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co2-co-processor-by-infinity-turbine

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Infinity Turbine LLC

Liquid CO2 and Water to CO Supercritical Electrolyzer Processor by Infinity Turbine

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Discover Infinity Turbine LLC's groundbreaking liquid CO_2 electrolysis technology, converting liquid CO_2 into high-value carbon monoxide (CO) with 95% efficiency. Revolutionizing carbon utilization, this innovative system offers immense industrial and environmental benefits, enabling sustainable solutions for synthetic fuels, methanol, and more. Licensing opportunities now available worldwide.

PDF Version of the webpage (first pages)

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Infinity Turbine LLC Introduces Breakthrough Liquid CO_2 Electrolysis System for Sustainable Carbon Utilization

Infinity Turbine LLC, a leader in innovative energy and sustainability solutions, is excited to announce a breakthrough in liquid CO_2 electrolysis technology, offering unparalleled opportunities for both small-scale laboratories and large-scale industrial operations. This cutting-edge system converts liquid carbon dioxide (CO_2) into high-value carbon monoxide (CO), a critical industrial chemical, while delivering substantial revenue potential and environmental benefits. Infinity Turbine LLC is now offering this transformative technology for licensing opportunities worldwide.

Revolutionizing Carbon Utilization
Infinity Turbine's liquid CO_2 electrolysis system addresses two global challenges: carbon capture and industrial sustainability. The system uses electricity and water to convert liquid CO_2 into carbon monoxide (CO) with 95% efficiency. Carbon monoxide, valued at $0.10 per gram, is a versatile chemical feedstock used in the production of synthetic fuels, methanol, acetic acid, and metal refining.

Tailored Solutions for Every Scale
Infinity Turbine's system is designed for flexibility, making it suitable for a variety of applications:

Small-Scale System: 1 Pound per Hour
• Applications: Laboratories, pilot testing, and R&D.
• Revenue Potential:
• Hourly Net Income: $68.74
• Monthly Net Income: $49,482.48 (24/7 operation)
• Yearly Net Income: $601,189.44
• Affordable Inputs: Operating costs include $1 per pound of liquid CO_2, $0.10 per gallon of water, and $0.10 per kWh of electricity, making this system ideal for researchers and small businesses.

Large-Scale System: 100 Pounds per Hour
• Applications: Industrial-scale carbon utilization for manufacturing and energy sectors.
• Revenue Potential:
• Hourly Net Income: $6,873.50
• Monthly Net Income: $4,956,120.00 (24/7 operation)
• Yearly Net Income: $60,897,960.00
• Scalability: Designed to handle high volumes with minimal environmental impact, enabling large-scale businesses to integrate this technology seamlessly.

Why Choose Infinity Turbine's Liquid CO_2 Electrolysis System?
1. Profitability: High-value CO output ensures rapid ROI.
2. Sustainability: Converts greenhouse gas emissions into a critical industrial resource.
3. Scalability: Systems available for small labs or full-scale industrial use.
4. Low Operating Costs: Affordable inputs ensure profitability across all scales.

Licensing Opportunities
Infinity Turbine LLC is now seeking global licensing partners for its liquid CO_2 electrolysis technology. This licensing opportunity provides companies with the tools and knowledge to implement a fully operational electrolysis system tailored to their specific needs.

Licensing includes:
• Detailed system designs and operating manuals.

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Why Invest in Liquid CO_2 Electrolysis?

1. Scalability:
• Systems can be tailored for small-scale R&D or large-scale industrial production.
2. Profitability:
• Both small and large systems generate substantial revenue.
• Even with the modest input costs of liquid CO_2, water, and electricity, net income remains high.
3. Environmental Impact:
• Converts CO_2, a greenhouse gas, into valuable industrial chemicals.
4. Versatility:
• CO is essential for various industries, including energy, chemicals, and manufacturing.

Liquid CO_2 electrolysis is a highly profitable and sustainable technology. A small-scale lab system can generate over $600,000 annually, while a large-scale industrial setup can bring in over $60 million per year in net revenue. With low input costs—just $1 per pound of liquid CO_2, $0.10 per gallon of water, and $0.10 per kWh for electricity—this technology offers a pathway to greener, more profitable industrial processes.

Whether you're looking to launch a pilot project or scale up for industrial production, liquid CO_2 electrolysis is a powerful opportunity to align sustainability with economic growth.

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Maximizing Revenue from Liquid CO_2 Electrolysis: The Power of Carbon Monoxide Production

In the race to create sustainable solutions for carbon emissions and generate valuable byproducts, liquid CO_2 electrolysis is emerging as a transformative technology. Among its many potential outputs, carbon monoxide (CO) stands out as the most lucrative byproduct, offering high market value and a wide range of industrial applications. Let's explore how optimizing a system for CO production can unlock significant revenue streams and pave the way for greener industrial processes.

Why Carbon Monoxide?
Carbon monoxide is a critical component in various industries, with applications in:
• Syngas Production: A precursor to synthetic fuels and chemicals.
• Chemical Manufacturing: Used in producing methanol, acetic acid, and other industrial chemicals.
• Metal Refining: Acts as a reducing agent in extracting metals from their ores.

With a market value of approximately $0.10 per gram, CO is among the most valuable products that can be derived from liquid CO_2 electrolysis.

System Design for Optimized CO Production
To maximize the yield of carbon monoxide, the system must be precisely configured to ensure high efficiency and consistent output.

Key Components:
1. Liquid CO_2 Feedstock:
• 1 liter of liquid CO_2 contains approximately 1.1 kg (1100 g).
• At a rate of 100 liters per hour, the system processes 110 kg of CO_2 per hour.

2. Electrochemical Setup:
• Cathode: A silver or gold catalyst, optimized for the reduction of CO_2 to CO.
• Anode: Water oxidation to produce oxygen gas as a secondary byproduct.

3. Primary Reaction:
• The electrolysis of CO_2 produces carbon monoxide

4. Efficiency:
• High-quality catalysts ensure 95% efficiency in converting CO_2 to CO.

Revenue Potential from CO Production
With the system operating at 100 liters of liquid CO_2 per hour, the revenue from CO production can be calculated as follows:

Step 1: CO_2 Input and Conversion
• Moles of CO_2 per liter:
• 1 liter of liquid CO_2 = 1.1 kg.
• Molecular weight of CO_2 = 44 g/mol.

Step 2: CO Production
• Mass of CO Produced:
• 1 mole of CO_2 produces 1 mole of CO.

Electrolysis of CO2

The electrolysis process typically directs CO_2 along specific reaction pathways depending on the electrochemical setup, catalysts, and reaction conditions.

1. Key Limitation: One Pathway at a Time
• Electrolysis Reactions are Selective:
• For example, if the reaction is optimized to produce carbon monoxide (CO), then most or all of the CO_2 will be converted into CO rather than other products like methane or formic acid.
• Similarly, a setup designed to produce formic acid (HCOOH) would focus on that pathway, making other byproducts negligible.
• Catalysts Play a Role:
• Specific catalysts (e.g., silver for CO, copper for methane) favor certain reactions, making it difficult to generate multiple products at significant yields in the same process.

2. Primary vs. Secondary Byproducts
• Some secondary byproducts can be produced alongside the primary product. For example:
• Hydrogen (H_2): If water is used as the electrolyte, hydrogen gas is often produced at the cathode as a secondary product.
• Oxygen (O_2): Generated at the anode when water is oxidized.
• These gases are generally complementary to the main CO_2 reduction pathway but will not significantly affect the yield of carbon-based products.

3. Efficiency and Allocation
• Mass Conservation: The total carbon from the CO_2 can only form one main product at a time. For instance:
• If all 10.31 moles of CO_2 (from 1 pound of liquid CO_2) are converted into CO, there is no remaining CO_2 to produce formic acid or methane.
• Similarly, if methane (CH_4) is produced, all the carbon from the CO_2 is consumed in that reaction.

4. Practical Scenario
To produce multiple products from 1 pound of liquid CO_2, the process would involve:
1. Sequential Electrolysis: Switching the reaction conditions to produce different products in stages.
2. Parallel Systems: Dividing the CO_2 and running separate electrolysis units optimized for each product.

For example:
• Half the CO_2 could be reduced to CO, while the other half is converted to formic acid in a separate system.
• Alternatively, hydrogen and oxygen gases could always be collected as secondary byproducts during any of these processes.

Summary: Can All Byproducts Be Produced Simultaneously?
No, not all byproducts can be produced simultaneously from the same 1 pound (or 1 liter) of liquid CO_2. The system must be optimized for specific primary products, and the efficiency of producing other byproducts (like H_2 or O_2) will depend on the setup.

If your goal is to maximize the value of the CO_2, designing the system to target high-value products (e.g., carbon monoxide or formic acid) and collecting secondary byproducts like hydrogen and oxygen is the most practical approach.

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Unlocking the Future: Electrolysis of Liquid CO_2 for Sustainable Chemical and Fuel Production

As the world grapples with the twin challenges of reducing carbon emissions and transitioning to sustainable energy sources, innovative solutions are emerging at the intersection of chemistry and energy. Among these, the electrolysis of liquid carbon dioxide (CO_2) is gaining attention as a groundbreaking technology that not only addresses carbon capture but also transforms CO_2 into valuable fuels, chemicals, and materials.

Let's explore how electrolysis of liquid CO_2 works, its potential products, and why it could revolutionize industries ranging from energy to manufacturing.

What Is Liquid CO_2 Electrolysis?
Electrolysis is a process that uses an electric current to split molecules into their constituent parts. In the case of liquid CO_2, this means breaking down the CO_2 molecule (one carbon atom and two oxygen atoms) into various byproducts, depending on the reaction conditions, catalysts, and electrolytes.

When liquid CO_2 is subjected to electrolysis, it undergoes reduction at the cathode, producing carbon-based compounds, while oxidation at the anode generates complementary byproducts. The process can be fine-tuned to create a wide array of products, making it a versatile tool for sustainable manufacturing.

How It Works
The electrolysis of liquid CO_2 typically requires:
1. Liquid CO_2: Maintained under high pressure and low temperature to keep it in liquid form.
2. Electrodes:
• Cathode: Where CO_2 is reduced into carbon-based compounds.
• Anode: Where water or other oxidizable substances produce complementary byproducts.
3. Catalysts: Materials like copper, silver, or indium to guide the reaction toward specific products.
4. Electrolytes: Conductive solutions that support ion movement and enable the reaction.

Products of Liquid CO_2 Electrolysis
The byproducts of liquid CO_2 electrolysis are versatile and valuable, depending on the process configuration. Here are some of the key outputs:

1. Carbon Monoxide (CO)
• How It Forms: Reduction of CO_2 at the cathode.

• Applications:
• Used in syngas production for creating synthetic fuels.
• Precursor for methanol synthesis and other industrial chemicals.

2. Formic Acid (HCOOH)
• How It Forms: Direct reduction of CO_2.
• Applications:
• Preservative in food and animal feed.
• Hydrogen storage material in fuel cells.

3. Methane (CH_4)
• How It Forms: Under specific catalysts, CO_2 can be fully reduced to methane.
• Applications:

Electrolysis of Liquid CO2

Electrolysis of liquid CO_2 (carbon dioxide) involves applying an electrical current to split CO_2 into its constituent components or transform it into other compounds. The specific byproducts depend on the electrolyte, catalysts, and conditions of the reaction (e.g., temperature, pressure, and applied voltage). Here's an overview:

1. General Reaction for CO_2 Electrolysis
The electrolysis of CO_2 typically involves the reduction of CO_2 at the cathode and the oxidation of water or other components at the anode.

Cathode (CO_2 Reduction):
• CO_2 molecules are reduced to form products like:
• Carbon monoxide (CO): A valuable feedstock for fuels and chemicals.
• Formic acid (HCOOH): Used in food preservatives and chemicals.
• Methanol (CH_3OH): A renewable fuel and chemical feedstock.
• Hydrocarbons (e.g., CH_4, C_2H_6): Produced under specific conditions.

Anode (Oxidation Reaction):
• If water is present, the anode produces:
• Oxygen gas (O_2): By oxidizing water molecules.
• Protons (H^+): Which can participate in reactions at the cathode.

2. Potential Byproducts
The byproducts depend on the electrolysis configuration, catalysts, and the phase of CO_2 (liquid or supercritical):

A. In the Presence of Water
If water is used as part of the electrolyte:
• Cathode Products:
• Carbon monoxide (CO).
• Formic acid (HCOOH) or formate.
• Methane (CH_4) or ethylene (C_2H_4), depending on catalysts.
• Hydrogen (H_2) from water reduction.
• Anode Products:
• Oxygen (O_2) from water oxidation.

B. Without Water
If no water is present and liquid CO_2 is the only reactant:
• Cathode Products:
• Reduced carbon compounds such as carbon monoxide (CO), formic acid, or carbon black (solid carbon).
• Anode Products:
• Likely no reaction unless a secondary oxidizable material is introduced.

C. Use of Specific Catalysts
• Catalysts such as copper, silver, or nickel can steer the reaction toward specific products:
• Copper: Tends to produce hydrocarbons (e.g., methane, ethylene).
• Silver/Gold: Efficient for producing carbon monoxide.
• Tin or Indium: Favor the formation of formic acid.