

VINCI TECHNOLOGIES

PILOT PLANTS

PRODUCT CATALOG

2026



PILOT PLANTS

LIST OF INSTRUMENTS

OIL REFINING	5
CO-REFINING OF BIO-BASED AND FOSSIL FEEDSTOCK IN A CONTINUOUS SLURRY HYDROCRACKING PILOT PLANT	6
HC - HYDROCRACKING PILOT PLANT	7
TC - THERMAL CRACKING PILOT PLANT	8
EBR EBULLATED BED HYDROPROCESSING PILOT PLANT FOR HEAVY RESID UPGRADING	9
POX - PARTIAL OXIDATION PILOT PLANT	10
HDS - HYDRODESULFURIZATION PILOT PLANT	11
HDT - HYDROTREATING PILOT UNIT (MULTIFUNCTIONAL HYDROGENATION)	12
CR - NAPHTA CATALYTIC REFORMING PILOT PLANT	13
BIO & CIRCULAR FUELS	14
HVO/SAF HYDROPROCESSING PILOT PLANT	15
BIOMASS PYROLYSIS PILOT PLANT	16
PLASTIC PYROLYSIS PILOT PLANT	17
PLASTIC-TO-LIQUID (PTL) PILOT PLANT	18
E-FUELS	19
FISCHER-TROPSCH PILOT PLANT	20
1.5 KG/H E-METHANOL PILOT PLANT	21
10 KG/H E-METHANOL PILOT PLANT	22
REVERSE WATER GAS SHIFT (RWGS) AND FISCHER–TROPSCH (FT) PILOT PLANT	23
GAS-TO-E-PARAFFINIC FUEL PILOT PLANT	24
GTL – GAS TO LIQUID PILOT PLANT	25
SMR - STEAM METHANE REFORMING PILOT PLANT	26
E-AMMONIA PILOT PLANT	27
ADSORPTION AND DESORPTION PROCESSES	28
SORBTEST - ADSORPTION AND DESORPTION PROCESS PILOT PLANT	29
POLYMERS	30
POLYESTER PILOT PLANT	31
POLYPROPYLENE PILOT PLANT	32
50 KG/HR LLDPE/HDPE PILOT PLANT	33
POLYOL DEVELOPMENT PILOT PLANT	34
NYLON 6 PRODUCTION SIMULATION PILOT PLANT	35
STIRRED DRY PHASE POLYMERIZATION UNIT (PE/PP)	36
CATALYST PERFORMANCE PROPERTIES	37
MCB- MICRO CATALYST BED TEST UNIT	38
CATATEST - HIGH-PRESSURE CATALYST TESTING SYSTEM	39
CTV- CATALYST TESTING VERSATILE UNIT	40
MRT-MULTI REACTOR CATALYST TESTING UNIT	41



CDU- FCC CATALYST DEACTIVATION UNIT _____	42
XY-MAT – AUTOMATED FCC CATALYST TESTING UNIT (FLUIDIZED BED) _____	43
MAT – FCC MICRO ACTIVITY TESTING UNIT (FIXED BED) _____	44
CATALYST MECHANICAL PROPERTIES _____	45
CM400 - CATALYST MIXER _____	46
CE-CATALYST EXTRUDER _____	47
VCS - CATALYST GRAIN AND BULK CRUSHING STRENGTH TESTER _____	48
RTT-RDT ROTATING TUBE AND ROTATING DRUM ATTRITION TESTERS _____	49
ABAT- AIR JET / FLUIDIZED BED ATTRITION TESTER _____	50
JCA-JET CUP ATTRITION APPARATUS _____	51

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OIL REFINING

Vinci Technologies **Oil Refining Pilot Plants** are engineered to accurately replicate full-scale refinery operating conditions at pilot scale. These systems enable refiners, licensors, and technology developers to evaluate catalysts, feedstock variability, and process configurations under realistic temperature, pressure, and flow regimes.

Typical pilot plants reproduce core refining operations such as hydroprocessing, cracking, reforming, and residue upgrading. The systems are designed with industrial-grade metallurgy, advanced heat integration, and precise process control to ensure data reliability and scalability. Integrated separation, sampling, and analytical interfaces allow continuous monitoring of product yields and quality.

These pilot plants are used to de-risk process changes, optimize catalyst performance, validate new technologies, and support scale-up decisions before commercial deployment.

These pilot plants reproduce **industrial refinery environments** to evaluate catalysts, feeds, and process routes under realistic operating conditions.



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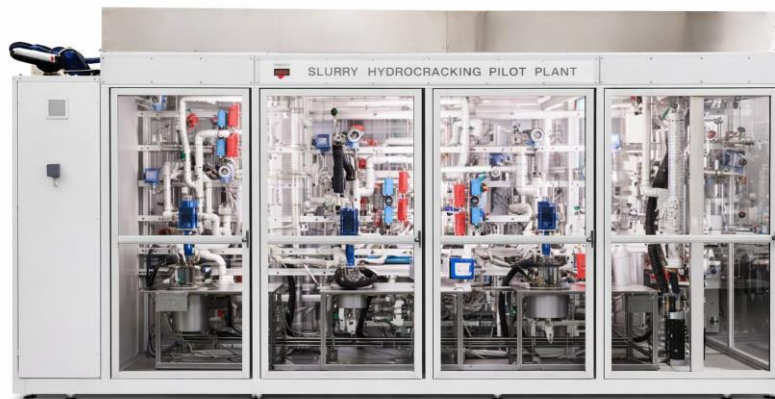
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CO-REFINING OF BIO-BASED AND FOSSIL FEEDSTOCK IN A CONTINUOUS SLURRY HYDROCRACKING PILOT PLANT

The slurry hydrocracking pilot plant is built to treat biomass slurry and assess its conversion into fuels under conditions that closely replicate industrial operations. It can run in either continuous or batch mode and is equipped with a stirred tank reactor (CSTR) of about 2 dm³, enabling precise testing of mixtures of bio-based and fossil feedstocks. The system operates under severe conditions, with temperatures reaching up to 500°C and pressures up to 180 bar, alongside a continuous supply of hydrogen to drive catalytic hydrogenation and thermal cracking processes. The biomass slurry, typically produced from pyrolysis oil, is introduced into the reactor with catalysts and hydrogen, where it is converted into multiple products such as gas, light and heavy fractions, and water. The plant integrates all key stages, including slurry preparation, gas injection, reaction, and product separation. Designed for stable continuous operation, it delivers accurate mass balance measurements, demonstrating its suitability for industrial scale-up. Overall, the pilot plant is essential for validating co-refining processes and improving the efficient use of biomass slurry in sustainable fuel production.



FEATURES

Operates under extreme conditions (up to 500°C and 180–200 bar) in continuous or batch modes with a CSTR reactor.

Processes biomass and fossil feedstocks using slurry with catalysts for efficient hydrogenation and cracking.

Integrates full system: slurry preparation, reaction, hydrogen supply, and product separation into multiple outputs.

Delivers high performance (~90% conversion) with advanced analysis, supporting research, flexibility, and industrial scale-up.

BENEFITS

High efficiency: up to ~90% conversion of feedstock

Sustainability: integrates biomass with fossil fuels → lower environmental impact

Valorization of waste: turns low-value biomass into useful fuels

Industrial relevance: compatible with existing refineries and scalable

Flexibility: handles complex feedstocks and supports innovation/testing



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HC - HYDROCRACKING PILOT PLANT

The Hydrocracking Pilot Plant developed by Vinci Technologies is a chemical pilot unit designed to evaluate hydrocracking processes under industrially representative conditions. It provides a flexible experimental platform for studying the conversion of heavy hydrocarbon feedstocks into lighter, higher-value products. The unit is used to assess catalyst activity, selectivity, and stability while reproducing the severity and complexity of commercial hydrocracking operations. It integrates high-pressure hydrogen systems, controlled liquid feed handling, and a fixed-bed reactor configuration suitable for long-duration testing. Accurate temperature control ensures safe management of highly exothermic reactions. Downstream separation systems allow efficient recovery and analysis of gas and liquid products. Advanced automation and data acquisition systems enable stable, reproducible operation and continuous monitoring. The pilot plant supports process optimization, catalyst benchmarking, and operating window definition. Overall, it bridges laboratory research and industrial deployment by generating reliable data that reduce scale-up and technology development risks.



FEATURES

- Fixed-bed hydrocracking reactor designed for industrially representative operation
- High-pressure hydrogen system enabling severe hydrocracking conditions
- Maximum operating pressure: up to 200 barg
- Maximum operating temperature: up to 500 °C
- Flexible liquid feed handling suitable for VGO and heavier hydrocarbon feedstocks
- Precise temperature control to manage highly exothermic reactions safely
- Integrated high- and low-pressure separation sections for gas and liquid recovery
- Accurate product sampling and mass balance capability

BENEFITS

- Reliable scale-up data generated under representative temperature, pressure, and H₂ severity
- Accelerated catalyst and process optimization through controlled, long-duration pilot testing
- Reduced technical and commercial risk by validating performance and product yields before full-scale deployment



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TC - THERMAL CRACKING PILOT PLANT

The Thermal Cracking Pilot Plant is a high-temperature, skid-mounted experimental unit designed to study thermal and steam cracking reactions under industrially representative conditions. It enables the evaluation of feedstock behavior, reaction severity, coke formation, and product selectivity to support process development and scale-up of commercial cracking technologies. Hydrocarbon feedstocks are vaporized and diluted with steam prior to entering a tubular radiant cracking reactor. Cracking is performed at high temperature and very short residence time. The reactor effluent is rapidly quenched to suppress secondary reactions, followed by cooling and gas-liquid separation. Gas and liquid products are continuously measured to ensure accurate mass balance closure. The reactor can be periodically decoked using a controlled oxidation procedure.



FEATURES

- Tubular cracking reactor operating up to ~950 °C with sub-second residence time
- Multi-zone electrically heated furnace with precise axial temperature control
- Steam dilution and feed vaporization for coke control and reaction severity adjustment
- Broad feedstock flexibility: C₂-C₄ gases, LPG, naphtha, gasoils, waxes
- Rapid quench system to suppress secondary reactions
- Integrated gas-liquid separation and in-situ decoking capability
- Continuous gas and liquid product measurement for full mass balance
- PLC/SCADA automation for unattended operation
- Skid-mounted, modular design for pilot-scale testing

BENEFITS

- Generates high-quality, industrially relevant cracking data
- Enables safe testing under severe thermal conditions
- Supports reliable extrapolation to commercial steam crackers



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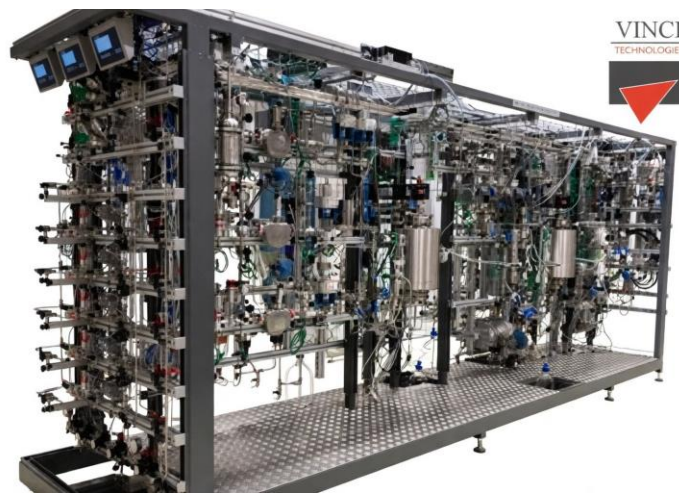
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EBR EBULLATED BED HYDROPROCESSING PILOT PLANT FOR HEAVY RESID UPGRADING

The Ebullated Bed Pilot Plant is an advanced hydroprocessing unit designed to replicate industrial ebullated-bed technologies for upgrading heavy and extra-heavy feedstocks. It operates with an upflow ebullated-bed reactor under realistic pressure and temperature conditions. The unit enables continuous catalyst circulation, ensuring stable operation and efficient heat transfer. It is specifically suited for challenging feeds such as vacuum residue, bitumen, and high-metal oils. The process combines hydrocracking and hydrotreating to convert heavy molecules into lighter, valuable products. High hydrogen availability allows effective removal of sulfur, nitrogen, and metals. The pilot plant provides accurate evaluation of catalyst activity, stability, and deactivation. Integrated feed, reaction, and separation sections replicate full process behavior. The skid-mounted and fully automated design ensures safe and flexible operation. Overall, it delivers reliable data for process optimization and commercial scale-up.



FEATURES

- One or more ebullated-bed reactors with internal liquid recirculation
- High-pressure operation up to 175 barg and temperatures up to 480°C
- True ebullated-bed hydrodynamics with magnetic-drive pumps
- Fully isothermal, multi-zone reactor furnaces
- Complete hydrogen and liquid feed systems with high-accuracy flow control
- Advanced gas/liquid separation and product recovery train
- Fully automated PLC control with data logging and multi-level safety systems
- Modular skid-mounted design

BENEFITS

- Industrial realism: faithfully reproduces commercial ebullated-bed behavior
- Technology de-risking: reliable data for catalyst selection and process scale-up
- Heavy-feed flexibility: handles the most challenging high-metal and high-asphaltene residues



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POX - PARTIAL OXIDATION PILOT PLANT

The Methane partial oxidation Pilot Plant developed by Vinci Technologies is a micro-reactor system dedicated to the study of catalytic partial oxidation of methane under controlled conditions. The unit is designed to investigate methane conversion pathways for syngas and hydrogen production. It is built around tubular fixed-bed reactors operating in down-flow mode, suitable for high-temperature and high-pressure operation. Two interchangeable reactors allow flexibility in catalyst volume and reaction severity. The pilot plant enables precise control of methane, oxygen, nitrogen, and hydrogen feed rates using mass flow controllers. A liquid feed system allows water or liquid reactants to be vaporized and co-fed with gases. The reactor is equipped with multi-zone electric furnaces to manage highly exothermic reactions and control temperature profiles. Operating temperatures can reach up to 950 °C with pressures up to 20 barg. Downstream cooling and phase separation systems enable recovery of gaseous and liquid products. On-line sampling to gas chromatography supports detailed product analysis. Advanced automation and safety systems ensure stable, reproducible, and safe operation. Overall, this pilot plant provides a robust experimental platform for catalyst development, reaction optimization, and scale-up studies in methane oxidation processes.



FEATURES

- Micro-reactor system for methane partial oxidation (POX)
- Two tubular fixed-bed reactors (50 cc and 365 cc catalyst volumes)
- Max operating conditions: 950 °C, 20 barg
- Down-flow reactor configuration with pre-heating, reaction, and cooling zones
- Independent gas feeds (CH₄, O₂, N₂, H₂) with mass flow controllers
- Liquid feed line with pump and vaporizer (0.01–5 ml/min)
- Total gas flow rate: 1–60 NI/h
- Two-zone electric furnace with PID and ramp temperature control
- Online gas sampling to gas chromatograph
- Gas–liquid separator with automatic liquid drainage

BENEFITS

- Flexible operation at high temperature and pressure
- High safety level with alarms and N₂ purge
- Accurate experimental data via precise flow control and online GC



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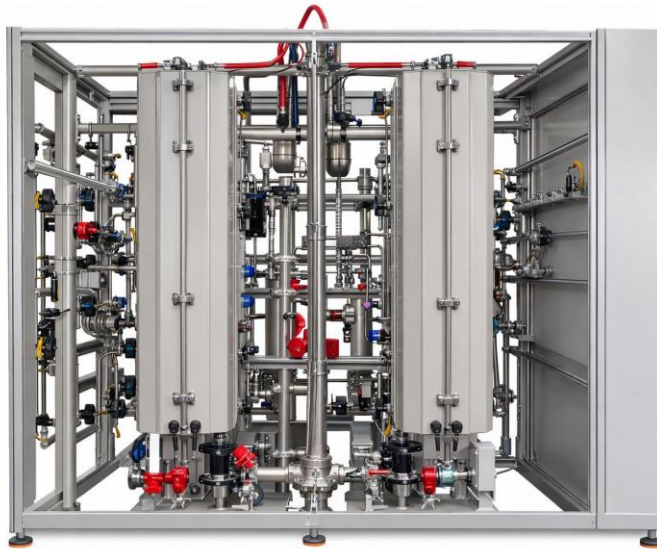
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HDS - HYDRODESULFURIZATION PILOT PLANT

The HDS pilot unit is a hydrotreating system specifically designed for the removal of sulfur compounds from liquid hydrocarbon feeds under hydrogenation conditions, with full compatibility for H₂S-containing streams. It enables detailed evaluation of catalyst performance, sulfur conversion efficiency, and operating parameters on feeds ranging from light distillates to heavier fractions. The unit is engineered to reproduce industrial HDS environments while remaining suitable for R&D, process optimization, and scale-up studies. The unit is built on a modular skid integrating feed handling, hydrogen supply, fixed-bed reactor(s), and high-efficiency gas-liquid separation. All wetted parts, materials of construction, and safety systems are selected to safely handle H₂S and sour hydrocarbons. Fully automated control and supervision allow stable long-duration testing, accurate sulfur mass balances, and safe operation when working with toxic and corrosive H₂S-rich effluents.



FEATURES

- Fixed-bed reactor configuration compatible with commercial HDS catalysts and sour feeds containing H₂S
- Materials of construction and sealing solutions suitable for H₂S service and corrosive environments
- Integrated hydrogen feed and recycle with precise flow, pressure, and H₂S-tolerant control components
- High-efficiency gas-liquid separation ensuring reliable handling of H₂S-bearing gas and liquid phases
- Modular skid design allowing customization of operating pressure, temperature, and sulfur load

BENEFITS

- Safe and representative testing of HDS catalysts under real sour-service conditions
- High-quality, transferable data for industrial hydrotreating unit design and optimization
- Reduced development risk when scaling up processes involving high sulfur feeds



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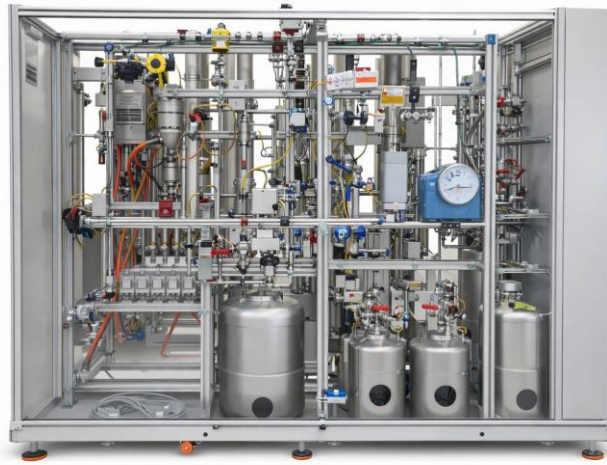
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HDT - HYDROTREATING PILOT UNIT (MULTIFUNCTIONAL HYDROGENATION)

The HDT pilot unit is a versatile hydrogenation platform designed to support a wide range of refining and upgrading reactions, including alkylation, hydrodeoxygenation (HDO), isomerization, and hydrodenitrogenation (HDN). It enables controlled investigation of catalyst performance, reaction pathways, and operating conditions for conventional and renewable feedstocks, such as petroleum-derived streams, bio-oils, and intermediate upgrading products. The unit is engineered to reproduce industrial hydrotreating conditions while retaining the flexibility required for R&D, process development, and scale-up activities. The system is built on a modular skid integrating feed preparation, hydrogen supply, fixed-bed reactor(s), and efficient gas-liquid separation. Its design allows easy adaptation to different reaction schemes, catalyst types, and operating windows, supporting both single-function and combined hydrotreating steps. Fully automated control and supervision ensure stable long-duration operation, accurate mass balances, and repeatable experimental campaigns.



FEATURES

- Fixed-bed reactor configuration suitable for alkylation, HDO, isomerization, and HDN catalyst testing
- Flexible process layout allowing single or sequential hydrotreating reactions within the same unit
- Integrated hydrogen feed and recycle with precise control of flow, pressure, and temperature
- High-efficiency gas-liquid separation for reliable product recovery and mass balance closure
- Modular skid design enabling customization of severity, reactor sizing, and feedstock range

BENEFITS

- One platform covering multiple hydrotreating and upgrading applications without dedicated units
- Reliable, industrially representative data for catalyst selection and process optimization
- Reduced development time and risk for scale-up of advanced hydrotreating pathways



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CR - NAPHTHA CATALYTIC REFORMING PILOT PLANT

The Naphta catalytic reforming pilot plant is designed as a research and development tool to study and optimize catalytic reforming processes under controlled and representative operating conditions. Its primary purpose is to evaluate catalyst performance, including activity, selectivity, stability, and deactivation behavior, when processing naphtha and other light hydrocarbon feedstocks. The unit allows operators to simulate industrial reforming conditions at pilot scale, generating reliable data on product yields, hydrogen production, and changes in feed composition. By operating under high temperature and high pressure in the presence of hydrogen, the pilot plant supports detailed investigation of reaction severity and operating variables, enabling process optimization before scale-up to commercial units. It is also used to compare different catalysts, assess the impact of feed quality, and validate kinetic models. Overall, the pilot plant provides a safe, flexible, and cost-effective platform for developing and improving reforming technologies while reducing technical and economic risks associated with full-scale refinery implementation.



FEATURES

- Catalytic reforming unit for naphtha and light hydrocarbons under hydrogen.
- High-temperature, high-pressure fixed-bed reactor in downflow operation.
- Industrial operating range: up to 550 °C and 50 barg.
- Small catalyst volume (up to 100 ml) for screening studies.
- Three-zone heated reactor for precise temperature control.
- Integrated gas–liquid separation downstream of the reactor.
- Compact skid-mounted design with integrated utilities.
- Accurate control and instrumentation for temperature, pressure, and flows.
- Pilot-scale relevance for catalyst evaluation and process optimization

BENEFITS

- Catalyst screening: Enables reliable evaluation of reforming catalysts under realistic conditions.
- Process optimization: Supports optimization of operating conditions before scale-up.
- Cost and risk reduction: Uses small catalyst and feed volumes to minimize development cost and risk



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BIO & CIRCULAR FUELS

The bio and Circular Fuel Pilot Plants developed by Vinci Technologies are dedicated to supporting the transition toward low-carbon, renewable, and circular energy systems. This category of pilot plants provides a flexible and industrially relevant platform for evaluating alternative feedstocks and innovative conversion pathways aimed at producing fuels with reduced environmental impact.

By addressing both renewable resources and circular feedstocks, including waste-derived materials, these pilot plants enable the development of sustainable fuel solutions aligned with energy transition and circular economy objectives.

Their primary purpose is to bridge the gap between laboratory research and commercial deployment by generating reliable data, validating process concepts, and reducing technical and economic scale-up risks. These facilities support catalyst development, process optimization, and technology benchmarking under representative operating conditions. They are used by industrial partners, technology developers, and research institutions to accelerate innovation, support investment and licensing decisions, and assess the feasibility of emerging fuel technologies.

Overall, this category of pilot plants plays a key role in advancing sustainable fuel production while contributing to decarbonization, resource efficiency, and long-term industrial resilience.



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HVO/SAF HYDROPROCESSING PILOT PLANT

The HVO/SAF Hydroprocessing Pilot Plant is a modular pilot-scale unit that converts biobased feedstocks into Sustainable Aviation Fuel via catalytic hydrodeoxygenation and isomerization reactions of the Hydrotreated Vegetable Oil (HVO) process, under representative pressure and temperature conditions. It integrates two fixed-bed reactors for Hydrodeoxygenation (HDO) and Isomerization (ISOM), operating up to 500 °C and 150 barg with multi-zone electrical furnaces ensuring precise temperature control. The plant features heated and nitrogen-blanketed liquid feed systems, high-pressure hydrogen and nitrogen supply with mass flow control, and a hydrogen recirculation loop via a dedicated compressor. Advanced gas conditioning and preheating sections ensure stable reactor operation. Multi-stage high- and low-pressure separation systems enable efficient gas, organic, and aqueous phase recovery. Product flows are accurately quantified using Coriolis flow meters and weight scales to ensure full mass balance closure. Fully automated with PLC and SCADA supervision, the unit is designed for unattended operation with a multi-layer safety architecture.



FEATURES

- Dual-reactor configuration: fixed-bed HDO and ISOM reactors for full SAF upgrading pathway
- Severe operating conditions: up to 500 °C and 150 barg, representative of industrial units
- Advanced thermal control: multi-zone electrical furnaces ensuring pseudo-isothermal operation
- Flexible feed handling: heated, nitrogen-blanketed liquid feed systems for biobased oils
- Hydrogen management: high-pressure H₂ supply with mass flow control and dedicated recirculation loop
- Efficient separation train: multi-stage HP/LP gas–liquid separation with water removal
- High-accuracy mass balance: Coriolis flow meters and weight scales on all product streams
- Full automation: PLC with SCADA for unattended operation
- Robust safety design: multi-layer safety architecture with alarms, interlocks, and relief systems

BENEFITS

- Faster scale-up: industrially representative operation accelerates SAF process validation.
- High-quality data: precise control and full mass balance ensure reliable results.
- Safe & efficient operation: automated control with robust safety systems reduces risk and cost.



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BIOMASS PYROLYSIS PILOT PLANT

This biomass pyrolysis pilot unit is designed for the controlled thermochemical conversion of solid biomass into bio-oil, permanent gases, and solid char under oxygen-free conditions. The unit enables the study and optimization of fast and intermediate pyrolysis routes, with precise control of operating parameters such as temperature, residence time, and heating rate. It is suitable for a wide range of biomass feedstocks, including agricultural residues, wood waste, and other lignocellulosic materials. The unit is engineered as a flexible, skid-mounted system integrating biomass feeding, pyrolysis reactor, vapor quenching and condensation, solid separation, and gas handling. Its modular architecture allows configuration adjustments to support process development, catalyst testing (when applicable), and scale-up studies. Designed for continuous operation, it provides reliable mass and energy balances and produces representative products for downstream upgrading or characterization.



FEATURES

- Oxygen-free pyrolysis reactor with accurate temperature and residence-time control
- Continuous solid biomass feeding and char discharge system
- Multi-stage vapor condensation for bio-oil recovery
- Integrated gas handling and measurement for non-condensable gases
- Modular skid design enabling customization and future process extensions

BENEFITS

- Enables rapid evaluation of biomass-to-bio-oil pathways under industrially relevant conditions
- Provide high-quality liquid, gas and solid products for detailed analytical and upgrading
- Supports process optimization and scale-up with reproducible and well-instrumented operation



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PLASTIC PYROLYSIS PILOT PLANT

The Continuous Plastic Pyrolysis Pilot Plant developed by Vinci Technologies is designed to support the development and validation of circular solutions for plastic waste valorization. The unit is built around a dedicated pyrolysis reactor, which constitutes the core of the process and enables controlled thermal decomposition of plastic feedstocks. This reactor is heated by an electrically powered heating system, ensuring precise temperature control, stable operation, and reproducible experimental conditions. The pilot plant provides an industrially representative platform to evaluate the conversion of a wide range of plastic materials into fuels and chemical intermediates. It is designed as a modular, skid-mounted unit, allowing flexible installation and safe operation. The overall configuration integrates feed preparation, reaction, and product separation within a compact and robust layout. Advanced automation and supervision systems allow accurate control of operating parameters and unattended operation. The unit is engineered using industrial standards to generate reliable scale-up data, reduce technical risks, and support the development of sustainable and circular fuel and chemical pathways



FEATURES

- Operating temperature: pyrolysis reactor operated up to 500 °C
- Operating pressure: reactor and process sections operated at near-atmospheric pressure
- Dedicated pyrolysis reactor designed for continuous thermal decomposition of plastic waste
- Electrically powered heating system with multi-zone temperature control for uniform operation
- Continuous feedstock loading mechanism enabling transfer of plastic waste into the reactor
- Wide feedstock flexibility, accommodating various plastic types, shapes, and compositions
- Integrated product separation and recovery sections for solids, liquids, waxes, and gases
- Advanced automation and supervision allowing precise control and unattended operation
- Accurate mass balance and data acquisition to support process evaluation and scale-up

BENEFITS

- Reliable scale-up data from continuous operation under controlled temperature and pressure
- Feedstock flexibility for testing diverse plastic waste streams
- Reliable data generation for process and technology validation



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PLASTIC-TO-LIQUID (PTL) PILOT PLANT

The Plastic-to-Liquid (PtL) pilot plant is a thermochemical conversion unit designed to transform plastic waste into liquid hydrocarbons through thermal-catalytic processing. It enables the depolymerization and cracking of post-consumer and industrial plastics under controlled operating conditions. The system can process heterogeneous and unsorted plastic streams, including municipal plastic waste. Thermal conversion is enhanced by catalysts to improve selectivity and control product distribution. The process produces low-sulfur liquid hydrocarbon fractions. Recovered liquids are suitable for reuse as petrochemical feedstocks or further upgrading. The pilot plant features a modular and configurable design. Operating parameters such as temperature, residence time, and catalyst formulation can be adjusted. This allows systematic catalyst screening and process optimization. The unit supports evaluation of scale-up and industrial feasibility. It can be integrated upstream of existing petrochemical or refinery infrastructure. The system generates representative pilot-scale performance data. It enables conversion of plastic waste otherwise destined for landfill or incineration. The PtL pilot plant supports chemical recycling and circular carbon utilization. It contributes to reduced reliance on virgin fossil feedstocks.



FEATURES

Thermal-catalytic conversion of mixed plastic waste

Production of low-sulfur liquid hydrocarbons

Modular and versatile pilot design for testing catalyst performance and process conditions

Potential integration upstream of existing petrochemical plants

Use cases: Waste valorisation, circular economy initiatives, catalyst evaluation for carbon-negative feedstocks

BENEFITS

Waste-to-value conversion by transforming mixed plastic waste into usable liquid hydrocarbons instead of landfilling or incineration.

Support for circular carbon strategies through the production of reusable feedstocks that reduce dependence on fossil resources.

Flexible pilot-scale testing enabling optimization of catalysts and process conditions before industrial deployment.



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E-FUELS

E-fuel pilot plants are modular, fully integrated experimental units designed to convert renewable electricity, green hydrogen and captured CO₂ into synthetic fuels and e-fuels relevant for the energy transition. Built around flexible reaction and separation sections, these pilot plants allow the demonstration, optimization and scale-up of key pathways such as Sustainable Aviation Fuel (SAF), e-methanol, e-ammonia and DME, starting from variable feedstocks and operating conditions. The architecture typically combines hydrogen production or supply, CO₂ conditioning, synthesis gas generation (via RWGS when required) and downstream synthesis reactors, with full mass and energy balance closure, enabling realistic process validation beyond bench scale.

Vinci Technologies designs and manufactures pilot plants that can be installed in standard laboratory environments or integrated into containerized units. These containerized pilot plants are fully transportable and can be deployed directly at the location of the feedstock, enabling on-site testing and process validation. Today, this approach is primarily applied to e-fuel pilot plants, supporting flexible, decentralized, and efficient development of synthetic fuel technologies.

Designed for research centers, technology developers and industrial players, Power-to-X pilot plants provide a robust platform to assess catalysts, reaction schemes and heat-integration strategies under representative conditions. Their skid- or container-based design ensures safe operation, rapid deployment and straightforward reconfiguration as priorities evolve—from drop-in SAF routes for aviation decarbonization, to methanol and DME as synthetic fuels and chemical carriers, and ammonia as both fertilizer feedstock and carbon-free energy vector. These units bridge the gap between laboratory research and first-of-a-kind industrial demonstrators, reducing technical risk and accelerating time to market for Power-to-X technologies



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FISCHER-TROPSCH PILOT PLANT

The Fischer–Tropsch pilot unit is a modular processing platform designed for the conversion of synthesis gas into liquid hydrocarbons under controlled and industrially representative conditions. The unit integrates feed preparation, reaction, and product separation in a compact skid-mounted layout, ensuring reliable operation and accurate mass balance for R&D and scale-up studies. Each Fischer–Tropsch unit is custom engineered to match the client’s objectives, whether for catalyst screening, process optimization or technology demonstration. Reactor configuration, operating envelope, materials of construction and downstream separation are adapted to the targeted product and research scope. The result is a versatile pilot plant that can evolve with the project, offering flexibility without compromising robustness, safety or data quality.



FEATURES

Fixed-bed reactor designed for representative catalytic testing

Adaptable to different syngas compositions

Integrated product separation for gas, water, liquid hydrocarbons and heavy fractions

Advanced control, monitoring and data acquisition for reproducible operation

Fully custom-made, skid-mounted design allowing future modification and expansion

BENEFITS

Reliable scale-up data: Industrially representative operation with accurate mass balance and reproducible results.

High flexibility: Modular, custom design adaptable to different syngas, catalysts, and product targets.

Lower development risk: Integrated, skid-mounted setup enables safe testing and faster technology validation.



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1.5 KG/H E-METHANOL PILOT PLANT

The e-methanol pilot plant is a compact, fully automated unit designed to convert captured CO₂ and green hydrogen into methanol via the Fischer–Tropsch (FT) process, at a capacity of 1.5 kg/h. It features a high-pressure fixed-bed reactor with precise isothermal temperature control, ensuring stable and representative FT reaction conditions. Advanced gas and liquid separation systems enable efficient recovery of FT products, while real-time process monitoring integrates safety, control, and data acquisition. This pilot plant enables rapid catalyst and FT process validation, de-risks industrial scale-up through reliable performance data, and supports decarbonisation strategies by transforming CO₂ into valuable, low-carbon fuels and chemicals for sustainable energy applications.



FEATURES

- Converts CO₂ and H₂ into e-methanol with a capacity of 1.5 kg/h
- High-pressure fixed-bed reactor operating up to 60 barg and 300°C
- Isothermal reactor design with double-jacket heating/cooling for precise temperature control
- Modular skid-mounted unit, compact and ready for laboratory or pilot hall installation
- Advanced gas feed system with high-accuracy mass flow controllers (H₂, CO₂, N₂, recycle gas)
- Integrated gas recirculation module to improve conversion efficiency
- High- and low-pressure gas/liquid separation with nitrogen stripping
- ≥90% liquid recovery with dedicated liquid recovery and sampling system
- Real-time gas analysis (CO₂, CO, H₂) and full mass balance calculation
- Fully automated SCADA control system with data logging, trends, and alarms
- Multi-layer safety architecture compliant with industrial standards (PED / ASME)

BENEFITS

- Speeds up development of CO₂-to-e-fuel technologies
- De-risks scale-up with reliable pilot-scale performance data
- Supports decarbonisation by converting CO₂ into valuable e-methanol



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10 KG/H E-METHANOL PILOT PLANT

This demonstration-scale pilot plant is designed for the conversion of CO₂ and hydrogen into methanol via the Fischer–Tropsch (FT) process, within a single integrated unit. The plant supports FT synthesis pathways enabling detailed investigation of catalysts, reaction schemes, and operating strategies for CO₂ valorization. The process layout includes gas feed preparation, reaction, effluent recirculation, and staged product separation, allowing precise control of conversion, selectivity, and product distribution under representative operating conditions. The unit is built on a modular, skid-mounted structure and is intended for continuous, unattended operation. Special emphasis is placed on reactor configurations and separation systems designed to handle highly exothermic FT reactions and multiphase effluents while maintaining stable, near-isothermal operation. The flexibility of the reactor design, ranging from multitubular configurations to a single industrially representative tubular fixed-bed reactor, makes the plant suitable for both FT process development and scale-up validation.



FEATURES

- Integrated CO₂-to-methanol and DME production within a single demonstration unit
- Reactor designs optimized for highly exothermic reactions, ensuring stable and near-isothermal operation
- Dedicated separation and recovery sections for methanol, DME and heavy by-products
- Modular, skid-mounted design suitable for continuous and unattended operation
- Flexible configuration enabling catalyst testing, process optimization, and scale-up studies

BENEFITS

- Dual-pathway CO₂ valorization:** Enables both methanol and DME production in a single integrated unit for direct comparison and optimization.
- Stable operation of exothermic reactions:** Optimized reactor and separation design ensures safe, near-isothermal continuous operation.
- Scalable and flexible platform:** Modular skid-mounted setup supports catalyst testing, process development, and scale-up validation.



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REVERSE WATER GAS SHIFT (RWGS) AND FISCHER-TROPSCH (FT) PILOT PLANT

This modular two-stage pilot plant is designed for the integrated study and demonstration of Reverse Water Gas Shift (RWGS) and Fischer-Tropsch (FT) processes within a single, compact unit. It allows researchers and technology developers to convert CO₂-rich or syngas feeds into synthetic hydrocarbons under fully controlled conditions, covering feed preparation, reaction, separation, and product recovery. The plant is engineered to support catalyst screening, process optimization, and performance evaluation, while maintaining operating flexibility and high data quality across a wide range of experimental scenarios. The unit is fully skid-mounted and can be delivered as a containerized system, enabling rapid installation and straightforward integration into existing R&D or pilot facilities. Each section—RWGS and FT—is equipped with dedicated reaction, heat management, separation, and analytical modules, allowing independent or sequential operation. The design philosophy emphasizes robustness, safety, and adaptability, making the plant suitable for both academic research and pre-industrial technology validation.



FEATURES

- Two-stage configuration combining RWGS and FT in a single integrated pilot plant
- Modular, skid-mounted design with containerized option for easy installation and relocation
- Advanced separation and product recovery systems for gas, liquids, and waxes
- Fully automated control and data acquisition system for safe, unattended operation

BENEFITS

- Industrial-scale relevance:** Generates SAF data under real refinery conditions to support reliable scale-up.
- Accurate yields & hydrogen balance:** High-precision measurement ensures trustworthy conversion, selectivity, and hydrogen consumption data.
- Safe, unattended operation:** Automated control and multi-layer safety enable long, continuous test campaigns with minimal supervision.



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GAS-TO-E-PARAFFINIC FUEL PILOT PLANT

The Gas-to-e-paraffinic Fuel pilot plant is a turnkey, modular skid solution that reproduces Fischer–Tropsch synthesis and downstream fuel upgrading under true industrial conditions to produce e-gasoline, e-diesel, and e-kerosene, enabling clients to make confident, data-driven scale-up decisions before full-scale deployment.



Step 1 – Fischer–Tropsch Synthesis (Gas-to-Liquids Conversion)

The first step converts synthesis gas ($\text{CO} + \text{H}_2$) into long-chain hydrocarbons through the Fischer–Tropsch (FT) reaction. High-pressure gas feeds (H_2 , CO , CO_2 , N_2) are accurately metered using thermal mass flow controllers and mixed to achieve the desired syngas composition. The gas mixture is preheated and sent to a fixed-bed tubular FT reactor operated under isothermal conditions. The reactor typically operates at 200–350 °C and up to ~40 barg, using an industrial-shaped catalyst. Catalyst activation is performed beforehand by reduction under hydrogen. The exothermic nature of the FT reaction is controlled via a furnace and double-jacket heat exchange system to maintain a flat temperature profile. Reaction products include heavy waxes, liquid hydrocarbons, water, and unreacted gases. Downstream of the reactor, high-pressure separation enables efficient recovery of waxes and liquids while gases are depressurized, metered, and optionally recycled or analyzed.

Step 2 – Liquid Product Upgrading (Hydroprocessing Stage)

In the second step, the liquid hydrocarbons produced in the FT section are upgraded to improve fuel quality. Liquid feeds (FT liquids or external hydrocarbons) are stored in heated vessels and pumped using high-pressure metering pumps. Hydrogen is introduced to enable reactions such as hydrocracking, hydrogenation, and desulfurization. Gas and liquid streams are mixed using miniature static mixers before entering the upgrading reactor. The reactor operates at higher pressures (up to 200 barg) and temperatures up to 550 °C, depending on the targeted upgrading reaction. The reactor design allows either single-reactor or series operation, enabling process flexibility and kinetic studies. After reaction, products pass through high- and low-pressure separators with nitrogen stripping to maximize gas–liquid disengagement. Upgraded liquid fuels and water are collected separately, weighed, and sampled, while gases are measured and routed to vent or analysis systems. This step enables the transformation of FT products into market-relevant fuels such as diesel-range hydrocarbons



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GTL – GAS TO LIQUID PILOT PLANT

The GtL lab-scale pilot plant is a fully integrated, skid-mounted unit designed for Fischer–Tropsch synthesis and process development. It converts synthesis gas (H_2 , CO, CO_2) into liquid hydrocarbons and chemicals under controlled conditions. At its core is a Vinci-Technologies proprietary tubular fixed-bed reactor with a total volume of approximately 2 liters, designed to generate industrially representative data. Its tubular geometry and high height-to-diameter ratio ensure efficient heat transfer and precise temperature control. The reactor operates in downflow, isothermal mode at pressures up to 45 barg and temperatures up to 350 °C, using industrial-shaped catalyst extrudates. An internal thermowell with multiple thermocouples provides axial temperature profiling. The reactor is integrated with a multi-zone isothermal split-tube furnace to ensure a uniform temperature profile. An upstream gas mixing and preheating system ensures homogeneous feed composition, while the gas feed section includes high-pressure H_2 , CO, CO_2 , N_2 , and effluent recirculation lines with mass flow control. Downstream separation systems allow efficient recovery of waxes, liquids, water, and gas products, with weighed recovery vessels enabling accurate mass balance. The pilot plant is fully automated via a SCADA-based control and supervision system, providing a robust and flexible platform for catalyst testing and GTL process optimization.



FEATURES

- Tubular fixed-bed reactor, ~2 L volume
- SS316 reactor, downflow, isothermal operation
- Operating conditions: up to 45 barg and 350 °C
- Multi-zone isothermal furnace with axial temperature profiling
- Industrial catalyst extrudates with inert packing
- High-pressure gas feeds (H_2 , CO, CO_2 , N_2) with thermal MFCs
- Gas mixing, electric preheating, and pressure regulation
- High- and low-pressure separation for waxes, liquids, and water
- Continuous product weighing and gas metering

BENEFITS

- Reliable catalyst selection through testing of catalysts under realistic conditions.
- Accurate performance assessment enabled by isothermal operation and temperature profiling.
- Faster catalyst screening thanks to automated operation and full mass balance.



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SMR - STEAM METHANE REFORMING PILOT PLANT

The Steam Methane Reforming Pilot Plant is designed to study hydrogen and syngas production under industrially relevant conditions. The unit is dedicated to the evaluation of steam reforming, dry reforming, and autothermal reforming reactions using gaseous and liquid hydrocarbon feedstocks. It provides a flexible experimental platform for catalyst screening, process optimization, and operating window definition. The pilot plant is built around a tubular fixed-bed reactor specifically designed for very high-temperature operation. It allows precise control of key parameters such as temperature, pressure, steam-to-carbon ratio, and gas hourly space velocity. Integrated gas and liquid feed systems enable processing of natural gas, light hydrocarbons, alcohols, and hydrotreated liquid fuels. A dedicated mixing and vaporization section ensures homogeneous reactant preparation before entering the reactor. Downstream separation systems allow effective gas-liquid disengagement and reliable product recovery.



FEATURES

High-temperature tubular fixed-bed reactor designed for reforming reactions

Reactor catalyst volume: typically ~0.5–1.0 L, depending on configuration

Maximum operating temperature: up to 1,000 °C

Maximum operating pressure: up to 30 barg

Flexible process capability: steam reforming, dry reforming, and autothermal reforming

Wide feedstock flexibility: natural gas, light hydrocarbons, alcohols, and liquid fuels

Precise control of temperature, pressure, steam-to-carbon ratio, and space velocity

Dedicated feed mixing and vaporization section for homogeneous reactant preparation

Integrated gas and liquid feed systems with accurate flow control

Downstream gas-liquid separation and conditioning for reliable product recovery

Advanced PLC-based automation and data acquisition enabling stable, unattended operation

BENEFITS

Industrial-grade validation under severe reforming conditions

High flexibility across reforming modes and feedstocks

Reduced scale-up risk through reliable pilot data



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E-AMMONIA PILOT PLANT

This e-ammonia pilot plant is a modular, containerized unit dedicated to ammonia production via the Haber–Bosch process using green hydrogen. It is designed to demonstrate and optimize the synthesis of ammonia from renewable hydrogen and nitrogen under controlled, industrially representative conditions. The plant integrates gas feed preparation, compression, catalytic reaction, and ammonia separation within a compact and fully instrumented system, enabling reliable evaluation of process performance and catalyst behavior. The unit is conceived as a flexible development platform. Reactor design, operating conditions, recycle schemes, and purification steps can be adapted to match specific project objectives, whether focused on green ammonia feasibility, process optimization, or scale-up validation. Emphasis is placed on stable continuous operation, precise control of pressure and temperature, and safe handling of hydrogen-rich streams. Its skid- or container-based architecture allows straightforward installation, relocation, and integration into power-to-X or renewable energy demonstration environments.



FEATURES

- Dedicated ammonia synthesis unit based on the Haber–Bosch process
- Designed for operation with green hydrogen from renewable sources
- Modular, containerized layout for demonstration and scale-up studies
- Integrated gas preparation, synthesis loop, and ammonia recovery

BENEFITS

- Industrial-grade validation:** Demonstrates green ammonia synthesis under controlled, representative Haber–Bosch conditions.
- Flexible development platform:** Adaptable reactor design, operating conditions, and recycle schemes for optimization or scale-up.
- Easy deployment & integration:** Modular, containerized unit suitable for relocation and power-to-X or renewable demo projects.



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ADSORPTION AND DESORPTION PROCESSES

Vinci Technologies has extensive experience in the design and fabrication of adsorption–desorption pilot plants dedicated to research, development, and pre-industrial validation, including carbon capture applications. These pilot units are engineered to closely reproduce industrial operating conditions while maintaining the flexibility required for process development, optimization, and adsorbent evaluation. Adsorption–desorption pilot plants are used to separate, purify, or capture targeted components from gas or liquid streams by means of solid adsorbent materials. During the adsorption step, selected species are retained on the adsorbent surface under controlled pressure, temperature, and flow conditions, while the desorption step regenerates the adsorbent through controlled pressure reduction, temperature increase, or inert gas sweeping.

The pilot plants are designed to support a wide range of operating modes and cycle configurations, including fixed-bed adsorption with thermal or pressure-driven regeneration. They integrate adsorption reactors, feed conditioning systems, pressure control devices, product separation and recovery sections, and advanced instrumentation for precise control and monitoring of operating parameters. The modular design allows rapid adjustment of process conditions and straightforward replacement of adsorbent materials. These units deliver high-quality experimental data essential for kinetic analysis, performance benchmarking, and scale-up, and are widely used in gas purification, CO₂ capture, hydrogen processing, and environmental treatment applications.



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SORBTEST - ADSORPTION AND DESORPTION PROCESS PILOT PLANT

The SORBTEST pilot plant is a skid-mounted mono-reactor unit developed by Vinci Technologies for studying adsorption and desorption processes in gas and liquid phases under industrially representative conditions. It integrates liquid and gas feed systems, a high-pressure fixed-bed reactor, pressure control, phase separation, and product recovery. Liquid feeds (water, oxygenates, light to medium hydrocarbons) are delivered from a nitrogen-blanketed vessel using a high-pressure HPLC pump controlled by a Coriolis mass flow meter, while gas feeds for adsorption, desorption, purging, and blanketing are regulated by high-pressure mass flow controllers up to 120 barg. The reactor handles up to 200 cm³ of adsorbent, operates up to 400 °C and 100 barg, and supports up-flow or down-flow operation. Heating is provided by a four-zone furnace enabling isothermal or pseudo-adiabatic operation with axial temperature monitoring. Downstream pressure control and gas-liquid separation ensure stable operation, with gas and liquid products accurately measured and sampled. The unit is built mainly from 316/316L stainless steel, designed for more than 48 hours of unattended operation, and fully automated via a PLC-based control and supervision system with integrated safety functions.



FEATURES

- Skid-mounted mono-reactor pilot unit
- Gas and liquid adsorption-desorption capability
- High-pressure fixed-bed reactor (100 barg, 400 °C)
- Up to 200 cm³ adsorbent volume
- Up-flow / down-flow operation
- High-pressure liquid and gas feeds with mass flow control
- Multi-zone furnace (isothermal or pseudo-adiabatic)
- Integrated pressure control and gas-liquid separation
- Accurate gas and liquid recovery with sampling
- PLC-based automation for unattended operation and safety



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POLYMERS

The pilot units of Vinci Technologies dedicated to polymerization do not, by themselves, address the full scope of the industrial challenge. Upstream of polymerization, the synthesis of monomers must be considered, as it represents a major strategic lever within the polymer materials value chain. The overall performance of a polymer depends as much on the quality and cost of the monomer as on the polymerization process itself.

New monomer synthesis processes are regularly developed to reduce production costs, improve reaction selectivity, or increase yields. For example, ethylene produced by the oxidative dehydrogenation of ethane or the use of bio-based feedstocks as substitutes for petroleum-derived raw materials, thereby addressing growing environmental and regulatory pressures. Mastery of these new production routes represents a decisive competitive advantage for industrial players and Vinci has accumulated a lot of experience and customer feedback on these research topics.

However, monomer synthesis projects are characterized by a particularly high level of confidentiality. The monomer production process is often regarded as a strategic asset, as it directly determines the producer's economic and technological competitiveness. As a result, such processes are rarely shared and remain strongly protected, including from technology partners or pilot unit suppliers.

Representative examples of polymerisation pilot plans are provided in the following datasheets. In these projects, innovation focuses on multi-stage synthesis—via new catalysts, operating conditions, or feedstocks—making confidentiality a key requirement to preserve competitive advantage. Over the years, Vinci focused on the design of fluidized beds for the synthesis of polypropylene, HDPE and LLDPE and the design of slurry and loop reactors which can also be used for depolymerization. Pilot results were shown to match MI and density of PE attained in industrial HDPE and LLDPE plants.



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POLYESTER PILOT PLANT

This pilot plant is a skid-mounted, modular unit designed for the flexible and safe production of low- to mid-molecular-weight polyesters at pilot scale. With a typical capacity of approximately 50 kg per batch, the unit provides an industrially representative platform for process development, optimization, and scale-up. Fully assembled and tested prior to delivery, the skid-mounted design minimizes on-site installation time and ensures rapid project deployment. The process is based on a multi step batch operation. In the first step, a base ester is produced in a loop reactor through controlled esterification of acids and glycols. Efficient heat transfer and mixing are ensured by a circulating loop equipped with pumps, heat exchangers, and a separator vessel. Reaction water is continuously removed using an integrated distillation column, driving the reaction to completion and enabling alcohol recovery and recycle for improved efficiency

In further steps, the base ester is converted into polyester by gradually reducing pressure and adjusting operating conditions to initiate polymerization. The process allows precise control of molecular weight, supported by online analytical tools that define the reaction endpoint. Multiple hot oil circuits provide accurate temperature control across the reactor, piping, and distillation systems, ensuring stable and reproducible operation.



FEATURES

- Batch pilot unit for low- to mid-molecular-weight polyester development (~50 kg per batch)
- Pressurized loop reactor operating up to ~100 psig during esterification for efficient heat and mass transfer
- Multi stage operation with controlled transition from esterification to polymerization via gradual pressure reduction
- Precise temperature control using multiple hot-oil circuits for reactor, piping, column, and reboiler
- Integrated distillation column for continuous removal of reaction water and alcohol recycle
- Flexible operating window supporting multiple acids, glycols, solvents, and bio-based feedstocks
- Real-time reaction monitoring compatibility (viscosity, NIR) for accurate molecular-weight control
- Industrial-grade design with 316L stainless steel construction, Class 1 Division 2 compliance, and full



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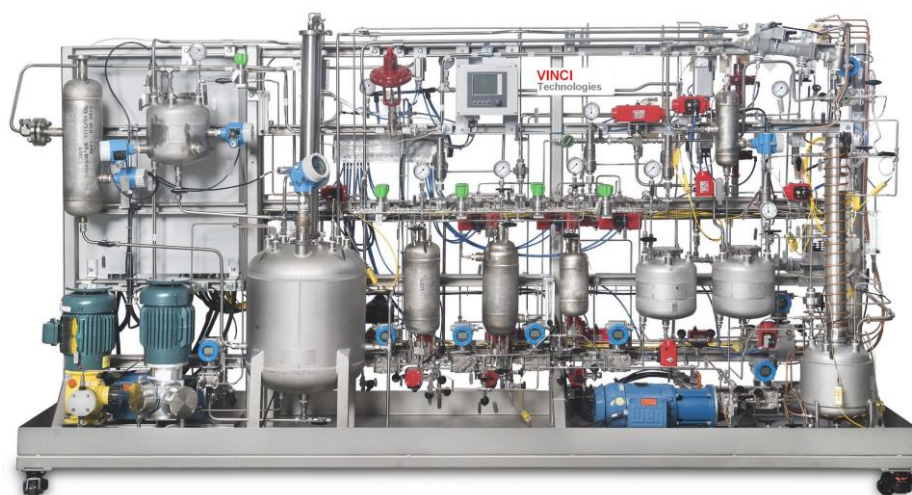
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POLYPROPYLENE PILOT PLANT

The Polypropylene Pilot Plant is a continuous polymerization unit designed for research and process development. The process begins with purification of propylene, ethylene, hydrogen, and nitrogen feeds. Purified monomers are fed to a pre-polymerization reactor operating at low temperature and pressure. Catalyst, co-catalyst, and donor are injected to initiate controlled polymer formation. The pre-polymer slurry is transferred to a sequence of stirred reactors. Reactor configurations allow operation in slurry, bulk, or gas-phase polymerization modes. Liquid propylene, hexane, or iso-butane may be used as the continuous phase in slurry operation. Polymerization temperature and pressure are precisely controlled in each reactor. Hydrogen and comonomer feeds regulate molecular weight and polymer properties. Reaction heat is removed using a tempered water circulation system. Polymer slurry or powder is continuously discharged from the reactors. Gas-phase operation includes recycle compression and condensation of unreacted monomer. Unreacted propylene is recovered and recycled back to the reactor system. Polymer samples can be withdrawn as slurry or powder during operation. The process enables flexible evaluation of catalysts, operating conditions, and polymer grades.



FEATURES

- Continuous pilot-scale polypropylene polymerization (1–2 kg/h)
- Flexible operation in slurry, bulk, or gas-phase modes
- Pre-polymerization step followed by multiple stirred reactors
- Precise control of temperature, pressure, hydrogen, and comonomer feeds
- Integrated monomer recovery and recycle system
- Suitable for catalyst screening and polymer grade development



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50 KG/HR LLDPE/HDPE PILOT PLANT

The LLDPE/HDPE Fluidized Bed Gas Polymerization Pilot Plant is a modular unit designed for polyethylene process development. It operates at a nominal capacity of 30–50 kg of polymer per hour. The plant is based on a gas-phase fluidized bed reactor technology. It enables the production of LLDPE using Ziegler-Natta or metallocene catalysts. Dry, pre-poly and slurry catalyst systems are fully supported and automated. Polymerization occurs in a vertical fluidized bed reactor with proprietary gas distribution. Reaction heat is removed through a recycle gas loop with integrated cooling. A centrifugal compressor ensures continuous circulation of reactor gases. Ethylene, hydrogen, nitrogen, and comonomers are precisely controlled. Optional condensing agents can be used to increase production rates. Polymer is continuously withdrawn as powder through a controlled discharge system. Residual hydrocarbons are removed in downstream degassing vessels. The unit includes gas purification and nitrogen management systems.



FEATURES

- Gas-phase fluidized bed polymerization
- Capacity: 30–50 kg/h
- LLDPE / HDPE/ PP development capability
- Dry and slurry catalyst flexibility
- Ziegler-Natta and metallocene compatible
- Precise control of ethylene, hydrogen, nitrogen, and comonomers
- Recycle gas loop with integrated cooling
- Continuous powder withdrawal and degassing
- Skid-mounted, modular design
- Automated operation with PLC control



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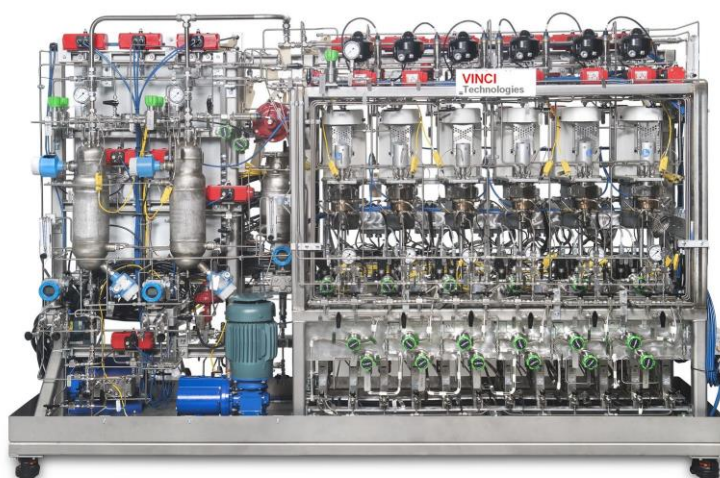
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POLYOL DEVELOPMENT PILOT PLANT

The Polyol Pilot Unit supports the development of advanced polyols—multi-alcohol molecules used as key polymer intermediates, especially for polyurethanes. The unit supports research on novel polyol synthesis routes incorporating reactive intermediates. It consists of several high-pressure reactors, a dedicated distillation column, and supporting subsystems. The distillation section provides purification of reactants and solvent recovery for reuse. The design minimizes stagnant zones to ensure safe and stable operation. Parallel reactors enable flexible experimentation and parallel testing campaigns. Each reactor is equipped with dual gas and dual liquid feed systems. Liquid feeds are precisely metered using HPLC pumps and mass flow measurement. Reactors operate under controlled high-pressure and temperature conditions. All process equipment is constructed from 316 stainless steel for chemical compatibility. Nitrogen inerting is used throughout the system to enhance safety. Off-gas and liquid effluents are treated via an integrated scrubber system. The unit is fully automated with PLC-based process control.



FEATURES

- Laboratory-scale polyol development unit
- High-pressure reactors in parallel
- Integrated distillation for purification and solvent recovery
- Precise gas and liquid feed control
- High-pressure, high-temperature operation
- Full nitrogen inerting for safe handling
- Automated PLC-based process control
- Skid-mounted, lab-compatible design
- Skid-mounted, modular design
- Automated operation with PLC control



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NYLON 6 PRODUCTION SIMULATION PILOT PLANT

The Nylon 6 Pilot Plant is a multi step polymerization line designed to convert caprolactam into Nylon 6 at pilot scale. Caprolactam is supplied from storage, preheated, and continuously fed to the polymerization section. The process consists of several stirred, jacketed, pressurized reactors arranged in series. The first reactor operates as a multi-stage CSTR to initiate polymerization and molecular weight build-up. Reaction temperature is progressively increased to approximately 300°C. Heat input and removal are controlled using Dowtherm A circulating through reactor jackets. Pressure in the first reactor is controlled using nitrogen or steam with venting to a condenser. Polymer melt is transferred through heated, jacketed lines with static mixing. The downstream reactors operate under reduced pressure to remove residual monomer and volatiles. Agitation promotes heat transfer and reaction uniformity in each vessel. Gear pumps provide controlled transfer of the high-viscosity polymer melt. The polymer is filtered through a high-pressure melt filter prior to finishing. Vapors from the reactors are condensed and scrubbed before discharge. The filtered polymer melt is sent to an underwater pelletizer. The plant is fully instrumented and controlled through a distributed control system.



FEATURES

- Multi-step, continuous polymerization of caprolactam to Nylon 6
- Series of stirred, jacketed, pressurized reactors with precise thermal control
- Operation at high temperature (up to ~300 °C) with Dowtherm-based heating
- Reduced-pressure stages for devolatilization and molecular weight control
- Heated transfer lines, gear pumps, and high-pressure melt filtration
- Integrated vapor condensation, scrubbing, and underwater pelletizing



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STIRRED DRY PHASE POLYMERIZATION UNIT (PE/PP)

The Stirred Dry Phase Polymerization Unit developed by Vinci Technologies is a bench-scale chemical pilot plant designed to study polyolefin polymerization under industrially representative conditions. It simulates fluidized-bed processes in a compact stirred reactor configuration. The unit is used for catalyst screening, kinetic studies, and copolymerization development for polyethylene and polypropylene grades. A low-speed ribbon-type agitator ensures homogeneous solid mixing and efficient gas–solid contact while preserving particle morphology. The jacketed reactor design provides precise temperature control to manage highly exothermic polymerization reactions especially when reaction starts. Optimized and even gas distribution at the reactor bottom ensures uniform bed fluidization. Monomer, comonomer, and hydrogen ratios are accurately controlled to reproduce industrial operating conditions. Real-time gas analysis and advanced automation enable stable, reproducible operation. The unit delivers reliable performance and scale-up data for polymer process development.



FEATURES

- Stirred dry-phase reactor simulating industrial fluidized-bed polymerization conditions
- Bench-scale reactor (~2.5 – 5 L working volume) for catalyst screening and process development. One day operation.
- Typical polymer production: ~200-500g g per experiment (~5-hour run)
- Low-speed ribbon-type agitator ensuring homogeneous mixing without particle attrition
- Optimized bottom gas distributor for uniform gas–solid contact and fluidization
- Jacketed reactor design enabling efficient temperature control of exothermic reactions
- Precise control of monomer, comonomer, and hydrogen feeds
- Real-time gas composition monitoring via on-line gas chromatography
- Advanced PLC-based automation and data acquisition for stable, reproducible operation

BENEFITS

- Effective catalyst screening under industrially representative conditions
- Reliable and reproducible data through precise control and monitoring
- Reduced scale-up risk for polymerization process development



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CATALYST PERFORMANCE PROPERTIES

Measurement of catalyst performance

A catalyst is a material that accelerates a chemical reaction without being consumed. It acts by lowering the activation energy of the reaction through active sites present on its surface, where reactant molecules adsorb, react, and then desorb. Catalysts are essential in the oil, petrochemical, energy, and chemical industries, where they increase yields, improve process selectivity, and reduce energy consumption.

Catalyst performance properties

A comprehensive evaluation of a catalyst is based on several fundamental properties:

Activity (reaction rate): The ability of the catalyst to accelerate the transformation of reactants. It is measured by the conversion rate or the rate of product formation.

Selectivity: The ability to favor the formation of the desired product over side reactions.

Stability and durability: The ability to maintain performance over long operating times or over many reaction cycles.

Resistance to deactivation: Sensitivity to poisoning, sintering, fouling, or coke formation.

Regenerability: The ability to restore the initial activity through thermal or chemical treatments.

Intrinsic activity: The efficiency of each active site, independent of the total amount of catalyst.

Vinci Equipment dedicated to catalyst performance measurement:

MCB – Micro Catalyst Bed Reactor System (3 cm³ of catalyst) : A laboratory micro-reactor designed for testing very small quantities of catalyst under controlled temperature and pressure conditions, allowing rapid screening and evaluation of catalytic activity.

CATATEST – Standard Catalyst Bed Reactor System (15 cm³ of catalyst): A standard fixed-bed catalytic reactor used for routine catalyst performance testing, enabling accurate measurement of conversion, selectivity, and reaction kinetics.

CTV – Large Catalyst Bed Reactor System (150 cm³ of catalyst): A larger-scale reactor that allows testing of greater catalyst volumes and operating conditions closer to industrial processes, improving scale-up reliability.

MRT – Multi Catalyst Bed Reactor System (×150 cm³ of catalyst): A multi-reactor platform capable of testing several catalyst beds simultaneously, enabling comparative studies and higher-throughput catalyst development.

CDU- FCC Catalyst Deactivation Unit: A dedicated unit used to study catalyst deactivation mechanisms such as coking, poisoning, or thermal degradation under realistic refinery conditions.

MAT – MicroActivity Testing Unit: A standardized testing unit commonly used in fluid catalytic cracking research to evaluate catalyst activity and performance under controlled fixed-bed conditions.



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MCB- MICRO CATALYST BED TEST UNIT

The MCB (Micro Catalytic Bench) is a laboratory-scale catalytic testing system used to evaluate the performance of heterogeneous catalysts under controlled reaction conditions. It operates with a continuous-flow fixed-bed reactor where gases or liquids pass through a catalyst-packed bed while key parameters such as temperature, pressure, flow rate, and reactant composition are precisely controlled. This setup allows researchers to study catalyst activity, selectivity, and stability, while analytical instruments measure product distribution and conversion rates. The system can simulate industrial catalytic processes on a small scale and is used to investigate several important reactions, including hydrogenation, hydroprocessing, hydrocracking, methanol synthesis, ammonia synthesis and decomposition, methane reforming (steam and CO₂ reforming), Fischer–Tropsch synthesis, and methanation. As a result, the MCB is widely used in catalysis research, petrochemical processing, fuel production, and hydrogen-related technologies to support catalyst development and reaction engineering studies.



FEATURES

Operating conditions: Up to 3 cm³ catalyst, 10–200 barg pressure, 550–850 °C temperature, reactor volume 10 cm³.

Feed systems: Gas and liquid feeds with mass flow controllers, HPLC pumps, heated lines, and gas mixer.

Reaction section: Continuous-flow fixed-bed reactor with pre-heater and precise furnace temperature control.

Product recovery: Gas-liquid separation, sampling vessels, flow meters, and GC connections.

Automation & safety: automated control, real-time monitoring, data logging, enclosed system with gas detectors.

BENEFITS

Compact and cost-effective: Small reactor and low catalyst requirement reduce investment costs.

Precise catalyst testing: Accurate control of temperature, pressure, and flow conditions.

Industrial simulation: Continuous-flow reactor replicates real catalytic processes.

Versatile analysis: Supports many reactions with real-time monitoring



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CATATEST - HIGH-PRESSURE CATALYST TESTING SYSTEM

The CATATEST is a laboratory-scale catalytic testing system used to evaluate the performance of heterogeneous catalysts under controlled reaction conditions. It operates with a continuous-flow fixed-bed reactor where gases or liquids pass through a catalyst-packed bed, allowing precise control of temperature, pressure, flow rate, and reactant composition. This enables researchers to analyze catalyst activity, selectivity, and stability, while analytical instruments measure product distribution and conversion rates at the reactor outlet. The system is widely used in catalysis research, reaction engineering, and process development to simulate industrial catalytic processes on a small scale with reliable and reproducible conditions. The CATATEST can study several important reactions, including hydrogenation, hydroprocessing, hydrocracking, methanol synthesis, ammonia synthesis and decomposition, methane reforming (steam and CO₂ reforming), Fischer–Tropsch synthesis, and methanation, which are key processes in petrochemical production, fuel synthesis, and hydrogen-related technologies.



FEATURES

Operating conditions: Up to 10 cm³ catalyst, 10–200 barg pressure, 550–850 °C temperature, reactor volume 40 cm³.

Feed systems: Gas and liquid feeds with mass flow controllers, HPLC pumps, heated lines, and gas mixer.

Reaction section: Continuous-flow fixed-bed reactor with pre-heater and precise furnace temperature control.

Product recovery: Gas-liquid separation, sampling vessels, flow meters, and GC connections.

Automation & safety: automated control, real-time monitoring, data logging, enclosed system with gas detectors.

BENEFITS

Compact and cost-effective: Small reactor and low catalyst requirement reduce investment costs.

Precise catalyst testing: Accurate control of temperature, pressure, and flow conditions.

Industrial simulation: Continuous-flow reactor replicates real catalytic processes.

Versatile analysis: Supports many reactions with real-time monitoring



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CTV- CATALYST TESTING VERSATILE UNIT

The CTV system is a laboratory-scale catalytic testing unit used to evaluate the performance of heterogeneous catalysts under controlled reaction conditions. It operates with a continuous-flow fixed-bed reactor where gases or liquids pass through a catalyst-packed bed, allowing precise control of temperature, pressure, flow rate, and reactant composition. This enables researchers to analyze catalyst activity, selectivity, and stability, while analytical instruments measure product distribution and conversion rates. The system is widely used in catalysis research, reaction engineering, and process development to simulate industrial catalytic processes at laboratory scale with reliable and reproducible conditions. The CTV unit can investigate several important reactions including hydrogenation, hydroprocessing, hydrocracking, methanol synthesis, ammonia synthesis and decomposition, methane reforming (steam and CO₂ reforming), Fischer–Tropsch synthesis, and methanation, which are key processes in petrochemical production, fuel synthesis, and hydrogen-related technologies.



FEATURES

Operating conditions: Up to 150 cm³ catalyst, 10–200 barg pressure, 550–850 °C temperature, reactor volume 500 cm³.

Feed systems: Gas and liquid feeds with mass flow controllers, HPLC pumps, heated lines, and gas mixer.

Reaction section: Continuous-flow fixed-bed reactor with pre-heater and precise furnace temperature control.

Product recovery: Gas-liquid separation, sampling vessels, flow meters, and GC connections.

Automation & safety: automated control, real-time monitoring, data logging, enclosed system with gas detectors.

BENEFITS

Accurate catalyst testing: Precise measurement of activity, selectivity, and stability under controlled conditions.

Industrial process simulation: Reproduces real catalytic reactor conditions using a continuous-flow fixed-bed system.

Versatile applications: Suitable for many reactions such as hydrogenation, reforming, methanol, ammonia, Fischer–Tropsch, and methanation.

Precise control and analysis: Accurate regulation of temperature, pressure, and flow, with real-time monitoring via analytical instruments (e.g., GC).



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MRT-MULTI REACTOR CATALYST TESTING UNIT

The MRT system is derived from the CTV reactor concept but expands its capabilities by integrating multiple reactors within a single modular process architecture. While the CTV system typically operates as a single reactor unit, the MRT configuration enables several reactors to be connected in parallel, in series, or in hybrid arrangements, depending on the process requirements. In a parallel configuration, multiple reactors operate simultaneously on the same feed stream, allowing higher throughput, improved productivity, and operational redundancy. In a series configuration, the output of one reactor becomes the input of the next, enabling multi-stage reaction pathways where intermediate products generated in the first reactor can undergo further conversion, purification, or conditioning in subsequent reactors. This modular design provides greater process flexibility, scalability, and control over reaction kinetics and residence time, making the MRT system particularly suitable for complex chemical transformations or processes requiring sequential reaction steps.



FEATURES

High-pressure and temperature capability: Operates up to 200 barg and 550 °C, suitable for demanding catalytic processes.

Gas and liquid feed handling: Manages both gas and liquid streams with heated feed and effluent lines for stable reactions.

Large reactor capacity: Reactors typically have 500 cm³ volume with up to 150 cm³ catalyst capacity.

Modular multi-reactor system: Several reactors integrated on one platform with parallel, series, or hybrid configurations.

Flexible operation: Independent control and sequential processing allow optimization of each reaction stage.

BENEFITS

Higher capacity: Parallel reactors increase throughput without needing a larger single reactor.

Flexible configuration: Reactors can operate in parallel, series, or hybrid setups to adapt to different processes.

Better performance and reliability: Stage optimization improves conversion, while parallel units allow maintenance with minimal downtime.



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CDU- FCC CATALYST DEACTIVATION UNIT

The Vinci Technologies FCC Catalyst Deactivation Unit is a fully automated laboratory system designed to study FCC catalyst aging and deactivation under controlled conditions representative of refinery operations. It reproduces the main deactivation mechanisms encountered in FCC units, allowing accurate evaluation of catalyst stability and resistance to degradation. The unit includes several operating modes such as hydrothermal steam treatment (ASTM D4463), which simulates high-temperature steam exposure that damages the zeolite structure and reduces catalyst activity. It also performs metal impregnation with nickel and vanadium to study metal poisoning and coke formation, as well as cyclic metal impregnation to replicate the gradual accumulation of metals in industrial FCC units. Another mode, cyclic propylene steaming (ASTM D7206), accelerates catalyst aging through repeated cracking, steaming, and regeneration cycles. Together, these modes reproduce hydrothermal degradation, metal contamination, and coke deposition, enabling the preparation of realistically aged catalysts for performance testing.



FEATURES

Temperature & pressure: 20–900 °C operating range (typical steaming 750–820 °C) with $\pm 1-2$ °C control, pressure up to ~ 5 bar(g).

Gas flow control: 10–1000 mL/min per line with $\pm 1\%$ MFC accuracy; typical gases include N₂ (purge), air/O₂ (regeneration), and steam.

Steam treatment (ASTM D4463): 10–100% steam, typically 100% steam at 760–800 °C for 4–24 h to simulate hydrothermal aging.

Propylene cracking (ASTM D7206): 20–100 mL/min propylene, 500–550 °C, cycles of 10–30 min cracking followed by steaming.

Metal impregnation (MM/CMI): Ni and V loading up to 10,000 ppm (typical Ni: 1000–3000 ppm, V: 1000–5000 ppm).

Catalyst capacity & automation: 5–50 g catalyst batches, fully automated cycles with programmable recipes (> 100 cycles).

BENEFITS

Realistic aging simulation: Reproduces hydrothermal degradation, metal contamination, and coke formation.

Standardized methods: Supports ASTM D4463, ASTM D7206, MM, and CMI aging procedures.

Automated operation: Automated control of temperature, gas flows, steaming, and cycles.

Fast catalyst evaluation: Produces representative aged catalysts quickly for screening and development.



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XY-MAT – AUTOMATED FCC CATALYST TESTING UNIT (FLUIDIZED BED)

The Advanced FCC Catalyst Test Unit is a laboratory-scale pilot system designed to reproduce industrial FCC operating conditions for catalyst evaluation. It enables controlled testing of FCC catalysts using realistic feedstocks and operating ratios, ensuring meaningful performance insights. With automated operation and real-time monitoring, the unit delivers consistent and reproducible results. Its flexible design allows multiple catalysts to be evaluated efficiently within a single test program. Overall, the unit supports informed decision-making for catalyst selection, process optimization, and FCC performance improvement while minimizing scale-up risk.



FEATURES

- Compact fluidized-bed pilot unit designed for FCC catalyst evaluation
- Uses VGO feedstock with a catalyst-to-oil ratio of 12–15
- 12 g catalyst loading capacity for precise laboratory-scale testing
- PLC-based fully automated control system for stable and repeatable operation
- Capability to test up to six FCC catalysts sequentially
- Reactor configuration that mimics real industrial FCC process conditions
- Real-time data acquisition and analysis
- High accuracy mass balance of 100% \pm 2%
- Enables studies of catalyst activity, selectivity, deactivation, and lifespan
- Modular design, configurable for different catalytic reactions and test objectives

BENEFITS

- Reliable catalyst performance prediction under realistic FCC conditions
- Reduced development time and risk through accurate, repeatable testing
- Improved FCC yields and throughput via precise process optimization



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MAT – FCC MICRO ACTIVITY TESTING UNIT (FIXED BED)

The FCC Micro Activity Test (MAT) system evaluates the activity and selectivity of FCC catalysts during catalytic cracking reactions. It measures how efficiently heavy hydrocarbons such as vacuum gas oil (VGO) are converted into lighter products like gasoline, LPG, cycle oils, and coke, while providing detailed product distribution data. The system can also co-process biomass-derived feeds using a dedicated syringe pump injection line. In operation, about 4 g of catalyst is placed in a quartz fixed-bed reactor heated to around 516 °C, where the hydrocarbon feed is injected and cracking reactions occur. The products are then separated and analyzed (typically by micro gas chromatography), and the deposited coke is burned off to regenerate the catalyst and measure coke yield. The MAT system follows ASTM D3907 and ASTM D5154 standards and supports catalyst development and refinery process optimization.



FEATURES

Reactor: Quartz fixed-bed reactor with up to 10 mL catalyst capacity (≈ 4 g typical), operating near atmospheric pressure and ~ 516 °C (max ~ 800 °C, ± 1 °C accuracy).

Feed injection: Automated injection with Coriolis mass flow control and heated feed lines up to 100 °C for heavy feeds such as VGO.

Catalyst regeneration: In-situ air burn-off with CO₂ monitoring via infrared analyzer to measure coke yield.

Product collection: Automatic gas–liquid separation; liquids condensed in ice-cooled receivers, gases collected in a Mariotte vessel.

Analysis: Micro GC for gas composition and SIMDIST (ASTM D2887) for liquid product fraction analysis.

Automation: Fully automated operation supporting 4–8 consecutive test runs with automated

BENEFITS

Accurate catalyst testing: Measures activity, selectivity, and coke formation under realistic FCC conditions.

Efficient and reproducible: Uses small catalyst quantities with high repeatability.

Automated analysis: Supports multiple feedstocks with automated multi-run testing and product balance.



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CATALYST MECHANICAL PROPERTIES

Vinci Technologies offers a comprehensive portfolio of catalyst mechanical testing instruments designed to evaluate the physical strength and durability of catalyst materials under conditions representative of industrial processes. These systems enable accurate measurement of key mechanical properties such as crushing strength, attrition resistance, and particle stability, which are critical for maintaining catalyst performance throughout its lifecycle.

By simulating the stresses encountered during catalyst handling, transport, reactor loading, and operation, these instruments help ensure the mechanical integrity of catalyst particles in demanding industrial environments. The data generated supports catalyst development, quality assurance, and process optimization.

Widely used by catalyst manufacturers, research laboratories, and refining and petrochemical companies worldwide, Vinci Technologies' mechanical testing solutions contribute to improving catalyst reliability, operational efficiency, and long-term process performance. They notably include:

CM400 – Catalyst Mixer : A laboratory mixer designed to homogenize catalyst powders and additives before forming or testing. It ensures consistent material preparation and uniform catalyst composition.

CE – Catalyst Extruder : A unit used to shape catalyst materials into extrudates or pellets. It allows researchers to produce catalyst samples with controlled geometry for testing and industrial simulation.

VCS – Catalyst Grain and Bulk Crushing Strength Tester : This system measures the compressive strength of individual catalyst particles or entire catalyst beds. It helps determine the resistance of catalysts to crushing during handling, loading, and reactor operation.

RTD-RTT – Rotating Drum and Rotating Tube Attrition Tester : A testing device that simulates mechanical stresses such as friction and particle collisions. It evaluates catalyst resistance to attrition and predicts fines generation during industrial operation.

ABAT – Air Jet / Fluidized Bed Attrition Tester : This tester evaluates catalyst attrition under high-velocity gas flow conditions. It simulates fluidized bed environments to measure catalyst durability and particle breakdown.

JCA – Jet Cup Attrition Apparatus : A system used to assess catalyst resistance to severe attrition caused by gas jets. It is commonly applied in testing catalysts used in fluid catalytic cracking and other high-velocity processes.



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CM400 - CATALYST MIXER

Dedicated to small-scale production of industrially relevant shaped catalysts, the CM400-catalyst Mixer is designed for R&D and pilot laboratories requiring precise and homogeneous mixing. It is ideal for thoroughly mixing, blending, or kneading paste-like and highly viscous materials, including oxides, water, and binders. Compact and easy to install, the unit delivers reliable, reproducible mixing results while supporting advanced catalyst formulation under controlled conditions, including vacuum operation.



FEATURES

- Working volume: 100–400 cc
- Mixing, blending, and kneading of viscous catalyst pastes
- Vacuum-capable operation
- Stainless steel, non-corrosive construction
- Variable blade speed for different rheologies
- Jacketed trough for heating and cooling
- Wide operating temperature range (5–170 °C)
- Quick disassembly for easy cleaning
- Compact, plug-and-play design (single cable, fast installation)

BENEFITS

- Homogeneous and reproducible mixing results
- Flexible processing of highly viscous catalyst formulations
- Clean, controlled operation with vacuum capability



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CE-CATALYST EXTRUDER

Designed for the small-scale production of industrially relevant shaped catalysts, the CE-catalyst extruder is a high-precision piston-type extrusion system specifically developed for use in R&D laboratories, pilot testing facilities, and formulation development environments. It allows researchers and process engineers to accurately replicate industrial extrusion conditions at laboratory scale, ensuring meaningful and reliable experimental results. The system enables the controlled transformation of mixed catalyst pastes into uniform, consistent, and highly reproducible final shapes, supporting a wide range of catalyst formulations and extrusion parameters. Through precise pressure control and robust mechanical design, the unit ensures excellent repeatability from batch to batch, while its fully ASME-compliant construction guarantees safety, reliability, and compatibility with demanding laboratory and pilot-scale operating standards.



FEATURES

- Piston-type extrusion system for precise pressure control
- Lab-scale catalyst shaping with industrial relevance
- ASME-compliant construction
- Compatible with a wide range of catalyst pastes
- Designed for R&D and pilot testing

BENEFITS

Reliable, reproducible results: Ensures consistent catalyst shapes for accurate testing and comparison.

Smooth scale-up to industrial production: Replicates industrial extrusion conditions at lab scale, reducing development risk.

Safe and standards-compliant operation: ASME-compliant design ensures reliability and confidence in laboratory and pilot environments.



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VCS - CATALYST GRAIN AND BULK CRUSHING STRENGTH TESTER

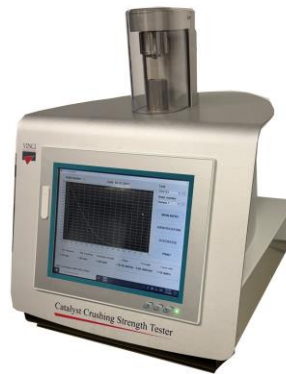
The versatile catalyst crushing strength tester can be configured for both single-grain and bulk crushing strength measurements. The unit is based on an automated press equipped with a high-precision force sensor to ensure accurate and repeatable results.

Single-Grain Crushing Strength (GCS) – ASTM D4179 & ASTM D6175

In single-grain mode, the tester evaluates individual catalyst pellets or radially oriented extrudates. Each grain is positioned on a transducer anvil and crushed by a motorized piston. The force applied at the moment of rupture is detected by the sensor and recorded by the control software. Results are automatically processed and presented in a detailed analytical report. The system includes multiple standardized hammer-anvil and hammer-holding sets made of stainless steel and fully complies with ASTM D4179 and D6175 standards.

Bulk Crushing Strength (BCS) – ASTM D7084 & SMS-1471

In bulk mode, the instrument measures the crushing resistance of a catalyst bed composed of grains up to 6 mm in size. This configuration is designed to assess the mechanical strength of catalyst batches under realistic loading conditions and complies with ASTM D7084-18 and SMS-1471 standards.



FEATURES

- Compliant with ASTM D4179 for single catalyst pellet crushing strength
- Compliant with ASTM D6175 for radial crushing strength of extrudates
- Compliant with ASTM D7084 for bulk crushing strength of catalysts
- Compliant with SMS-1471 as an alternative method for bulk catalyst crushing strength
- Supports both single-grain and bulk testing configurations
- Ensures standardized, reliable, and comparable mechanical strength measurements

BENEFITS

- Standard-compliant measurements ensuring reliable and comparable crushing strength data
- Versatile testing capability for both single-grain and bulk catalyst evaluations
- High confidence in catalyst quality control through accurate mechanical strength assessment



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RTT-RDT ROTATING TUBE AND ROTATING DRUM ATTRITION TESTERS

Vinci Technologies offers two dedicated systems for evaluating the attrition and abrasion resistance of granular catalysts and adsorbents. These RTD and add-on RTT units are designed to assess the mechanical durability of materials under controlled and repeatable conditions. Both systems allow customization of test parameters and adjustment of the fines size collected after testing, enabling accurate simulation of handling and operating stresses encountered in industrial processes.

The ASTM D4058-96 – Rotating Drum method applies more severe mechanical stress. A granular catalyst or adsorbent sample is placed in a rotating cylindrical drum operated at 60 ± 5 rpm for 30 minutes. Fines generated by attrition and abrasion are collected using an ASTM No. 20 sieve (0.85 mm aperture). Attrition loss is calculated by comparing the initial sample mass with the retained residue.

The Spence Method – Rotating Tube evaluates attrition under mild mechanical stress. Catalyst samples of up to 25 g each are loaded into cylindrical metal tubes mounted on a rotating frame. The frame rotates at 25 rpm for one hour, after which the samples are recovered and sieved. The sieve aperture is set to two-thirds of the smallest granule size, resulting in a fines fraction larger than that obtained with ASTM methods.



FEATURES

Two complementary testing methods: Rotating Drum (ASTM D4058-96) and Rotating Tube (Spence method)

Suitable for granular catalysts, catalyst carriers, and adsorbents

Adjustable test conditions to simulate different mechanical stress levels

Controlled rotation speed and test duration for reproducible results

Quantitative attrition evaluation through precise sieving and weighing

BENEFITS

Realistic assessment of catalyst durability under handling and operating conditions

Flexible testing approach covering both mild and severe attrition scenarios

Reliable and reproducible measurements supporting catalyst selection and quality control



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ABAT- AIR JET / FLUIDIZED BED ATTRITION TESTER

Vinci - Technologies offers specific equipment geared towards determining the attrition of powdered catalysts in fluidized beds as per the ASTM D5757 standard. The ABAT- Air Jet / Fluidized Bed Attrition Tester is particularly suited to FCC catalysts (fresh or steamed) of sizes ranging from 10 to 180 microns. Attrition is measured by subjecting samples to fluidization with humid air jets and the percentage of fines after a 5 hour test is given by the Air Jet Attrition (AJI). A manual and automated versions are available with the same measurement accuracy. The automated version allows the monitoring, control and recording of parameters such as operating pressure (upstream & downstream fluidized bed reactor), temperature, flow rate hygrometry, sample and fine weights by the help of external weight scale and experiment time.



FEATURES

- Fully compliant with ASTM D5757 standard
- Controlled air flow at 0.5 kg/cm² gauge, 35% humidity, and room temperature
- Maximum air flow rate limited to 10 L/min
- Attrition disengagement section with a sapphire attrition tube for durability and stable airflow
- Disengaging tubes for effective separation of catalyst particles and fines
- Fines collection system with dedicated filter and hygrometer
- Equipment dimensions strictly compliant with ASTM specifications

BENEFITS

- Accurate FCC catalyst durability assessment under realistic fluidized bed conditions
- High reproducibility and reliability through strict ASTM compliance and controlled operating parameters
- Operational flexibility with both manual and automated configurations to suit different laboratory needs



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JCA-JET CUP ATTRITION APPARATUS

The JCA- Jet Cup Attrition apparatus designed for the quantitative evaluation of attrition resistance of catalytic materials. The proposed system fully complies with ASTM D8414 / D8414M and is suitable for routine quality control, catalyst qualification, and research and development applications in refining and catalyst manufacturing environments. The Jet Cup Attrition apparatus determines the Jet Cup Attrition Index (JCI) by subjecting a defined mass of catalyst to high-velocity, humidified air under controlled conditions. The air jet induces particle-to-particle and particle-to-wall collisions within a precision jet cup, generating fines through abrasion and fracture mechanisms. A fines disengagement chamber separates particles smaller than 20 μm , which are collected in dedicated thimbles and quantified gravimetrically. The JCI is calculated as the weight percent of fines generated per hour, providing a direct and reproducible indicator of catalyst mechanical durability.



FEATURES

Applicable materials: FCC catalysts, catalyst additives, powdered catalytic materials

Sample mass: 5 g

Air flow rate: 21.0 slpm

Relative humidity: 50 % RH at the disengagement chamber

Test duration: 2 \times 20 minutes

Measured particle size fraction: < 20 μm

Output parameter: Jet Cup Attrition Index (JCI, wt.% fines/hour)

Analytical balance resolution: 0.0001 g (not included unless specified)

BENEFITS

Accelerated simulation of FCC unit attrition behavior

High reproducibility and laboratory-to-laboratory consistency

Minimal sample requirement, ideal for R&D environments

Short analysis time enabling fast decision-making

Robust industrial design suitable for continuous laboratory use



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