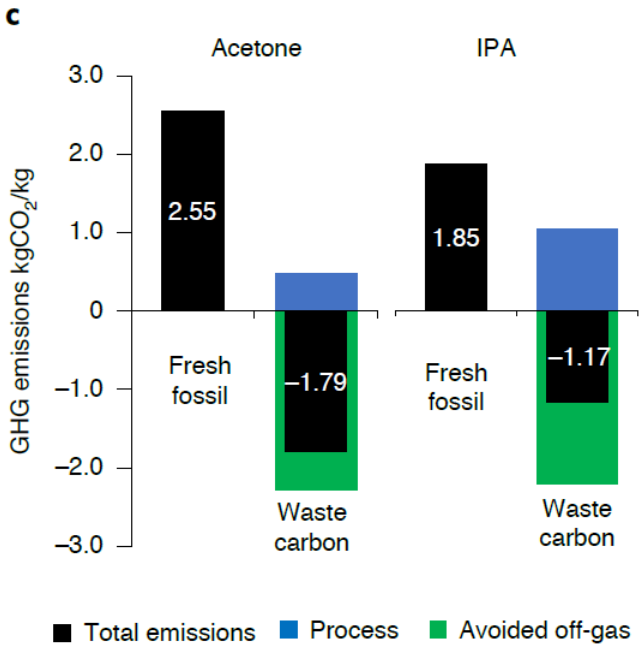
LCA for Acetone and IPA peer reviewed and published in Nature Biotechnology

LCA Results:

LCA was used to compare the GHG emissions of acetone and IPA produced using LanzaTech's gas fermentation technology with fresh fossil-based production via propene and the cumene process (Fig. c). Chemical and energy inputs and product yield for LanzaTech's technology, which uses steel mill off-gas feedstock with utilities (e.g. electricity, steam), were determined using pilot-scale data coupled with LanzaTech's commercial-scale design. The GHG emissions of acetone and IPA produced by the LanzaTech process (Fig. c) are -1.78 $kgCO_2e/kg$ acetone and -1.17 $kgCO_2e/kg$ IPA, respectively, and provide substantial emission savings of >160% over their fossil-derived counterparts. The LanzaTech process provides an environmentally beneficial pathway for commercial-scale production of these chemicals which currently are only produced at scale from fossil sources.



LCA Methodology:

The scope of the LCA is cradle to gate meaning end-of-life is excluded. Carbon in the steel mill off-gas would end up in the atmosphere without the LanzaTech process so a credit is taken for carbon sequestered in the acetone (2.27 $kgCO_2e/kg$ acetone) and IPA (2.20 $kgCO_2e/kg$ IPA). The steel mill off-gas carries no burden of upstream steel mill emissions as the off-gas is an unintended consequence of the steel making process. Therefore, the GHG emissions of steel production do not change with the addition of the LanzaTech process. The LCA treats the biogas and LanzaTech microbial protein co-products using system expansion by taking credits for the former replacing natural gas and the latter replacing soybean meal based on protein content. Inputs that contributed <5% of the total GHG emissions were excluded from the analysis. Emission factors were taken directly from the GREET 1 model (https://greet.es.anl.gov/) and ecoinvent database[21].

The journal article can be found at https://www.nature.com/articles/s41587-021-01195-w.