Blue Hydrogen Production and Blending

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WHAT'S THE ISSUE?

Canadians are amongst the world's worst carbon emitters, with housing and transportation as the dominating sectors. The production of blue hydrogen as an energy source poses as a method to significantly reduce carbon dioxide emissions while maintaining a substantial energy capacity. This aligns with the country’s Net Zero Emissions Accountability Act.

As the nation's largest natural gas producer and eighth largest globally, Alberta holds the potential to be an international leader in blue hydrogen production and exportation. Additionally, the Alberta Carbon Trunk Line (ACTL) is the largest carbon capture and storage project in the world, further solidifying blue hydrogen’s viability for success in the province.

Feasibility

Innovative method for reducing emissions while cornering the hydrogen market.

Alberta’s NG infrastructure is already rated for a 20% by volume of hydrogen blend.

Stimulate healthy economic growth & provincial employment opportunities.

WHY HYDROGEN BLENDING?

1. SMR Reactor
   - Multi-tubular PBR
   - Operating at 923°C & 25 bar
   - Simple pass conversion of 89.9%
   - Nickel catalyst within tubes
   - Heated length of 1m

2. Water Gas Shifter
   - Low-temperature WGS process
   - Multi-tubular PBR
   - Operating at 200°C & 29 bar
   - 98% conversion of CO
   - Packed with CuO/ZnO/Al2O3
   - 101 tubes, with ID 0.11m & 1m in length

3. CO2 Separation Unit
   - Main Reaction:
     \[ \text{CO}_2 + \text{H}_2 \text{O} \leftrightarrow \text{H}_2 \text{O} + \text{CO}_2 \]
   - Absorption tower with 20 stages, utilizing a blended MDEA/MEA solvent (ratio of 30/20).
   - Subsequent 15 stage stripping tower to regenerate amine solvent.

4. Pressure Swing Adsorption Units
   - Four PBR, operating at 90°C & 25 bar
   - Adsorbent bed material: component of Zircar 10A
   - H2 purity and recovery rate at 99%
   - Length of 10m and internal diameter of 2m
   - Can be purged when saturated

5. CO2 Compression Unit
   - A 4-stage compressor will be equipped to liquefy and ensure the carbon dioxide stream meets the required conditions of the ACL.
   - The system also consists of intercoolers to remove the heat of compression.

How to ACTL for Sequestration

Process Overview

- 1. Steam Methane Reforming Reactor
- 2. Water Gas Shifter
- 3. CO2 Separation Unit
- 4. Pressure Swing Adsorption Columns
- 5. CO2 Compression Unit
- Blended Natural Gas to Households

Environmental & Social Breakdown

- 16.694 tonnes CO2 captured per annum
- Blending 20% hydrogen with natural gas reduces consumer emissions
- Action plan to educate the public on hydrogen blending

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