fuel
• material consumed to produce energy
• material that maintains or stimulates an activity or emotion

technology
• the application of science, especially to industrial or commercial objectives
• the body of knowledge available to society

“The energy of the mind is the essence of life.”
Aristotle
sasol overview

our business context

Sasol is an international, integrated energy and chemicals company that creates value through its proven alternative fuels technology and talented people to provide sustainable energy solutions to the world.

Sasol has been a frontrunner in technology innovation and excellence since inception in the 1950s, to address the need for energy security in South Africa – a country with no significant oil reserves.

Today we produce more than 120 different products and are listed on the Johannesburg and New York stock exchanges in South Africa and the USA, respectively. We have operations in more than 35 countries and employ about 34 000 people.

Technology is at the core of Sasol and is fundamental to our sustainability and competitiveness. As market needs and expectations change, our services and products are required to reflect the spirit of the age and the need of the day. Continuous and effective innovation of our technology can only be derived from optimal research and development (R&D), informed by a strategic view of the economic landscape.

Sasol commits to sustainable development in its operations around the world and is a signatory of Responsible Care®, a worldwide initiative that strives to improve performance in safety, health and the environment.

Did you know?

• Sasol contributes just under 5% of South Africa’s Gross Domestic Product (GDP).
• Sasol produces about 34% of South Africa’s total liquid fuels requirements.
fuels technology

our role

The fuels technology team’s role is to ensure that Sasol’s products perform in the market today and into the future. Through world-leading R&D and technical services, the team helps Sasol to competitively meet current and future market requirements for:

• transport fuels (petrol, diesel and jet fuel);
• lubricants;
• bitumen; and
• industrial heating fuels.

The team does this by:

• scanning the external environment and predicting future fuels trends;
• carrying out research;
• developing new products and new applications for products;
• supporting Sasol’s production plants; and
• providing product technical market support.

The teams of dedicated fuels technology scientists and engineers have been responsible for our consistently exceptional contributions and successes for more than five decades.

Our team consists of more than 80 members, many of whom have postgraduate degrees in chemistry, chemical engineering and mechanical engineering, and many years of experience in their fields.

Did you know?

• Fuels technology produces over 20 publications and international conference presentations annually.

our competitive advantage

Fuels technology’s competitive advantage derives from:

• our understanding of the relationship between production, properties and performance of synthetic and semi-synthetic fuels, and our application of this understanding in various current and future product applications;
• our technical experience from commercial operations through to the end user; and
• our experience and understanding of a suite of synthetic, semi-synthetic, crude-oil-derived and bio-derived products.
our structure

Fuels technology's activities are divided into four broad areas:

- Fuels Research;
- International Energy Technical Services;
- South Africa & Africa Energy Technical Services; and
- Product Quality Governance.

These areas are supported by the Strategy and Business Enablement team.

our locations and facilities

The hub of fuels technology’s activities is located in Sasolburg, about 80 kilometres south of Johannesburg. The historical site of Sasol’s first production plant, it remains the centre for all R&D activities in the group.

Product technical service specialists are located at Sasol’s production and marketing businesses in Secunda, Sasolburg and Johannesburg.

Our facilities in Sasolburg include chemistry laboratories and a comprehensive blending and logistics facility where specialised fuels blends are prepared and dispatched for internal use, for motor racing, and to serve our various collaborations worldwide.

The Sasolburg site also houses the heating fuels and gas test centre.

The Sasol Fuels Application Centre (Sasol FAC) in Muizenberg, Cape Town, is a state-of-the-art fuels application and emissions testing facility that includes heavy-duty and transient testing capability at a sea-level location.

The Sasol Advanced Fuels Laboratory (Sasol AFL) is a collaboration with the University of Cape Town (UCT), where fuels technology personnel and postgraduate students carry out further longer-term and in-depth understanding research. The projects at the Sasol AFL focus on products and engine technology that will be prevalent five years and beyond.

A well-equipped mobile laboratory is available to conduct quality tests on products being used at customers’ sites.

With Sasol’s planned growth in North America, fuels technology has a presence in Houston to support Sasol’s North American business.
Sasol produces fuels and other refinery products in the Natref crude oil refinery in Sasolburg, its coal-to-liquids (CTL) plant in Secunda, and in the existing gas-to-liquids (GTL) plant, ORYX GTL, in Qatar.

The products that we research and support in the market include:
• road transport fuels (petrol and diesel);
• jet fuel;
• lubricants and lubricant base oils;
• industrial heating fuels;
• bitumen; and
• naphtha, liquefied petroleum gas (LPG), and illuminating paraffin.
road transport fuels

Sasol’s view of the transport energy landscape is that liquid transport fuels will be in use until at least 2050. Fuels technology carries out research and development on crude-oil-derived, synthetic, semi-synthetic and bio-derived petrol and diesel.

These fuels are formulated and tested in world-class laboratories and test facilities to meet the harsh requirements of future engines.

Experienced technical experts support the plants producing these fuels as well as our customers, the motorists, who use our fuels.

We use our motorsport as a laboratory on wheels to continuously improve Sasol’s product offering.

lubricants

The fuels technology team carries out product development and technical support for a broad spectrum of lubricating oil and grease products that are used in the industrial and automotive markets. All Sasol lubricants, greases and speciality products are manufactured in world-class blending plants in compliance with international requirements. From extensive tests in the laboratory to the gruelling conditions of the race track, every effort is made to deliver high-performance products.

bitumen

South Africa is dependent on the quality and durability of its road network. At fuels technology, the performance of bitumen for road building products is being continually optimised. This involves an in-depth understanding of the impact of different crude oils on bitumen quality.
jet fuel

Until 1998, the only jet fuel that was approved for use was derived from crude oil. With the worldwide drive to find and qualify alternative jet fuel for commercial use, the need for a generic approval protocol and specification for alternative jet fuel was identified by the American Society of Testing and Materials (ASTM).

Semi-synthetic jet fuel:
A shortage of jet fuel (predicted in 1996) at what is now OR Tambo International Airport (ORTIA) led to Sasol’s discussions with the jet fuel specification authorities to gain approval for the commercial use of synthetic jet fuel.

Between 1996 and 1998, within the context of a very conservative jet fuel industry and led by the fuels technology team, Sasol carried out extensive laboratory and engine test work in South Africa and the USA to gain approval for the use of a 50% synthetic jet fuel component, in a crude-oil-derived jet fuel.

In April 1998, iso-paraffinic kerosene (IPK), produced by Sasol Synfuels in Secunda, was included in the UK specification and, in February 1999, the first batch of Sasol semi-synthetic jet fuel was certified at Natref.

In September 2009, a new ASTM specification D7566 (Aviation Turbine Fuel Containing Synthesised Hydrocarbons) was approved. Sasol’s CTL and GTL paraffinic kerosene were part of this process (three of the five jet fuels supplied for testing were supplied by Sasol).

Fully synthetic jet fuel:
Between 2001 and 2007, extensive laboratory and engine test work was carried out on blends of potential jet fuel streams at Synfuels and, in April 2008, the formal approval of Synfuels’ fully synthetic jet fuel was published. Shortly thereafter, Synfuels’ fully synthetic jet fuel was also included in the USA jet fuel specification.

Sasol’s synthetic jet fuel was thus approved for commercial use in all types of turbine aircraft internationally and, in 2010, we conducted the world’s first passenger flight from Johannesburg to Cape Town in a jet aircraft using fully synthetic fuel.

Fuels technology has both the expertise and the test facilities to develop sustainable jet fuel for the future.

did you know?

• Sasol was the first company to gain international approval for semi-synthetic jet fuel, the first to supply semi-synthetic jet fuel for commercial use, and the first to gain international approval for fully synthetic jet fuel from its synthetic fuels plant in Secunda.

• If you’ve flown out of Johannesburg’s ORTIA since 1999, it was most probably on a jet fuel blend containing coal-derived jet fuel.
fuel oils

Sasol uses two distinct processes: conventional crude-oil refining and our synthetic process (GTL or CTL) to produce various hydrocarbon products, including residual streams such as fuel oils that can be used as an energy source in industry.

A distinctive characteristic of Sasol’s synthetic fuel oils is that they contain virtually no sulphur and no heavy metals (such as vanadium, aluminium and nickel), which makes them an attractive, environmentally acceptable energy source.

Fuels technology has the expertise to develop fuel oils for specific applications and to provide technical support for these products in the market. A mobile laboratory and analyst are also available to conduct tests at customers’ sites.

our technical marketing role

paving the way for new products in new markets

Sasol was the first to bring commercial GTL diesel – produced using Sasol’s low-temperature hydrocarbon synthesis – to market on a large scale, and paved the way for the introduction of GTL fuels in international markets. This required absolute confidence in the performance and fit-for-purpose nature of the product.

GTL diesel has been thoroughly tested in neat form and in blends. It has been tested in the chemistry laboratory, in a variety of engines in test cells, and extensively in vehicles on the road. In a 330 000 km, three-year-long Sport Utility Vehicle (SUV) trial using GTL diesel, there were no fuel-related concerns and oil condition monitoring showed optimal performance.

Our thorough and detailed investigations have shown the superior properties of GTL diesel to the world in over 100 research publications and presentations.

Sasol has also led the way in gaining international approval for the only fully synthetic alternative jet fuel. Approval for semi-synthetic GTL jet fuel is now contained in the ASTM D7566 specification.

The GTL Challenge:

This 11 000 km trans-Africa expedition – from Sasolburg in South Africa to Doha in Qatar – took 46 days and used 1 400 litres of neat GTL diesel – “A symbolic passage of the technology across Africa, from where it was developed, to Qatar, where it has been taken to the next stage of commercial development…”

De Wildt Cheetah Programme:

We supplied two Mercedes 4x4s, used to support the De Wildt Cheetah Programme in South Africa, with neat GTL diesel. These vehicles were driven many thousands of kilometres in harsh terrain to prove the superior performance of GTL diesel.
Sasol’s university collaboration initiative is aimed at building competency in the fields of science and chemical engineering, and ensuring the long-term supply of highly trained postgraduates for Sasol and other South African industries or universities. Through this initiative, in which Sasol is investing R250 million over 10 years, universities are able to work with Sasol’s research resources, while Sasol is able to complement its own research efforts and capabilities by leveraging academic excellence to assist with the effective execution of R&D projects.

Eleven universities were selected for their specific expertise in various areas of research that are of interest to Sasol. Fuels technology also has a very successful collaboration with the University of Cape Town, focusing on liquid transport fuels research.

“Sasol is investing R250 million over 10 years in support of the university collaboration initiative.”

taking science to the children

Many children in rural areas have never seen or experienced a chemistry laboratory. The fuels technology team takes science to the children by visiting schools in the mobile laboratory and carrying out chemistry experiments in front of enthusiastic audiences.
Sasol’s history of technology innovation

1950:
- Sasol is formed to convert coal to liquid fuels and chemicals via Sasol HCS

1955:
- The world’s first CTL facility in Sasolburg comes on line (Sasol 1)
- The first flare from Sasol 1 indicates that Kellogg synthesis is working (by the end of that year cars could fill up with Sasol petrol)

1957:
- An ARGE catalyst manufacturing plant in Sasolburg is commissioned

1974:
- Sasol 2 in Secunda is announced

1979:
- Sasol 3 in Secunda is announced

1980:
- Sasol 2 construction is completed

1982:
- Sasol 3 comes on line
- After extensive research and development, Sasol SMX launches its unique Expan technology to world mining explosives
- High purity ethanol plant comes on stream in Sasolburg

1990:
- The first Sasol AS reactor comes on line

1992 - 1995:
- Fuels technology develops fuels and lubricants for the Jordan Formula 1 racing team, demonstrates the use of gaseous fuels as a transport fuel and starts paving the way for GTL products in the international market

1994:
- A twin trainhexene/pentene plant is commissioned

1995:
- The first Sasol AS reactor comes on line

1996:
- The first on-specification n-propanol product is produced in Secunda

1998:
- An anode coke plant comes on stream

1999:
- Syntoh reactors are replaced with Sasol AS reactors
- A new high purity ethanol plant comes on line in Secunda
- Octene Train 1 is commissioned
- The first semi-synthetic jet fuel is supplied to ORTIA

2000:
- Hexene Train 3 is commissioned

1980s:
- Introduction of lower sulphur diesel in South Africa

For a full list of acronyms used in this timeline, please refer to the glossary on Pg 24.
2001:  • The ninth Sasol AS reactor comes on stream  • Ethyl acetate plant start-up occurs

2002:  • SAFOL is commissioned  • Octene Train 2 plant is commissioned  • The Sasol SPD catalyst is commercialised (500 tpa)

2003:  • The Hydrodesulphurisation Unit is commissioned

2005:  • The TNPE plant is commissioned

2006:  • The SCC starts up  • A state-of-the-art, 32 400 bbl/day ORYX GTL plant in Qatar is commissioned

2008:  • Octene Train 3 plant is commissioned  • 3% benzene spec in petrol is achieved

2010:  • Sasol conducts the world’s first commercial flight using fully synthetic jet fuel

2011:  • Third cobalt-based GTL catalyst manufacturing facility commissioned in Sasolburg

2012:  • 38 000 bbl/day GTL facility envisaged for Uzbekistan  • 96 000 bbl/day GTL facility envisaged for USA, incorporating latest catalyst and reactor development technologies  • Front-end engineering and design (FEED) phase for an integrated GTL (with extraction of chemicals and production of base oil) and ethane cracker complex in the USA commences  • Sasol makes strategic investment in next-generation polymer lithium sulphur battery technology  • 140 MW natural gas engine power plant comes on line in Sasolburg  • Construction begins on 140 MW natural gas engine power plant in Mozambique  • First steam methane reformer commissioned in Secunda  • Four additional Advanced MkIV Sasol FBDB gasifiers commissioned in Secunda as part of Synfuels growth programme

2013:  • World’s first tetramerisation plant to be commissioned

2013/2014:  • Completion of Secunda growth programme

2014 & beyond:  • Accelerate GTL growth  • Grow chemicals based on technology, market or feedstock advantage  • New Energy  • Improve and grow existing asset base  • Grow upstream business  • Implement Clean Fuels 2 for South Africa (based on Euro 5 Fuel specification)

2011 & the future:  • New products and processes continue to be developed  • Continued reduction in Sasol’s environmental footprint

2007:  • Fuels technology supports the first diesel from ORYX GTL in the market

2008:  • The first fully-synthetic jet fuel is approved

2009:  • The Sasol FAC opens in Capricorn Park, Cape Town

2009:  • 140 MW natural gas engine power plant comes on line in Sasolburg

2008:  • The SCC starts up  • A state-of-the-art, 32 400 bbl/day ORYX GTL plant in Qatar is commissioned

2013:  • World’s first tetramerisation plant to be commissioned

2013/2014:  • Completion of Secunda growth programme

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2009:  • The Sasol FAC opens in Capricorn Park, Cape Town
### Glossary

- **bbd/day**: oil barrel per day
- **ASTM**: American Society of Testing and Materials
- **CTL**: coal-to-liquids
- **FBDB**: Fixed-bed dry-bottom
- **FEED**: Front-end engineering and design
- **GDP**: Gross Domestic Product
- **GTL**: gas-to-liquids
- **IPK**: iso-paraffinic kerosene
- **LPG**: liquefied petroleum gas
- **MW**: megawatts
- **ORTIA**: OR Tambo International Airport
- **R&D**: Research and Development
- **Sasol AFL**: Sasol Advanced Fuels Laboratory
- **Sasol AS**: Sasol Advanced Synthol
- **Sasol FAC**: Sasol Fuels Application Centre
- **Sasol HCS**: Sasol Hydrocarbon Synthesis
- **Sasol SPD**: Sasol Slurry Phase Distillate
- **Sasol SPW**: Sasol Slurry Phase Wax
- **SCC**: Superflex Catalytic Cracker
- **SMX**: Sasol Mining Explosives
- **SUV**: Sport Utility Vehicle
- **TNPE**: Tar Naphtha Phenolic Extraction
- **UCT**: University of Cape Town
- **UK**: United Kingdom
- **USA**: United States of America

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“Research is formalised curiosity. It is poking and prying with a purpose.”

Zora Neale Hurston (author)