

M C P SERVER

NO CODE

CLOUD HOSTED

CO₂ Flood Design Tool for EOR.

Calculate injection strategies and recovery estimates through your AI agent.

CO₂ Flood Design Tool gives your AI client the engineering math needed for Carbon Dioxide Enhanced Oil Recovery. It handles the heavy lifting for reservoir modeling, from calculating Minimum Miscibility Pressure to predicting oil yields and assessing equipment corrosion risks based on specific reservoir conditions.

A+ Quality Score 100/100

eor

co2

reservoir-engineering

carbon-capture

oil-recovery



The connectivity layer between AI and the world's software.

Vinkius sits between AI and every application. All communication passes through Vinkius Cloud via the Model Context Protocol (MCP) — with governance, observability, and security at every layer.

Your AI Connections Run Through Vinkius Cloud

The world's largest
managed MCP catalog

Vinkius is the connectivity layer where AI connects to the software your business already runs. We handle the hosting, the security, the credentials, the uptime — you get agents that actually do things.

We operate the world's largest managed MCP catalog. Major SaaS platforms, CRMs, databases, and cloud providers — running, monitored, production-ready. This MCP server is hosted and maintained by the Vinkius Cloud for AI Agents.

The agent doesn't manage credentials, doesn't manage uptime, doesn't manage security. Vinkius does.

— Architecture principle

Four Pillars of the Vinkius Runtime

01 — Security by design

Credentials stay encrypted at rest via AES-256. The AI agent never touches raw keys — they're injected into a sandboxed V8 isolate at runtime. Actions are logged, and connections have an emergency kill switch.

03 — Deterministic observability

Eight immutable metrics per endpoint: request volume, p95 latency, error rate, active connections, cost attribution. A live payload feed logs every tool call with mutation detection.

02 — Built on MCP Fusion

This MCP server was built with **MCP Fusion**, the open-source framework (Apache 2.0) that powers the entire Vinkius catalog. Schema-as-firewall strips undeclared fields, compiled PII redaction runs at zero overhead, and cryptographic lockfiles produce git-diffable audit trails.

04 — Autonomous operations

Servers are deployed, monitored, and patched autonomously. New capabilities and security patches ship weekly. Zero-downtime deployments ensure continuous availability across all managed MCP servers.

AES-256

Encryption at rest

Ed25519

PKI vault signatures

24h TTL

Ephemeral session keys

V8 Isolate

Sandboxed execution

One Token. Instant Access.

Every MCP server on Vinkius is accessed through a **Connection Token**. Tokens are generated in the cloud dashboard and produce a unique MCP endpoint URL. Paste this URL into any MCP-compatible client — no SDK required.

A single token can serve **multiple AI clients simultaneously**, or you can issue separate tokens per client for granular access control. Each token tracks its own request count, last activity timestamp, and can be individually enabled or revoked.

MCP ENDPOINT`https://edge.vinkius.com/{token}/mcp`

Claude



Cursor



VS Code



Windsurf



Grok



Gemini

Security Is the Architecture

Security in Vinkius is not a feature — it's the foundation of the runtime. The gateway enforces multiple independent protection layers between AI agents and third-party APIs.

01 — Ed25519 PKI Vault

Every workspace has an Ed25519 Master Key. Session keys are generated ephemerally (24h TTL) and signed by the Master Key. Credentials never leave the vault boundary.

02 — V8 Isolate Sandboxing

Tool code runs inside isolated-vm V8 isolates with 64 MB memory caps and per-request timeouts. No filesystem access, no network access except through the SSRF-guarded fetch bridge.

03 — SSRF Guard

All outbound HTTP requests are DNS-resolved and validated before execution. Private IP ranges (10.x, 172.16-31.x, 192.168.x, AWS metadata 169.254.x) are blocked at the network layer.

05 — Cryptographic Audit Trail

Every request is signed into a SHA-256 hash chain with Ed25519 signatures. Events form a tamper-proof, SIEM-exportable forensic record.

04 — DLP & PII Redaction

A ResponseGuard pipeline intercepts every tool response. Configurable redaction patterns strip sensitive fields (emails, SSNs, card numbers) before data reaches the AI agent.

06 — Honeypot Trap System

Phantom credentials are injected into isolated environments. If a honeypot is used outside Vinkius infrastructure, the server is quarantined instantly.

Emergency Kill Switch

EU AI Act Art. 14(1)
Compliant

The kill switch is an **emergency halt** mechanism — not a simple toggle. When triggered, it executes three actions atomically:

01 — Server deactivated

The MCP server is immediately taken offline across the entire cluster.

02 — All tokens revoked

Every connection token is invalidated. Total lockout — reconnection blocked until new tokens are issued.

03 — WebSocket connections killed

Active connections terminated via Redis pubsub broadcast. Propagates to every runtime node in the cluster.

Full Visibility. Zero Guesswork.

The Vinkius cloud dashboard includes a full MCP Governance suite — real-time analytics and security controls for production AI operations.

Control Plane

KPI dashboard with request volume, latency, success rate, token consumption, and AI-generated operational briefings.

FinOps

Cost tracking per tool, payload compression savings, budget optimization signals, and consumption trends.

Firewall & DLP

PII redaction activity, sensitive data protection counters, and security event timeline.

Agent Activity

Which AI clients are connecting, how often, and what they're doing — real-time session tracking.

Tool Health

Slowest and most error-prone tools, with actionable root-cause insights and performance baselines.

Incident Log

Error trends, failure rates, status-code breakdowns, and forensic audit trail access.

Get started at cloud.vinkius.com — connect your AI agent in under 60 seconds.

CO₂ Flood Design Tool MCP

4 tools available

Cloud-hosted on Vinkius

You can use this MCP to run complex CO₂ Enhanced Oil Recovery (EOR) calculations directly within your AI client. Instead of manually calculating pressure requirements or WAG ratios, you tell your agent the reservoir parameters and let it handle the math. It's built for reservoir engineers who need to quickly iterate on injection strategies or check if a specific CO₂ source will eat through their existing infrastructure. You can model how much oil you'll actually get back and how much CO₂ you'll need to recycle to keep the project running. It turns your AI into a specialized reservoir engineering assistant that understands the relationship between pressure, temperature, and fluid chemistry.

Core Capabilities

01 — Miscibility Modeling

Your agent uses this to find the pressure needed for effective CO₂ displacement.

02 — Injection Optimization

The AI calculates optimal WAG ratios and injection rates for the reservoir.

03 — Yield Prediction

Your agent estimates total oil recovery and the necessary CO₂ recycling volumes.

04 — Integrity Assessment

The tool evaluates how CO₂ and water will impact your equipment's lifespan.

One Click on Vinkius — From Prompt to Execution

Available at vinkius.com/en/ai-agent-connect/co2-flood-design-tool — connect your AI agent in three steps.

- 01 Connect your AI client to the Vinkius-hosted MCP.
- 02 Provide reservoir data like pressure, temperature, or oil makeup to your agent.
- 03 The agent calls the specific engineering tool needed for your request.
- 04 The tool returns the calculated values or risk assessments.
- 05 Your agent presents the results in your chat window.

You connect your AI client to Vinkius and start running engineering calculations through natural language.

Built For

This MCP is built for petroleum and reservoir engineers working on carbon capture and EOR projects.

Reservoir Engineer

You hand off reservoir parameters to the AI to quickly iterate on injection designs.

Production Engineer

You use the tool to check corrosion risks and equipment compatibility for new CO2 streams.

EOR Project Manager

You use the recovery and recycle estimates to build project economic models.

What Changes When You Connect

- 01 Reduces manual calculation time for MMP and WAG ratios.
- 02 Provides immediate feedback on equipment corrosion risks.

03 Connects reservoir physics directly to your AI chat interface.

04 Automates the estimation of CO2 recycling requirements.

Real-World Applications

Initial Project Scoping

Use the recovery and recycle tools to see if a CO2 flood is economically viable for a specific reservoir volume.

Asset Integrity Planning

Check if industrial capture CO2 will cause high corrosion risks at your current operating temperatures.

Injection Design Iteration

Quickly test different WAG ratios to find the most efficient injection strategy.

Miscibility Verification

Confirm that your planned injection pressure stays above the Minimum Miscibility Pressure.

4 Tools Available

#	TOOL	DESCRIPTION
01	assess_corrosion_risk	This tool checks how CO2 and water interact to threaten your equipment's integrity. It evaluates risk based on temperature and the specific CO2 source.
02	calculate_mmp	This tool finds the Minimum Miscibility Pressure for your specific oil and CO2 mixture. It's the baseline for ensuring successful displacement.
03	design_injection_strategy	This tool determines the best injection rates and Water-Alternating-Gas (WAG) ratios for your project. It helps you set the operational parameters for the flood.
04	estimate_recovery_and_recycle	This tool predicts your total oil yield and the volume of CO2 you'll need to recycle. It gives you a clear look at the project's output and recycling needs.

See It in Action

Real prompts you can use once this MCP is connected to your AI agent through Vinkius Cloud.

U What is the minimum miscibility pressure for an oil with light hydrocarbon makeup at 5000 feet and 180 degrees Fahrenheit?



The calculated Minimum Miscibility Pressure is 2450 psi, and the current conditions are likely to support miscibility.

U Estimate the oil recovery for a reservoir with a volume of 10,000,000 barrels, an injection rate of 5000 barrels per day, and a WAG ratio of 1.5.



The estimated total recovery is 1,250,000 barrels of oil, with a daily CO2 recycle requirement of 450 barrels.

U What is the corrosion risk for a reservoir at 220 degrees Fahrenheit using industrial capture CO2 at an injection rate of 2000 barrels per day?



The corrosion risk level is High. It is recommended to use corrosion-resistant alloys (CRA) and continuous chemical inhibitor injection.

Frequently Asked Questions

01 What is the purpose of this CO2 flood MCP?

It provides specialized engineering tools for designing CO2 Enhanced Oil Recovery projects, including miscibility, injection, and recovery calculations.

02 Which AI clients can I use with this tool?

You can use any MCP-compatible client, such as Claude, Cursor, Windsurf, or VS Code.

03 How does the tool handle corrosion risk?

It evaluates the risk of equipment damage by looking at how CO2 and water interact at specific temperatures and CO2 sources.

04 Can I use this to calculate WAG ratios?

Yes, the design_injection_strategy tool is specifically designed to determine optimal WAG ratios and injection rates.

05 Do I need to host the MCP myself?

No, Vinkius hosts and manages the MCP for you. You just connect your client and start working.

Go Live in 60 Seconds

Get your connection token from cloud.vinkius.com, then paste the endpoint URL into any MCP-compatible client.

YOUR MCP ENDPOINT

`https://edge.vinkius.com/[TOKEN]/mcp`

CLIENT	WHERE TO CONFIGURE
 Claude AI	Profile → Customize → Connectors → "+" → Add custom connector → Paste endpoint
 Cursor	Settings → Features → MCP Servers → "+" Add New MCP Server" → Type: SSE → Paste endpoint
 VS Code	Ctrl/Cmd+Shift+P → "MCP: Add Server" → add <code>"co2-flood-design-tool": { "url": "..." }</code>
 Windsurf	MCP Settings → <code>mcp_settings.json</code> → Add endpoint URL
 ChatGPT	Settings → Tools & plugins → Add MCP server → Paste endpoint
 Gemini	Extensions → Add MCP Server → Paste endpoint URL

ASK AN AI ABOUT THIS

Let your preferred AI explain this MCP server

-  Ask ChatGPT 
-  Ask Claude 
-  Ask Perplexity 
-  Ask Gemini 
-  Ask Grok 

READY TO CONNECT

CO₂ Flood Design Tool is live on Vinkius Cloud.

Get your connection token, paste it into your AI agent, and
start building. No SDK. No deployment. Just results.

Start at cloud.vinkius.com →

vinkius.com · support@vinkius.com

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DOCUMENT INFORMATION

Generated	September 2026
MCP Server	CO2 Flood Design Tool MCP
Server ID	01a09ae5-a540-73cb-9755-c4a8199fef72
Platform	Vinkius Cloud for AI Agents
Endpoint	https://edge.vinkius.com/{token}/mcp

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