

TECH OFFER

Clean Syngas From Waste For Energy And Chemicals



KEY INFORMATION

TECHNOLOGY CATEGORY:

Chemicals - Bio

Energy - Biofuels & Biomass

Energy - Waste

Waste Management & Recycling - Waste

TECHNOLOGY READINESS LEVEL (TRL): **TRL4**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO174587**

OVERVIEW

Syngas is a valuable feedstock for energy generation and chemical synthesis. Currently, it can be produced by the gasification of locally available materials such as municipal solid waste and biomass. However, the prominent issue that arises during syngas utilisation is the high level of impurities that can damage the electricity generator and chemical reactors. In addition, current conventional syngas purification processes require quenching and wet-scrubbing stages, resulting in heat loss and increasing the costs for treating liquid waste before disposal.

The proposed technology is an innovative hot purification process that can effectively remove syngas impurities to acceptable levels for downstream applications. This solution is a technology process starting with a catalytic reforming apparatus that can remove tar in high particle-loading syngas from the gasifier at high temperatures. The upgraded syngas is then treated in a desulfurisation system with regenerative sorbents for high-temperature and continuous sulfur removal. This process allows

energy conservation and no liquid waste is generated.

The technology owner is seeking collaboration with industry partners for research collaboration or technology licensing.

TECHNOLOGY FEATURES & SPECIFICATIONS

The distinctive features of the system are high-temperature processes with up to 90% of tar and sulfur removal efficiency that minimise heat losses during syngas purification. Tar compounds are removed using a highly sulfur- and halogen-resistant nickel-based catalyst in an innovative fluidised bed reformer to treat dusty syngas. After chlorine and particle removal, the syngas is further purified in a desulfurisation system utilising regenerable ZnO-based sorbents with 10-40 times higher sulfur capacity than commercially available materials.

Syngas purification technologies are typically conducted at lower temperatures with cooling and scrubbing with water and oil-based liquids before either combustion for utilisation in power generation or conditioning for chemical synthesis. In this case, high-temperature purification process allows energy to be conserved, and all syngas treatments stages are liquid-free. Further, high-performance and regenerative materials are used to enable long-term syngas purification with limited waste generation.

POTENTIAL APPLICATIONS

This technology is applicable in the purification of syngas from solid waste (e.g., municipal solid waste, sewage sludge, food waste) and biomass (e.g., horticultural waste) gasification. The purified syngas can be utilised in gas engines and solid oxide fuel cells or as a feedstock for chemical synthesis. The purification system can treat syngas of various compositions and types of impurities, such as tar, chlorine and sulfur compounds.

UNIQUE VALUE PROPOSITION

The main advantages of this technology include a quenching- and liquid waste-free process with high performance and regenerable chemicals that enables continuous syngas purification that is cost effective, has low carbon footprint, and high energy efficiency.