 2006. Their plant is being built by their head office in the United Kingdom and has capacity to process 22,000 litres per day or 8 to 9 million litres annually. The other producer foresees that their locally built batch processing plant will be commissioned by the middle of 2007. Initially their annual processing capacity will be 10 million litres, but their plant is designed to expand to 30 million litres.

One respondent stated that their biodiesel processing project is still at a feasibility stage. When they initiated their project research they envisaged to buy technology to process 100,000 litres annually.

The other two respondents are currently not processing biodiesel, but are cultivating oil plants for biodiesel feedstock.

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6.1.3 RESEA

Research question 2 sought to establish whether South African organisations that process biodiesel have adequate capacity to successfully and profitably process biodiesel on a commercial scale.

As shown in Table 5-3 all seven respondents agreed that producers have adequate industry knowledge on how to processes biodiesel. Four of the respondents said that they have adequate knowledge on how to cultivate feedstock, particularly high oil containing plants such as the Jatropha Curcas. As identified in Section 2.4 this forms part of Van Gerpen's (2004) first principle of successful biodiesel business start-ups, namely a thorough research of the biodiesel industry including, knowledge and understanding of the industry, all aspects of entering the industry, technology and feedstock supply. These aspects of the first business principle will be discussed next.

Quality Standards:

Quality control is one of Van Gerpen's (2004) key steps to business success. Six of the respondents mentioned that they have the ability to process biodiesel to the South African National Standard (SANS 1935) quality standard. It was however established during the interviews that there is currently no organisation in South Africa that can do the full spectrum of tests for the SANS 1935 quality standard. This finding contradicts the statement made by the Department of Minerals and Energy (DME) that the SANS 1935 standard will ensure high quality biodiesel for blending with normal (fossil) diesel (DME, 2006). The standard alone will not control the quality of biodiesel in the industry. Testing facilities and proper control measures are required to achieve this goal.

Maintaining quality standards in the industry supports $(S\&T)^2$ Consultants Inc. and Meyers Norris Penny LLP's (2004) concern that low quality biodiesel sold to the market has the potential to seriously set back the growth of this new industry. They found that smaller biodiesel producers

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will not be a ts, which generally are expensive. As is explained below, the profit margin for manufacturing of biodiesel is largely depended on the price and availability of feedstock as well as the cost of fossil oil. The price of feedstock is currently very unstable and depends on the production of agricultural products, namely what yields are achieved and what volumes are supplied. The price of fossil oil is largely controlled by the Organisation of Petroleum Exporting Countries (OPEC). As can be seen in Figure 1-1, the US dollar per barrel oil fluctuates a great deal. Based on these factors, smaller biodiesel producers will not be able to generate enough profit to be able to afford costly testing procedures. In addition, SABA's (2006) aim to promote biodiesel as an excellent quality fuel contradicts the finding that there are not sufficient control and quality testing measures in place for the biodiesel manufacturing industry.

Technology / Processing Plants:

Five of the respondents stated that producers have the ability to run and optimise biodiesel processing plants. This finding supports Van Gerpen (2004) opinion that productivity is a key step to business. Four respondents however stated that it is not a requirement to have superior biodiesel processing knowledge. They explained that automated biodiesel processing technology can be bought which requires little intervention or understanding. Three of the respondents however stated that they will use their own technology for biodiesel processing plants. This result points out the importance of Van Gerpen's (2004) first business principle. If producers want to build their own biodiesel processing plants, they must have complete knowledge of the biodiesel process and industry to ensure that they process biodiesel to high quality standards. Only two respondents however indicated that biodiesel processing must be done on a large scale for it to become a viable business.

Feedstock:

More than half of the respondents indicated that feedstock supply is a current constraint in the South African market. This contradicts the

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opinion of Pa[illegible]ne of the most striking advantages of biodiesel feedstock is that it can be grown locally within a few months. Either this is not the case or there are not enough incentives in place to grow biodiesel feedstock. Three of the respondents however explained that there is enough feedstock for biodiesel processing. Two respondents stated that they will also import feedstock to ensure continuous feedstock supply to their plants. One of the respondents currently imports soybeans for processing to biodiesel. Four of the respondents further indicated that they are cautious of the possible rise in food prices as a result of biodiesel processing of food feedstocks (such as soybeans, sunflower and corn). Three of the respondents who cultivate their own feedstock state that non-edible feedstocks must be used for biodiesel production.

The data in Table 5-3 further shows that six of the respondents indicated that they have adequate financial resources or means to finance a biodiesel processing business. Van Gerpen's (2004) second business principle state the importance of investigating how the business will be financed, including capital cost, operational cost as well as the pricing structure of the biodiesel industry. Supporting this principle is the fact that all seven of the respondents' calculations show that there is an adequate profit margin in the manufacturing of biodiesel. One respondent however indicated that the profit margin might be small compared to the profit margin of other industries. $(S\&T)^2$ Consultants Inc. and Meyers Norris Penny LLP (2004) state that biodiesel production costs are dominated by the cost of feedstock. The respondents have not identified the cost of feedstock as the dominating cost component in the manufacturing of biodiesel.

Understanding the markets is Van Gerpen's (2004) third business principle which is supported by the fact that all seven of the respondents gave reasons to believe that they understand the biodiesel markets. They further agreed that the market size and need for biodiesel by consumers is far-reaching.

Five respondents mentioned that they have written a business plan. This supports Van Gerpen's (2004) fifth business principle for a successful business start-up.

Van Gerpen's (2004) forth business principle of meeting all regulation and permit requirements is confirmed by research question 1. The only requirement is that commercial biodiesel producers must apply for a license from SARS. One respondent who currently process biodiesel on a commercial scale has already received a license.

In conclusion, the respondents comply with the business principles of a successful start-up as identified by Van Gerpen (2004):

- All the respondents have a thorough understanding and knowledge of the industry. This includes knowledge on which technologies to use, optimisation of biodiesel processing, quality requirements and feedstock supply and constraints.
- The respondents further have adequate financing and know the factors that impact profitability.
- The respondents understand the biodiesel markets and know that there is an extensive requirement for biodiesel.
- Where required the respondents have complied with regulation and permit requirements.
- Most of the respondents have indicted that they have written a business plan.

The results have shown that South African organisations have adequate capacity to successfully and profitably manufacture biodiesel on a commercial scale. The cost of feedstock is a major component in the financial model of biodiesel manufacturing. The current feedstock constraints are therefore a major concern that will impact the sustainability of any producer who aims to manufacture biodiesel on a commercial scale.

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6.1.4 RESEARCH QUESTION 3

Research question 3 sought to establish whether South African organisations that process biodiesel have adequate experience and skills to enable them to manufacture biodiesel on a commercial scale.

As shown in Table 5-4, six of the seven respondents agreed that management of the workforce have sufficient skills and experience to commercially process biodiesel. This supports Van Gerpen's (2004) six steps of business success. This step identifies management experience and skills as well as the experience and skills of employees, as critical to business success. Two of the seven respondents have actually indicated that the number of people with technical experience and skills in South Africa might be inadequate for a probable fast growing industry.

Training and skills development is crucial to ensure that management and employees are equipped for the growing industry. Only three of the respondents stated that they train their workforce extensively in-house. Two of the respondents will however incorporate the training and skills development as part of the project package of the technology provider. The technology provider will therefore have to train the workforce to ensure that biodiesel is processed to quality standards.

In conclusion, it is found that South African organisations that produce biodiesel have adequate experience and skills to manufacture biodiesel on a commercial scale. A concern is however the lack of training and skills development programmes for the biodiesel manufacturing industry.

6.1.5 RESEARCH QUESTION 4

Research question 4 sought to establish whether South African organisations that manufacture biodiesel have adequate government support to enable them to process biodiesel on a commercial scale.

The results of even respondents believe that the government is not sufficiently supportive of this growing industry. (S&T)^2 Consultants Inc. and Meyers Norris Penny LLP's (2004: p32) state that "biodiesel will need significant financial incentives to be cost competitive with diesel fuel". Four of the respondents believe that the government has not introduced sufficient incentives to drive the industry. This is despite the two tax incentives implemented by government namely, accelerated depreciation and a 40% reduction in the general fuel levy (Manuel, 2006). Three of the respondents have however agreed that the government has put in place an initial framework.

Three respondents shockingly alleged that they receive far greater support from the governments of neighbouring countries than from the South African government. Three respondents specified that the government does not adequately support feedstock development. One respondent stated that there is hardly any support for emerging farmers who would like to participate in the biodiesel industry. Only one respondent argued that the government is extremely helpful and supportive.

In conclusion, it is fair to believe that the government have put in place frameworks and measures to regulate the biodiesel industry. It is however evident that the respondents believe that the government should be more supportive to the industry. This support should be in the form of financial incentives as well as in the development of feedstocks for biodiesel processing. The industry can create employment opportunities for many individuals should the potential growth of the industry be realised. As identified in research hypothesis 2, more must be done by government to ensure that high quality standards are maintained for processing biodiesel.

6.1.6 RESEARCH QUESTION 5

Research question 5 sought to identify the benefits and constraints of biodiesel. Table 5-5 provides the results of the benefits and constrains of biodiesel.

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The three top b / the respondents are:

1. Biodiesel is a renewable energy source – identified by five respondents
2. Biodiesel is beneficial to the environment – identified by five respondents.
3. The biodiesel industry offers numerous employment opportunities and economic development – identified by four respondents.

These benefits confirm Pahl (2005), Prasad and Visagie (2005), Prakash (1998) and Van Gerpen's (2005) findings on the benefits of biodiesel. Prakash (1998: p1) stated that "biodiesel is a renewable fuel that can be produced from vegetable oils, animal fats, used cooking oil, and waste from the pulp and paper industry. It can be used in its neat form, or as a blend with conventional diesel fuel, in diesel engines without any modifications to the vehicles engines. Since biodiesel is produced from renewable, domestically grown feedstock, it can reduce the use of petroleum based fuels and possibly lower the overall greenhouse gas emissions from the use of internal combustion engines".

Only one respondent acknowledged that biodiesel offers a great business opportunity.

The three highest constraints of the biodiesel industry as identified by the respondents are:

1. There might be a negative impact on food prices – identified by three respondents.
2. Biodiesel will not make our fuel economy independent of oil – identified by three respondents.
3. The positive impact and contribution that biodiesel brings to the energy economy is not as great as would have been liked.

Only one respondent acknowledged that feedstock supply is a constraint. Another respondent identified the impact on vehicle warrantees. Currently

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vehicle manuf icles that use up to a maximum of 5% biodiesel mixed with regular diesel.

6.1.7 CONCLUSION

In light of the above discussion it is apparent that the biodiesel industry is undeveloped in South Africa. There is currently only one biodiesel producer who commercially process biodiesel. The industry has however potential commercial biodiesel producers who are currently undertaking various feasibility studies and research into the manufacturing of biodiesel. It is expected that a second producer will enter the commercial biodiesel market by the end of 2006. A third commercial biodiesel producer will probably manufacture biodiesel on a commercial scale by the middle of 2007.

The findings indicated that South African producers of biodiesel have the required capability to manufacture biodiesel on a commercial scale. They have knowledge of the industry and the process of producing biodiesel; the technology requirements and the required means of financing their businesses. This however contradicts the perception that the industry is not supported sufficiently by the government. An explanation for this finding is that the producers believe that the industry can offer more advantages to the South African economy, the general public and to those who seek employment opportunities. With full government support it is believed that the industry development will be faster to reap the opportunities it offers to all.

A concern is however the constraints in feedstock supply and the sustainability thereof. Biodiesel feedstocks are the greatest operational cost in the processing of biodiesel. If the prices of feedstocks can't be sustained at a reasonable level, biodiesel production might become uneconomical.

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Further, althou producers have the ability to process biodiesel to quality standards, it is believed that far reaching damage can be done to the industry if not monitored and regulated meticulously. The quality standards of the smaller producers in the industry are of particular concern.

It can be accepted that management and employees of South African biodiesel producers have the skills and experience to process biodiesel. If the industry reaches its potential size, the number of available experienced technical personnel might become problematic unless addressed now. More time and resources should be channelled towards training and development programmes for the biodiesel manufacturing industry.

Government knows the benefits of a biodiesel industry in South Africa. It is however believed that there is a small window of opportunity which will allow South Africa to become a leader in the industry. Many of the international players are currently investing in other African countries which is taking away opportunities for economic development in South Africa. The South African biodiesel industry must move swiftly and seize the opportunities that exist. For this to happed, the industry requires additional support from the South African government.

6.2 BUYER-READINESS TO USE BIODIESEL

6.2.1 INTRODUCTION

The sample was selected based on accidental sampling by requesting potential respondents to participate in a questionnaire for an MBA research project. It was explained to the respondents that the purpose of the research was to explore the viability of alternative vehicle fuels. The sample was selected from two Shell Ultra Cities; the Middelburg Shell Ultra City (east bound and west bound) and the Midrand Shell Ultra City

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(north bound a aires were presented on five different days.

During the period a sample of 349 potential respondents was selected, however 33 potential respondents declined to participate in the research. The sample for the buyer-readiness section included 316 vehicle owners.

In the following sections, the key findings under each research hypothesis in Chapter 3 are discussed in the context of the literature reviewed in Chapter 2. New findings from the research hypotheses evaluated will be explained.

Each of the hypotheses was evaluated based on the hierarchy-of-effects model of Rodgers (1995). Kotler and Keller (2005) describe this model as buyer-readiness stages. The buyer-readiness stages are:

1. Awareness – degree of observation of the existence of the product or service.
2. Knowledge – degree of familiarity and acquaintance with the product or service.
3. Liking – degree of favourable view of the product or service.
4. Preference – degree of preference for the product or service to substitute products or services by comparing quality, value, performance and other features.
5. Conviction – degree of deployment of a conviction or passion to buy the product or service.
6. Purchase – final action to buy the product or service.

Appendix C, Table C-1, shows the Buyer-Readiness Questionnaire that was presented to the respondents. Each question tested a different buyer-readiness stage. Each question with the corresponding buyer-readiness stage that was tested can be seen in Appendix C, Table C-2.

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6.2.2 RESEA

Research hypothesis 1 sought to establish whether owners of passenger vehicles are at a Preference or higher stage of buyer-readiness for biodiesel. The Preference stage is the fourth stage of the buyer-readiness stages (Kotler and Keller, 2005).

In total 127 respondents were spontaneously aware and knowledgeable on biodiesel and 189 respondents were prompted on biodiesel and its benefits. The data in Table 5-10 shows that for both the spontaneous group (those respondents who received an average score above 70% for the awareness and knowledge questions) and the prompted group (those respondents who received an average score below 70% for the awareness and knowledge questions) had a mean far greater than three for the Liking, Preference and Conviction stage. This initial finding showed that the respondents might be at a Preference buyer-readiness stage or higher.

Results from the statistical data of the NCSS One Sample T-Test report showed that the respondents from the spontaneous group were past a Preference stage and already at a Conviction stage. See Table 5-11 to Table 5-16 for descriptive statistics of these findings. Table 5-17 provides data showing that consumers from the spontaneous group are not at a Purchase stage since only 5.1% of the respondents at the Conviction stage have used biodiesel before.

Results from the statistical data of the NCSS One Sample T-Test report further showed that the respondents from the prompted group were past a Preference stage and already at a Conviction stage. See Table 5-18 to Table 5-23 for descriptive statistics of these findings. Table 5-24 provides data showing that consumers from the prompted group are not at a Purchase stage since only 1.5% of the respondents at the Conviction stage have used biodiesel before.

In conclusion, t[illegible]t both the group that was spontaneously aware and knowledgeable on biodiesel and the group that was prompted to be aware and knowledgeable on biodiesel are at a Preference buyer-readiness stage or higher.

This new finding gives producers, distributors and sellers of biodiesel a better perspective on what to expect from one of their biodiesel target markets. Marketers now know where to focus their communication strategies. The fact that consumers have not yet purchased biodiesel is mainly due to the limited availability of biodiesel. Those respondents who have used biodiesel before may have produced the biodiesel themselves.

Cognisance should however be taken of the fact that 189 of the respondents, that is 59.8% of the respondents, received a score below 70% when tested how aware and knowledgeable they were on biodiesel. This might indicate that although both groups feel passionate about biodiesel, extensive communication and marketing must still be done to make the potential market aware and knowledgeable on biodiesel. Only 18.75% of females and 44% of males received a score above 70% on their biodiesel awareness and knowledge. This finding leads to research hypothesis 2.

6.2.3 RESEARCH HYPOTHESIS 2

Research hypothesis 2 sought to establish whether both female and male owners of passenger vehicles are at the same stage of buyer-readiness for biodiesel.

Table 5-25 to Table 5-36 provides descriptive statistics of the mean value between females and males for each of the buyer-readiness stages. Results of the statistical data from the NCSS Two Sample T-Test report indicates that both females and males are at the same buyer-readiness stage for biodiesel, except for the Awareness and Knowledge stage where males are significantly more aware and knowledgeable than females. The

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Awareness an ely the first and second buyer-readiness stage as presented by Kotler and Keller (2005).

In conclusion, the new findings show that marketers must focus their communications and marketing strategies on making consumers more aware and knowledgeable on biodiesel. Focus should however be placed on the female population to raise their levels of awareness and knowledge. Both male and female consumers have similar mean values when their liking, preference, conviction and readiness to purchase biodiesel were tested. Both male and female consumers have not yet used biodiesel as fuel for their vehicles.

6.2.4 RESEARCH HYPOTHESIS 3

Research hypothesis 3 sought to establish whether owners of passenger vehicles from different age groups are at the same stage of buyer-readiness for biodiesel.

Table 5-37 to Table 5-48 provide descriptive statistics of the mean values between the different age groups for each of the buyer-readiness stages. Results of the statistical data from the NCSS One-Way ANOVA report indicated that the different age groups are at the same buyer-readiness stage for biodiesel.

For the age group 18 to 34 years 33% of the respondents received a score higher than 70% for the questions based on how aware and knowledgeable they are on biodiesel. For the age group 35 to 44 years 48% of the respondents received a score greater than 70% for the same questions and for the last group, respondents 45 years and older, 43% of the respondents received a score greater than 70%.

In conclusion, the new findings show that consumers of all ages are at the same stage of buyer-readiness. Table 5-37 and Table 5-39 show the low percentage each age group scored on the awareness and knowledge

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questions resp emale and male groups, marketers must focus their communications and marketing strategies on making consumers of all age groups more aware and knowledgeable of biodiesel.

6.2.5 RESEARCH HYPOTHESIS 4

Research hypothesis 4 sought to establish whether owners of passenger vehicles do not agree that biodiesel is more beneficial than petroleum diesel for the engines of their vehicles.

This hypothesis is based on question 15 of the Buyer-Readiness Questionnaire that falls within the Preference stage of Kotler and Keller's (2006) buyer-readiness stages. Table 5-49 shows the mean value for this question. Results from the NCSS One Sample T-Test report indicated that the respondents are of the opinion that biodiesel is more beneficial for their vehicle engines than normal (fossil) diesel. This supports Pahl (2005), Prasad and Visagie (2005), and Prakash's (1998) view that biodiesel has great benefits for vehicle engines.

In conclusion, the finding shows that marketers have to direct less time and resources promoting the benefits biodiesel has for vehicle engines. Respondents are already of the opinion that biodiesel is better for their vehicle engines.

6.2.6 RESEARCH HYPOTHESIS 5

Research hypothesis 5 sought to establish whether owners of passenger vehicles are prepared to pay more on a Rand per litre basis for biodiesel than for petroleum diesel.

This hypothesis is based on question 14 of the Buyer-Readiness Questionnaire that falls within the Conviction stage of Kotler and Keller's (2006) buyer-readiness stages. Table 5-51 shows the mean value for this

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question. Res ... e T-Test report identified that the respondents agree that they are not prepared to pay more for biodiesel than for petroleum diesel.

In conclusion, the new finding shows that marketers and sellers have to position biodiesel at a price lower than or equal to petroleum diesel. Consumers are not prepared to pay more for biodiesel than for petroleum diesel. It can be assumed that consumers would prefer a scenario where biodiesel is sold at a lower price than petroleum diesel. It should also be noted that the questionnaire was administered during a time period when South Africa has seen a number of increases in the petroleum diesel pump price.

6.2.7 CONCLUSION

In light of the above discussion it is apparent that both the spontaneously aware and knowledgeable group, as well as the prompted aware and knowledgeable group, are at a Conviction buyer-readiness stage. These consumers have a passion to buy biodiesel for their vehicles. Only 2.8% of the vehicle owners have actually used biodiesel before. This is probably due to the fact that biodiesel is not yet commercially available.

It is however identified that merely 40.2% of the respondents were in the spontaneously aware and knowledgeable group. Marketers should therefore focus their effort to make consumers more aware and knowledgeable on biodiesel. Females and males have similar mean scores for each of the buyer-readiness stages, except the Awareness and Knowledge buyer-readiness stage. Particular focus should be placed on making females more aware and knowledgeable on biodiesel. For the Awareness stage the females received a very low mean percentage of 37.5% and the males a better mean percentage of 61.9%. For the Knowledge stage the females received a very low mean percentage of 36% and the males a better mean percentage of 53.8%. It should however be remembered that all the respondents were made aware and

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knowledgeable er completing Section C (relating to the Awareness and Knowledge stages) of the Buyer-Readiness Questionnaire. This was done to give the respondents an opportunity to demonstrate their attitude towards the Liking, Preference and Conviction buyer-readiness stages.

The results of the research further showed that consumers of all ages are at the same buyer-readiness stage. All the age groups received similar mean values for each of the buyer-readiness stages.

Marketers and sellers should be aware that consumers are already of the opinion that biodiesel is better for their vehicle engines than petroleum diesel. They should further be sensitive to the fact that consumers are not prepared to pay a higher price for biodiesel than for petroleum diesel.

CHAPTER 7. CONCLUSION

7.1 INTRODUCTION

The aim of the research project was twofold. Firstly to determine whether South African producers are equipped to commercially manufacture biodiesel, namely whether the biodiesel producers have the required resources, capacity, experience, skills, and government support to manufacture biodiesel. Face-to-face interviews were done with key stakeholders in South Africa who commercially manufacture biodiesel or who intend to commercially manufacture biodiesel in the near future.

Secondly to determine whether vehicle owners are aware of, ready and willing to use biodiesel, namely those owners of passenger vehicles who would normally use petroleum diesel. Buyer-readiness questionnaires were presented at selected petroleum fuel stations. The questionnaires were used to test the readiness of vehicle owners to use biodiesel.

7.2 CONCLUSION

The research project therefore focussed on both the supply side as well as the demand side of the biodiesel industry.

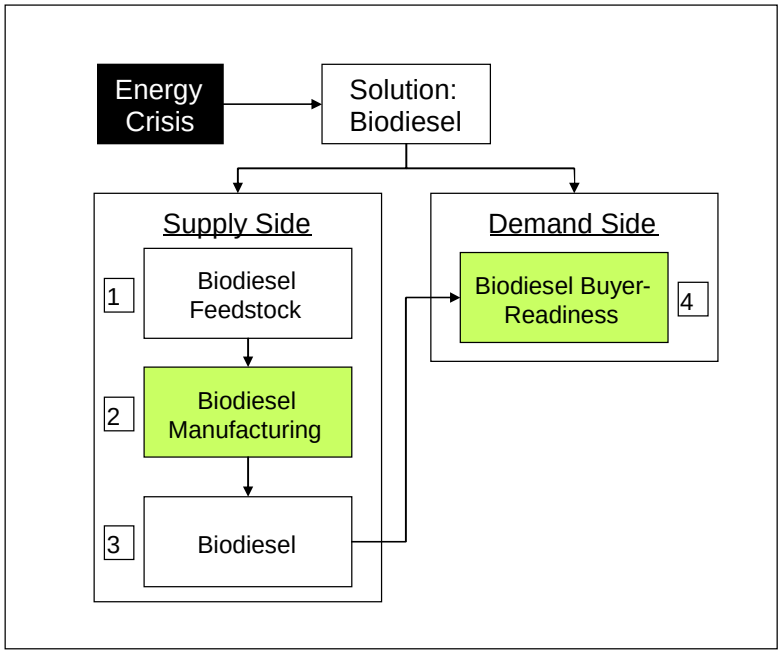
Figure 7-1 provides a diagram representing a summary of the research. In Chapter 1 it was identified that global economies are depended on energy. One of the major sources of energy is oil. However, as stated by Pahl (2005) it is an undeniable fact that we are running out of oil. Currently the annual demand for oil is four times greater than the volume of new oil reserves discovered. The diagram below shows that we have an energy crisis.

A great percentage of oil is refined from normal (fossil) diesel which is used in the transport sector. As depicted in the diagram, and described in Chapter 2, biodiesel is a feasible replacement for normal (fossil) diesel. At the same time the

manufacturing of biodie e South African economy and environment.

The research focused on box 2, biodiesel manufacturing, and box 4, the buyer-readiness to use biodiesel.

Figure 7-1: Research Project Summary



In the following section conclusions are made on Figure 7-1's numbered boxes.

7.2.1 BIODIESEL FEEDSTOCK

The supply side of the biodiesel industry starts with the feedstock for biodiesel manufacturing. Feedstock supply and the sustainability thereof are of immense concern. More than half of the respondents have indicated that this is the case in South Africa. Biodiesel feedstocks are the greatest operational cost in the manufacturing of biodiesel. One of the key factors to profitably manufacture biodiesel is to purchase feedstock at a stable, low price.

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7.2.2 BIODII

There is currently one producer in South Africa who commercially manufactures biodiesel. The research found that South African producers have the capability to manufacture biodiesel on a commercial scale. A major concern is that the number of people with technical experience and skills in South Africa might be inadequate for a fast growing industry. In addition the lack of training and skills development programmes for the biodiesel manufacturing industry is a concern. The government has put in place certain regulations and frameworks, but it was discovered that the industry requires additional support and incentives.

7.2.3 BIODIESEL

The respondents indicated that they have the ability to process biodiesel to the SANS 1935 biodiesel quality standard. The research has however identified that there is no organisation that currently has the means to perform the full spectrum of quality tests to ensure the product is manufactured to the required standard.

7.2.4 BUYER-READINESS FOR BIODIESEL

On the demand side of the biodiesel industry are the owners of passenger vehicles who normally use fossil diesel. Although only 2.8% of the vehicle owners have actually used biodiesel before, it was identified that the vehicle owners are at a Preference and higher stage of buyer-readiness. It should however be noted that all the respondents were made aware and knowledgeable on biodiesel before completing the questions based on the Liking, Preference and Conviction questions. It was therefore found that for the questions before the biodiesel definition was read (Awareness and Knowledge stage), the vehicle owners were not adequately aware and knowledgeable of biodiesel.

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Females and r iness stage, but females are far less aware and knowledgeable of biodiesel. Vehicle owners from different age groups are also at the same buyer-readiness stage.

The respondents are aware that biodiesel is better for their vehicle engines, but are not prepared to pay more for biodiesel than for petroleum diesel.

7.3 RECOMMENDATION

Based on the findings of the research, the following section provides recommendations for the different role players in the biodiesel industry.

7.3.1 GOVERNMENT

The government probably plays the most important role in the development of the biodiesel industry. It is recommended that the government investigate the implementation of additional incentives to further stimulate the growth of the biodiesel industry. South Africa has the ability to be a leader in this industry. The biodiesel industry provides extensive opportunities for economic development.

A key component for the industry to be successful is high quality biodiesel. Although the SANS 1935 biodiesel standard exists, the government and associations such as SABA must ensure that all biodiesel sold is produced to the SANS 1935 standard. Facilities must be made available for the testing and regulation of biodiesel. Government should implement measures that make it feasible for the small producers to test their product at a low cost. The biodiesel industry will suffer extensive damages if low quality biodiesel is sold into the market.

The government should further assist the growth of the biodiesel feedstock market. Measures should be put in place to accelerate the environmental impact studies for different oil bearing plants. In addition the government

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should assist t iesel manufacturers with the implementation of measures that stimulate the growth of feedstock as well as stabilising the feedstock prices.

In addition the government could assist in the training and development of people with technical experience.

7.3.2 FEEDSTOCK PRODUCERS

Feedstock producers should identify the feedstock they can grow in their region that can be used for biodiesel manufacturing. In addition they must enter into agreements with the biodiesel manufacturers who will purchase the feedstock at guaranteed prices. This will be one way to guarantee of take as well as a stable price (not affected by agricultural market conditions)

7.3.3 BIODIESEL MANUFACTURERS

Apart from the government who should create an environment that will stimulate growth of the biodiesel industry, the manufacturers play a key role in ensuring sustainability and growth of the industry.

It is the biodiesel manufacturers who must ensure that they process biodiesel to the SANS 1935 quality standard. It is also the manufacturers who must ensure that training and development programmes are created for their workforce. It is further recommended that the manufacturers assist the feedstock producers as far as possible because without them the biodiesel industry will not be economically viable.

7.3.4 BIODIESEL DISTRIBUTORS AND MARKETERS

The biodiesel distributors also play a key role in ensuring that the biodiesel sold is to high quality standards. It is recommended that the marketers spend time understanding their potential consumers and what their

requirements nt campaigns to make consumers more aware and knowledgeable of biodiesel, especially the females. This is based on the assumption that vehicle owners will have the option whether to use biodiesel or not and that it will not be mandatory to premix with normal (fossil) diesel grades. In such a case where consumers have the option to purchase biodiesel or not it is recommended that biodiesel is sold at a reduced or at least the same price as normal (fossil) diesel.

7.4 FUTURE RESEARCH

Since the biodiesel industry is a new industry and South Africa has only "produced" its first commercial manufacturer this year, great effort must be taken to grow the industry.

It is recommended that future research on the biodiesel industry focus on the following:

7.4.1 SUPPLY SIDE

- The feasibility for alternative feedstock production, such as algae, in South Africa.
- A study of pricing mechanisms for biodiesel feedstock to ensure that both the feedstock production and the manufacturing of biodiesel industries are sustainable.
- Research on the expected size of the biodiesel industry in the near future and the experience and training development that would be required to grow the industry to meet the demand.
- Investigation into systems and procedures that will ensure that all biodiesel sold in South Africa meets the SANS 1935 quality standard.

7.4.2 DEMA

- Research on the benefits of biodiesel that is pre mixed with normal (fossil) diesel versus the benefits of consumers having the choice of purchasing 100 percent biodiesel.
- If vehicle owners will have a choice of whether to purchase biodiesel or not, further research is required on the marketing of biodiesel.

7.5 CLOSING REMARKS

It is hoped that this research will contribute to the biodiesel industry and create awareness of the remaining structural requirements from the perspective of manufacturing biodiesel. The research has also shed new light on the readiness of vehicle owners to use biodiesel.

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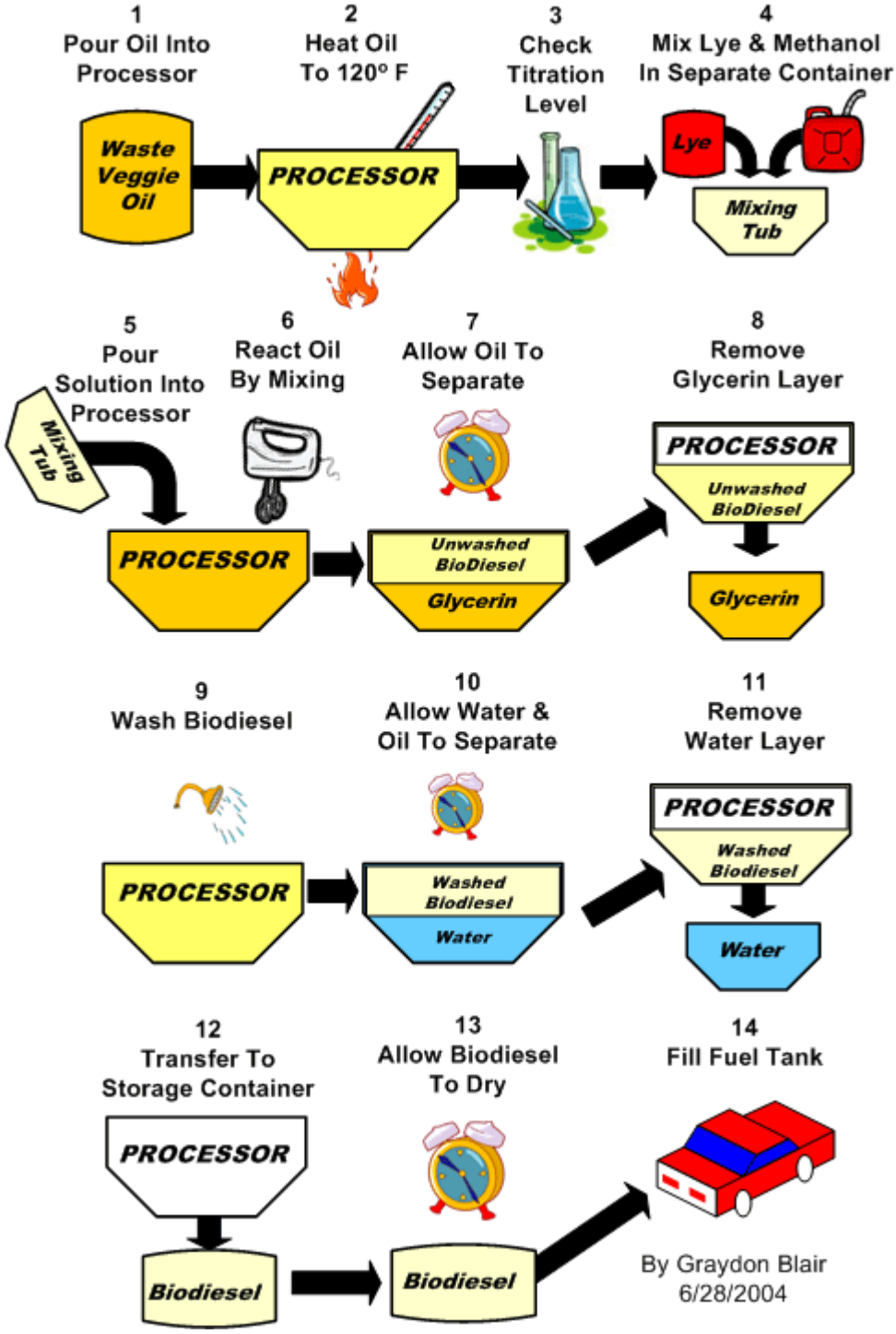
APPENDIX A: MAKING BIODIESEL

Figure A- 1: How Biodiesel is Made



(Source: Blair, 2004)

APPENDIX B: BIODIESEL PRODUCERS

Table B- 1: Biodiesel Producers and Sample Respondents

NAME	ORGANISATION	TITLE
Brian Tait	Sasol Technology	Manager: Alternative Energy
Darryl Melrose	Biodiesel S.A.	Owner / CEO
Gjalt Hooghiemstra	D1 Oils South Africa	Head of Agronomy
Chappy Holtzhausen	Invest North West (Mafikeng Bio-Diesel)	Executive Director: Marketing
Lourens van Rensburg	Deulco Renewable Energy	Group Executive Director
Frik de Beer	De Beers Fuel	Owner / CEO
Dr Frans Hugo	Evergreen Biofuels	CEO

Table B- 2: Interv

	QUESTION	PROMPTS
1	Question 1: Are there organisations in South Africa that process biodiesel on a commercial scale?	Tel me more about your operations and customers. Do you process biodiesel only for your own use? What is your process capacity? Do you sell your processed biodiesel?
2	Question 2: Does these South African organisations that process biodiesel have adequate capacity to successfully and profitably process biodiesel on a commercial scale?	Tel me more about the success of your business. Would you say that your operation can be streamlined? Where do you get your raw materials from, do you import? Who is your biggest customer? How do you see the future of your business?
3	Question 3: Does these South African organisations that process biodiesel have adequate experience and skills to enable them to process biodiesel on a commercial scale?	Tel me more about your workforce as well as your management team. Do you have a knowledge management system? Do your employees receive training, any international training? What are the average years of work experience of your employees in the industry? Do you have any partners you work closely with?
4	Question 4: Does these South African organisations that process biodiesel have adequate government support to enable them to process biodiesel on a commercial scale?	Tel me more about how you started the business. Who are the biggest investors in your biodiesel business? Do you receive any financial or other support? What role do you see the government should play in the biodiesel industry?
5	Question 5: What are the benefits and constraints of biodiesel?	What do you like about biodiesel? What are the negatives of the industry?

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APPENDIX C: BUYER-READINESS QUESTIONNAIRE

Table C- 1: Buyer-Readiness Questionnaire

MBA RESEARCH QUESTIONNAIRE

Administered by: Where: Date: Time:

SECTION A

Please provide the following biographical information that will be used purely for research purposes.

1 Age:

2 Gender: Male Female

3 Race: Black White Coloured Indian Other

4 Residing Province:

Northen Cape | Kwazulu Natal | Mpumalanga | Other
Eastern Cape | Free State | North West Province
Western Cape | Gauteng | Limpopo

SECTION B

Please provide the following specific vehicle information purely for research purposes.

1 I do own a vehicle Yes No

If "Yes" please complete the vehicle details section below

2 Vehicle Make: (eg. Volkswagen)

3 Vehicle Model: (eg. Polo)

4 Model Year:

5 Fuel Type: Diesel Petrol

SECTION C

		Please use the scale below to answer the questions:		
1	Diesel vehicles can run on fuels other than normal (fossil) diesel.	TRUE	FALSE	NOT SURE
2	Vehicle fuels can be processed from vegetable oils such as Soybeans.	TRUE	FALSE	NOT SURE
3	Biodiesel is a substitute for normal (fossil) diesel.	TRUE	FALSE	NOT SURE
4	Biodiesel can be processed / made from cooking oil.	TRUE	FALSE	NOT SURE
5	Biodiesel is refined the same way as normal (fossil) diesel.	TRUE	FALSE	NOT SURE
6	Biodiesel smells the same as normal (fossil) diesel.	TRUE	FALSE	NOT SURE
7	Using biodiesel promotes a healthy life and healthy environment.	TRUE	FALSE	NOT SURE
8	Biodiesel can be mixed in any ratio with normal (fossil) diesel.	TRUE	FALSE	NOT SURE
9	Biofuels is the general term used for biodiesel, bioethanol and biogas	TRUE	FALSE	NOT SURE

SECTION D

In this section please assume that you are driving a normal (fossil) diesel vehicle.

Biodiesel is a diesel fuel substitute produced from renewable sources such as vegetable oils, animal fats, and recycled cooking oils. It is thus a "greener" fuel that could make our fuel economy less dependend on oil.

		Please use the scale below to answer the questions:				
10	I like the benefits of biodiesel over that of normal (fossil) diesel.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
11	I like the concept of using biodiesel as vehicle fuel.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
12	Biodiesel should be the vehicle fuel of the future.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
13	I will prefer to use biodiesel in my vehicle rather than normal (fossil) diesel.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
14	I'm prepared to pay more for biodiesel than for normal (fossil) diesel.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
15	Biodiesel is better for the engine of your vehicle that normal (fossil) diesel.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
16	I prefer normal (fossil) diesel because the quality assurance of biodiesel is poor.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
17	I will purchase biodiesel when it becomes available if the price is acceptable.	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
18	I will not purchase biodiesel to use in my vehicle (no matter the price).	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
19	I have already purchased and used biodiesel in my vehicle	TRUE		FALSE		

Each question of the different buyer-readiness stage as indicated below:

Table C- 2: Questions Addressing Buyer-Readiness Stages

	Question	Buyer-readiness stage
1	Diesel vehicles can run on fuels other than normal (fossil) diesel.	Awareness
2	Vehicle fuels can be processed from vegetable oils such as Soybeans.	Awareness
3	Biodiesel is a substitute for normal (fossil) diesel.	Knowledge
4	Biodiesel can be processed / made from cooking oil.	Knowledge
5	Biodiesel is refined the same way as normal (fossil) diesel.	Knowledge
6	Biodiesel smells the same as normal (fossil) diesel.	Knowledge
7	Using biodiesel promotes a healthy life and healthy environment.	Knowledge
8	Biodiesel can be mixed in any ratio with normal (fossil) diesel.	Knowledge
9	Biofuels is the general term used for biodiesel, bioethanol and biogas	Knowledge
10	I like the benefits of biodiesel over that of normal (fossil) diesel.	Liking
11	I like the concept of using biodiesel as vehicle fuel.	Liking
12	Biodiesel should be the vehicle fuel of the future.	Liking
13	I will prefer to use biodiesel in my vehicle rather than normal (fossil) diesel.	Preference
14	I'm prepared to pay more for biodiesel than for normal (fossil) diesel.	Conviction
15	Biodiesel is better for the engine of your vehicle that normal (fossil) diesel.	Preference
16	I prefer normal (fossil) diesel because the quality assurance of biodiesel is poor.	Preference
17	I will purchase biodiesel when it becomes available if the price is acceptable.	Conviction
18	I will not purchase biodiesel to use in my vehicle (no matter the price).	Conviction
19	I have already purchased and used biodiesel in my vehicle	Purchase

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APPENDIX D: BUYER-READINESS DATA

Table D- 1: Buyer Readiness Data

Respondents	Administered By	Where	Date	Time	Age	Age Group	Gender	Race	Residing Province	Own a Vehicle	Vehicle Make	Vehicle Model	Model Year	Fuel Type	AWARENESS	Question 1	Question 2	KNOWLEDGE	Question 3	Question 4	5 Reversed	6 Reversed	Question 7	Question 8	Question 9	LIKING	Question 10	Question 11	Question 12	PREFERENCE	Question 13	Question 15	Question 16	CONVICTION	Question 14	Question 17	Question 18	PURCHASE
1	RR	Mdb UC WB	2006/08/04	15:10	37	B	M	2	7	1	Toyota	Verso	2005	2	1.00	1	1	0.43	1	1	3	3	3	3	1	3.00	3	3	3	3.00	3	3	3	3.00	1	4	4	2.00
2	RR	Mdb UC WB	2006/08/04	15:20	42	B	M	2	6	1	Ford	30 S	1987	2	0.00	3	3	0.00	3	3	3	3	3	3	3	3.67	3	4	4	4.00	4	4	4	4.00	4	4	4	2.00
3	RR	Mdb UC WB	2006/08/04	15:30	34	A	M	2	9	1	Mercedus Benz	C220 CDI	2003	1	1.00	1	1	0.71	1	1	3	1	1	1	3	4.67	4	5	5	2.67	3	2	3	3.00	1	4	4	2.00
4	RR	Mdb UC WB	2006/08/04	15:40	57	C	M	2	6	1	Mercedus Benz	230 Kompressor	1997	2	1.00	1	1	0.57	1	1	3	3	3	1	1	4.33	4	5	4	3.67	4	3	4	4.67	4	5	5	2.00
5	RR	Mdb UC WB	2006/08/04	15:45	30	A	M	1	6	2					0.00	3	2	0.00	3	2	3	3	2	2	3	1.67	2	1	2	2.00	2	2	2	2.00	2	2	2	2.00
6	RR	Mdb UC WB	2006/08/04	15:55	30	A	F	1	10	2					0.00	3	3	0.14	3	3	3	2	1	3	3	4.33	3	5	5	3.67	5	3	3	4.33	3	5	5	2.00
7	RR	Mdb UC WB	2006/08/04	16:00	33	A	M	2	6	1	Honda	CRV	2000	2	1.00	1	1	0.71	1	2	1	3	1	1	1	3.67	3	4	4	2.33	3	2	2	4.00	3	4	5	2.00
8	RR	Mdb UC WB	2006/08/04	16:05	39	B	M	2	6	1	Toyota	Corrola	1992	2	0.50	2	1	0.43	1	3	3	3	1	3	1	5.00	5	5	5	4.33	5	4	4	3.67	3	5	3	2.00
9	RR	Mdb UC WB	2006/08/04	16:15	24	A	F	2	8	1	Toyota	Tazz	1993	2	0.50	3	1	0.43	2	3	3	1	1	3	1	4.33	3	5	5	4.33	5	4	4	4.00	3	3	6	2.00
10	RR	Mdb UC WB	2006/08/04	16:25	22	A	M	2	6	1	Volkswagen	Golf	1991	2	0.50	2	1	0.57	3	2	1	1	1	1	3	4.00	4	4	4	3.00	4	3	2	3.67	2	4	5	2.00
11	RR	Mdb UC WB	2006/08/04	16:30	41	B	F	1	6	1	Toyota	Tazz	2005	2	0.00	3	3	0.00	3	3	3	3	3	3	3	3.33	4	3	3	3.00	2	3	4	3.33	3	2	5	2.00
12	RR	Mdb UC WB	2006/08/04	16:30	21	A	M	2	9	1	Ford	Fiesta	2004	2	0.00	2	3	0.14	3	2	2	2	1	3	3	3.33	4	3	3	3.33	4	3	3	3.00	3	3	3	2.00
13	RR	Mdb UC WB	2006/08/04	16:40	27	A	F	1	6	1	Proton	Gen2	2006	2	0.00	3	2	0.43	1	3	3	3	1	3	1	3.67	3	4	4	3.33	4	3	3	3.67	3	5	3	2.00
14	RR	Mdb UC WB	2006/08/04	16:40	29	A	F	1	6	1	Renault	Clio	2004	2	1.00	1	1	0.29	1	3	2	3	1	3	3	5.00	5	5	5	4.00	4	3	5	3.67	3	5	3	2.00
15	RR	Mdb UC WB	2006/08/04	16:40	32	A	F	2	6	1	Isuzu	300D	2004	1	0.50	3	1	0.29	3	3	3	3	1	1	3	4.00	4	4	4	3.67	4	3	4	3.33	3	4	3	2.00
16	RR	Mdb UC WB	2006/08/04	16:45	33	A	M	2	6	1	Toyota	Hilux	2001	1	1.00	1	1	0.43	1	3	3	3	1	3	1	5.00	5	5	5	4.00	5	3	4	4.00	3	4	5	2.00
17	RR	Mdb UC WB	2006/08/04	16:50	74	C	F	2	7	1	Volkswagen	Passat	1989	1	0.00	2	2	0.14	3	2	1	2	2	2	3	4.00	4	4	4	3.67	4	3	4	4.00	4	4	4	2.00
18	RR	Mdb UC WB	2006/08/04	17:00	44	B	M	2	6	1	Volkswagen	Caddy	2006	1	1.00	1	1	0.71	1	3	2	1	1	1	1	4.00	4	4	4	3.33	4	3	3	2.33	1	4	2	2.00
19	RR	Mdb UC WB	2006/08/04	17:05	70	C	M	2	6	1	Volkswagen	Passat	2000	2	0.50	1	3	0.57	3	3	1	1	1	3	1	3.67	4	4	3	3.00	3	3	3	3.33	3	4	3	2.00
20	RR	Mdb UC WB	2006/08/04	17:10	33	A	M	2	5	1	Toyota	Yarris	2006	2	1.00	1	1	0.57	1	3	2	1	1	2	1	4.00	4	4	4	3.00	4	2	3	3.33	2	4	4	2.00
21	RR	Mdb UC WB	2006/08/04	17:15	20	A	M	2	9	1	Mazda	MX6	1998	2	0.00	3	3	0.29	2	3	3	2	1	3	1	4.00	4	4	4	3.33	4	4	2	4.33	4	4	5	2.00
22	RR	Mdb UC EB	2006/08/04	17:20	25	A	F	2	6	1	Hyundai	Accent	1999	2	1.00	1	1	0.71	2	1	1	1	1	1	2	4.33	4	4	5	3.33	3	4	3	3.33	3	4	3	2.00
23	RR	Mdb UC EB	2006/08/04	17:20	28	A	M	2	6	1	Volkswagen	Polo 1.4 TDI	2004	1	0.50	1	3	0.86	1	1	2	1	1	1	1	4.33	4	4	5	4.33	5	4	4	3.33	3	4	3	2.00
24	RR	Mdb UC EB	2006/08/04	17:25	44	B	M	2	6	1	Isuzu	250	2005	1	1.00	1	1	0.86	1	1	2	1	1	1	1	3.00	3	3	3	3.00	3	3	3	3.67	3	3	5	2.00
25	RR	Mdb UC EB	2006/08/04	17:30	22	A	M	2	6	1	Volkswagen	City Golf	2004	2	1.00	1	1	0.57	3	1	3	3	1	1	1	3.67	3	4	4	3.33	4	3	3	3.33	1	5	4	2.00
26	RR	Mdb UC WB	2006/08/12	17:10	48	C	M	2	6	1	Volvo	XE 90	2005	2	0.50	2	1	0.57	1	3	3	3	1	1	1	4.00	4	4	4	3.33	4	3	3	4.33	4	4	5	2.00
27	RR	Mdb UC WB	2006/08/12	17:15	20	A	M	1	10	2					0.00	2	3	0.43	1	2	3	1	2	2	1	4.33	4	4	5	3.33	4	4	2	3.33	4	2	4	2.00
28	RR	Mdb UC WB	2006/08/12	17:15	19	A	M	1	10	2					0.50	2	1	0.43	3	2	2	1	1	3	1	4.67	5	4	5	3.67	5	4	2	3.33	3	3	4	2.00
29	RR	Mdb UC WB	2006/08/12	17:20	49	C	M	2	6	1	Toyota	Hilux	2006	1	0.50	2	1	0.29	3	1	3	3	1	3	3	4.00	4	4	4	3.33	4	3	3	4.00	4	4	4	2.00
30	RR	Mdb UC WB	2006/08/12	17:25	35	B	F	2	6	1	Ford	Fiesta	2005	2	0.50	1	3	0.14	3	3	3	1	3	2	3	4.00	4	4	4	3.67	4	3	4	4.00	4	4	4	2.00
31	RR	Mdb UC WB	2006/08/12	17:25	43	B	M	1	7	1	Rover	Club 75	2003	2	0.00	2	3	0.14	3	3	3	3	1	3	3	5.00	5	5	5	4.00	5	3	4	3.33	3	3	4	2.00
32	RR	Mdb UC WB	2006/08/12	17:45	42	B	M	2	6	1	Nissan	Sentra	1996	2	0.50	2	1	0.43	1	3	2	3	1	3	1	5.00	5	5	5	4.33	5	3	5	4.00	3	5	4	2.00
33	RR	Mdb UC WB	2006/08/12	17:40	40	B	M	2	4	1	Toyota	Hilux	2006	1	1.00	1	1	0.86	1	1	1	1	1	3	1	5.00	5	5	5	4.00	5	4	3	3.33	2	5	3	2.00
34	RR	Mdb UC WB	2006/08/12	17:50	22	A	M	2	6	1	Toyota	Hilux	2000	2	0.00	3	3	0.14	2	3	3	2	1	2	3	4.00	4	4	4	3.33	4	2	4	3.33	2	4	4	2.00
35	RR	Mdb UC WB	2006/08/12	17:55	25	A	M	2	9	1	Toyota	Land Cruiser	2002	1	0.00	2	2	0.43	1	2	3	3	1	3	1	4.00	4	4	4	3.67	4	4	3	4.00	4	4	4	2.00
36	RR	Mdb UC WB	2006/08/12	18:05	36	B	F	2	6	1	BMW	316	1998	2	0.00	2	3	0.14	3	3	3	3	1	3	3	4.00	4	4	4	3.33	4	3	3	3.67	2	4	5	2.00
37	RR	Mdb UC WB	2006/08/12	18:20	37	B	M	1	7	1	Isuzu	KB 260	1998	2	0.50	2	1	0.57	3	1	1	1	1	2	3	3.33	4	4	2	3.33	4	4	2	2.00	1	4	1	2.00
38	RR	Mdb UC WB	2006/08/12	18:20	54	C	M	2	6	1	Chevrolet	SS Gounty E	2006	2	0.50	2	1	0.43	1	1	2	3	2	3	1	3.00	3	4	2	3.00	3	3	3	3.00	3	4	2	2.00
39	RR	Mdb UC WB	2006/08/12	18:25	28	A	M	2	6	1	Opel	Corsa Utility	2000	2	1.00	1	1	0.00	3	3	3	3	3	3	3	4.00	4	4	4	3.33	4	3	3	3.33	2	4	4	2.00
40	RR	Mdb UC WB	2006/08/12	18:30	32	A	M	1	6	2					0.50	2	1	0.14	3	2	3	2	3	1	3	2.00	2	2	2	2.00	2	2	2	2.67	2	2	4	2.00
41	LR	Midrand UC NB	2006/09/12	09:00	59	C	M	4	6	1	Mercedes Benz		1998	2	1.00	1	1	1.00	1	1	1	1	1	1	1	4.00	4	4	4	4.00	4	4	4	4.00	4	4	4	2.00
42	LR	Midrand UC NB	2006/09/12	09:05	48	C	M	2	7	1	Chevrolet	Spark	2006	2	0.00	2	3	0.43	1	3	1	1	3	3	3	4.00	4	4	4	3.67	4	3	4	3.67	2	4	5	2.00
43	LR	Midrand UC NB	2006/09/12	09:10	68	C	M	2	6	1	Nissan	Maxima	1992	2	0.50	2	1	0.00	3	3	3	3	3	3	3	4.00	4	4	4	3.33	4	3	3	3.00	3	2	4	2.00
44	LR	Midrand UC NB	2006/09/12	09:15	42	B	M	2	6	1	Volkswagen	Polo Tdi 1.9	2006	1	1.00	1	1	0.86	1	1	1	1	1	1	3	4.00	4	4	4	3.33	4	3	3	3.67	3	4	4	2.00
45	LR	Midrand UC NB	2006/09/12	09:20	35	B	M	2	6	1	Ford	Ikon	2001	2	0.50	3	1	0.43	1	1	2	3	3	3	1	3.67	3	4	4	3.33	4	3	3	3.67	3	4	4	2.00
46	LR	Midrand UC NB	2006/09/12	09:25	22	A	M	2	6	1	Opel	Monza	1990	2	0.50	2	1	0.57	2	2	1	1	1	2	1	4.00	4	4	4	3.67	4	3	4	3.67	3	4	4	2.00
47	LR	Midrand UC NB	2006/09/12	09:30	64	C	M	2	6	1	Fiat	Uno	1995	2	0.50	3	1	0.86	1	1	2	1	1	1	1	5.00	5	5	5	4.67	5	4	5	3.67	2	5	4	2.00
48	LR	Midrand UC NB	2006/09/12	09:35	35	B	M	3	6	1	Mercedes Benz	C180 Kompressor	2005	2	1.00	1	1	0.57	1	3	2	3	1	1	1	5.00	5	5	5	4.00	5	3	4	4.67	5	5	4	2.00
49	LR	Midrand UC NB	2006/09/12	09:40	49	C	M	2	6	1	Toyota	Prado	2004	2	0.00	2	2	0.71	1	1	3	1	1	1	3	3.67	3	4	4	3.33	3	4	3	3.33	2	4	4	2.00
50	LR	Midrand UC NB	2006/09/12	09:45	51	C	M	2	6	1	Mitsubishi Colt	2.8 Tdi	2005	1	0.00	2	3	0.71	1	1	1	1	1	2	3	4.00	4	4	4	3.33	4	3	3	2.67	2	4	2	2.00
51	LR	Midrand UC NB	2006/09/12	09:50	41	B	M	2	6	1	Toyota	Land Cruiser	2005	2	1.00	1	1	0.86	1	1	1	2	1	1	1	4.00	4	4	4	3.33	4	3	3	3.67	3	4	4	2.00
52	LR	Midrand UC NB	2006/09/12	09:55	45	C	M	1	6	1	Nissan	Navara	2006	2	0.50	2	1	0.71	1	2	2	1	1	1	1	5.00	5	5	5	3.67	5	5	1	4.67	5	5	4	2.00
53	LR	Midrand UC NB	2006/09/12	10:00	39	B	F	2	6	1	Toyota	Tazz	2005	2	0.50	2	1	0.43	3	1	2	3	1	1	3	4.33	3	5	5	4.33	5	5	3	4.67	5	5	4	2.00
54	LR	Midrand UC NB	2006/09/12	10:05	46	C	M	2	6	1	Toyota	Run X	2004	2	1.00	1	1	0.71	1	1	2	2	1	1	1	5.00	5	5	5	4.00	5	5	2	4.67	5	5	4	2.00
55	LR	Midrand UC NB	2006/09/12	10:10	34	A	M	2	6	1	Jaguar		2004	2	0.00	3	3	0.00	3	3	3	3	3	3	3	1.00	1	1	1	2.33	3	3	1	4.00	5	3	4	2.00
56	LR	Midrand UC NB	2006/09/12	10:15	32	A	F	1	6	1	Opel	Corsa 1.4	1997	2	0.00	3	3	0.00	3	3	3	3	3	3	3	3.00	3	3	3	3.00	3	3	3	3.67	3	3	5	2.00
57	LR	Midrand UC NB	2006/09/12	10:20	45	C	M	2	10	1	BMW	5 Series	2001	1	0.50	3	1	0.57	1	2	1	2	1	2	1	5.00	5	5	5	4.00	5	3	4	4.33	4	5	4	2.00
58	LR	Midrand UC NB	2006/09/12	10:25	32	A	M	4	6	1	Toyota	Tazz	2001	2	0.50	2	1	0.29	2	2	1	1	2	2	2	3.00	3	3	3	3.00	3	3	3	3.67	3	3	5	2.00
59	LR	Midrand UC NB	2006/09/12	10:30	37	B	M	2	6	1	Nissan	Hardbody	2004	2	1.00	1	1	0.86	1	1	2	1	1	1	1	4.67	4	5	5	4.67	5	5	4	3.67	1	5	5	2.00
60	LR	Midrand UC NB	2006/09/12	10:35	54	C	M	2	6	1	Toyota	Tazz	2005	2	1.00	1	1	0.29	1	2	2	2	1	2	3	3.67	4	3	4	3.00	4	3	2	3.67	2	4	5	2.00
61	LR	Midrand UC NB	2006/09/12	10:40	31	A	M	2	6	1	Toyota	Hilux	2006	1	0.50	2	1	0.43	3	1	3	2	1	1	3	3.00	3	3	3	3.00	3	3	3	2.67	3	3	2	2.00
62	LR	Midrand UC NB	2006/09/12	10:45	44	B	M	2	6	1	Mazda	Drifter	1995	2	1.00	1	1	0.71	1	1	3	2	1	1	1	3.67	3	4	4	3.33	4	4	2	3.67	4	2	5	2.00
63	LR	Midrand UC NB	2006/09/12	10:50	41	B	M	2	6	1	Landrover	Discovery	2006	1	1.00	1	1	0.71	1	2	1	1	1	2	1	5.00	5	5	5	3.67	5	3	3	4.33	4	5	4	2.00
64	LR	Midrand UC NB	2006/09/12	10:55	27	A	M	2	6	1	Nissan	Hardbody	2003	2	1.00	1	1	0.86	1	1	1	1	1	2	1	4.00	4	4	4	3.67	4	3	4	2.33	2	4	1	2.00
65	LR	Midrand UC NB	2006/09/12	11:00	41	B	M	2	6	1	Isuzu	Bakkie	2004	1	1.00	1	1	0.86	1	1	1	2	1	1	1	5.00	5	5	5	3.33	4	4	2	4.00	4	4	4	2.00
66	LR	Midrand UC NB	2006/09/12	11:05	29	A	M	2	6	1	Nissan	Terrano	2003	1	1.00	1	1	0.86	1	1	3	1	1	1	1	4.67	4	5	5	3.33	4	3	3	3.67	2	4	5	2.00
67	LR	Midrand UC NB	2006/09/12	11:10	57	C	M	2	6	1	Mercedes Benz	E3	1998	2	1.00	1	1	0.57	1	1	3	3	1	1	3	4.00	4	4	4	3.00	3	4	2	2.67	1	4	3	2.00
68	LR	Midrand UC NB	2006/09/12	11:15	52	C	M	2	6	2					0.50	1	2	0.14	3	3	3	3	1	3	3	3.00	3	3	3	3.00	3	3	3	3.00	3	3	3	2.00
69	LR	Midrand UC NB	2006/09/12	11:20	27	A	M	2	6	1	Toyota	Hilux	2002	1	1.00	1	1	0.86	1	1	1	1	1	1	2	5.00	5	5	5	3.00	5	2	2	3.67	2	4	5	2.00
70	LR	Midrand UC NB	2006/09/12	11:25	32	A	M	4	6	1	Mitsubishi Colt		2003	2	1.00	1	1	0.29	2	2	3	1	1	3	3	3.67	3	4	4	3.67	5	3	3	4.00	4	5	3	2.00
71	LR	Midrand UC NB	2006/09/12	11:30	35	B	M	2	6	1	BMW	323 i	1998	2	1.00	1	1	0.71	2	1	1	3	1	1	1	4.00	4	4	4	4.00	4	4	4	3.67	2	4	5	2.00
72	LR	Midrand UC NB	2006/09/12	11:35	40	B	F	2	6	1	Ford		1999	2	0.00	2	3	0.57	1	1	2	1	1	3	3	4.33	4	4	5	4.00	5	4	3	3.33	4	4	2	2.00
73	LR	Midrand UC NB	2006/09/12	11:40	22	A	M	2	6	1	Opel	Astra	1995	2	0.50	3	1	0.57	1	1	1	1	2	3	3	5.00	5	5	5	3.67	5	3	3	3.67	5	5	1	2.00
74	LR	Midrand UC NB	2006/09/12	11:45	24	A	M	2	6	1	Ford	Fiesta	2001	2	0.00	3	2	0.29	1	2	1	2	2	3	3	4.00	3	4	5	4.33	3	5	5	4.00	4	5	3	2.00
75	LR	Midrand UC NB	2006/09/12	11:50	23	A	M	2	6	1	Toyota	Run X	2005	2	1.00	1	1	0.71	1	1	3	3	1	1	1	5.00	5	5	5	4.00	5	3	4	3.33	2	5	3	2.00
76	LR	Midrand UC NB	2006/09/12	11:55	29	A	M	2	6	1	Mazda	Drifter	2003	1	1.00	1	1	0.71	1	3	1	1	3	1	1	4.00	4	4	4	3.33	3	3	4	4.00	4	4	4	2.00
77	LR	Midrand UC NB	2006/09/12	12:00	42	B	F	1	6	1	Isuzu	KB 280 D	1995	1	0.00	3	3	0.29	1	2	1	2	2	2	2	4.00	4	4	4	4.00	4	4	4	4.00	4	4	4	1.00
78	LR	Midrand UC NB	2006/09/12	12:05	50	C	M	2	6	1	Mercedes Benz	C200	2002	2	1.00	1	1	0.86	1	1	3	1	1	1	1	5.00	5	5	5	4.00	5	3	4	3.33	1	4	5	2.00
79	LR	Midrand UC NB	2006/09/12	12:45	41	B	M	2	10	1	Nissan	Patrol	1996	2	1.00	1	1	0.86	1	1	1	3	1	1	1	5.00	5	5	5	3.67	5	3	3	4.67	5	5	4	2.00
80	LR	Midrand UC NB	2006/09/12	12:50	34	A	M	2	6	1	Mitsubishi	Colt	2002	1	1.00	1	1	0.86	1	1	2	1	1	1	1	4.00	4	4	4	4.00	4	4	4	3.67	2	4	5	2.00
81	LR	Midrand UC NB	2006/09/12	12:55	32	A	M	2	6	1	Volkswagen	Polo	2005	1	1.00	1	1	1.00	1	1	1	1	1	1	1	4.67	5	5	4	3.00	3	3	3	2.67	2	4	2	2.00
82	LR	Midrand UC NB	2006/09/12	13:00	32	A	M	2	6	1	Ford	XLT 2.5	2002	1	0.50	2	1	0.86	1	1	1	1	1	2	1	4.00	4	4	4	3.67	4	4	3	3.67	4	4	3	2.00
83	LR	Midrand UC NB	2006/09/12	13:05	37	B	M	4	6	1	Hyundai	Elantra	2002	2	0.00	3	3	0.14	3	3	3	3	1	3	3	5.00	5	5	5	4.33	5	4	4	3.33	1	5	4	2.00
84	LR	Midrand UC NB	2006/09/12	13:10	51	C	M	2	6	1	Ford	Ranger	2005	2	1.00	1	1	0.71	1	1	2	2	1	1	1	5.00	5	5	5	4.00	4	4	4	4.00	4	4	4	2.00
85	LR	Midrand UC NB	2006/09/12	13:15	24	A	M	2	6	1	Honda	Ballade	1992	2	1.00	1	1	0.57	1	1	1	2	1	2	2	4.00	4	4	4	2.67	3	2	3	3.33	2	4	4	2.00
86	LR	Midrand UC NB	2006/09/12	13:20	36	B	M	2	6	1	Volkswagen	Golf	2006	1	1.00	1	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	3.00	4	2	3	3.33	2	5	3	1.00
87	LR	Midrand UC NB	2006/09/12	13:25	25	A	F	2	7	1	BMW	X3	2005	2	0.50	1	3	0.29	1	3	1	2	3	3	3	4.00	5	4	3	3.33	4	4	2	3.33	4	4	2	2.00
88	LR	Midrand UC NB	2006/09/12	13:30	27	A	M	2	6	1	Opel	Corsa	2005	2	1.00	1	1	0.71	1	1	3	3	1	1	1	5.00	5	5	5	3.67	5	3	3	2.67	1	5	2	2.00
89	LR	Midrand UC NB	2006/09/12	13:35	47	C	M	2	6	1	Toyota	Carola	1985	2	1.00	1	1	0.71	1	1	3	2	1	1	1	4.00	4	4	4	3.67	4	3	4	3.00	3	4	2	2.00
90	LR	Midrand UC NB	2006/09/12	13:40	33	A	M	2	6	1	Volkswagen	Passat	2001	2	0.50	2	1	0.57	1	1	1	3	1	3	3	4.33	4	4	5	3.00	3	3	3	3.33	2	4	4	2.00
91	LR	Midrand UC NB	2006/09/12	13:45	27	A	M	2	6	1	Volkswagen	Golf	1996	2	1.00	1	1	0.71	1	1	2	1	1	3	1	5.00	5	5	5	4.67	5	4	5	3.67	1	5	5	2.00
92	LR	Midrand UC NB	2006/09/12	13:50	41	B	M	2	6	1	Toyota	Verso	2006	2	0.50	2	1	0.71	1	1	2	1	1	2	1	4.00	4	4	4	4.33	4	4	5	4.33	4	5	4	2.00
93	LR	Midrand UC NB	2006/09/12	13:55	45	C	M	2	6	1	Volkswagen	Jetta	1992	2	1.00	1	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	5.00	5	5	5	3.67	2	5	4	2.00
94	LR	Midrand UC NB	2006/09/12	14:00	38	B	M	1	6	1	Landrover	Ranger	2005	2	1.00	1	1	0.71	1	1	1	2	1	2	1	4.67	5	4	5	4.00	4	4	4	3.67	3	4	4	2.00
95	LR	Midrand UC NB	2006/09/12	14:00	33	A	M	2	6	1	Audi	A6	2003	2	0.50	2	1	0.57	1	1	3	3	1	3	1	4.00	4	4	4	4.00	4	4	4	3.67	3	4	4	2.00
96	LR	Midrand UC NB	2006/09/12	14:05	34	A	M	1	6	1	Peugeot	Sedan	2006	2	0.00	3	2	0.00	3	2	3	3	3	3	3	5.00	5	5	5	3.67	5	5	1	4.67	5	5	4	2.00
97	LR	Midrand UC NB	2006/09/12	14:10	35	B	F	1	6	1	BMW	318 i	1996	2	0.00	3	3	0.00	3	3	3	3	3	3	3	4.33	5	5	3	4.33	5	5	3	4.33	5	4	4	2.00
98	LR	Midrand UC NB	2006/09/12	14:15	34	A	M	2	6	1	Volkswagen	Polo	2006	2	1.00	1	1	0.57	1	1	2	3	1	1	3	5.00	5	5	5	3.00	5	2	2	3.00	2	4	3	2.00
99	LR	Midrand UC NB	2006/09/12	14:20	44	B	M	2	6	1	BMW	320	2002	2	1.00	1	1	0.71	1	1	1	3	1	3	1	3.67	3	4	4	3.33	4	3	3	4.00	3	4	5	2.00
100	LR	Midrand UC NB	2006/09/12	14:25	41	B	F	1	6	1	Subaru	Forester	2005	2	1.00	1	1	1.00	1	1	1	1	1	1	1	3.00	3	3	3	3.00	3	3	3	3.67	3	3	5	2.00

Respondents	Administered By	Where	Date	Time	Age	Age Group	Gender	Race	Residing Province	Own a Vehicle	Vehicle Make	Vehicle Model	Model Year	Fuel Type	AWARENESS	Question 1	Question 2	KNOWLEDGE	Question 3	Question 4	5 Reversed	6 Reversed	Question 7	Question 8	Question 9	LIKING	Question 10	Question 11	Question 12	PREFERENCE	Question 13	Question 15	Question 16	CONVICTION	Question 14	Question 17	Question 18	PURCHASE
101	LR	Midrand UC NB	2006/09/12	14:30	35	B	M	2	6	1	Mazda	6	2004	2	1.00	1	1	0.57	1	1	1	1	3	3	3	4.00	4	4	4	3.33	4	3	3	3.33	2	4	4	2.00
102	LR	Midrand UC NB	2006/09/12	14:35	24	A	M	2	6	1	Toyota	Hilux	2003	2	0.00	2	2	1.00	1	1	1	1	1	1	1	5.00	5	5	5	3.67	5	5	1	4.00	3	5	4	2.00
103	LR	Midrand UC NB	2006/09/12	14:35	29	A	M	2	6	1	Volvo	S40	2006	2	1.00	1	1	0.71	1	1	3	1	1	1	3	5.00	5	5	5	3.67	5	3	3	5.00	5	5	5	2.00
104	LR	Midrand UC NB	2006/09/12	14:40	30	A	M	2	6	1	Opel	Corsa	2005	2	0.50	2	1	0.71	1	3	3	1	1	1	1	4.00	4	4	4	4.00	4	4	4	2.67	3	3	2	2.00
105	LR	Midrand UC NB	2006/09/12	14:40	21	A	M	1	6	2					1.00	1	1	0.57	1	2	1	3	1	1	2	4.00	4	4	4	3.67	4	4	3	3.33	3	4	3	2.00
106	LR	Midrand UC NB	2006/09/12	14:45	30	A	M	2	6	1	Volkswagen	Passat	2000	2	0.00	3	3	0.00	3	3	3	3	3	3	3	3.67	4	4	3	2.33	3	2	2	4.00	4	4	4	2.00
107	LR	Midrand UC NB	2006/09/12	14:50	25	A	F	1	4	2					0.50	2	1	0.57	1	1	1	2	1	2	2	3.67	3	3	5	1.67	1	3	1	2.67	1	4	3	2.00
108	LR	Midrand UC NB	2006/09/12	14:55	41	B	M	2	6	1	Isuzu	2.6 DC	1997	2	1.00	1	1	0.14	3	3	3	3	3	3	1	5.00	5	5	5	3.67	5	3	3	4.33	3	5	5	2.00
109	LR	Midrand UC NB	2006/09/12	15:00	44	B	M	2	6	1	Nissan	Almera	2004	2	1.00	1	1	0.43	1	1	3	3	1	3	3	4.67	4	5	5	3.33	5	2	3	3.67	2	4	5	2.00
110	LR	Midrand UC NB	2006/09/12	15:05	41	B	M	2	9	1	Toyota	Raider 2.7 i	2004	2	1.00	1	1	0.43	1	1	3	3	3	3	1	5.00	5	5	5	3.67	5	3	3	4.00	2	5	5	2.00
111	LR	Midrand UC NB	2006/09/12	15:10	30	A	M	2	6	1	Peugeot	307	2004	2	1.00	1	1	0.71	1	1	3	3	1	1	1	5.00	5	5	5	4.00	4	4	4	3.33	4	5	1	2.00
112	LR	Midrand UC NB	2006/09/12	15:15	37	B	M	2	6	1	Honda	Accord	2006	2	1.00	1	1	0.86	1	1	1	1	1	3	1	3.67	3	4	4	2.67	3	3	2	3.67	2	4	5	2.00
113	LR	Midrand UC NB	2006/09/12	15:20	45	C	M	5	6	1	BMW		1995	2	0.00	2	2	0.86	1	1	1	1	1	2	1	4.33	4	4	5	4.67	5	5	4	4.67	5	5	4	2.00
114	LR	Midrand UC NB	2006/09/12	15:20	26	A	M	2	6	1	BMW	3 Series	1996	2	1.00	1	1	0.71	1	1	2	2	1	1	1	5.00	5	5	5	4.00	5	4	3	3.67	5	5	1	2.00
115	LR	Midrand UC NB	2006/09/12	15:25	48	C	M	2	6	1	Nissan	Hardbody	2004	2	0.50	1	3	0.57	1	1	2	3	1	1	3	5.00	5	5	5	4.00	5	3	4	4.67	5	4	5	2.00
116	LR	Midrand UC NB	2006/09/12	15:30	35	B	M	2	6	1	Isuzu	KB 300 D	2006	1	0.00	3	3	0.14	3	3	3	3	1	3	3	4.33	5	4	4	3.00	3	3	3	3.33	3	4	3	2.00
117	LR	Midrand UC NB	2006/09/12	15:35	42	B	M	2	6	1	Nissan	Hardbody	2004	1	0.50	1	3	0.71	1	1	3	1	1	3	1	4.00	4	4	4	3.67	4	3	4	3.00	2	4	3	2.00
118	LR	Midrand UC NB	2006/09/12	15:40	32	A	M	2	6	1	Ford	Ranger v6 4 L	2006	2	0.50	2	1	0.57	1	1	2	3	1	1	3	4.33	4	4	5	3.67	4	3	4	3.00	2	4	3	2.00
119	LR	Midrand UC NB	2006/09/12	15:45	47	C	F	1	6	1	BMW	318 is	1998	2	0.00	3	3	0.00	3	3	3	3	3	3	3	4.00	4	4	4	3.67	4	3	4	4.00	4	4	4	2.00
120	LR	Midrand UC NB	2006/09/12	15:50	28	A	F	1	6	1	Volkswagen	Polo 1.4	2004	2	0.50	1	2	0.14	3	3	3	1	3	3	3	4.00	4	4	4	3.33	4	2	4	4.00	3	4	5	2.00
121	LR	Midrand UC NB	2006/09/12	15:55	46	C	M	2	6	1	Ford	Pacer	2006	1	1.00	1	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	4.33	5	4	4	3.67	3	4	4	1.00
122	LR	Midrand UC NB	2006/09/12	16:00	55	C	M	2	6	1	Nissan	Hardbody	2006	1	0.50	2	1	0.57	1	1	2	3	1	3	1	3.00	3	3	3	3.67	3	4	4	2.67	3	4	1	2.00
123	LR	Midrand UC NB	2006/09/12	16:05	37	B	M	2	7	1	Isuzu	KB 260	1999	2	1.00	1	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	4.67	5	5	4	3.67	1	5	5	2.00
124	LR	Midrand UC NB	2006/09/12	16:10	35	B	M	2	6	1	Hyundai	Getz	2004	2	1.00	1	1	0.43	1	1	3	1	3	3	3	5.00	5	5	5	3.67	5	3	3	3.33	4	4	2	2.00
125	LR	Midrand UC NB	2006/09/12	16:15	22	A	M	2	6	1	Nissan	1400	2003	2	0.50	2	1	0.71	1	1	1	2	1	2	1	5.00	5	5	5	5.00	5	5	5	3.33	1	5	4	2.00
126	LR	Midrand UC NB	2006/09/12	16:20	47	C	M	2	6	1	Toyota	Corolla	1994	2	0.00	2	3	0.71	1	3	1	1	1	3	1	4.00	4	4	4	3.33	3	3	4	3.67	3	4	4	2.00
127	LR	Midrand UC NB	2006/09/12	16:25	45	C	F	1	6	1	Hyundai	Elantra	1995	2	0.50	2	1	0.71	1	3	1	1	1	2	1	5.00	5	5	5	3.67	5	3	3	3.00	2	4	3	2.00
128	LR	Midrand UC NB	2006/09/12	16:30	42	B	M	2	6	1	Chevrolet	Aveo	2005	2	1.00	1	1	0.86	1	1	1	1	1	3	1	4.67	4	5	5	3.33	4	3	3	2.33	1	4	2	2.00
129	LR	Midrand UC NB	2006/09/12	16:35	29	A	M	2	6	1	Volkswagen	Polp 1.3 tdi	2003	1	0.00	3	3	0.14	1	3	3	2	3	3	3	4.00	4	4	4	3.33	4	3	3	4.33	4	4	5	2.00
130	LR	Midrand UC NB	2006/09/12	16:40	54	C	F	2	6	1	Renault	Scenic	2005		0.50	2	1	0.29	3	3	3	3	1	3	1	4.00	4	4	4	3.00	4	3	2	4.33	4	4	5	2.00
131	LR	Midrand UC NB	2006/09/12	16:45	37	B	F	1	6	1	Audi	A3	2004	2	0.00	3	3	0.29	3	3	3	3	1	1	3	4.00	4	4	4	3.33	4	3	3	3.00	2	4	3	2.00
132	LR	Midrand UC NB	2006/09/12	16:50	47	C	F	2	6	1	Mazda	6	2006	2	0.00	2	3	0.43	1	1	2	3	1	2	2	4.00	4	4	4	3.33	4	3	3	3.67	2	4	5	2.00
133	LR	Midrand UC NB	2006/09/12	16:55	24	A	M	2	6	1	Opel	Corsa	1997	2	0.00	2	3	0.71	1	2	1	1	1	2	1	4.00	4	4	4	2.67	3	3	2	3.33	2	4	4	2.00
134	LR	Midrand UC NB	2006/09/12	17:00	36	B	M	2	6	1	Opel	Corsa Utility	2005	1	0.00	3	3	0.43	3	2	1	1	1	3	3	4.00	4	4	4	3.33	4	3	3	3.00	2	4	3	2.00
135	LR	Midrand UC NB	2006/09/12	17:00	32	A	F	1	6	1	Opel	Corsa 170 DTi	2004	1	0.50	2	1	0.29	1	3	3	3	1	3	3	5.00	5	5	5	3.67	5	3	3	4.33	4	5	4	2.00
136	LR	Midrand UC NB	2006/09/12	17:05	32	A	M	2	6	1	Fiat	Uno 1.3	2000	2	0.50	1	3	0.43	1	1	2	3	1	3	3	4.00	4	4	4	3.33	4	3	3	4.33	4	4	5	2.00
137	LR	Midrand UC NB	2006/09/12	17:05	32	A	M	5	6	1	Ford	Bantam	2004	2	0.00	2	2	0.71	2	1	1	1	1	3	1	5.00	5	5	5	3.33	4	4	2	4.00	3	5	4	2.00
138	LR	Midrand UC NB	2006/09/12	17:10	44	B	M	2	6	1	Mitsubishi	Colt Hi-Raider	2001	2	0.50	2	1	0.43	1	1	3	3	1	3	3	4.33	4	4	5	3.33	4	3	3	3.67	2	4	5	2.00
139	LR	Midrand UC NB	2006/09/12	17:15	26	A	F	1	6	1	BMW	320 D	2006	2	0.50	2	1	0.57	1	3	2	1	1	3	1	4.00	4	4	4	4.00	4	4	4	3.67	2	4	5	2.00
140	LR	Midrand UC NB	2006/09/12	17:20	45	C	M	2	6	1	Mercedes Benz	E200	1986	2	0.50	3	1	0.14	1	3	3	3	3	3	3	5.00	5	5	5	5.00	5	5	5	3.67	5	5	1	2.00
141	LR	Midrand UC NB	2006/09/12	17:25	59	C	M	2	6	1	Mazda	Midge	1996	2	0.00	3	3	0.71	1	1	2	3	1	1	1	4.00	4	4	4	3.33	4	3	3	4.33	4	5	4	2.00
142	LR	Midrand UC NB	2006/09/12	17:30	37	B	M	2	6	1	Nissan	Hardbody	2005	2	1.00	1	1	0.71	1	1	2	1	3	1	1	3.00	3	3	3	3.00	3	3	3	3.33	3	3	4	2.00
143	LR	Midrand UC NB	2006/09/12	17:35	25	A	M	2	6	1	Opel	Corsa	1999	2	0.50	2	1	1.00	1	1	1	1	1	1	1	4.00	4	4	4	3.00	3	3	3	3.33	2	4	4	2.00
144	LR	Midrand UC NB	2006/09/12	17:40	36	B	M	2	6	1	Audi	A4	2000	2	1.00	1	1	0.57	1	1	3	3	1	3	1	4.00	4	4	4	3.67	4	3	4	4.00	4	4	4	2.00
145	LR	Midrand UC NB	2006/09/12	17:45	40	B	M	2	6	1	BMW		2004	2	0.50	3	1	0.43	1	1	3	1	3	3	3	3.33	3	4	3	3.00	3	3	3	2.67	1	3	4	1.00
146	LR	Midrand UC NB	2006/09/12	17:45	33	A	M	2	6	1	Volkswagen	Polo	1996	2	1.00	1	1	0.71	1	1	2	2	1	1	1	4.33	4	4	5	4.33	5	4	4	3.00	1	4	4	2.00
147	LR	Midrand UC NB	2006/09/12	17:50	40	B	M	2	6	1	Honda	Accord	2004	2	0.50	2	1	0.71	1	1	2	2	1	1	1	4.00	4	4	4	3.33	4	3	3	3.33	2	3	5	2.00
148	LR	Midrand UC NB	2006/09/12	17:50	41	B	M	2	6	1	Toyota	Run X	2005	2	0.00	3	2	0.57	1	2	1	1	3	2	1	4.00	4	4	4	3.33	4	3	3	3.33	3	4	3	2.00
149	LR	Midrand UC NB	2006/09/12	17:55	40	B	M	2	6	1	Honda	Ballade	1990	2	0.00	2	2	0.57	1	2	1	3	1	3	1	5.00	5	5	5	4.00	5	3	4	3.67	2	4	5	2.00
150	LR	Midrand UC NB	2006/09/12	18:00	33	A	M	2	6	1	Audi	A4	2005	2	1.00	1	1	0.71	1	1	3	3	1	1	1	4.33	4	4	5	4.00	4	3	5	4.00	2	5	5	2.00
151	LR	Midrand UC NB	2006/09/12	18:00	36	B	M	2	6	1	Audi	A3	2003	1	1.00	1	1	0.86	1	1	2	1	1	1	1	3.67	3	4	4	3.67	4	4	3	4.00	3	4	5	2.00
152	LR	Midrand UC NB	2006/09/12	18:05	31	A	M	2	6	1	Chrysler	Crossfire	2004	2	0.50	2	1	0.71	1	2	2	1	1	1	1	4.00	4	4	4	3.33	3	3	4	3.33	2	4	4	2.00
153	LR	Midrand UC NB	2006/09/12	18:10	40	B	M	2	6	1	Audi	1.8 T	2002	2	1.00	1	1	0.14	1	3	3	3	3	3	3	4.00	4	4	4	3.33	4	3	3	3.33	2	4	4	2.00
154	LR	Midrand UC NB	2006/09/12	18:15	44	B	M	2	6	1	Toyota	Raider	2000	1	0.50	2	1	0.71	1	1	3	2	1	1	1	4.00	4	4	4	3.00	4	3	2	3.67	3	4	4	2.00
155	LR	Midrand UC NB	2006/09/12	18:20	46	C	M	2	6	1	Rover	1.8 T	2005	2	0.00	3	3	0.00	3	3	3	3	3	3	3	4.00	4	4	4	3.33	4	3	3	4.00	4	4	4	2.00
156	LR	Midrand UC NB	2006/09/12	18:25	39	B	F	1	6	1	Ford	2.5 D/C	2003	2	0.00	3	2	0.43	1	3	3	2	1	3	1	4.00	4	4	4	3.33	4	3	3	3.67	2	4	5	2.00
157	LR	Midrand UC SB	2006/09/14	09:30	27	A	M	2	9	1	Isuzu	KB 300 D	2003	1	1.00	1	1	0.86	1	1	1	2	1	1	1	4.33	4	5	4	3.67	4	4	3	3.33	1	5	4	2.00
158	LR	Midrand UC SB	2006/09/14	09:35	52	C	M	2	6	1	Mercedes Benz	C220 CDI	2005	1	1.00	1	1	0.71	1	1	3	1	1	1	3	4.00	4	4	4	2.67	3	2	3	3.33	3	4	3	2.00
159	LR	Midrand UC SB	2006/09/14	09:35	30	A	M	2	6	1	Audi	A3	2006	2	0.50	2	1	0.71	1	1	2	1	1	2	1	4.00	4	4	4	3.33	4	4	2	3.33	3	4	3	2.00
160	LR	Midrand UC SB	2006/09/14	09:40	57	C	M	2	6	1	Volkswagen	Golf	1999	2	1.00	1	1	0.43	1	3	3	1	1	3	3	4.00	4	4	4	3.33	4	3	3	2.67	2	3	3	2.00
161	LR	Midrand UC SB	2006/09/14	09:45	42	B	M	2	6	1	BMW	323	2006	2	1.00	1	1	0.57	1	1	3	3	1	3	1	5.00	5	5	5	4.33	5	3	5	3.00	1	5	3	2.00
162	LR	Midrand UC SB	2006/09/14	09:45	38	B	M	2	6	1	Mazda	Etude	2000	2	0.00	2	2	0.14	2	2	3	3	1	3	3	4.00	4	4	4	3.67	4	3	4	3.67	1	5	5	2.00
163	LR	Midrand UC SB	2006/09/14	09:45	28	A	M	2	6	1	Volkswagen	Polo	2006	1	0.00	2	3	0.43	1	3	3	1	1	2	3	4.00	4	4	4	3.67	4	4	3	3.67	3	4	4	2.00
164	LR	Midrand UC SB	2006/09/14	09:50	60	C	M	2	6	1	Toyota	Land Cruiser	1992	2	1.00	1	1	0.57	1	1	3	3	1	3	1	5.00	5	5	5	4.00	5	5	2	3.67	2	5	4	2.00
165	LR	Midrand UC SB	2006/09/14	09:50	49	C	M	2	6	1	Mercedes Benz	Kompressor	2002	2	0.00	2	2	0.43	1	2	1	1	3	3	3	4.00	4	4	4	3.67	4	4	3	3.33	2	4	4	2.00
166	LR	Midrand UC SB	2006/09/14	09:55	49	C	M	2	6	1	Opel	Utility	2005	2	1.00	1	1	0.43	1	3	3	3	1	1	3	4.00	4	4	4	3.33	4	4	2	4.00	4	4	4	2.00
167	LR	Midrand UC SB	2006/09/14	10:00	58	C	M	2	6	1	Ford	Escourt	1999	2	0.00	2	2	0.00	2	2	3	3	3	3	3	4.00	4	4	4	3.33	4	3	3	4.33	4	4	5	2.00
168	LR	Midrand UC SB	2006/09/14	10:00	24	A	M	2	6	1	Fiat	Uno Fire	1995	2	0.50	3	1	0.43	1	2	3	3	1	3	1	4.33	4	5	4	3.33	4	3	3	3.67	2	4	5	2.00
169	LR	Midrand UC SB	2006/09/14	10:05	20	A	F	2	6	1	Subaru	Forester	2005	2	0.50	2	1	0.71	1	1	1	1	1	2	3	4.33	4	4	5	3.00	3	4	2	3.67	3	4	4	2.00
170	LR	Midrand UC SB	2006/09/14	10:05	38	B	M	2	6	1	Toyota	KZTE 3.0	2001	1	0.00	3	3	0.29	1	3	3	1	3	3	3	4.00	4	4	4	4.00	4	4	4	3.00	2	4	3	2.00
171	LR	Midrand UC SB	2006/09/14	10:05	53	C	F	2	6	1	Landrover	Discovery	2004	2	1.00	1	1	0.43	1	1	3	3	1	3	3	4.00	4	4	4	4.00	4	4	4	3.33	4	4	2	2.00
172	LR	Midrand UC SB	2006/09/14	10:10	44	B	M	2	5	1	Toyota	LUV	2006	2	1.00	1	1	0.43	1	1	3	3	2	1	3	3.00	1	3	5	3.00	3	3	3	3.00	1	4	4	2.00
173	LR	Midrand UC SB	2006/09/14	10:15	55	C	M	2	6	1	Audi	A3	2002	2	0.50	2	1	0.43	1	1	3	3	1	3	3	4.00	4	4	4	3.33	4	3	3	3.67	3	4	4	2.00
174	LR	Midrand UC SB	2006/09/14	10:15	24	A	M	2	6	1	Volkswagen	Polo	2006	2	1.00	1	1	0.86	1	1	3	1	1	1	1	4.33	4	4	5	3.33	4	3	3	2.67	1	4	3	2.00
175	LR	Midrand UC SB	2006/09/14	10:20	44	B	M	2	6	1	Mercedes Benz	E500		2	1.00	1	1	0.43	1	1	3	3	1	3	3	5.00	5	5	5	4.33	5	4	4	4.33	3	5	5	2.00
176	LR	Midrand UC SB	2006/09/14	10:20	46	C	M	2	6	1	Mazda	626	1999	2	1.00	1	1	0.86	1	1	3	1	1	1	1	5.00	5	5	5	5.00	5	5	5	3.00	1	5	3	2.00
177	LR	Midrand UC SB	2006/09/14	10:20	32	A	F	2	6	1	Mercedes Benz	Cdi	2003	1	0.00	3	3	0.00	3	3	3	3	3	3	3	3.00	3	3	3	3.00	3	3	3	3.00	3	3	3	2.00
178	LR	Midrand UC SB	2006/09/14	10:35	32	A	M	2	6	1	Volkswagen	Touran	2005	1	0.50	3	1	0.71	1	1	1	2	3	1	1	4.67	5	5	4	3.67	5	3	3	3.33	1	5	4	2.00
179	LR	Midrand UC SB	2006/09/14	01:35	39	B	M	2	6	1	Toyota	Hilux	2006	1	0.50	3	1	0.29	1	1	3	3	3	3	3	3.00	3	3	3	1.67	2	2	1	3.00	1	3	5	2.00
180	LR	Midrand UC SB	2006/09/14	10:35	30	A	M	2	6	1	BMW	120D	2005	1	1.00	1	1	0.71	1	1	2	1	1	2	1	5.00	5	5	5	3.67	5	3	3	4.67	4	5	5	2.00
181	LR	Midrand UC SB	2006/09/14	10:40	37	B	M	2	6	1	Nissan		2004	1	0.00	3	3	0.00	3	3	3	3	3	3	3	3.67	4	3	4	3.67	5	3	3	3.67	2	5	4	2.00
182	LR	Midrand UC SB	2006/09/14	10:40	44	B	M	2	6	1	Range Rover		2003	1	1.00	1	1	0.86	1	1	1	2	1	1	1	5.00	5	5	5	4.33	5	4	4	4.33	4	5	4	2.00
183	LR	Midrand UC SB	2006/09/14	10:45	45	C	M	2	6	1	Mercedes Benz	MK270 CDI	2005	1	0.50	1	3	0.43	1	2	2	1	2	1	2	4.00	5	3	4	3.00	3	4	2	4.00	4	4	4	2.00
184	LR	Midrand UC SB	2006/09/14	10:45	30	A	M	4	6	1	BMW	118i	2005	2	0.00	3	3	0.00	3	3	3	3	2	3	3	3.33	3	3	4	4.00	4	4	4	4.00	3	4	5	2.00
185	LR	Midrand UC SB	2006/09/14	10:45	42	B	M	2	6	1	Mazda	Bakkie	2001	1	0.00	2	3	0.14	3	1	2	3	3	3	3	4.00	4	4	4	3.33	4	3	3	3.33	2	4	4	2.00
186	LR	Midrand UC SB	2006/09/14	10:50	36	B	M	2	10	1	Mitsubishi	Pajero	2001	1	1.00	1	1	1.00	1	1	1	1	1	1	1	3.33	3	3	4	3.00	3	3	3	3.33	3	3	4	2.00
187	LR	Midrand UC SB	2006/09/14	10:50	62	C	M	2	6	1	Mercedes Benz	CDI	2003	1	1.00	1	1	0.57	1	1	3	1	1	3	3	4.33	5	4	4	3.33	4	3	3	3.67	2	4	5	1.00
188	LR	Midrand UC SB	2006/09/14	10:55	30	A	F	2	6	1	Toyota	Corolla	2003	2	0.50	2	1	0.00	3	3	3	3	3	3	3	4.00	4	4	4	3.33	4	3	3	3.33	2	4	4	2.00
189	LR	Midrand UC SB	2006/09/14	11:00	28	A	M	2	6	1	BMW	325	2004	2	1.00	1	1	0.86	1	1	1	3	1	1	1	5.00	5	5	5	4.00	5	3	4	4.00	5	3	4	2.00
190	LR	Midrand UC SB	2006/09/14	11:05	49	C	M	2	6	1	Toyota	Corolla	2004	2	0.50	2	1	0.86	1	3	1	1	1	1	1	3.67	4	4	3	3.33	3	3	4	3.33	2	4	4	2.00
191	LR	Midrand UC SB	2006/09/14	11:10	34	A	M	2	6	1	Nissan	Bakkie	2005	2	0.50	2	1	0.71	1	3	1	1	1	1	3	4.00	4	4	4	4.00	4	4	4	2.67	1	4	3	2.00
192	LR	Midrand UC SB	2006/09/14	11:15	49	C	M	2	6	1	Toyota	Corolla 140i	2005	2	0.50	1	2	0.57	1		1	3	1	3	1	4.00	4	4	4	4.00	4	4	4	3.33	3	4	3	2.00
193	LR	Midrand UC SB	2006/09/14	11:20	25	A	M	2	6	1	Opel	Corsa	1999	2	1.00	1	1	0.71	1	1	1	2	2	1	1	3.33	3	4	3	2.67	3	2	3	3.00	1	4	4	2.00
194	LR	Midrand UC SB	2006/09/14	11:20	53	C	M	2	6	1	Toyota	Rave 4	2005	2	1.00	1	1	0.86	1	1	3	1	1	1	1	4.67	5	4	5	4.33	5	4	4	4.33	4	5	4	1.00
195	LR	Midrand UC SB	2006/09/14	11:25	46	C	M	2	6	1	Ford	Fiesta	2006	1	1.00	1	1	0.71	1	1	3	2	1	1	1	4.33	4	4	5	4.33	5	4	4	4.33	4	4	5	1.00
196	LR	Midrand UC SB	2006/09/14	11:25	38	B	M	2	6	1	Volkswagen	Golf	1986	2	0.50	3	1	0.29	3	1	3	3	1	3	3	3.67	3	4	4	3.33	4	3	3	3.33	2	4	4	2.00
197	LR	Midrand UC SB	2006/09/14	11:30	50	C	M	2	5	1	Nissan	X-Trail	2005	2	0.00	2	2	0.71	1	1	3	1	1	3	1	5.00	5	5	5	3.67	5	3	3	3.00	2	5	2	2.00
198	LR	Midrand UC SB	2006/09/14	11:30	30	A	M	2	6	1	Volkswagen	Golf	2004	2	0.00	2	2	0.14	1	3	3	3	3	3	3	4.00	4	4	4	3.00	3	3	3	2.67	2	4	2	2.00
199	LR	Midrand UC SB	2006/09/14	11:35	24	A	M	2	6	1	Fiat	Palio	2002	2	1.00	1	1	0.00	3	3	3	3	2	3	3	5.00	5	5	5	3.67	5	5	1	4.67	5	4	5	2.00
200	LR	Midrand UC SB	2006/09/14	11:45	33	A	M		6	1	Volkswagen	Polo	2003	2	0.50	1	3	0.29	1	3	3	3	1	2	2	3.00	3	3	3	3.00	3	3	3	3.33	3	3	4	2.00
201	LR	Midrand UC SB	2006/09/14	11:45	38	B	M	2	6	1	BMW	325	2000	2	0.50	2	1	0.71	1	3	1	2	1	1	1	3.33	3	4	3	3.00	3	3	3	3.33	2	4	4	2.00
202	LR	Midrand UC SB	2006/09/14	11:45	30	A	M	2	6	1	Isuzu		2003	1	1.00	1	1	0.57	1	1	3	1	1	3	3	5.00	5	5	5	4.33	5	4	4	4.67	5	5	4	2.00
203	LR	Midrand UC SB	2006/09/14	11:50	22	A	M	2	6	1	Toyota	Tazz	2002	2	0.50	1	3	0.57	2	1	3	3	1	1	1	4.00	4	4	4	4.00	4	4	4	4.00	4	4	4	2.00
204	LR	Midrand UC SB	2006/09/14	11:50	34	A	M	2	6	1	Ford	Ranger	2003	1	1.00	1	1	0.71	1	2	1	1	1	2	1	4.00	4	4	4	3.67	3	4	4	3.33	2	3	5	2.00
205	LR	Midrand UC SB	2006/09/14	11:55	37	B	M	2	6	1	Ford	Territory	2006	2	0.50	3	1	0.71	1	1	3	1	1	3	1	4.00	4	4	4	3.33	4	3	3	3.33	3	4	3	2.00
206	LR	Midrand UC SB	2006/09/14	11:55	40	B	M	3	6	1	Audi	A3	2005	1	1.00	1	1	0.29	1	1	3	3	3	3	3	4.00	4	4	4	1.67	1	3	1	2.33	1	1	5	2.00
207	LR	Midrand UC SB	2006/09/14	12:00	24	A	F	2	6	1	Renault	Modus 1.4	2006	2	1.00	1	1	0.43	3	1	3	3	1	1	3	3.00	3	3	3	3.00	3	3	3	3.33	3	3	4	2.00
208	LR	Midrand UC SB	2006/09/14	12:05	27	A	M	2	6	1	Renault	Megane	2001	2	1.00	1	1	0.43	1	1	1	3	2	3	3	4.33	3	5	5	3.67	5	3	3	3.67	2	4	5	2.00

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Respondents	Administered By	Where	Date	Time	Age	Age Group	Gender	Race	Residing Province	Own a Vehicle	Vehicle Make	Vehicle Model	Model Year	Fuel Type	AWARENESS	Question 1	Question 2	KNOWLEDGE	Question 3	Question 4	5 Reversed	6 Reversed	Question 7	Question 8	Question 9	LIKING	Question 10	Question 11	Question 12	PREFERENCE	Question 13	Question 15	Question 16	CONVICTION	Question 14	Question 17	Question 18	PURCHASE
209	LR	Midrand UC SB	2006/09/14	12:05			M	1	6	1	Mercedes Benz	C180 Kompressor	2004	2	0.00	3	3	0.14	3	3	3	3	1	3	3	3.67	3	4	4	3.33	4	3	3	3.00	2	4	3	2.00
210	LR	Midrand UC SB	2006/09/14	12:11	30	A	M	3	6	1	Audi	TT	2003	2	0.00	2	2	0.29	3	2	1	1	2	3	3	3.00	3	3	3	3.00	3	3	3	3.33	3	3	4	2.00
211	LR	Midrand UC SB	2006/09/14	12:14	34	A	M	4	6	1	BMW	3200	2005	1	0.00	3	2	0.29	3	3	3	1	1	3	3	4.00	4	4	4	3.33	4	3	3	3.00	2	4	3	2.00
212	LR	Midrand UC SB	2006/09/14	12:16	27	A	F	2	6	1	Toyota	Tazz	2005	2	0.00	3	3	0.00	3	3	3	3	3	3	3	4.00	4	4	4	3.33	4	4	2	4.00	4	4	4	2.00
213	LR	Midrand UC SB	2006/09/14	12:20	38	B	M	2	6	1	Peugeot	407	2006	1	0.50	2	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	4.67	5	5	4	3.33	1	4	5	2.00
214	LR	Midrand UC SB	2006/09/14	13:00	38	B	M	2	6	1	Toyota	Raider	2005	2	0.00	3	3	0.00	3	3	3	3	3	3	3	3.00	3	3	3	3.00	3	3	3	3.00	3	3	3	2.00
215	LR	Midrand UC SB	2006/09/14	13:01	39	B	M	2	6	1	Renault	Megane	2005	2	1.00	1	1	0.71	1	1	3	1	1	3	1	5.00	5	5	5	3.67	5	3	3	4.33	3	5	5	2.00
216	LR	Midrand UC SB	2006/09/14	13:01	23	A	M	2	7	1	Ford	2.5 Supercab	2006	1	1.00	1	1	0.43	1	1	3	3	3	3	1	5.00	5	5	5	3.67	5	3	3	2.33	1	4	2	2.00
217	LR	Midrand UC SB	2006/09/14	13:05	57	C	M	2	6	1	Mercedes Benz	C180 Kompressor	2005	2	1.00	1	1	0.86	1	1	3	1	1	1	1	3.00	3	3	3	3.00	4	3	2	4.00	4	4	4	2.00
218	LR	Midrand UC SB	2006/09/14	13:08	59	C	M	2	6	1	Mercedes Benz	E500	2005	2	0.50	2	1	0.57	1	2	1	3	1	3	1	4.00	4	4	4	3.33	4	3	3	2.67	2	2	4	2.00
219	LR	Midrand UC SB	2006/09/14	13:08	33	A	F	2	6	1	Toyota	Corolla 1.8	1994	2	1.00	1	1	0.57	1	1	2	2	1	3	1	4.33	3	5	5	4.00	5	4	3	3.33	3	4	3	2.00
220	LR	Midrand UC SB	2006/09/14	13:16			M	1	6	1	Honda	Ballade	1984	2	0.00	2	3	0.14	2	2	2	2	1	3	3	3.33	3	4	3	3.00	3	4	2	2.67	2	3	3	2.00
221	LR	Midrand UC SB	2006/09/14	13:16	53	C	M	2	6	1	Mazda	Etude	2002	2	0.00	2	2	0.57	1	2	2	1	1	3	1	5.00	5	5	5	3.33	4	3	3	3.00	2	4	3	2.00
222	LR	Midrand UC SB	2006/09/14	13:16			M	2	6	1	Nissan	Almera	2002	2	0.00	2	2	0.14	3	3	3	3	1	3	3	2.00	2	2	2	2.00	2	2	2	3.00	2	2	5	2.00
223	LR	Midrand UC SB	2006/09/14	13:25	24	A	M	2	6	1	Mercedes Benz	C180 Kompressor	2003	2	1.00	1	1	0.57	1	1	2	3	1	1	3	5.00	5	5	5	3.67	5	4	2	4.00	3	4	5	2.00
224	LR	Midrand UC SB	2006/09/14	13:25	37	B	M	2	6	1	Volkswagen	Caddy	1998	2	1.00	1	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	2.00	3	1	2	3.33	1	5	4	2.00
225	LR	Midrand UC SB	2006/09/14	13:26	34	A	M	2	6	2					0.00	3	3	0.57	1	1	1	2	1	3	3	5.00	5	5	5	4.00	5	3	4	3.67	3	5	3	2.00
226	LR	Midrand UC SB	2006/09/14	13:50	26	A	M	2	6	1	Toyota	Run X	2004	2	0.50	2	1	0.29	2	1	1	3	3	3	3	4.33	4	4	5	4.33	5	4	4	3.33	1	4	5	2.00
227	LR	Midrand UC SB	2006/09/14	13:50	34	A	M	2	6	1	Ford	Bantam	2006	2	0.50	2	1	0.43	3	1	1	3	1	3	3	2.33	3	2	2	3.00	3	3	3	2.67	1	4	3	2.00
228	LR	Midrand UC SB	2006/09/14	14:00	25	A	M	2	6	1	Polo	1.9 TDI	2005	1	0.50	2	1	0.43	1	1	1	3	3	3	3	4.00	4	4	4	3.67	3	4	4	3.67	3	4	4	2.00
229	LR	Midrand UC SB	2006/09/14	14:00	37	B	F	2	6	1	Nissan	Primera	2001	2	0.00	3	3	0.14	3	3	3	3	1	3	3	4.00	4	4	4	4.00	4	4	4	3.67	4	4	3	2.00
230	LR	Midrand UC SB	2006/09/14	14:10	29	A	F	2	6	1	Volkswagen	Polo		2	0.50	3	1	0.43	1	1	3	3	1	3	3	5.00	5	5	5	4.33	5	4	4	2.67	1	5	2	2.00
231	LR	Midrand UC SB	2006/09/14	14:10	27	A	M	2	6	1	Fiat	Uno	2002	2	0.00	3	3	0.14	3	1	3	3	3	3	3	3.00	3	3	3	3.00	3	3	3	2.00	2	3	1	2.00
232	LR	Midrand UC SB	2006/09/14	14:12	54	C	M	2	6	1	Nissan	Maxima	1996	2	0.50	2	1	0.43	3	1	2	3	2	1	1	4.00	5	2	5	4.33	5	4	4	3.67	4	4	3	2.00
233	LR	Midrand UC SB	2006/09/14	14:15	22	A	M	2	6	1	Volkswagen	Golf	1996	2	0.50	2	1	0.29	1	1	3	3	3	3	3	3.00	3	3	3	3.00	3	3	3	2.67	1	3	4	2.00
234	LR	Midrand UC SB	2006/09/14	14:16	35	B	M	2	6	1	Toyota	Prado	2006	1	1.00	1	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	4.33	5	3	5	3.33	1	5	4	2.00
235	LR	Midrand UC SB	2006/09/14	14:26	45	C	M	3	6	1	BMW	325i	2001	2	1.00	1	1	0.71	1	1	2	3	1	1	1	5.00	5	5	5	3.67	5	3	3	4.67	5	5	4	2.00
236	LR	Midrand UC SB	2006/09/14	14:26	59	C	M		2	1	Audi	2	2002	2	1.00	1	1	0.43	3	2	3	3	1	1	1	2.67	4	2	2	3.00	2	4	3	3.67	4	4	3	2.00
237	LR	Midrand UC SB	2006/09/14	14:29	32	A	M		6	2					1.00	1	1	0.29	2	2	1	2	1	2	2	3.33	3	4	3	3.00	3	3	3	2.67	1	3	4	2.00
238	LR	Midrand UC SB	2006/09/14	14:30	35	B	M	2	10	2	Toyota	Tazz		2	0.00	3	3	0.00	3	3	3	3	3	3	3	3.00	3	3	3	3.00	3	3	3	3.33	3	3	4	2.00
239	LR	Midrand UC SB	2006/09/14	14:30	23	A	M	2	6	1	Audi	A3	1999	2	1.00	1	1	0.71	1	2	2	1	1	1	1	4.33	4	4	5	3.33	4	3	3	3.00	3	4	2	2.00
240	LR	Midrand UC SB	2006/09/14	14:35	41	B	M	2	6	1	Volkswagen	Carovelle	2003	2	1.00	1	1	0.57	1	1	3	1	1	3	3	5.00	5	5	5	3.67	5	3	3	3.67	3	5	3	2.00
241	LR	Midrand UC SB	2006/09/14	14:50	53	C	M	2	6	1	Rover	75	2003	2	0.50	2	1	0.43	3	3	3	3	1	1	1	4.00	4	4	4	3.33	4	3	3	3.33	3	4	3	2.00
242	LR	Midrand UC SB	2006/09/14	14:55	34	A	F	2	6	1	Citroen	C4	2005	2	1.00	1	1	0.57	1	1	3	3	1	3	1	4.67	4	5	5	4.00	5	3	4	4.33	3	5	5	2.00
243	LR	Midrand UC SB	2006/09/14	14:56	32	A	M	2	6	1	Jeep	Cherokee	2003	1	0.50	2	1	0.57	1	1	2	2	1	1	2	4.00	4	4	4	3.33	4	4	2	3.00	4	4	1	2.00
244	LR	Midrand UC SB	2006/09/14	14:56	45	C	M	2	5	1	SamyangMusso	601	1996	1	1.00	1	1	0.86	1	1	2	1	1	1	1	5.00	5	5	5	4.00	5	3	4	3.00	1	5	3	2.00
245	LR	Midrand UC SB	2006/09/14	15:00	39	B	F	2	6	1	Corsa		2002	2	0.00	2	3	0.00	3	3	3	3	3	3	3	3.00	3	3	3	3.00	3	3	3	2.67	1	3	4	2.00
246	LR	Midrand UC SB	2006/09/14	15:00	29	A	M	2	6	1	Nissan	Sentra	1989	2	0.50	2	1	0.43	1	3	3	3	1	3	1	4.00	4	4	4	3.33	4	3	3	3.67	2	4	5	2.00
247	LR	Midrand UC SB	2006/09/14	15:04	40	B	M	2	6	1	Opel	Astra	2002	2	1.00	1	1	0.71	1	3	1	3	1	1	1	4.00	4	4	4	3.00	4	2	3	3.33	2	4	4	2.00
248	LR	Midrand UC SB	2006/09/14	15:13	39	B	F	2	6	1	Mercedes Benz	A	2000	2	0.00	2	2	0.29	3	3	1	3	1	3	3	3.67	4	4	3	3.33	4	3	3	3.33	2	4	4	2.00
249	LR	Midrand UC SB	2006/09/14	15:16	50	C	M	2	4	2					1.00	1	1	0.57	3	3	1	1	1	3	1	3.67	4	4	3	3.00	3	3	3	3.00	2	4	3	2.00
250	LR	Midrand UC SB	2006/09/14	15:20	46	C	M	2	6	1	Mercedes Benz	S320	1998	1	1.00	1	1	0.29	3	3	3	1	1	3	2	3.00	3	3	3	3.00	3	3	3	3.00	3	3	3	2.00
251	LR	Midrand UC SB	2006/09/14	15:20	52	C	M	2	6	1	Jeep	4.7	2005	2	0.50	2	1	0.57	1	1	2	2	2	1	1	4.00	4	4	4	4.00	4	4	4	3.67	4	5	2	2.00
252	LR	Midrand UC SB	2006/09/14	15:20	46	C	M	2	6	1	BMW		2004	1	0.50	2	1	0.00	3	3	3	3	3	3	3	5.00	5	5	5	3.67	5	3	3	3.67	3	4	4	2.00
253	LR	Midrand UC SB	2006/09/14	15:25	29	A	M	2	7	1	Isuzu	RD 300	2006	1	1.00	1	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	3.33	5	2	3	3.33	2	5	3	2.00
254	LR	Midrand UC SB	2006/09/14	15:45	50	C	F	2	6	1	Toyota	Corolla	2005	2	1.00	1	1	0.43	1	3	3	3	1	3	1	4.00	4	4	4	4.33	4	5	4	3.00	4	4	1	2.00
255	LR	Midrand UC SB	2006/09/14	15:50	50	C	M	3	6	1	Toyota	RSI	1997	2	0.50	2	1	0.57	1	1	3	3	1	3	1	3.67	3	4	4	2.33	2	3	2	3.33	2	3	5	2.00
256	LR	Midrand UC SB	2006/09/14	15:55	42	B	M	2	5	1	Prado	Toyota	2004	2	0.50	1	3	0.57	1	3	3	2	1	1	1	4.00	4	4	4	3.67	4	3	4	3.67	2	4	5	2.00
257	LR	Midrand UC SB	2006/09/14	16:10	43	B	F	2	6	1	Chrysler	Voyager	2002	2	1.00	1	1	0.86	1	1	1	1	1	1	3	3.67	3	4	4	4.00	4	4	4	4.33	4	4	5	2.00
258	LR	Midrand UC SB	2006/09/14	16:10	34	A	M	2	6	1	Jeep	Wrangler	2003	2	0.00	3	3	0.71	1	1	2	2	1	1	1	3.00	3	3	3	3.00	3	3	3	3.33	3	3	4	2.00
259	LR	Midrand UC SB	2006/09/14	16:20	62	C	M	2	6	1	Mercedes Benz	E320	1999	2	1.00	1	1	0.57	1	1	3	3	1	1	3	4.00	4	4	4	3.33	4	3	3	3.67	3	4	4	2.00
260	LR	Midrand UC SB	2006/09/14	16:25	39	B	M	2	6	1	Volkswagen	Polo	2006	2	1.00	1	1	0.43	1	1	3	3	3	1	3	4.00	4	4	4	3.33	4	3	3	3.33	2	4	4	2.00
261	LR	Midrand UC SB	2006/09/14	16:25	53	C	M	2	6	1	Volkswagen	Polo	2004	2	1.00	1	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	4.00	5	5	2	3.33	2	5	3	2.00
262	LR	Midrand UC SB	2006/09/14	16:30	35	B	M	3	6	1	Mazda	Midge	1998	2	1.00	1	1	0.57	1	2	1	2	2	1	1	3.67	3	4	4	3.33	4	2	4	4.00	3	4	5	2.00
263	LR	Midrand UC SB	2006/09/14	16:45	20	A	F	2	6	1	Volkswagen	City Golf	1996	2	0.00	2	2	0.57	3	1	2	2	1	1	1	5.00	5	5	5	4.00	5	5	2	4.00	3	4	5	2.00
264	LR	Midrand UC SB	2006/09/14	16:54	26	A	M	2	6	1	Ford	TDI	2005	1	0.00	3	3	0.00	3	3	3	3	3	3	3	4.33	4	5	4	3.67	4	4	3	3.00	3	4	2	2.00
265	LR	Midrand UC SB	2006/09/14	16:58	24	A	M	4	6	1	Subaru	Wrx Impreza	2006	2	0.00	3	3	0.29	3	3	2	1	1	3	3	4.67	4	5	5	3.67	5	3	3	2.67	3	3	2	2.00
266	LR	Midrand UC SB	2006/09/14	17:00	24	A	M	2	6	1	Volkswagen	Polo	2001	2	0.50	2	1	0.43	1	2	1	1	2	2	2	4.00	3	4	5	3.67	4	4	3	4.33	4	4	5	2.00
267	LR	Midrand UC SB	2006/09/14	17:04	52	C	M	2	6	1	Tana	Telcodine	2005	1	1.00	1	1	0.43	1	1	3	3	3	3	1	4.00	4	4	4	3.33	4	3	3	2.33	2	4	1	2.00
268	LR	Midrand UC SB	2006/09/14	17:10	35	B	M	2	6	1	Lotus	Elise	2005	2	0.50	2	1	1.00	1	1	1	1	1	1	1	2.33	3	3	1	3.00	3	3	3	3.00	3	3	3	2.00
269	LR	Midrand UC SB	2006/09/14	17:15	34	A	M	2	6	1	Honda	Ballade	1998	2	1.00	1	1	0.71	1	1	2	2	1	1	1	4.33	5	5	3	4.00	5	3	4	4.00	2	5	5	2.00
270	LR	Midrand UC SB	2006/09/14	17:17	48	C	M	2	7	1	Honda		2006	1	0.50	1	3	0.14	2	2	2	1	2	2	2	3.33	4	4	2	2.67	4	2	2	2.67	4	2	2	2.00
271	LR	Midrand UC SB	2006/09/14	17:27	53	C	M	1	6	1	Jaguar	X	2005	2	0.50	2	1	0.43	1	2	3	1	1	3	2	4.67	5	5	4	3.33	4	3	3	4.33	4	5	4	2.00
272	LR	Midrand UC SB	2006/09/14	17:30	37	B	M	2	6	1	Toyota	Condor		2	0.00	3	3	0.00	3	3	3	3	3	3	3	4.00	4	4	4	3.00	3	3	3	3.00	1	3	5	2.00
273	LR	Midrand UC SB	2006/09/15	09:00	21	A	M	2	6	1	Opel	Corsa	2006	2	0.00	2	3	0.43	1	2	3	3	1	2	1	3.00	4	2	3	3.00	4	3	2	3.33	3	4	3	2.00
274	LR	Midrand UC SB	2006/09/15	09:10	27	A	F	2	6	1	BMW	318	2004	2	1.00	1	1	0.57	3	1	1	1	1	3	3	3.67	3	4	4	3.00	3	3	3	3.00	1	3	5	2.00
275	LR	Midrand UC SB	2006/09/15	09:10	46	C	M	2	6	1	Nissan	Navara	2006	1	0.50	2	1	0.57	1	2	1	3	1	3	1	4.00	4	4	4	4.00	4	4	4	3.33	2	4	4	2.00
276	LR	Midrand UC SB	2006/09/15	09:10	50	C	M	2	6	1	Jeep	Cherokee	2004	2	1.00	1	1	0.57	1	1	3	1	1	3	3	4.00	4	4	4	3.33	4	4	2	4.33	4	4	5	2.00
277	LR	Midrand UC SB	2006/09/15	09:10	52	C	M	2	6	1	Mercedes Benz	C200	2002	2	1.00	1	1	0.57	1	1	1	1	3	3	3	5.00	5	5	5	4.33	5	4	4	3.67	2	4	5	2.00
278	LR	Midrand UC SB	2006/09/15	09:16	49	C	M	2	6	1	Toyota	Corolla	2000	2	1.00	1	1	0.86	1	1	1	1	1	2	1	5.00	5	5	5	4.67	5	5	4	4.33	4	4	5	2.00
279	LR	Midrand UC SB	2006/09/15	09:16	39	B	M	2	6	1	Volkswagen	Bakkie	1999	2	1.00	1	1	0.86	1	1	3	1	1	1	1	5.00	5	5	5	3.67	5	3	3	3.33	2	4	4	2.00
280	LR	Midrand UC SB	2006/09/15	09:25	60	C	M	2	6	1	Toyota	Verso	2004	2	1.00	1	1	0.71	1	1	3	3	1	1	1	4.00	4	4	4	3.67	4	3	4	3.67	3	5	3	2.00
281	LR	Midrand UC SB	2006/09/15	09:30	25	A	F	2	6	1	Hyundai	Elantra	1995	2	0.00	3	2	0.86	1	2	1	1	1	1	1	4.67	5	5	4	3.67	5	5	1	4.00	4	4	4	2.00
282	LR	Midrand UC SB	2006/09/15	09:55	40	B	M	2	6	1	Volkswagen	Golf	1990	2	1.00	1	1	0.86	1	1	2	1	1	1	1	5.00	5	5	5	4.33	5	4	4	3.33	2	5	3	2.00
283	LR	Midrand UC SB	2006/09/15	09:35	72	C	M	2	5	1	Camry		1993	2	1.00	1	1	0.71	1	1	3	3	1	1	1	4.00	4	4	4	4.00	4	4	4	3.33	2	4	4	2.00
284	LR	Midrand UC SB	2006/09/15	09:40	27	A	M	2	6	1	Mazda	Drifter	2006	1	0.50	2	1	0.43	1	3	2	2	1	2	1	4.00	4	4	4	3.67	4	4	3	4.33	4	4	5	2.00
285	LR	Midrand UC SB	2006/09/15	09:42	26	A	F	2	6	1	Citroen	C2	2004	2	0.50	2	1	0.71	1	1	3	3	1	1	1	5.00	5	5	5	4.33	5	4	4	3.33	3	4	3	2.00
286	LR	Midrand UC SB	2006/09/15	09:44	25	A	M	2	6	1	Volkswagen	Polo	1998	2	0.50	2	1	0.43	1	1	3	2	1	3	3	5.00	5	5	5	2.33	3	3	1	3.33	1	4	5	2.00
287	LR	Midrand UC SB	2006/09/15	09:45	48	C	M	2	6	1	Ford	Bantam	1997	2	1.00	1	1	0.71	1	1	1	3	1	3	1	4.00	4	4	4	4.00	4	4	4	3.67	2	4	5	2.00
288	LR	Midrand UC SB	2006/09/15	09:50	36	B	M	2	6	1	Audi	A4	2005	2	1.00	1	1	0.86	1	1	1	1	1	2	1	5.00	5	5	5	3.67	5	4	2	3.33	4	4	2	2.00
289	LR	Midrand UC SB	2006/09/15	09:50	32	A	M	4							0.00	3	3	0.00	3	3	3	3	3	3	3	3.00	3	3	3	3.00	3	3	3	3.67	3	3	5	2.00
290	LR	Midrand UC SB	2006/09/15	09:55	39	B	M	2	1	1	Toyota	Hilux	1992	2	1.00	1	1	0.57	1	3	3	3	1	1	1	5.00	5	5	5	3.67	5	3	3	3.67	3	5	3	2.00
291	LR	Midrand UC SB	2006/09/15	10:00	23	A	M	2	6	1	Volkswagen	Polo	2006	2	1.00	1	1	1.00	1	1	1	1	1	1	1	1.00	1	1	1	2.33	2	4	1	4.00	3	4	5	2.00
292	LR	Midrand UC SB	2006/09/15	10:04	23	A	M	2	6	1	Nissan	Sentra	1993	2	0.00	2	3	0.57	1	2	1	2	1	2	1	4.00	4	4	4	3.67	4	3	4	3.33	2	4	4	2.00
293	LR	Midrand UC SB	2006/09/15	10:05	39	B	M	1	6	1	BMW	320	2004	2	0.50	2	1	0.43	1	1	2	3	1	3	3	3.67	3	4	4	3.33	4	3	3	3.67	3	4	4	2.00
294	LR	Midrand UC SB	2006/09/15	10:12	61	C	M	2	6	1	Mercedes Benz	ML	2004	2	1.00	1	1	0.71	1	1	2	3	1	1	1	5.00	5	5	5	4.33	5	3	5	3.67	1	5	5	2.00
295	LR	Midrand UC SB	2006/09/15	10:12	43	B	M	2	6	1	Nissan	1Ton	2003	2	0.00	2	2	0.29	2	2	1	1	2	2	2	4.00	4	4	4	3.00	3	3	3	3.00	2	4	3	2.00
296	LR	Midrand UC SB	2006/09/15	10:14	25	A	M	1	6	1	Mazda	3	2004	2	0.00	3	3	0.43	3	1	3	3	1	2	1	3.67	3	4	4	3.33	5	2	3	4.00	3	5	4	2.00
297	LR	Midrand UC SB	2006/09/15	10:25	39	B	F	2	6	1	Mercedes Benz	350C	2006	2	0.00	3	3	0.00	3	3	3	3	3	3	3	4.00	4	4	4	4.33	4	4	5	4.33	4	4	5	2.00
298	LR	Midrand UC SB	2006/09/15	10:25	47	C	M	2	6	1	Opel	Astra	1998	2	0.00	2	3	0.00	3	3	3	3	3	3	3	5.00	5	5	5	3.67	5	3	3	3.67	3	4	4	2.00
299	LR	Midrand UC SB	2006/09/15	10:26	57	C	M	2	6	1	Volkswagen	Jetta	2001	2	1.00	1	1	0.71	1	1	2	2	1	1	1	4.00	4	4	4	3.67	4	4	3	4.33	4	4	5	1.00
300	LR	Midrand UC SB	2006/09/15	10:30	44	B	M	2	5	1	Isuzu	260 D/C	2003	1	0.50	1	3	0.43	1	1	3	3	3	3	1	3.67	4	4	3	3.00	3	3	3	3.33	2	4	4	2.00
301	LR	Midrand UC SB	2006/09/15	10:30	38	B	M		6	1	BMW		2000	1	0.00	2	3	0.29	2	2	3	3	1	2	1	3.67	3	4	4	4.00	4	4	4	3.33	2	4	4	2.00
302	LR	Midrand UC SB	2006/09/15	10:34	50	C	F	2	6	1	Peugeot	407	2004	2	0.00	3	3	0.00	3	3	3	3	3	3	3	3.00	3	3	3	3.00	3	3	3	3.33	3	3	4	2.00
303	LR	Midrand UC SB	2006/09/15	10:40	37	B	M	2	6	1	Volkswagen	Polo	2004	2	1.00	1	1	0.71	1	1	3	3	1	1	1	5.00	5	5	5	3.67	5	5	1	4.00	3	5	4	2.00
304	LR	Midrand UC SB	2006/09/15	10:48	37	B	M	2	6	1	Nissan		2006	1	0.50	1	3	0.14	3	2	2	2	1	3	3	4.00	4	4	4	3.67	4	4	3	4.00	4	4	4	2.00
305	LR	Midrand UC SB	2006/09/15	10:55	29	A	M	1	6	1	BMW	3201	2005	2	0.00	3	2	0.00	3	3	3	3	3	3	3	5.00	5	5	5	3.67	5	3	3	4.00	4	5	3	2.00
306	LR	Midrand UC SB	2006/09/15	10:55	25	A	F	1	6	1	Mini	Cooper	2005	2	0.50	3	1	0.71	1	1	3	3	1	1	1	1.00	1	1	1	3.00	3	3	3	4.00	2	5	5	2.00
307	LR	Midrand UC SB	2006/09/15	10:55	32	A	M	2	6	1	Toyota	Hilux	2005	1	0.00	3	3	0.00	3	3	3	3	3	3	3	4.00	4	4	4	3.33	4	3	3	4.00	4	4	4	1.00
308	LR	Midrand UC SB	2006/09/15	10:56	31	A	M	1	6	1	Audi	A4	2004	1	0.50	1	3	0.57	1	1	3	3	1	3	1	4.67	5	5	4	3.67	5	5	1	4.33	4	5	4	2.00
309	LR	Midrand UC SB	2006/09/15	11:20	48	C	M	2	6	1	Corsa	Bakkie	2005	2	1.00	1	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	5.00	5	5	5	3.67	1	5	5	2.00
310	LR	Midrand UC SB	2006/09/15	11:20	26	A	M	2	6	1	Peugeot	206	2004	2	1.00	1	1	0.43	2	1	3	1	1	3	2	4.67	5	5	4	4.00	5	3	4	3.00	2	4	3	2.00
311	LR	Midrand UC SB	2006/09/15	11:20	28	A	M	2	6	1	Ford	Bantam	2003	2	1.00	1	1	1.00	1	1	1	1	1	1	1	5.00	5	5	5	5.00	5	5	5	3.67	1	5	5	2.00
312	LR	Midrand UC SB	2006/09/15	11:25	34	A	M	2	10	1	Toyota	Camry	2000	2	0.50	2	1	0.86	1	1	1	1	1	2	1	4.00	4	4	4	3.67	4	3	4	3.00	2	4	3	2.00
313	LR	Midrand UC SB	2006/09/15	11:25	38	B	M	2	6	1	Kia	Rio	2002	2	1.00	1	1	0.00	3	3	3	3	3	3	3	3.33	3	3	4	3.00	3	3	3	3.67	3	3	5	2.00
314	LR	Midrand UC SB	2006/09/15	11:30	52	C	M	2	6	1	Mitsibishi	Pelero	2002	2	0.50	3	1	0.71	1	1	2	1	1	2	1	3.00	1	4	4	4.00	4	4	4	3.33	3	4	3	2.00
315	LR	Midrand UC SB	2006/09/15	11:35	49	C	M	2	6	1	Volkswagen	Jetta	1999	2	1.00	1	1	0.29	1	1	3	2	3	3	3	4.00	4	4	4	3.33	4	3	3	3.00	1	4	4	2.00
316	LR	Midrand UC SB	2006/09/15	11:36	24	A	M	2	6	1	Hyundai	Accent	1997	2	0.00	2	2	0.00	3	2	3	3	3	3	3	3.67	3	4	4	3.00	3	3	3	3.33	2	5	3	2.00