

Success Stories of Advanced Biofuels for Transport

BEIJING SHOUGANG LANZATECH NEW ENERGY SCIENCE & TECHNOLOGY CO., LTD.: GAS FERMENTATION

Year of plant start-up:	2018
Location:	Caofeidian, Hebei Province, China
Technology:	Gas fermentation to ethanol
Plant capacity:	45k MTA (Metric Tons Annually)
Operational experience achieved:	Over 1 year of operation since start up; more than 28,000 tons of fuel ethanol produced
Total Capital Expenditure:	350 million RMB ¹
Principle feedstocks:	Steel mill off gas
Feedstock Capacity:	Design flowrate 59,000 kg/hr
Products/markets:	Transport fuel, Jet fuel feedstock (ATJ-SPK), biomass for animal feed and biogas for use at steel mill.
Technology Readiness Level (TRL):	TRL 8 – system complete and qualified

DESCRIPTION

LanzaTech's technology has been demonstrated at five industrial sites with over 850,000 hours of operation using steel mill waste gases (BlueScope Steel, NZ; Shougang Steel, CN; BaoSteel, CN; China Steel, TW) and approximately 30,000 hours using syngas from industrial MSW gasification (Sekisui, JPN). Operations were conducted as series of campaigns, each frequently over 2,000 hours in duration. In addition to customer-owned pilot/demonstration units, LanzaTech operates an R&D and piloting facility in Soperton, GA known as LanzaTech Freedom Pines Biorefinery.

With the success of its pilot and demo programs, LanzaTech started construction on the first generation commercial facility in China in 2016. On May 3, 2018, LanzaTech initiated operations at this facility with its Joint Venture partner, Shougang Group. The 45,000-ton ethanol/annum facility located at the Jingtang Steel Mill outside Beijing is currently producing ethanol and optimization efforts are underway.

¹ 1 RMB (Chinese Yuan) = 0.13 EUR



LanzaTech Commercial Facility with Shougang, China

Stakeholders involved:	Joint Venture Partners: LanzaTech; Shougang Group, Tangmin; Site: Jingtang Steel Mill, Financing: Shougang Group, Shougang Funds; Tangmin Group; Shanghai Dehui
Financing Support:	The project has received multiple grants from municipal, provincial governments for carbon reduction and circular economy.
Contribution to Sustainable Development Goals:	<p>Through utilization of waste emissions this project enables local production of low carbon fuels, that displace need for fresh fossil inputs; it creates new green employment at the steel mill and by avoiding combustion of gases at site, the processes reduces criteria pollutants which would impact local communities.</p> <p>Using wastes and residues in this way, promotes sustainable consumption patterns and provides a new avenue for low carbon fuels.</p> <p>With this in mind, the project contributes to the following SDGs: GHG emission reduction (SDG13), sustainable consumption and production patterns (SDG 12), reliable, sustainable and modern energy for all (SDG7), regional development (SDG8) and promotion of sustainable industrialization (SDG9).</p>
Contribution to GHG emission reduction in transports:	<p>The facility in China is a first generation commercial facility converting industrial off gases to ethanol.</p> <p>This project is a landmark facility that will show European Steel mills the opportunities of carbon recycling, through production of low carbon fuel as ethanol or jet fuel, supporting decarbonisation goals.</p> <p>Optimization of the technology will be implemented at LanzaTech's Steeanol project in Belgium with ArcelorMittal. This will be the first project globally to demonstrate utilization of blast furnace (BF) gas in a live fermentation. This is particularly important as more than 80% of the carbon rich gases available at steel mills is BF gas, highlighting the first commercial application of using this gas stream globally. This project will have the GHG reduction potential of taking 80,000 cars off the road each year.</p>
Employment:	The plant employs ~ 130 engineers & operators.
Replicability and scale-up potential:	A further three plants are in the pipeline in the USA, South Africa, Europe and India.
Success factors:	It is important to have a supportive legislative and financial landscape for successful projects to replicate. Technology neutral policy and broad decarbonisation targets will support deployment of new facilities, as it will create

a stable marketplace and create confidence for investors to finance more projects.

Constraints:

Technology neutral policy is not global today, but the language is changing to include new technologies such as gas fermentation of waste emissions. There are some countries today, where there isn't a level playing field for incentives (tax credits or mandates). In such cases, where new approaches such as recycled carbon fuels are ineligible, this is a constraint.

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