

Turning waste into renewable energy



What is plasma?

Plasma-chemical processing is used in various industrial applications, especially waste treatment. The Plasma Technology Group of the South African Nuclear Energy Corporation (Necsa) specialises in high temperature and plasma chemistry and the development of advanced plasma systems and applications.

The Necsa technology

The Plasma Waste-to-Energy Project (PlasWEn) is a plasma gasification system through which waste materials, including municipal, tyre, medical, organic and nuclear waste, is converted into useable and versatile syngas, which is a mixture of N_2 , CO and H_2 . The syngas is then converted into various renewable energy sources, including electricity, methanol, methane, steam, heat and hydrocarbon fuels and associated products.

The need and gap

South African companies are operating in an economically strained environment and are therefore trying to reduce operational cost through projects such as waste disposal and energy savings. Much focus is being placed on the role that renewable energy sources can and should play in the country's energy mix.

The Necsa value proposition

The PlasWEn system is small, mobile and very easy to operate, with relatively low risk, and will allow small waste producers to convert their waste into a source of renewable energy. For larger applications, the PlasWEn system could be scaled to sizes up to 100 tons per day of waste. Since each system will be custom-made for the specific user, the technology is very flexible with respect to feedstock (raw material), capacity and the type of energy product produced. Once in operation, the PlasWEn system is self-sustaining with regard to electricity supply.

Benefits of PlasWEn

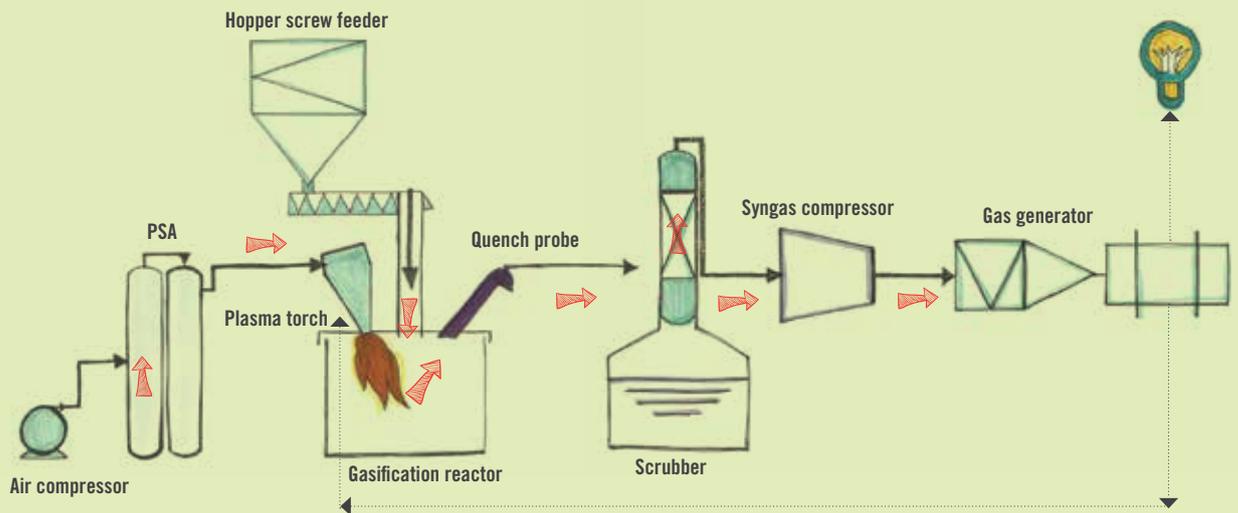
- Opportunity for renewable energy supply
- Promotes a smaller carbon footprint
- Solves various waste problems, including municipal, medical, nuclear and organic waste
- Reduces pressure on traditional electricity supply
- Reduced greenhouse gas emissions
- Leads to job creation
- Waste can be traded for energy security



South African Nuclear Energy
Corporation SOC Limited

Converting waste into energy – the PlasWEn process

1. After waste preparation, the waste is fed into the gasification reactor.
2. The waste is then converted into syngas in the high temperature (thermal) plasma reactor, using air as plasma gas. Depending on the waste, some reagents might be needed to optimise the efficiency of the conversion.
3. After gasification, the syngas is quickly cooled to room temperature before it is stripped of any particulate matter and some inorganic components in a water scrubber.
4. The syngas is then converted into energy products such as electricity.



Technology readiness level (TRL) and intellectual property protection

- TRL 4 – Laboratory Testing/Validation of Component(s)/Process(es)

Become a partner in this technology

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About Necsa

Nuclear technology plays a fundamental role in day-to-day life. Applications such as medical isotopes, used in cancer treatment, and fluorochemicals, used in petroleum manufacturing and in items such as LCD screens and cellphones, enhance more than 10 million lives every year.

Necsa is at the forefront of nuclear energy and radiation science research and development (R&D) on the African continent. NTP Radioisotopes SOC Ltd, a Necsa subsidiary, is one of the top three producers of nuclear medicine in the world, while Pelchem SOC Ltd, another Necsa subsidiary, is the only fluorochemical production, sales and distribution company in the southern hemisphere.

The Applied Chemistry Group at Necsa undertakes R&D of commercial or Nuclear Fuel Cycle (NFC) fluorination processes/products. The focus is on the synthesis of fluoro-organics using dry fluorinating agents and supporting technologies such as molecular spectroscopy and modelling, thermal analysis and chemometrics.