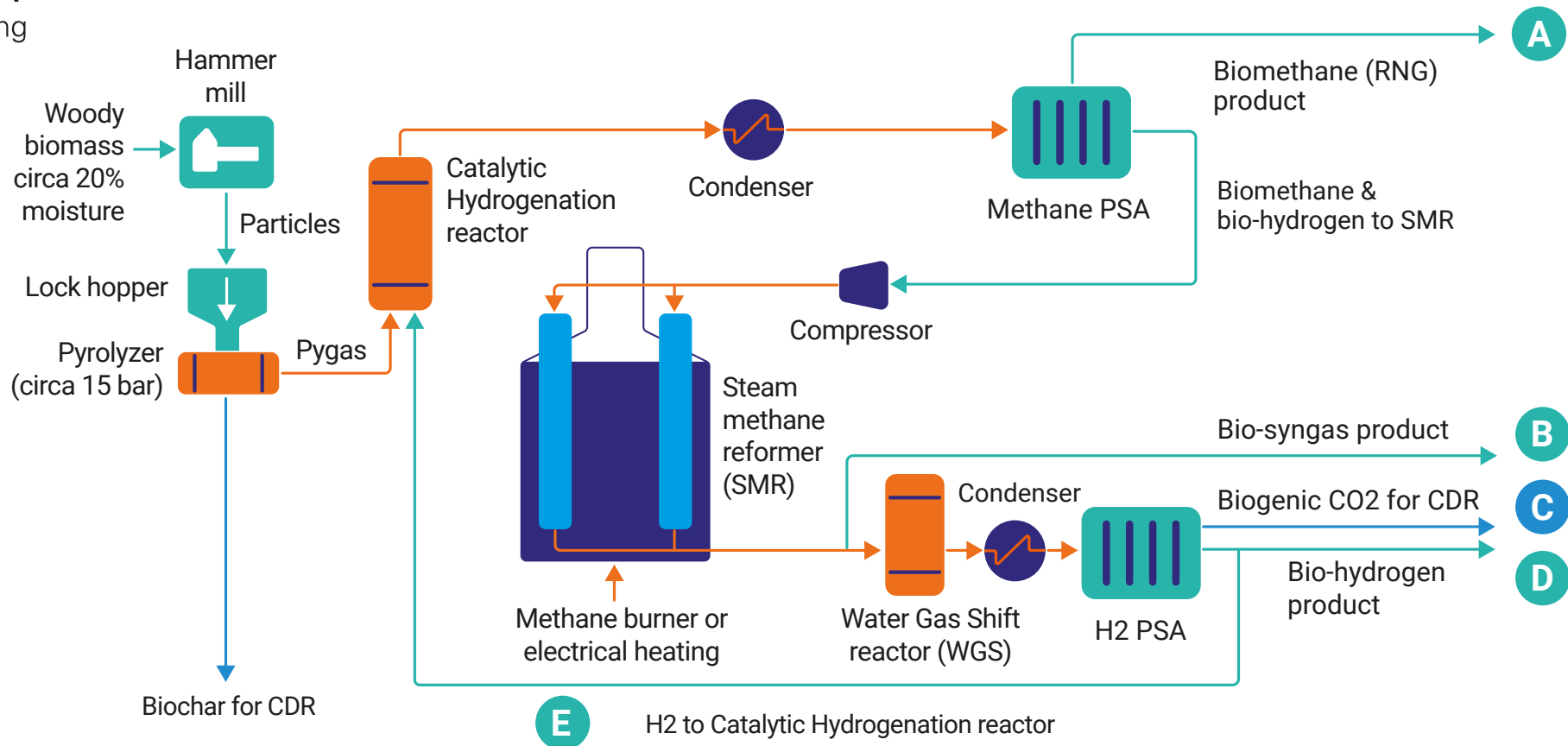


G4 PyroCatalytic Hydrogenation (PCH) process for biomethane, bio-hydrogen, biogenic CO₂ and biochar production from woody biomass



1. Residual forestry waste (woody biomass) is milled to circa 5mm particles to enable thorough conversion in the pyrolyzer chamber
2. The ideal Catalytic Hydrogenation reaction is: $4C_6H_9O_4 + 28H_2 \rightarrow 15CH_4 + 16H_2O + 9C$
3. The Catalytic Hydrogenation reactor uses a de-risked, proven commercial catalysts and is a proprietary design with features to...
 - Manage heat distribution from the exothermic hydrogenation reaction to prevent zonal overheating
 - Manage the heat profile to prevent tars condensation in cooler zones
 - Ensure mixing for complete product conversion of pygas to biomethane
4. Circa 20% moisture in the biomass feed is beneficial and requires no additional drying beyond covered storage
5. Biochar is produced with circa 80% carbon content
6. Minerals (ash) that are contained in the woody biomass leave the process with the biochar
7. Methane from the Catalytic Hydrogenation reactor is converted to hydrogen in the SMR

8. Some hydrogen must be recycled to the Catalytic Hydrogenation reactor to ensure sufficient hydrogen is available to convert carbon in the biomass to biomethane
 - Biogenic CO₂ (C) is always produced, due to the need to produce hydrogen for the Catalytic Hydrogenation reactor
9. The process can be designed, or adjusted during operation, to favour different products...
 - If bio-syngas (B) or bio-hydrogen (D) are the desired products, the total stream from the Catalytic Hydrogenation reactor can be fed to the SMR
 - If bio-methane (A) is the desired product, the feed gases to the SMR can be minimised to produce only the amount of hydrogen required for the Catalytic Hydrogenation reactor
 - The ratio of bio-hydrogen plus biogenic CO₂ (C + D) to bio-syngas (B) can be adjusted according to the preferred product mix