

MCP SERVER

NO CODE

CLOUD HOSTED

Ammonia Plant Design Suite MCP

Model Haber-Bosch synthesis plants with precision engineering tools.

Ammonia Plant Design Suite MCP provides the engineering math needed to design ammonia synthesis plants. It models the Haber-Bosch process by calculating reformer dimensions, synthesis loop pressures, catalyst volumes, and energy requirements for heat recovery.

A+ Quality Score 100/100

ammonia

haber-bosch

chemical-engineering

process-design

industrial



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.

Ammonia Plant Design Suite MCP

4 tools available

Cloud-hosted on Vinkius

You can now run complex chemical engineering calculations directly through your AI client. This MCP handles the heavy lifting for Haber-Bosch process modeling, allowing you to move from initial concept to detailed equipment specifications without manual math. You'll use it to determine how large a steam reforming unit needs to be or to find the exact pressure required for a specific synthesis loop. It also handles material requirements, such as the volume of catalyst needed to hit your production targets, and evaluates how much energy you can recover through heat integration. Instead of jumping between spreadsheets, you just tell your agent what your production goals are and let it run the numbers for your plant design.

Core Capabilities

01 — Reformer Sizing

Your agent calculates the necessary dimensions and configurations for steam reforming units.

02 — Loop Pressure Modeling

The MCP determines the operational pressure and recycle ratios for the synthesis stage.

03 — Catalyst Volume Estimation

Your AI client calculates the mass and volume of catalyst required for specific production capacities.

04 — Energy Analysis

The tool evaluates total energy consumption and the efficiency of heat recovery systems.

One Click on Vinkius — From Prompt to Execution

Available at vinkius.com/en/ai-agent-connect/ammonia-plant-design-suite — connect your AI agent in three steps.

- 01 Connect your preferred MCP-compatible client to Vinkius.
- 02 Provide your production targets or pressure requirements to your AI agent.
- 03 The agent invokes the specific engineering tool needed for the calculation.
- 04 Receive precise technical specifications like volume, pressure, or mass.

Connect your AI client to the Vinkius-hosted MCP to start running engineering calculations.

Built For

This MCP is built for professionals working in chemical and process engineering.

Process Engineer

Uses the MCP to generate equipment specifications and loop parameters.

Plant Designer

Relies on the tool to size reformers and estimate material volumes.

Chemical Engineer

Uses the modeling tools to evaluate energy integration and carbon footprints.

What Changes When You Connect

- 01 Calculates reformer dimensions based on annual production capacity.
- 02 Determines synthesis loop pressure and flow rates for specific targets.
- 03 Estimates catalyst mass and volume to meet production goals.

- 04 Evaluates heat recovery to assess energy needs and carbon impact.
-

Real-World Applications

Initial Plant Sizing

Determine the scale of a new ammonia plant by inputting desired annual tonnage.

Process Optimization

Adjust loop pressures and recycle ratios to find the most efficient operating points.

Material Procurement

Get exact catalyst volume requirements to plan for material orders.

Energy Auditing

Model heat recovery impacts to understand the energy footprint of a design.

Patterns to Avoid

Guessing equipment dimensions

❌ AVOID

You tell your agent to just pick a standard reformer size for a new plant without checking the math.

✓ INSTEAD

Run the specific sizing math first by using `get_reformer_specs` to get the exact configuration you need.

Manual catalyst math

❌ AVOID

You try to estimate catalyst mass by looking at old spreadsheets and hoping the production targets match.

✓ INSTEAD

Use `estimate_catalyst_requirements` to get the precise volume needed for your specific production goals.

Ignoring loop pressure

❌ AVOID

You set a fixed pressure for the synthesis stage and assume it works for every production scale.

✓ INSTEAD

Use `calculate_synthesis_loop` to determine the correct operational pressure and recycle ratios for your specific setup.

The Right Fit

Process engineers and plant designers should connect this MCP if they need to move from concept to spec without manual calculation. If you are just looking for general chemical theory or high-level industry trends, this isn't for you. The decision depends on whether you need hard numbers for equipment sizing and energy modeling.

Ammonia Plant Design Suite 4 Tools

These tools handle the heavy math for Haber-Bosch process modeling and equipment sizing.

#	TOOL	DESCRIPTION
01	get_reformer_specs	This tool determines the specific size and configuration required for your steam reforming unit.
02	calculate_energy_and_integration	Use this to estimate total energy needs and the specific impact of heat recovery on the system.
03	calculate_synthesis_loop	This tool calculates the operational pressure and loop requirements for the ammonia synthesis stage.
04	estimate_catalyst_requirements	This tool finds the exact volume of catalyst you need to meet your production targets.

See It in Action

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

U What are the specifications for a reformer using natural gas with an annual capacity of 500,000 metric tons?



The required reformer volume is 1250 cubic meters with a steam-to-carbon ratio of 3.0 and an operating temperature of 850 degrees Celsius.

U Calculate the synthesis loop pressure for a plant producing 1,000,000 tons of ammonia per year using natural gas.



The required loop pressure is 250 bars with a recycle ratio of 4.5 and a total loop flow rate of 15,000 kg/s.

U How much catalyst is needed for a loop pressure of 200 bars and an annual capacity of 200,000 tons?



The required catalyst volume is 450 cubic meters and the total catalyst mass is 320 metric tons.

Frequently Asked Questions

01 What process does this MCP model?

This MCP models the Haber-Bosch process used in ammonia synthesis.

02 Can I use this with Claude or Cursor?

Yes, you can use this MCP with any MCP-compatible client like Claude, Cursor, or Windsurf.

03 What kind of engineering data can I get?

You can get reformer specifications, synthesis loop pressures, catalyst volumes, and energy integration estimates.

04 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.

05 Can it help with carbon footprint estimation?

Yes, the `calculate_energy_and_integration` tool helps evaluate heat recovery and the resulting carbon footprint.

06 What feedstock types are supported?

The tools support natural gas and naphtha as primary hydrocarbon feedstocks for the reforming process.

07 How does heat integration affect the design?

By using `calculate_energy_and_integration`, you can enable heat recovery to reduce total energy consumption by recycling heat from the exothermic synthesis reaction.

08 Can I calculate the required catalyst mass?

Yes, the `estimate_catalyst_requirements` tool provides both the total volume and the mass of catalyst needed for your target capacity.

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>"ammonia-plant-design-suite": { "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

Ammonia Plant Design Suite 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

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Platform	Vinkius Cloud for AI Agents
Endpoint	https://edge.vinkius.com/{token}/mcp

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