

Waste To Methanol Project

WEALTHANOL

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Introduction

Elevator Pitch:

What if waste wasn't a problem but a solution? Our project transforms inorganic waste into methanol, reducing emissions, creating sustainable profits. This is the future we're building.

Problem Statement:

Inorganic waste causes significant environmental challenges due to inefficient disposal methods. Our project aims to address this issue by designing a sustainable plant that converts inorganic waste into methanol while minimizing harmful emissions and optimizing resource utilization.

Objective of The Project

To design a sustainable plant that converts inorganic waste into methanol, reducing emissions, minimizing environmental impact, and creating a valuable resource for a cleaner, profitable future.

Constraints and Specifications

Constraints:

- Total cost is less than 6000 SR
- Temperature is greater than 300C
- Complexity of construction to meet the specifications for the test
- Flammability of the methanol product
- Meeting the specifications to test the prototype safely

Specifications:

- Prototype weight ≤ 60 Kg
- Reactor volume < 50 cm³
- Prototype area < 1 m²
- H₂S concentration from the purification unit is less than 45ppm
- Video shows a working part of the prototype

Validation

The prototype is divided into three parts furnace with purification unit, Reactor and distillation column. Due to safety concerns and the unavailability of the required equipment the reactor has been verified by ASPEN HYSYS the First and the Third parts are verified by testing as shown in the Video clip.

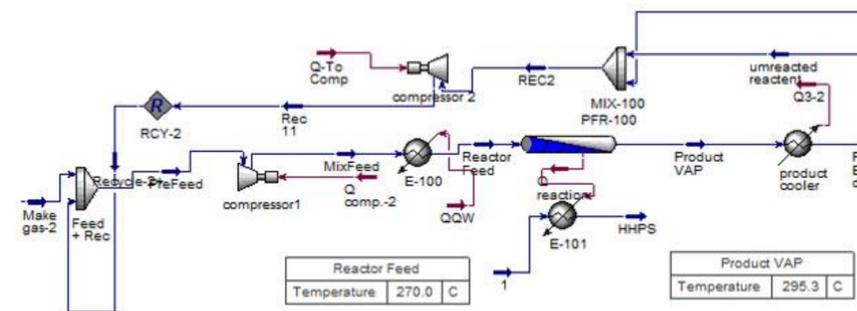


Figure (1): Reactor Simulation

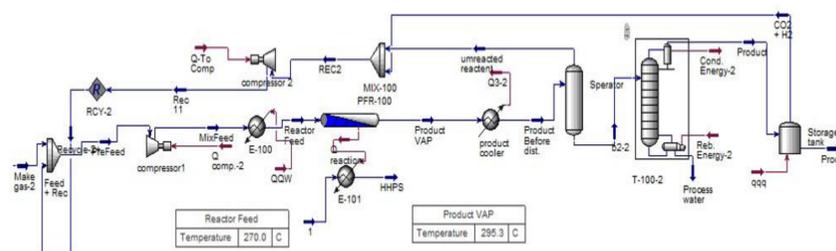


Figure (2): The Methanol Synthesis Simulation

Plug Flow Reactor: PFR-100 - PFR

Design	Reactions	Rating	Worksheet	Performance	Dynamics
Rating					
Sizing					
Nozzles					
Tube Dimensions					
Total Volume		3.817e-005 m ³			
Length		0.1500 m			
Diameter		6.000e-003 m			
Number of Tubes		9			
Wall Thickness		5.000e-003 m			

Figure (3): ASPEN HYSYS Reactor Sizing

Drawings



Figure (4): The SolidWorks Pprototype Design



Figure (5): The SolidWorks Reactor Shell Design

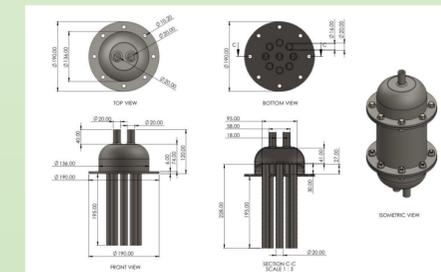


Figure (6): The SolidWorks Reactor Tubes Design

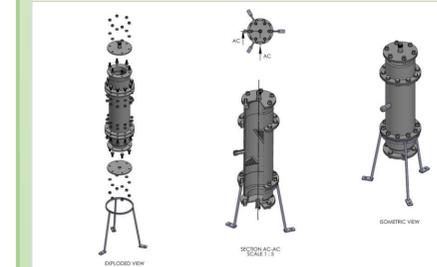


Figure (7): Multiple Views of The Distillation Column

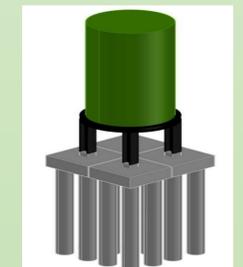


Figure (8): Structural & Foundation Design

Conclusion and Recommendations

Conclusion:

The process has a lot of modification potential if it were to be implemented, which will increase the profit in real life. For a prototype, the best parameters were chosen, and the main goal has been achieved with the minimum cost, meeting all the needs.

Recommendations:

In a real plant situation, a heat withdrawal from the reactor should be added to maintain the temperature inside the reactor.