

MCP SERVER

NO CODE

CLOUD HOSTED

Cyclohexane Plant Designer MCP

Build precise industrial reactor specifications and process models.

Cyclohexane Plant Designer MCP provides the engineering math needed to design benzene hydrogenation plants. Your AI client uses these tools to calculate reactor dimensions, estimate hydrogen needs, and check if your process meets purity standards. It handles the heavy lifting for liquid and vapor phase comparisons so you can focus on the plant layout.

A+

Quality Score 100/100

chemical

hydrogenation

reactor-design

benzene

cyclohexane



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.

Cyclohexane Plant Designer MCP

4 tools available

Cloud-hosted on Vinkius

You can use this MCP to model the production of cyclohexane from benzene. Instead of manually running chemical engineering formulas, you tell your AI client what your feed rate and target capacity are, and it handles the math. You can determine the physical size and operating parameters of a reactor, or figure out exactly how much hydrogen you need to keep the process running at a specific efficiency. It also helps you decide between liquid-phase and vapor-phase setups by comparing their efficiency based on your specific inputs. If you have a target purity in mind, the MCP can validate whether your current design parameters will actually hit that mark. It turns your AI agent into a specialized chemical engineering assistant that understands hydrogenation kinetics and reactor design.

Core Capabilities

01 — Reactor Sizing

Your agent calculates volume, height, and catalyst mass for specific feed rates.

02 — Hydrogen Estimation

The AI determines stoichiometric and excess hydrogen requirements for production.

03 — Purity Validation

Your client checks if process parameters meet target purity thresholds.

04 — Phase Comparison

The tool compares the efficiency of liquid versus vapor phase operations.

05 — Parameter Optimization

Your agent identifies optimal temperature and pressure settings for a given capacity.

One Click on Vinkius — From Prompt to Execution

Available at vinkius.com/en/ai-agent-connect/cyclohexane-plant-designer — connect your AI agent in three steps.

- 01 Connect your MCP-compatible client to Vinkius.
- 02 Prompt your AI agent with your specific benzene feed and capacity data.
- 03 The agent invokes the necessary engineering tools to run the math.
- 04 You receive precise technical specifications like volume, pressure, and temperature.

Connecting this MCP to your AI client gives you direct access to specialized chemical engineering tools.

Built For

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

Chemical Engineers

They hand off complex hydrogenation calculations to the AI to verify reactor specs.

Process Designers

They use the tool to compare phase efficiencies during the initial plant design phase.

Plant Managers

They use the hydrogen demand tool to plan feedstock procurement and logistics.

What Changes When You Connect

- 01 Reduces manual calculation errors in reactor dimensioning.
- 02 Provides instant comparison between liquid and vapor phase efficiency.
- 03 Validates product purity against set thresholds before physical prototyping.

- 04 Calculates precise hydrogen flow rates including excess requirements.
-

Real-World Applications

Initial Reactor Sizing

You provide benzene feed rates and target capacity to get immediate reactor volume and height specs.

Quality Assurance Modeling

You test if a specific temperature and pressure setup will meet a 99.5% purity requirement.

Feedstock Planning

You calculate the exact hydrogen flow rate needed for a specific production volume.

Process Optimization

You use phase comparison to decide if a vapor-phase or liquid-phase process is more efficient for your inputs.

Patterns to Avoid

Guessing reactor dimensions

❌ AVOID

You tell your agent to just pick a standard reactor size for a new benzene feed rate.

✓ INSTEAD

Use ``calculate_reactor_spec`` to get the exact volume, height, and catalyst mass needed for your specific capacity.

Ignoring purity requirements

❌ AVOID

You design a process based solely on temperature and pressure without checking the final product quality.

✓ INSTEAD

Run ``verify_purity_compliance`` to ensure your design parameters actually hit your target purity thresholds.

Underestimating hydrogen needs

❌ AVOID

You calculate hydrogen based only on the stoichiometric ratio and ignore the excess required for the process.

✓ INSTEAD

Use `estimate\_hydrogen\_demand` to account for both stoichiometric and excess hydrogen requirements.

The Right Fit

Chemical engineers and process designers should connect this MCP to automate hydrogenation math. Plant managers looking for feedstock logistics planning will also find it useful. If you are just doing general chemistry homework or non-industrial modeling, this tool is too specialized for your needs.

Cyclohexane Plant Designer 4 Tools

These tools handle the chemical engineering math for benzene hydrogenation. Your agent uses them to size reactors, estimate hydrogen needs, and validate process efficiency.

#	TOOL	DESCRIPTION
01	calculate_reactor_spec	This tool determines the physical dimensions and operational parameters required for your reactor.
02	estimate_hydrogen_demand	Use this to calculate the total hydrogen required to support your planned production levels.
03	verify_purity_compliance	This tool checks if your designed process meets specific product purity requirements.
04	compare_phase_efficiency	This tool provides a comparative analysis between liquid-phase and vapor-phase processes for your specific inputs.

See It in Action

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

- U** Calculate the reactor specifications for a liquid-phase process with a benzene feed rate of 500, target capacity of 450, and purity threshold of 0.99.



The reactor requires a volume of 12.5 m³, a height of 4.2 m, an optimal temperature of 150°C, an optimal pressure of 25 bar, and 150 kg of catalyst mass.

- U** How much hydrogen do I need for a vapor-phase process with 400 benzene feed and 95% conversion efficiency?



The total hydrogen flow rate required is 125.5 kg/h, consisting of 114.0 kg/h stoichiometric hydrogen and 11.5 kg/h excess hydrogen.

- U** Will my design meet a 99.5% purity requirement with a 15 m³ reactor at 160°C in the liquid phase?



The predicted purity is 99.7%, which is compliant with your 99.5% threshold.

Frequently Asked Questions

01 What kind of chemical processes does this MCP support?

This MCP is specifically designed for cyclohexane production via benzene hydrogenation.

02 Can I use this with Claude or Cursor?

Yes, you can connect this MCP to any compatible client like Claude, Cursor, or Windsurf.

03 Does it calculate hydrogen requirements?

Yes, it includes a tool to estimate both stoichiometric and excess hydrogen demand for your production.

04 How does it handle purity checks?

The `verify_purity_compliance` tool checks your design parameters against your required purity threshold.

05 Can it compare different reaction phases?

Yes, the `compare_phase_efficiency` tool analyzes the efficiency of liquid-phase versus vapor-phase processes.

06 How do I design a reactor for my plant?

You can use the `calculate_reactor_spec` tool by providing the benzene feed rate, target capacity, purity threshold, and the chosen process phase.

07 Can I compare liquid and vapor phase processes?

Yes, the `compare_phase_efficiency` tool provides a comparative analysis of metrics and recommendations for both phases.

08 How is hydrogen consumption calculated?

The `estimate_hydrogen_demand` tool calculates the total hydrogen flow rate required based on benzene feed, phase, and conversion efficiency.

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>"cyclohexane-plant-designer": { "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

Cyclohexane Plant Designer 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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