

Honeywell Technologies UOP Service guide

Imagination, innovation, and discovery inspired by expertise

Honeywell Technologies UOP



Table of contents

Introduction 3

Service offerings 4

Service capability 5

Field services 5
Inspection services 6
Regional services 7
Performance managers 7
Technology services 8
Global solution center 9

Recurring service agreements 10
Retainers 10
Performance+ 12
Everystep service 14

Offering events (one-time focused efforts) 15
Start-up and reload services 15
Inspection service offerings 16
Healthcheck 17
Key equipment/heater healthcheck 18
Healthcheck - fired heater 19
Healthcheck - control system 20
Elite turnaround services 21
Elite showcase turnaround services 22
Operational excellence services 23
Asset due dilligence assessment 24

Training services 25
Honeywell Technologies UOP Academy 25
Engineering design seminar 26
Process technology workshop 27
Fired heater workshop 28
Corrosion and fouling workshop 29
Train your refinery inspector workshop 30
Engineering development program 31
UOP Foundations e-learning program 33
Process training safety 34
Connected workforce competency 35

Digital services 37
Process monitor 37
Process technology analytics 39
Exception-based alerts 40
Benchmarking 40
Case studies 41
Additional digital capabilities 42



Introduction

In today's dynamic operating environment, confident execution depends on having the right expertise, insights, and support in place before challenges arise. Honeywell UOP Services delivers a proactive approach that combines industry-leading service expertise with connected digital capabilities in a fully integrated offering, providing customers with a single trusted partner across their operational needs. By leveraging deep domain knowledge and decades of operational experience, UOP helps customers maximize safety, reliability, and profitability throughout the entire asset lifecycle.

Operating successfully requires balancing efficiency and reliability with continuous innovation and performance improvement. To help customers achieve these objectives, UOP has built a dedicated global service organization comprised of more than 2,500 engineers and scientists. UOP experts have supported over 3,000 process unit start-ups worldwide and continue to help optimize the performance of more than 4,500 operating units. This expertise is delivered through a comprehensive network of Field Services supporting critical start-up, shutdown, and turnaround activities; Regional Services providing ongoing operational guidance and introducing new capabilities; Performance Managers focused on driving profitability improvements; and Technology Services that bring specialized technical expertise to address the most complex challenges. Together, these capabilities enable customers to make informed decisions, minimize risk, and execute with confidence.

Building on a legacy of proven services, including industry-recognized inspection and turnaround offerings such as Elite and Showcase, Honeywell UOP continues to invest in innovative solutions that deliver greater value across every stage of operations. From service event support and workforce training to advanced digital solutions, UOP is continuously evolving its portfolio to meet changing industry needs. New offerings such as Lifecycle Services provide customizable end-to-end turnaround and lifecycle support, while investments in AI-powered digital technologies help strengthen existing services and unlock new opportunities for operational excellence.

Drawing on more than a century of industry best practices, Honeywell UOP Services transforms operational knowledge into proactive, ongoing support that helps customers achieve safer operations, improved performance, and sustainable business success. With the right partner and the right insights at the right time, organizations can execute with confidence today while preparing for the opportunities of tomorrow.

UOP Global Service community is well positioned to support our customers



Why Honeywell Technologies

- Proven Expertise in Process Technology
- In-Depth Process Understanding
- Global Support Network
- Extensive Track Record



Service offerings

Service capability
Learn more about the expert service personnel available to support our customers.

Recurring service agreements
Most customers operating our process units maintain a fixed entitlement to our services by establishing a recurring service engagement in the form of a customizable service contract or subscription (e.g. Performance+).

Start-up and reload services
Leverage the UOP on-site team to support all phases of a project, from unit construction to start-up, through to catalyst loading and operations.

Inspection service offerings
We use our proprietary inspection methodology and deep process knowledge to help ensure optimum performance and profitable unit operation.

Lifecycle service offerings
By combining field-proven services with digital tools, we help refineries and petrochemical plants maximize reliability, extend asset life, and enhance profitability.

Healthcheck
A customizable offering that through an on-site assessment will identify key areas for improvement. A best-practices review is provided for operation staff to help position your facilities for success in future.

Elite and showcase turnaround services
Full coverage service packages proven to support customers through turnaround processes. Showcase adds the additional benefit of installation service support for a turnkey solution.

Operational excellence services
Service that embeds experienced operational experts alongside refinery and process plant teams to improve safety, reliability, workforce capability, and day-to-day operational performance.

Asset due diligence assessment
A structured, evidence-based assessment that evaluates refinery or process assets and their operating history to support risk-based, cost-effective decisions on asset acquisition, repair, restart, modernization, and value creation.

Training services
Comprehensive training offerings that can be in person and/or web based.

Process monitor
A foundational digital service that automates the collection and processing of operation data daily and will allow continuous tracking of key performance indicators (KPI).

Process technology analytics
A technology-specific feature that utilizes UOP's deep domain knowledge and robust tools to provide greater insight into specific operational capabilities.

Exception-based alerts
A continuous data connection through Process Monitor enables UOP to offer Exception Based Alerts (EBA) by UOP specialists. With EBA, UOP regularly assesses and evaluates an expanded set of critical composite operating variables and parameters to detect potential problems early and provide proactive advice to our customers.

Benchmarking
Gain valuable insights into unit operations by comparing a unit's key operating parameters with other operators running units under similar conditions.



Service capability

The extensive services we offer are made possible by our extensive global service community. Our in-depth knowledge of the hydrocarbon processing industries enable us to understand challenges and provide effective solutions.

Field services

The Field Services (FS) group works to maintain close contact between UOP's customers and our staff in the field during the commissioning of new UOP process units. UOP FS group assists in checkout and commissioning of new UOP process units, catalyst and adsorbent loadings, regenerations, troubleshooting and unit testing.

Our on-site startup team typically consists of a chief process advisor, an instrument advisor and three process advisors. From the final phase of unit construction through catalyst loading and the start of round-the-clock operations, our advisors will assist the customer's personnel with unit operations, conduct plant demonstration tests, and document the unit's initial performance. FS' regional presence allows the group to respond quickly to customer needs and the needs of UOP's on-site staff. Our FS team is a global workforce that can be mobilized at short notice and will stay on-site for an extended period to make sure our customers receive full support.

What value does FS provide?

UOP's FS Advisors bring in-depth field experience and superb technical knowledge backed by support from UOP's Technical Service Specialists to our customer's field projects to substantially reduce start-up time and turnaround schedules and produce on-spec product as quickly as possible.

Customer Testimonial

As per the project execution plan, we initially anticipated challenges in adhering to the timeline. However, the task has been completed within the scheduled timeframe, thanks to the dedicated efforts of the UOP team. We highly appreciate the efforts put in by the Instrument Advisor and all involved at the site for their support in executing the job successfully and on time.



Inspection services

Who better to inspect and troubleshoot key process units than the company who designed them?

A robust inspection process is the cornerstone of an effective reliability and maintenance program. Finding potential problems, and correcting them before failures occur can result in significantly reduced downtime and longer equipment life.

Organizations that consistently execute quality inspection programs can maximize process unit reliability, availability, and profitability.

Oil refineries and petrochemical plants worldwide have relied on UOP's field Inspection Services for over sixty years. Backed by UOP's engineering and service organizations, we identify potential problems and recommend solutions to avoid failures.

Our people make the difference

UOP's highly trained, experienced and certified field inspection engineers form the backbone of our services. Our inspectors receive extensive training in inspection best practices and key refinery technologies. They're backed by the entire UOP technical organization, including world-class metallurgists, corrosion experts, process experts, equipment design specialists and operating technical services.

Why choose UOP for quality field inspection services?

- We can help you maximize the life of your UOP process unit
- We bring decades of experience to the field inspection process
- Our inspection engineers have deep expertise and broad exposure to issues our customers face
- We offer experienced project management for your turnaround inspection program
- We can train your team in optimal inspection practices and procedures
- We have a long history and commitment to the hydrocarbon processing industries

Customer Testimonial

UOP's team demonstrated a high level of technical proficiency and attention to detail, ensuring all tasks were performed safely, within schedule, and in accordance with the highest industry standards. The services provided by your team, including reactor inspections, supervision of catalyst change-outs, and post-turnaround startup of refinery, were executed flawlessly. UOP's commitment to providing top tier services and expertise has been truly commendable.





Regional services

UOP Service Managers (SM) bring formidable industry experience to customer teams.

Our Regional Services (RS) group has two main functions: to support the delivery, startup and on-going operation of all UOP technology at customer sites; and to identify opportunities for maximizing customer profits through the use of all technology. RS managers are each assigned a group of customer sites and have the responsibility to act as UOP's initial point-of-contact for consultation and troubleshooting, as well as to respond to any technical service needs.

UOP SM are technical generalists who visit a company's facilities on a regular basis to assess the performance of UOP process unit equipment and to address operating issues.

Service Managers enable rapid response to service requests and can facilitate customer access to UOP technical specialists.

What value does FOS provide?

Our Services Managers, with their broad knowledge of the industry and UOP technologies serve as reliable, long-term customer partners to help solve technical issues, simple and complex, and identify opportunities for maximizing customer profits through new technologies and capabilities.

Performance managers

Performance Managers are similar to Service Managers but in addition to their vast industry experience, they also focus on profitability improvements.

UOP's Performance Managers are specifically aligned to the Performance+ Service engagements. They facilitate the collaborative partnership between the customers' technical teams and UOP's experts. The Performance Manager will manage the various entitlements and deliverables of the Performance+ engagement including any digital component.

The Performance Manager conducts a performance review with support from our Technical Specialists. A performance review focuses on unit performance, reliability, and profitability improvements. The performance review will comprise of a unit performance deep dive with discussion on unit constraints and end user operating objectives. The resulting discussion should align benefits and produce a prioritized action plan that sets the baseline to improve unit performance.

Our Performance Managers provide direct and proactive service through the application of our digital solutions. This focus ensures value is created and realized.

Customer Testimonial

UOP's dedication to collaboration not only met project objectives but also continued to enhance partnership between the two parties. We are looking forward to further expanding out cooperation in the future.

Customer Testimonial

You met the challenge. We are generating value together, being proactive and aligning on priority. We make our catalyst and other purchasing decisions with heavy consideration of the service we get from our suppliers.



Technology services

UOP's Technology Services (TS) group is composed of highly skilled engineers and scientists who are experts in their particular process technology.

These technology experts work closely with their counterparts in UOP's research, development, engineering, regional services, and field operating services groups to deliver new technology, and transfer knowledge to our customers.

TS specialists monitor the operation of UOP processes, equipment, catalysts and adsorbents by analyzing plant data. Guidance on operating conditions and strategies is provided to support customers as they optimize their units for safe and profitable operation. Technology Services also provides startup, revamp, and reload support for customer turnaround planning and execution.

When a customer purchases UOP catalysts, adsorbents or equipment, they get more than world-class products. They also get the dedicated attention of a UOP TS specialist.

UOP's TS specialists complete rigorous training that includes assignments in UOP's field operating services, engineering, and development groups.

Specialists can draw upon a significant network of R&D, engineering, analytical, and TS resources, as well as specialized tools and operating data from many other UOP units.

At the time of a catalyst or adsorbent purchase, a UOP TS specialist will review the customer's operations, equipment, and procedures to develop the most appropriate and effective startup for the new load. The specialist can also provide advice on loading and startup procedures for use by technical and operations staff.

Once the unit is operational, the UOP TS specialist will work with the customer to review post-startup operations and recommend operating strategies to ensure optimal catalyst performance.

This initial review can be supplemented by periodic on-site performance reviews, which enable our specialist to provide ongoing technical support to maximize system performance through the end of the cycle.

What value does the technology services group provide?

UOP's TS Specialists draw upon a significant network of UOP research, engineering, and analytical resources, as well as operating data from many other UOP units to provide ongoing technical support to maximize process performance through the end of the cycle.

Honeywell UOP, through its designated laboratories, can also provide laboratory analysis of UOP catalyst samples from operating process units. TS specialists will review and deliver the laboratory analysis in form of a written report.

TS specialists are the trusted advisors for troubleshooting any operating issue and partners with customers to determine the best path forward. TS specialists also conduct data reviews for specific process units by obtaining operating data through the Process Monitor, EBA, laboratory analysis and performance report for the purpose of analyzing the heat and material balance. Other objectives from this analysis will be to maximize existing assets to enhance unit performance (e.g. optimize reactor operations, fractionator operations / evaluation, other constraints in the unit).

Customer Testimonial

It was remarkable how the team managed to overcome unforeseen difficulties during the catalyst change, as well as carry out a sulfidation process in which most of our team members had no experience.



Global solution center

Honeywell UOP's Global Solution Center (GSC) offers 24/7 proactive remote monitoring and technical support for Honeywell's customers in the oil and gas sector worldwide. The center leverages connected solutions and digital tools to service over 200 refinery units for more than 50 customers in all UOP core technologies, with the capacity to add over 1000 units over the next few years.

The global solution center team

The GSC is comprised of unique service engineers with a variety of process technology knowledge plus expertise in data processing and utilization of different data models, including AI/ML. They use these specialized models and data troubleshooting capabilities to track key performance indicators (KPI) and generate actionable insights for each unit monitored. The GSC partners with the TS Specialist to ensure the application of sound process technology understanding is embedded in all recommendations and insights uncovered.

Maximize enterprise performance

The center provides another set of eyes to monitor the performance of all connected process units. The team utilizes best-in-class software applications to analyze sub-optimal conditions, troubleshoot issues, and uncover opportunities to enable end user operations to act quickly and maximize unit performance.

Service products

Recurring service agreements

Long history of UOP service

With over a century of experience in innovation, licensing, and the design of process units across various technologies, Honeywell UOP has a distinguished history of supporting its licensees. We assist our clients not only in the operation and troubleshooting of these units but also in reloads and restarts, as well as process and asset modernization.

Furthermore, Honeywell UOP Services are highly regarded within the industry. Most customers who operate our process units benefit from a fixed entitlement to our services by establishing a recurring service engagement. This typically takes the form of a service contract or a subscription, ensuring they have ongoing access to our support and expertise.

Challenging times

In today's market, operators must maximize profitability with aging assets, changes in workforce while achieving new energy and sustainability goals. Depending on where a facility is within the asset lifecycle, different challenges will drive different operational decisions. UOP Services are both broad and deep to help address the following needs:

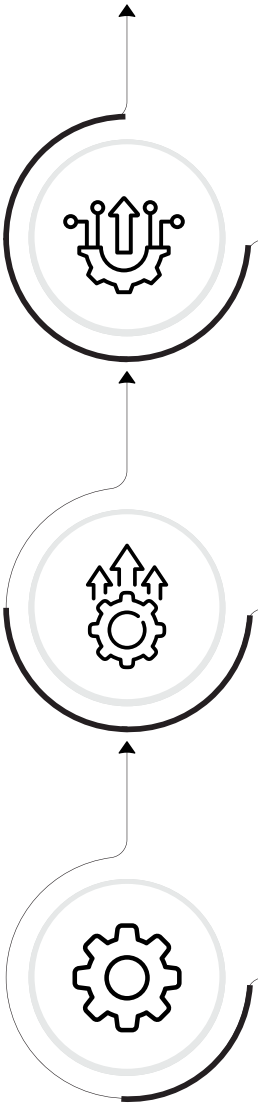
- Process issues and equipment failures lead to unplanned downtime. Changing feed, catalyst condition, or objectives without adjustments can lead to performance being less than optimal.
- Operators & process engineers may not always have the time, tools, experience, and in-house technical support to quickly identify root causes and solve operational challenges or manage changes for optimal performance with reduced risk.
- Energy & emissions monitoring is becoming increasingly more important, as new sustainability goals and emission standards are being adopted.
-

Framework of a recurring service agreement

A recurring service agreement is sold as a service retainer agreement, which acts as a framework for service entitlement provided by Honeywell UOP on an annual basis. The retainer agreement is periodically renewed to ensure that UOP can introduce the latest offerings and ensure the scope of work matches current changes in feeds, unit conditions, and short- and long-term operating targets. Service Agreements also enable customers to engage with Honeywell UOP.

UOP offers three Service Retainer Tiers to deliver optimal customer value: Legacy, Premier and Performance+.





PERFORMANCE+

- proactive
- connected
- value focused and customer service

PREMIER

- reactive
- connected
- on-demand service needs

LEGACY

- reactive
- non-connected
- on-demand service needs

Legacy and premier service agreements

Having a service agreement provides access to Honeywell UOP Services team in time of need for immediate response and support in establishing an action plan. Honeywell UOP maintains relationships with long-time customers through a Legacy Service Agreement. The UOP Service Manager assigned to a specific customer or sites will conduct a minimum number of visits annually, either virtually or in-person to collect process unit status, answer questions, follow up on requests, and update site personnel and management on new and upcoming offerings from UOP. Depending on the scope of work, the agreement also contains yearly site visit(s) from Technology Service specialists and data reviews for specific process units. The service agreement also includes entitlement on consultation hours from Technology Service teams within the contract years, with options to request call-off services at more favorable rates.

In order to improve productivity and responsiveness and being adaptive to the ever-transforming needs of today's markets and operating landscape our technologies reside in, Honeywell UOP offers Premier Service Agreements with all the existing entitlement, plus access to our digital offerings such as Process Monitor and Process Technology Analytics.

Case Study

Power of Connected

The Challenge: An operating Gas Processing facility utilizes a TRAPS Pretreatment and Separex Membrane System to remove contaminants from landfill gas and produces renewable natural gas.
The customer has engaged with UOP Premier Service Agreement using Process Monitor to provide guidance on performance optimization, membrane management and quick troubleshooting.

The Results: The Technology Service team consulted with the customer and provided a variety of recommendations that resulted in $30k/day of incremental revenue by:

1. Added elements over time to improve hydrocarbon recovery and overall higher capacity
2. Eliminated flaring of excess landfill gas
3. Increased gas production by 40%



Performance+ services

UOP Performance+ Services is a digitally- enabled, profitability-focused service solution that is designed to improve UOP units' operating efficiency and reliability and customers' margin by $5M+/year per site. This solution combines industry-leading technologies for process licensing, automation, and industrial software under the same umbrella to offer customers value-added, digital solutions supported by UOP experts. To ensure benefits are achieved and sustained on an ongoing basis, a collaborative UOP Service team, enabled by our digital services, work with our customers to achieve operational excellence.

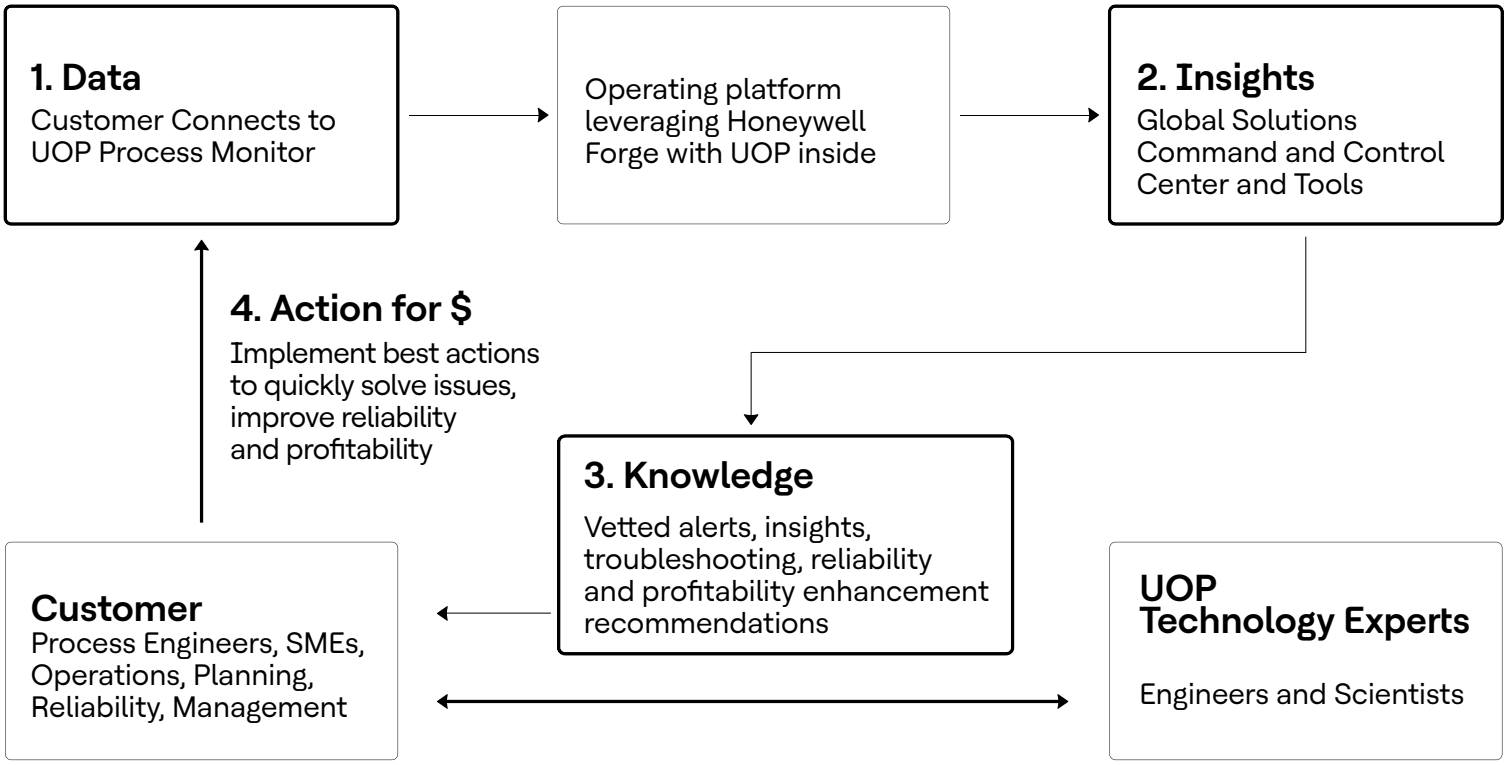
This proactive service brings deeper insights and real-time recommendations through priority access to UOP technical experts to help you improve unit reliability, production rates, operational efficiency, performance, and overall unit and site profitability.

Performance+ Service is a fully customized service designed to prioritize customer needs, operating objectives and profitability.

How Performance+ works

The components of Performance+ include a dedicated team of UOP experts, continuous access to operating data, plus the application of advanced digital tools to assist end-users in operational and technical business decisions. This enhanced relationship combined with the digital services will enable the exchange of actional technical recommendations to allow end-user teams to become proactive instead of reactive.

See on the following page to see how data is transformed into insights, converted into knowledge, and finally into actions where value is realized.



Power of Plus

Leverage UOP Performance+ Services to help solve problems faster and better, identify opportunities for increased profitability via reliability and optimization improvements. Typical refinery benefits range from $1MM to $5MM per year when considering the improvements in production/ yields, reliability, catalyst life, and energy usage.

Case Study

UOP has service engagements with more than 330 customers operating refining, petrochemical, and gas processing plants with most customers opting to renew over the past seven decades. Performance+ service engagements are rapidly growing with over 20 customers signing up in 18 months.

The Challenge: A North American refinery operating a typical fuel based refinery with multiple technology units was looking to improve overall performance without impacting reliability. They also were challenged with access to technology expertise within their own organization.

The Results: Within the first 6 months of the Performance+ engagement, UOP and the customer collaborated on various challenges and opportunities that led to over $4M/yr of achieved value.

Lifecycle service offerings

Overview

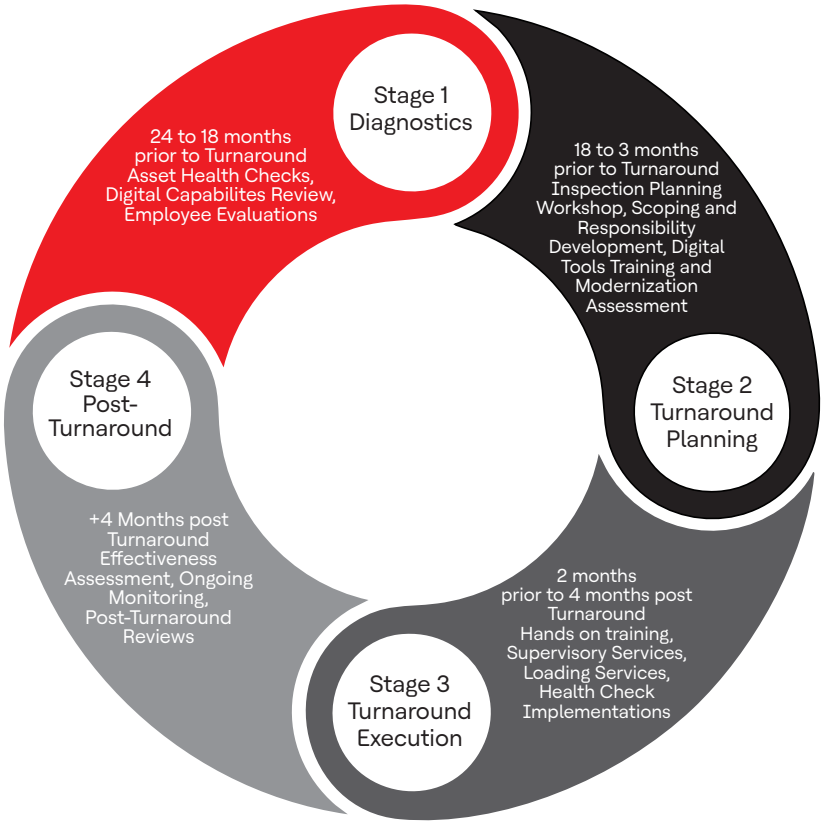
During a plant shutdown or turnaround, time saved is money earned for you. Choosing the right partner to help you through this process is important. While partners promise to be your single source of turnaround expertise, there is only one organization that fundamentally understands the technology, the equipment, and the true challenges you face. Honeywell UOP brings a century of technology innovation experience to bear to help you with every phase of your turnaround.

Honeywell UOP's Lifecycle service offerings align people, processes and assets from early diagnostics through post-turnaround optimization. By combining field-proven services with digital tools, we help refineries and petrochemical plants maximize reliability, extend asset life, and enhance profitability.



Your Turnaround Is Our Priority

With over a century of experience, the most important aspect of our Lifecycle service offerings is our customer-focused approach. Our team can provide complete, around-the-clock support for your planned or emergency turnarounds. We offer end-to-end solutions, from concept to operation, and we are available 24 hours a day, 7 days a week to help you maximize your operations.



Service products

Offering events

Start-up and reload services

New unit start-ups, revamps and reloads require additional focus from both the operating company and UOP to ensure investment meets performance expectations. From checkout, loading, commissioning, optimization and completing the demonstration test, UOP's on-site service team provide prompt guidance to achieve quality and timely startups.

Our on-site startup team typically consists of a chief process advisor, an instrument advisor and three process advisors. From the final phase of unit construction through catalyst loading and the start of round-the-clock operations, our advisors will assist the customer's personnel with unit operations, conduct plant demonstration tests, and document the unit's initial performance. FOS' regional presence allows the group to respond quickly to customer needs and the needs of UOP's on-site staff.

Customer Testimonial

I would like to extend my sincere gratitude and appreciation of your outstanding support and professionalism in facilitating the safe startup of the PSA unit. Despite various challenges we faced, your dedication to working for extended hours and your close collaboration with our team were the key success to achieve the safe startup. Thank you and I look forward to collaborating with you on more projects in the near future. - a Middle East Refiner, PSA Startup



Inspection service offerings

We use our proprietary inspection methodology and deep process knowledge to help ensure optimum performance and profitable unit operation.

Fabrication Shop Inspection – To help ensure equipment and plant construction quality, UOP supplies global shop inspection coverage to maximize long-term performance.

Turnaround Inspections – Our inspection engineers can provide mechanical consultation for conformance to industry codes and UOP's specifications, with unmatched expertise in UOP Platforming™, UOP Unicracking™, UOP HF Alkylation, and UOP Fluid Catalytic Cracking (FCC) Process units.

Inspection Planning – We work closely with our customers to establish the inspection requirements and plan based on UOP's methodology and experience, and the codes and specifications in force. We can also lead inspection planning workshops for your team.

Inspection Training – UOP can train your team in optimal inspection practices and procedures so that you can implement and sustain a world-class inspection program.

Inspection and Technology Service Workshops – Our team of inspectors and TS specialists can partner with the site operational team to employ Enhance turnaround planning for maintenance and inspection activities, achieve a balance of efficiency and safety and understand the key areas for process and reliability improvement. The workshops can help shorten turnaround schedules, lower costs, and reduce potential health, safety, and environmental (HS&E) incidents. They foster a collaborative approach that ensures buy-in from both leadership and the technical teams at the site.



Healthcheck

Overview

The Honeywell UOP Healthcheck is a customizable solution that leverages a proven process. Over the past decade, this solution has delivered impressive results, benefiting from the extensive expertise of UOP Technology Specialists.

An onsite assessment will identify key areas of improvement and an operational best practice review with your operations staff will position your facilities for success. Further collaboration to understand your short- and long-term processing objectives, product specification requirements, and sustainability goals produce revamp solutions aligned with your vision. The output of Healthcheck is a customized roadmap of recommendations and actions to address your short- and long-term operating goals.

Benefits

By addressing the above challenges with a Healthcheck roadmap, you can identify and take action to:

- **Optimize unit operation**
- **Establish a baseline for Key Performance Indicators compared to industry standards**
- **Maximize critical asset utilization**
- **Identify potential unit updates for improved operability and reliability**
- **Hand's on training for operators and engineers**

Needs

In the current challenging economic times, end users need to maximize the economic benefit for every barrel of feed processed. However, this is achieved only when the unit operation is optimized and pushed for maximum throughput possible.

Consider:

- Are you bottlenecked and looking to push throughput?
- Does your feedstock, unit severity or contamination levels change and are you able to adjust operations to meet these changes?
- Is your unit designed to accommodate new operating objectives including sustainability challenges?
- Have you lost experience due to recent retirements or other changes in the workforce?
- How do you balance and prioritize unit reliability vs profitability?



Case Study 1

Reduced HF Acid Consumption

The Challenge: A North American customer operating a UOP-designed C4 Merox unit was facing instability with product sulfur which led to high HF acid consumption in the Alkylation unit.

The Results: Operational improvements recommended in the Merox Healthcheck led to a reduction in product total sulfur of up to 15 wppm. **This directly led to a 40% reduction in HF acid consumption, with annual savings of over $200K.**

Case Study 2

Fixing a Leak

The Challenge: An Asia-based customer is operating a UOP designed CCR Platforming unit and was facing challenges to meet aromatic yield.

The Results: UOP's Tech Service expert performed the onsite Healthcheck, identified that there are high levels of unconverted methyl cyclohexane and cyclohexane in the reformate. It suggested that there was a leak in the Packinox combined feed exchanger. By completing the Healthcheck, the size of the leak was quantified and economic impact determined at $5 mm/year. **This gave the customer economic justification to repair the Packinox and to implement Low-Flow, Low-Firing to mitigate future leaks.**

Key equipment/heater healthcheck

A Honeywell UOP Process Specialist can carry out a high-level assessment of your existing equipment to help identify gaps in operability and sustainability.

The mechanical review will analyze the key equipment performance and equipment evaluation for turnaround work.

With our process expertise, the Heater Healthcheck is expected to deliver a series of recommendations which could unlock potential incremental gross margin over the current operation. In addition to improving the margins, the Healthcheck also delivers additional benefits in reliability, transfer of knowledge and unit performance.

As a result of this Healthcheck, our team can identify better bottom-line results and identify a pathway for future improvement. The benefits delivered are expected to include:

- Optimized heater performance and minimizing operating expenses and maximizing unit reliability.
- Direct interaction with an expert from UOP Heater Specialist to interact with your operations, technology, laboratory and maintenance teams for a deeper dive into issues that are not possible with remote interaction and discuss best practices.
- A benchmark on current operation, with sufficient resolution to allow engineering design improvements or for an engineering study.
- Identification of improvements made while at site, including financial impact.
- A follow-up report highlighting potential short- and long-term investment options, with corresponding benefits to allow future decision making.

Case studies have shown values derived from Heater Healthchecks have ranged from hundreds of thousands of dollars to multi-million dollars per year, providing quick payback on this investment for your facilities



Healthcheck - fired heater

Overview

The UOP Fired Heater Healthcheck is a comprehensive assessment program designed to evaluate the performance, reliability, safety, and efficiency of fired heaters. The service combines onsite specialist evaluations, operational reviews, data collection and analysis, performance benchmarking, and follow-up recommendations to help customers maximize the value of critical heater assets. The assessment identifies performance gaps, operational constraints, combustion issues, reliability risks, and potential improvement opportunities while providing a practical roadmap for optimization and long-term asset management.

Typical activities include:

- Review of operating, maintenance, and inspection history
- Visual heater inspections
- Data collection and performance benchmarking
- Tube temperature measurements and thermography (where available)
- Evaluation of combustion performance and operating practices
- Recommendations for operational improvements and potential future upgrades or revamps
- Final findings presentation and follow-up report with actionable recommendations.

Needs

Refineries often operate heaters based on historical limits and assumptions that may no longer reflect actual equipment capability. Heater Healthcheck addresses customers who need to:

- Determine whether a fired heater is limiting throughput, reactor temperature, or unit performance.
- Validate whether operating constraints are true design limitations or conservative operating practices.
- Improve reliability and reduce unplanned shutdowns.
- Address combustion problems, flame impingement, coking, or uneven firing.
- Improve energy efficiency and reduce fuel consumption.
- Support catalyst changes, process upgrades, or higher severity operation.
- Identify opportunities to extend asset life and reduce safety risks.
- Establish a data-driven basis for future heater investments, upgrades, or turnaround planning.

Benefits

Heater Healthcheck helps customers unlock value from existing fired-heater assets while reducing risk and operating costs. Key benefits include:

- **Higher asset utilization through validation of heater operating limits.**
- **Improved throughput by identifying and removing operational bottlenecks.**
- **Enhanced reliability and safety through identification of early warning signs and risk areas.**
- **Improved fuel economy and heater efficiency through combustion optimization and operational improvements.**
- **Reduced downtime and disruptions by addressing reliability concerns before failures occur.**
- **Knowledge transfer to operations personnel through direct engagement with heater specialists.**
- **Actionable recommendations that range from operational improvements to long-term revamp opportunities.**
- **Performance benchmarking against industry best practices and UOP expertise developed from servicing hundreds of units globally.**

Case Study 1

Increase Heater Capacity Through Heater Assessment

A refinery operating multiple heaters conducted a review to improve reliability and understand operating limitations. The assessment identified opportunities to reduce flame impingement, improve burner performance, seal sources of tramp air, and optimize combustion practices. Recommendations included periodic heater monitoring, burner maintenance improvements, and prioritizing reliable operation while maintaining production targets. The review demonstrated that significant spare capacity existed once operational issues were corrected.

The Challenge: Improve Reliability Through Heater Healthcheck

UOP conducted a Heater Healthcheck on the charge heater and interheaters in the Platforming Unit. Activities included site inspections, review of operating conditions, assessment of heater limits, fuel quality review, tube wall temperature evaluation, inspection practices, and heater sealing assessment. The engagement resulted in a comprehensive report with findings, operating recommendations, simulation-based evaluations, and guidance for improving heater performance and reliability.

The Results: Power of Heater Healthcheck

Heater Healthcheck helps refineries verify operating assumptions, improve fired-heater reliability and efficiency, identify hidden capacity, and develop a clear path to safer, more profitable operation.

Healthcheck - control system

Overview

The Control System Healthcheck is a comprehensive assessment designed by UOP experts to improve the reliability, performance, and longevity of UOP Process Information & Control (PIC) systems. The engagement evaluates system health, architecture, obsolescence risk, hardware and software condition, alarm management, diagnostics, backup practices, and overall operational readiness. Deliverables include a detailed assessment report, prioritized action plan, and knowledge-transfer workshop.

This helps refiners maximize PIC system reliability, mitigate obsolescence risk, prepare for future upgrades, and avoid costly operational disruptions through expert evaluation, actionable recommendations, and targeted training.

Needs

Customers typically pursue a Control System Healthcheck when facing one or more of the following challenges:

- Aging or obsolete control system components that increase failure risk.
- Limited visibility into hardware/software lifecycle status.
- Frequent alarms, diagnostics issues, or troubleshooting challenges.
- Knowledge loss due to personnel turnover.
- Upcoming turnarounds requiring upgrade planning.
- Need to improve operational confidence and system reliability.
- Concerns about the operational impact of an unexpected PIC system outage.

Benefits

The Control System Healthcheck helps customers:

- **Extend system longevity through proactive lifecycle and obsolescence management.**
- **Identify obsolescence risks before unsupported hardware or software creates operational issues.**
- **Plan future upgrades and align modernization activities with scheduled turnarounds.**
- **Improve reliability and availability of proprietary UOP control systems.**
- **Strengthen troubleshooting capabilities through system reviews and operator training.**
- **Bridge knowledge gaps caused by workforce turnover.**
- **Increase operational confidence by improving understanding of system health and performance.**
- **Optimize architecture and alarm management while reducing dependence on reactive maintenance.**

Case Study 1

Reliability Improvement After Upgrade

The Challenge: A site experienced persistent alarms, hardware issues, and operator skill gaps even after a recent control system upgrade.

The Results:

- Redundancy issues were identified and corrected.
- Channel fault alarms were resolved through software, logic, and field modifications.
- Troubleshooting skills were improved through hands-on workshops.
- Spare parts requirements were reviewed and procurement plans established.
- Overall system reliability and operator confidence improved.

Case Study 2

Maximizing Aging Asset Value

The Challenge: An aging PIC system, unmanaged for over a decade, was experiencing persistent hardware and channel faults, limited spare-part readiness, and critical knowledge gaps that increased operational risk.

The Results:

- Resolved long-standing hardware board voter fault.
- Eliminated multiple channel fault alarms through software, logic, and field corrections.
- Reduced reliability risk with preventive power supply battery replacement.
- Improved operator understanding of alarm significance and system performance.
- Established a modernization roadmap with retrofit recommendations and spare-parts strategy.
- Overall system reliability and operator confidence improved.

Elite turnaround services

Overview

Honeywell UOP's Elite Turnaround Services offering is grounded in a well-established combination of processes, tools, and systems specifically designed to tackle today's challenges. This approach has consistently demonstrated excellent results for nearly a decade, driven by the extensive expertise of UOP specialists and experts.

They focus on developing the skills and behaviors necessary for achieving improved outcomes. The path to a more successful turnaround begins with the Elite kickoff meeting far in advance of the event with delivery of key framework materials for scheduling and executing the plan, either before or after contractor selection. Throughout the Elite process, UOP essentially becomes a part of your Turnaround.

The planning team is focused on elevating their preparation and planning to best-in-class levels. Key factors that enable safer, more effective, and faster turnarounds include contingency planning,



procedure development and review, as well as targeted workshops that engage your chosen contractor. This collaboration ensures that the scope is aligned among all parties and incorporates essential checklists, along with many other components.

Enhanced field support ensures that right and fast decisions are made, not only for the tasks at hand, but to also address the myriad of unknown challenges that are inevitably part of every turnaround. In the end, your turnaround can be done faster, safer and result in highest reliability after restart with Honeywell UOP's Elite turnaround Services.

Needs

In today's environment, it is difficult to find and maintain staff with expertise in major mechanical works, especially for technologies that operate for many years before such maintenance is required. When a process unit or complex requires a maintenance event, the assets are not producing and every day lost is a day of negative margin for your business.

Consider:

- How long has it been since your unit has been turned around? Or is it perhaps the first time the unit will have such a significant mechanical event?
- How many of your staff were in the same key positions for this last turnaround? How many were present and participated in the last full turnaround of similar scope?
- Have your past turnarounds run overschedule or overbudget?

Benefits

By addressing the above challenges with UOP Elite expertise and your turnaround planning and execution teams, you can achieve:

- **Faster completion with fewer product-out to product-in days, allowing more production.**
- **Safer operations with more complete pre-planning and better preparedness**
- **Improved effectiveness for maximum reliability after restart**
- **Faster optimization post-turnaround to leverage the most from the refurbished unit**
- **Direct access to Technical Services.**

Case Study 1

Reduced Turnaround Time

The Challenge: North American Refinery with 2 Parex units had much longer than planned chamber to chamber time in last Parex reload, executed 11 years earlier, and wanted to ensure that this Parex reload was executed on-time and on-budget, without sacrificing safety or quality.

The Solution: UOP's Parex Elite Turnaround Package

The Results:

- Saved over 27 calendar days as compared to prior train reload, 14 compared to original expected schedule without Elite.
- 14 days of savings valued at over $1.7M in opportunity production and over $1M in additional savings with reduced turnaround time.
- Trouble free restart, quickly attaining excellent performance and high operational reliability after restart.

Case Study 2

Quick and Accurate

The Challenge: An Asian operator with a 23KBPD CCR Platforming Unit wanted to replace catalyst and reactor internals with minimum production impact due to high gasoline demand.

The Solution: UOP' CCR Elite Turnaround Package

The Results:

- Fast and Right Execution
- Finished turnaround 6 days early, oil-out to oil-in.
- Savings of 6 days valued at $1.6M in production value
- Quality reactor internals replacement and catalyst changeout performed with a quick return to optimized production

Elite showcase turnaround services

Upgrade

Elite Showcase Turnaround Services are an extension of the Elite Turnaround Services when a turnkey solution is preferred.



Benefits

By upgrading UOP Elite Turnaround Services to a UOP Elite Showcase solution, you can achieve all of the benefits of Elite plus:

Single point accountability for execution.

Even faster execution with the subcontractor reporting directly to UOP.

High quality implementation with experienced oversight by technology experts.

Adjustable scope to manage other maintenance tasks.

Case Study 1

Ahead of Schedule

The Challenge: An Asian aromatics complex with two Parex Trains had a turnaround window that was weeks less than was expected to be accomplished, which required a reload of four adsorbent chambers with their contractor who lacked Parex experience.

The Solution: UOP's Parex Elite Showcase Turnaround Services

The Results:

- Saved more than two weeks versus the original expected schedule and finishing mechanical work 7% faster than represented.
- Overall project completed ahead of schedule and able to restart over two weeks early, valued at over $10M in opportunity production.
- Zero injuries and smooth restart of complex.

Operational excellence services

Overview

Operational Excellence Services (OES) provides embedded, practical operations expertise to refineries and process plants to improve safety, reliability, and workforce capability. OES works alongside engineering, operations, and leadership teams to close the gap between process design intent and day-to-day plant operation. Unlike traditional consulting or classroom-based training, OES focuses on how facilities actually operate—supporting teams on site and in real time to build operational judgment, discipline, and confidence. The service integrates engineering knowledge with hands-on operational experience to help plants achieve safer, more reliable, and more optimized performance across the asset lifecycle.

Needs

Operational Excellence Services is most valuable for organizations facing one or more of the following challenges:

- Introducing new technologies or units where operators have limited practical operating experience
- Startup, commissioning, or major revamp phases where early operational decisions impact long-term performance
- Loss of experienced operators or supervisors, combined with rapid hiring and limited onboarding time
- Increasing safety, compliance, and reliability pressure across operations
- Gaps between process design knowledge and real-world operating practices
- Inconsistent or declining operational performance driven by early execution or capability issues

Benefits

Achieved through continuous, plant-embedded engagement that supports both immediate performance needs and long-term capability building, organizations that engage Operational Excellence Services realize measurable improvements across people, performance, and plant reliability, including:

- **Improved operational reliability through early identification and mitigation of operational and safety risks**
- **Enhanced safety performance by strengthening operational discipline and decision-making at the operator and supervisor level**
- **Reduced operational errors by aligning procedures, design intent, and real operating conditions**
- **Stronger workforce capability with embedded coaching, practical training, and knowledge transfer**
- **Sustained unit optimization by building internal competencies rather than relying on short-term external support**
- **Faster stabilization during change such as startups, revamps, or workforce turnover**



Asset due diligence assessment

Overview

The Asset Due Diligence Assessment is a structured, evidence-based assessment designed to evaluate refinery assets and operations providing insights into economics, efficiency, and effectiveness. Assets that can be assessed include process units and equipment, infrastructure, utilities, and support systems, and operational procedures and management.

The assessment optimizes assets by:

- Establishing current asset condition and value
- Identifying key areas to recover/enhance operational performance and the expected financial return
- Benchmarking operational metrics against similar global and regional facilities
- Reviewing alignment with refinery production, environmental, and financial targets
- Exploring feasibility, cost, and timeline for varying refinery value creation pathways

Needs

Current or potential asset owners often face challenges in effectively utilizing assets, meeting operational targets, and aligning with best practices. Asset Due Diligence Assessment addresses following objectives:

- Is performance in-line with similar global and regional refineries?
- Can both present and future demand.be met with existing infrastructure?
- Are disruptions that lead to loss of production minimized?
- Are assets being utilized in a way that maximizes profit?
- Are risks mitigated to ensure asset reliability?
- Are processes optimized to maximize efficiency without compromising safety?

Benefits

UOP provides integrated technical expertise with financial-driven evaluation for the Asset Due Diligence Assessment, namely:

- **Technical insight and design information enabling efficient, well-supported recommendations based on UOP's expertise and proven design capabilities**
- **Catalyst and equipment recommendations aligned with licensed unit specifications.**
- **Optimize catalyst and adsorbent selection from UOP's portfolio, along with associated equipment recommendations, to maximize unit performance and reliability**
- **Inspection services backed by 60+years of field and metallurgy experience, as well as process insight.**
- **Practical, implementable actions informed by UOP's technical expertise to accelerate unit readiness and minimize downtime.**

Case Study 1

Severe Flooding

The Challenge: A US refinery experienced severe flooding and needed a full inspection assessment composed of internal inspections of vessels and exchangers, an extensive plan for dismantling piping circuits and components, and visual inspection of exposed flanges and valves.

The Solution: Asset Due Diligence Assessment

The Results:

- Three UOP inspectors and multiple mechanical contracting teams were dispatched.
- Comprehensive work extended beyond basic inspection into documentation, repair definition, servicing, refurbishment, and replacement.
- UOP Provided both technical inspection capability and field coordination/quality oversight



Service products

Training services

Honeywell Technologies UOP Academy

Overview

Prepare your team to perform their jobs accurately and safely with flexible competency solutions from an industry leader in refining, petrochemical and gas processing technologies. UOP offers both in-person and on-demand training and tools you need to address the growing skills gap while helping to increase productivity and reduce the risk of human performance issues at your plant.

- Our courses include classroom lectures, case studies, and problem solving exercises. We incorporate the latest technology advances and industry know-how into our programs.
- Our instructors are leading experts in refining, petrochemical and gas processing.

Benefits

- **Equip your personnel with knowledge that contributes to your bottom line.**
- **Improve your corporate succession planning.**
- **Train your personnel to identify, prevent and respond to potential hazards.**
- **Enable your personnel to achieve their highest levels of performance.**



Engineering design seminar

Overview

This intensive 39-day program gives participants the opportunity to learn the fundamentals of refining process design. Each topic is presented in the context of the design of a refinery process unit or the selection of a specific type of refinery equipment. Seminar sessions are led by UOP process design and equipment design specialists who demonstrate how to apply engineering principles to solve design problems.

Course benefits

Course participants will be able to:

- **Understand the practical applications of basic design engineering principles**
- **Develop steady-state simulations of process flowsheets, including design guidelines, generation of heat/mass balances, and process optimization**
- **Systematically assess hydraulic circuits**
- **Understand key criteria for designing vessels, heat exchangers, rotating equipment, piping, relief valves, fractionating columns, and fired heaters**
- **Explain how to process stream properties affect process equipment metallurgy**
- **Understand the content and applications of process flow diagrams (PFDs) and piping and instrument diagrams (P&IDs)**

Topics

- Compressors
- Carbon capture
- Energy systems
- Environmental issues
- Fired heaters
- Fractionation
- Gravity separation
- Heat exchangers
- Instrumentation
- Line sizing and hydraulics
- Metallurgy, corrosion and fouling
- Operational safety
- Pinch technology
- Process unit design
- Pressure vessel and flange ratings
- Process and project engineering
- Process fluid properties
- Pumps
- Refinery business economics
- Relief valves
- Simulation tools for process design
- Steam turbines
- Tray sizing
- Vacuum unit
- Utilities and offsites



Process technology workshop

Overview

The workshop enables your team to monitor and optimize unit operations, ensure safe and reliable operations, and also have the knowledge and skills to respond to both normal and abnormal events. Participants gain knowledge in process flow, equipment, troubleshooting, startup, shutdown, maintenance procedures, metallurgy and corrosion protection.

Course benefits

Course participants will be able to:

- **Describe and understand the function of the unit**
- **Describe and understand the main process flow**
- **Understand key process indicators**
- **Understand the impact of contaminants**
- **Learn troubleshooting skills**
- **Understand the best practices for startup, normal operations and shutdown**

Topics

- Introduction, theory, chemistry
- Process variables
- Process flow
- Process contaminants
- Process equipment
- Process control
- Normal operations
- Startup, shutdown
- Unit optimization
- Troubleshooting
- Case studies



Fired heater workshop

Overview

The workshop enables your team to monitor and optimize unit operations, ensure safe and reliable operations, and also have the knowledge and skills to respond to both normal and abnormal events. Participants gain knowledge in furnace design, burner operations and maintenance practices.

Topics

- Heater basics
- Radiant and convection section
- Flame temperature
- Heater efficiency
- Pilots and burners
- Field evaluation
- Troubleshooting
- Design and safety features
- Inspection and turnaround practices
- Reliability
- Instrumentation

Course benefits

Course participants will be able to:

- **Gain knowledge in applicable codes and standards**
- **Explain key operating parameters**
- **Recognize typical problems and identify possible causes**
- **Discuss inspection and turnaround items**



Corrosion and fouling workshop

Overview

The workshop enables your team to monitor and optimize unit operations, ensure safe and reliable operations, and also have the knowledge and skills to respond to both normal and abnormal events. Participants gain knowledge in the science of corrosion, causes and prevention techniques associated with corrosion and fouling.

Topics

- Introduction to corrosion and fouling
- Low/high temperature corrosion mechanisms
- Unit specific corrosion information
- Corrosion from chemicals and inhibitors
- Corrosion testing, monitoring and prevention

Course benefits

Course participants will be able to:

- **Identify common causes of refinery corrosion and fouling**
- **Describe types of corrosion and fouling based on location, process conditions, and symptoms**
- **Identify control strategies, associated benefits and possible risks**
- **Apply knowledge to troubleshoot operations, and solve less common corrosion and fouling issues**



Train your refinery inspector workshop

Overview

The workshop helps prepare your inspectors for in-service inspection of existing assets. The course also covers routine repairs to restore equipment for continued service. The course can also be used to train visual examiners to apply the API-510 Pressure Vessel and API-570 Piping Inspection Codes.

Topics

- Inspection overview
- Pressure vessels, heat exchangers
- Fired heaters
- Gunned refractory linings
- Process piping, valves,
- Instrumentation
- Equipment corrosion

Course benefits

Course participants will be able to:

Discuss construction, in-service inspection, examination, and routine repair of pressure vessels, heat exchangers, fired heaters and process piping including valves and instrumentation

Recognize when repair or fitness for service assessments are required



Engineer development program

Overview

Prepare leaders to step quickly into highly responsible roles with little or no drop-off during workforce transition.

Scope

This intensive 12-month program is designed to cultivate well-rounded engineering professionals through structured rotations across key departments within UOP. This comprehensive program combines fundamental design knowledge with hands-on application and equips participants with technical expertise and practical skills necessary for future roles within your organization.

Process design

Participants will focus on design principles like gravity separation, fluid properties, equipment design guidelines that enable safe and reliable operations. Participants will apply fundamentals to real world projects. The training program spans a duration of 2 to 3 months and is focused on applying process design fundamentals to create comprehensive project specifications. Participants will learn to select appropriate metallurgy to ensure safe and reliable operations.

- Core design principles like fluid properties, gravity separation
- Equipment sizing and selection
- Process control fundamentals
- Safety and environmental considerations in design

Rotation 1

Engineering department

Participants will apply fundamentals to real world projects. The training program spans a duration of 2 to 3 months and is focused on applying process design fundamentals to create comprehensive project specifications. Participants will learn to select appropriate metallurgy by assessing contaminants and operating conditions while adhering to NACE guidelines for corrosion control.

The curriculum will also cover the generation of specifications for essential equipment such as pumps, trays, and vessels, ensuring that all aspects of the design and material selection process for optimal operations.

- Develop heat and weight balance
- Develop process flow and instrument diagrams - PFD, P&ID, MSD
- Generate project specifications for trays, vessels, pumps, relief valves

Benefits

- **Accelerated professional development through the different rotations and mentorship from experienced technical specialists**
- **Develop critical thinking and problem-solving skills**
- **Develop steady-state simulations of process flowsheets, including design guidelines, generation of heat/mass balances, and process optimization**
- **Understand key criteria for designing vessels, heat exchangers, rotating equipment, piping, relief valves, fractionating columns, and fired heaters**
- **Optimize and troubleshoot processes by evaluating key data trends**
- **Understand commercial applications of core technologies and its impact on refinery economics**



Rotation 2

Technical services department

Participants will focus on operational excellence and technology optimization. The training program spans a duration of 4 to 6 months, designed to equip participants with essential knowledge in process technology operations. Throughout this period, trainees will receive mentoring from UOP experts, ensuring personalized guidance and support. The focus will be on technology training that aids in assessing performance, enabling participants to analyze data effectively, optimize processes, and troubleshoot issues as they arise.

Additionally, trainees will have the opportunity to engage in P&ID reviews, which will enhance their understanding of process design and safety.

Participation in multi-licensee courses will further enrich their learning experience, fostering collaboration and knowledge exchange with peers from various backgrounds and sectors.

This comprehensive approach will prepare personnel to contribute significantly to operational excellence.

- Process flow
- Effects of the process variables and the impact on performance and catalyst deactivation
- Catalyst chemistry and the impact on performance, identify catalyst poisons
- Normal Procedures
- Emergency Procedures
- Monitor the process operations, troubleshoot typical operating problems.

Rotation 3a

On site field services (* based on site/ customer policies)

Participants will participate in startup activities like equipment checkout, pre-commissioning activities and verify that a unit is ready for startup.

This rotation typically lasts between 4 to 6 months. Participants will learn to bridge the gap between design and operations, understand the different pre-commissioning activities required to ensure that a unit meets the performance guarantees.

Participants will establish the parameters for safe operations and will develop critical skills needed during the startup phase.

Learning to coordinate between contractors, vendors, and operations personnel is a key learning in this rotation.

- Verify unit readiness for startup
- Equipment Inspection and testing protocols
- Establish safe operating procedures
- Initial performance testing and optimization
- Troubleshooting during critical commissioning phase
- Coordinate with contractors, vendors, owners' operations personnel
- Establish normal operations and initiate test run for unit acceptance

Rotation 3b

Global solutions command center

Participants will analyze and evaluate plant data using UOP's digital solutions. Data analysis includes flow, temperature, pressure drop deviations that impacts unit economics and operating stability. Analysis will also include benchmarking against similar units and can be used to improve or optimize unit operations.

Insights from the data can also be used to drive catalyst changeout to meet market conditions.

- Monitor unit performance
- Evaluate and discuss trends with peers
- Provide insight using trends for improving performance of assets and people

UOP foundations e-learning program

Overview

UOP e-Learning courses and modules are designed to teach operators and engineers the basic concepts of UOP process technology in a flexible environment that will meet the scheduling needs of any student. Web-based training will enhance the knowledge level and skills of your employees to improve your operations.

Cost saving
Save costs on training large groups of employees (versus in-person, onsite training)

Enhance onboarding
Fast-track competency of early career employees with a wide portfolio of courses

Refresh and retain
Refresher training on UOP-specific technologies for experienced employees

Benefits

- **Unlimited, 24/7 access to 1400+ hours of self-paced and engaging e-learning courses**
- **Courses range from general engineering to UOP engineering and technologies**
- **Dedicated tracks available based on specialty: EH&S, Engineering, Operator, Maintenance**
- **Save costs with the flexibility of on-demand learning**
- **Complimentary access to updated content or new courses released during active subscription**

Details

- Unlimited access to the UOP e-Learning Library
- Preferred pricing for multiyear commitment
- Quarterly student progress reports

Topics

Multiple courses are available within each e-learning category offered. The UOP Foundations e-Learning subscription program offers access to over 550+ courses with more than 1400 hours worth of content.



UOP e-learning

Amine GuardTM FS Process

Atmospheric CCR PlatformingTM Process

CycleMax I CCR PlatformingTM Process

CycleMax II/III CCR PlatformingTM Process

Fired Heaters

Fixed Bed PlatformingTM Process

Fluid Catalytic Cracking (FCC) Process

MeroxTM Extraction Process

Oleflex Process Technology

Parex Process PenexTM Process Refining Process

Fundamentals

Polybed Pressure Swing Adsorption (PSA)

SeparexTM Membrane System

UnicrackingTM Process

Refining Process

Fundamentals

Non-UOP e-learning

EH&S

General Maintenance Skills and Knowledge

Instrumentation and Control

Math and Science Fundamentals

Process Operations

Refinery Operations

Rotating and Reciprocating Equipment

Stationary Equipment

Utility, Safety and Facility Systems

Electricity and Electrical Equipment

Gas Processing Operations

Hydrocarbon Storage and Loading

Petrochemical Process Equipment

Pipeline Operations Process Safety Production Operations

Petroleum Industry Overview

Process training safety

Overview

Process safety training is vital for refineries and petrochemical plants due to the hazardous materials and high-pressure systems they handle.

Key components include:

HAZOP
Identifies hazards and operational issues.

LOPA
Analyzes protective layers to mitigate risks.

SIL ASSESSMENTS
Evaluates safety system reliability.

Reviewing past incidents helps prevent future accidents. This training promotes safety, enhances emergency response, and ensures regulatory compliance.

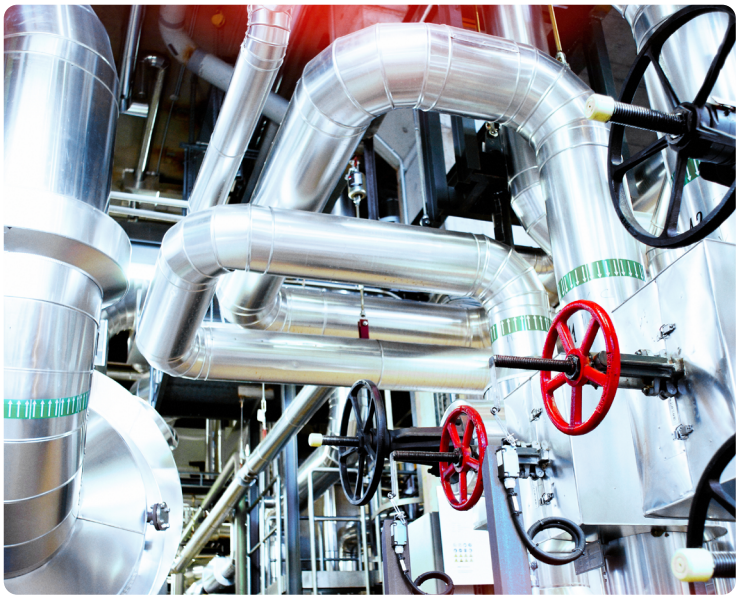
Topics

- Hazard identification and protocols
- HAZOP principles for risk analysis and management
- Layers of Protection Analysis (LOPA)
- Safety Integrity Level (SIL)
- Incident investigations and RCA
- Tools for safer design
- Overpressure protection and pressure relief valves
- Hazardous area classification schedule and drawings
- Corrosion detection and mechanisms, metallurgy selection
- Emergency Isolation Valves (EIVs) and safety measures
- Case studies

Benefits

Process safety training is crucial for refineries and petrochemical plants due to the inherently hazardous nature of their operations. These facilities manage flammable materials, toxic chemicals, and high-pressure systems, which pose substantial risks to personnel and the environment. Effective training encompasses methodologies such as Hazard and Operability Study (HAZOP), Layer of Protection Analysis (LOPA), and Safety Integrity Level (SIL) assessments, which help employees identify, analyze, and mitigate potential hazards. Additionally, reviewing past incidents is a vital component of this training, ensuring that lessons learned are integrated into current practices to prevent recurrence.

This comprehensive approach not only promotes a culture of safety and enhances emergency response capabilities but also ensures compliance with regulatory requirements. Investing in process safety education ultimately protects lives and contributes to the overall efficiency and reliability of refinery and petrochemical operations.



Connected workforce competency

Overview

Accelerate and improve hands-on learning with Unisim-based dynamic simulators. Dynamic simulators provide a safe environment to train operators in unit operations.

The simulators prepare the operators on normal procedures and how to respond effectively to abnormal situations as well. Both classroom instruction and the use of dynamic simulators are key to increasing competency.

Why Honeywell Technologies UOP?

Honeywell UOP has been a leader in the energy sector for over 100 years. Our experience has taught us that the only way to handle unpredictable times is by being proactive and by taking control. We know that if you wait to react, you've already lost.

Honeywell UOP brings people and process together to achieve operational excellence. We ensure your workforce has the knowledge, skills and competency to get the most from your investments and sustain the benefits.

Our courses focus on operating and new process technologies, designing refineries and process units, and optimizing operations.

We can work with you to deliver the programs and content that is best suited to meet your business goals and enable you to maximize the benefits from your most valuable asset.

Simulation-based training

Replicating fast-paced operating scenarios in a simulation environment is the best method for preparing operations personnel to be competent and informed decisions makers during start-up, shutdown, and process upsets. Furthermore, it enables trainers to mentor and assess trainees either remotely or in classroom sessions.

Simulation-Based Training forms the foundation of a comprehensive program that prepares operators for production scenarios before initial operations and refresher training.

Key Features

- **Trusted Simulation Technology:** First principles models and thermodynamic relationships are used to accurately represent plant behavior. These capabilities have been applied extensively and proven repeatedly in live plant applications. Honeywell simulations are cutting- edge dynamic models with high fidelity and performance.
- **Ready-Now Models:** High-fidelity models are available for both UOP and non-UOP technologies.
- **Cloud Hosted:** Training is deployed in Honeywell's Microsoft Azure cloud infrastructure which enables simulation-based learning and instructor capabilities delivered to desktop anytime and anywhere.
- **Scalable:** Virtualized cloud infrastructure can scale up and down as required from one or more concurrent local users to global enterprise-wide access.
- **Customized Models:** When appropriate, customized models can be built based on the definition of a plant as represented by Piping and Instrumentation Diagrams (P&IDs) and equipment datasheets.
- **Experience:** Dynamic Simulators have been supplied to a diverse range of verticals in Refining, Petrochemicals, Chemicals, Oil & Gas, Pulp & Paper, Plastics, Power, and Mining / Minerals / Metallurgy.

Case Study 1

USA Refinery FCC

The Challenge: An American refinery's FCC unit suffered high catalyst losses in their pre-2023 start-up and between 2022-2024, the operations crew lost expertise. During this time, the customer requested a targeted training program for operations personnel.

The Results: During 2023, UOP collaborated with SITE SME to design a targeted operational training program based on identified knowledge gaps. In April 2024,the operator workshop was conducted to address key KPI's, practice start-up and emergency procedures using the UOP FCC dynamic simulator. Operators were able to apply lessons learned during an emergency in May 2024 and were able to quickly recover from an abnormal situation.

Case Study 2

Central Europe Refinery FCC

The Challenge: A refinery in Central Europe was commencing an FCC and Alkylation complex using UOP technology with a Honeywell DCS system. While the complex was under construction, the customer mandated that all operations personnel would be trained/ certified via dynamic simulator.

The Results: The customer was able to conduct start-up on the complex ahead of schedule (~2 months) which resulted in a gross margin benefit of ~40M.

Comprehensive training and ready-now features

Benefits from comprehensive operator training programs are well known. Immediate benefits are realized through operator preparation for an effective start-up. Ongoing benefits are realized under normal operating conditions where the focus shifts to maintaining production by recognizing and avoiding incidents that result in production losses, equipment damage, personnel injury, and environmental hazard.

For operations training and competency management applications, ready-now offerings include basic coursework, problem solving and trainee assessment. Effective management of these tasks is achieved through a graphical user interface (GUI) with facilities for:

- **Basic User Features:**
  Snapshots, initial conditions, backtracks, time management (freeze, step, fast time), and feature navigation bar.
- **Centralized Simulation Server:**
  Provides a repository for managing downloadable models, performance reporting and license management.
- **Training Tools:**
  Graphic displays with faceplates, remote functions, operator trends, alarm display and annunciator, document library, video player, and event-driven help.
- **Advanced Instructor Tools:**
  Manage exercises, scenarios, upsets, instructor variables, performance monitoring and assessment, and alarm and event summary.

Benefits to Customers

Connected Workforce Competency enables sustained and measurable upgrades in plant reliability and operating performance and can be used by both operations and engineering team to:

Reduce operating costs by the reduction of incidents caused by human errors

Improve operations performance by providing training and validating procedures that help protect people, plant assets, and the environment

Institutionalize knowledge capture and dissemination; repurpose staff to operate new equipment and processes

- Accelerate the process of propagating, assessing diagnostic and skills, and developing relevant process know-how
- Monitor the level of attainment of operators at individual, shift, or site levels

Models and starter training content

In addition to custom model capability, Connected Workforce Competency offers the following ready-now high-fidelity process models.

- **UOP Process Models:**
  UOP Unicracking™ Process for Hydrocracking, UOP Platforming™ and CycleMax™ Continuous Catalyst Regeneration, UOP Fluid Catalytic Cracking, UOP C3 Oleflex™ Reactor and Product Recovery
- **Non-UOP Refining Models:**
  FCC, Advanced Distillation, Crude/ Vacuum Distillation Unit, Delayed Coker Unit, Naphtha Stabilizer and Splitter Unit, Naphtha Hydrotreater Unit, Diesel Hydrotreating Unit, Sulphur Recovery and Tail Gas Treating, Naphtha Isomerization, Catalytic Reformer, Amine Treatment, LPG Merox Unit Recovery
- **Instructor-Led Training Content:**
  Training content for ready-now options addresses information and experiences critical to profitable daily operations which can serve as a curriculum kick-start. Training content includes:
- **Process Familiarization:**
  From cause and effect to fundamentals necessary for operations and troubleshooting.
- **Control and Safety System Operation:**
  Provides an understanding of the operation and interactions of the control and safety system.
- **Start-Up and Shutdown:**
  Simulation-based learning is one of the best methods to teach infrequent and high-consequence procedures such as unit start-up and shutdown.
- **Normal Operations:**
  Normal operating procedures are also included, as effective day- to-day operation of the unit is a key contributor to process safety, reliability and performance.
- **Optimization:**
  Optimization exercises provide the trainee with the experience of executing typical daily operating instructions, while maintaining important constraints within their safe operations range.
- **Abnormal Situations:**
  Numerous equipment failures and process conditions variations support training scenarios associated with identifying and responding to abnormal situations.

Service products

Digital services

Honeywell UOP Digital Services are designed to deliver UOP insights and recommendations faster, ultimately enabling our end users to make better operating decisions. These digital tools can be incorporated with any Performance+ engagement, a traditional service engagement, or standalone engagement.

Process monitor

Overview

Process Monitor is the foundation for all UOP Digital Service activities. Process Monitor automates the collection and processing of operation data daily and allows customers to continuously track the KPIs of their UOP units. It is also used as the starting point for additional digital entitlements UOP offers.

Process Monitor is built on a secure cloud-hosted platform to ensure that the service produces ongoing value. Process Monitor combines UOP's in-depth process knowledge with a customer's site-specific information to provide several key assessments through:

- **Automated data transfer of plant data from historian and laboratory systems to a secure Honeywell cloud.**
- **Data reconciliation, normalization, validation of the raw data.**
- **Calculation to transform the reconciled data into KPIs specific to your unit operations.**
- **Publish the calculated KPIs on a secure user interface webpage that both the customer and UOP have access.**



This approach will be integrated with data from the process to deliver a consistent view of all unit operations, stream properties, and unit performance. Figure 2 on the following page illustrates the overall service architecture and key processing steps.

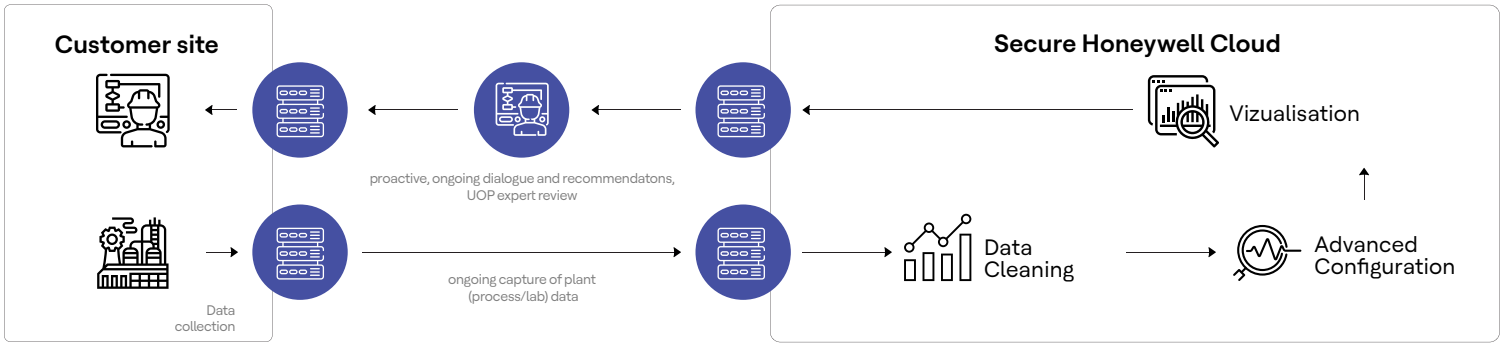


Figure 2

Key Operating Parameters

Description	UOM	Design	Value	Changed From: Previous Day		Changed From: Rolling Week		Changed From: Rolling Month	
Material Balance	wt %		100.30	0.90	0.9 %	1.04	1.0 %	1.49	1.5 %
Space Velocity (LHSV)	1/h		2.87	0.00	0.0 %	0.00	-0.1 %	0.11	4.1 %
H2 to HC ratio	mol/mol		0.34	0.09	35.7 %	0.02	-5.4 %	0.08	-19.0 %
Weight Avg Inlet Temp (WAIT)	F		1159.9	0.1	0.0 %	0.7	-0.1 %	0.5	0.0 %
Weight Avg Bed Temp (WABT)	F		1120.9	0.1	0.0 %	0.4	0.0 %	0.0	0.0 %
Reactor 1 Delta T	F		105.7	0.3	0.3 %	0.0	0.0 %	1.6	1.6 %
Reactor 2 Delta T	F		94.0	0.5	0.6 %	1.1	1.2 %	0.8	-0.8 %
Reactor 3 Delta T	F		70.4	2.0	-2.7 %	2.4	-3.3 %	2.5	-3.5 %
Reactor 4 Delta T	F		48.6	0.3	-0.7 %	1.2	-2.5 %	2.1	-4.1 %
Reactor Total Delta T	F		318.8	1.5	-0.5 %	2.6	-0.8 %	3.8	-1.2 %
Propane Conversion	wt %		28.93	0.01	0.0 %	0.05	-0.2 %	1.11	4.0 %
Propylene Selectivity	wt %		78.92	0.22	-0.3 %	0.24	0.3 %	3.82	5.1 %
Propylene Yield Per Pass	wt %		22.83	0.06	-0.3 %	0.03	0.1 %	1.15	5.3 %

Figure 3

Current unit performance is presented through dashboards on a secure website accessible by customer employees worldwide. Customizable reports and trends are also provided for all users (see Figure 3).

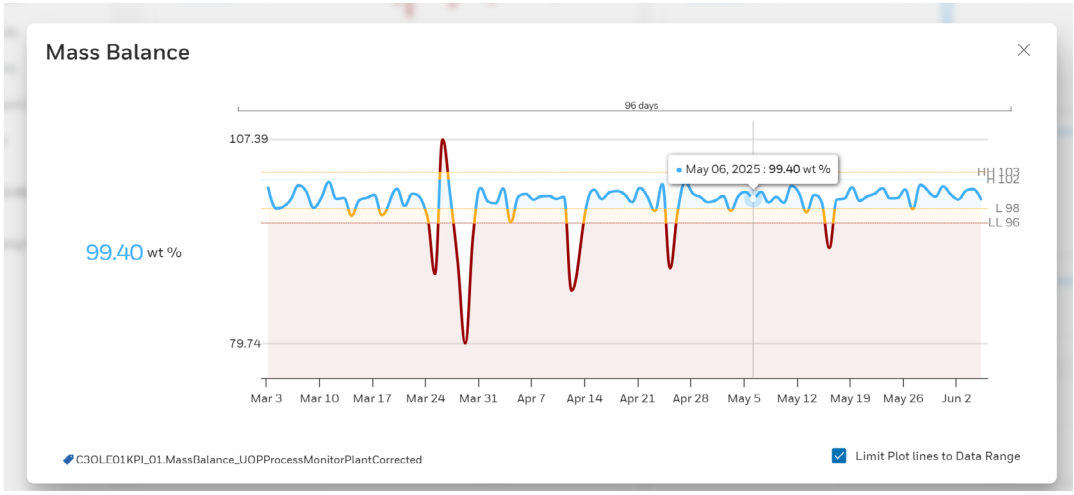


Figure 4

Process Monitor can be implemented on most UOP process units (see Figure 4). Contact your Honeywell UOP Service Manager to learn more.

Process technology analytics

Overview

Process Technology Analytics (PTA) is a technology-specific feature that utilizes UOP's deep domain knowledge and the robust tools to provide greater insight into specific operational capabilities. Each PTA is built on Process Monitor and leveraging the same user interface.

The PTAs enable continuous improvement through focused insights on operations. They utilize unit current operational information, UOP kinetic process models that reflect the deep domain knowledge and multiple years of UOP's experience of troubleshooting and optimizing process unit operations.

Each PTA is built to address a key customer pain point or operational challenge for optimal performance and operational planning. UOP has a dedicated development team focused on building these PTA modules that address the customer needs with the goal of developing and deploying quickly. As a result, the PTA enables faster resolutions through quick identification of operational issues with targeted appropriate remediation. It also helps to get fast responses to reduce production upsets and potentially avoids unplanned shutdowns.

See Figure 5 below to see the standard PTAs for each process category. Contact your Honeywell UOP Service Manager to find out about other PTA capabilities.

Technology	Analytic	Focus
CCR Platforming	Performance Predictor	• User-defined "What if" to identify target operations before changes in feed or product properties. • Unit Optimisation to provide optimised operating variables on an everyday basis.
	Dynamic Coke Laydown	• Based on operating severity, estimates coke make throughout the reactors system.
	Catalyst Imaging Sensor and Analytic	• Estimates catalyst health properties including H2:Pt in near real-time
	Packinox Proforma	• Estimates near real-time constraint potential of the Packinox heat exchanger
Penex	Performance Predictor	• User defined "What if" to identify target operations before changes in feed or product properties. • Unit Optimization to provide optimized operating variables on an everyday basis.
Merox	Mercaptide Sensor and Analytic	• Estimates continuous mercaptide concentration eliminating the need for a shake test
FCC	Cyclone Performance Predictor	• Estimates ongoing erosion of cyclone refractories and provides a "what if" to estimate future erosion
Polybed PSA	PSA Valve Analytics	• Estimates which valves are likely to fail before causing the unit to trip or bed switchover
C3 Oleflex	Reactor Performance Optimizer	• User defined "What if" optimization for production, R4 run length, and feed consumption
	RIT Profile Optimizer	• Provides optimal reactor inlet temperatures to achieve lower feed consumption at target production rates near current operation
	Burn Zone Monitor	• Shows impact of operating changes on Burn Zone temperature profile
	Reactor Screen Monitor	• Monitors current Reactor 4 health and allows a user to see estimated timing of Reactor 4 maintenance based on current operating conditions
	Catalyst Transfer Pipe Monitor	• Reactor to Catalyst Collector transfer monitoring with alerts to notify a user of abnormal conditions that require user attention to review and evaluate if procedural actions are needed
	Sulfur Injection Monitor	• Estimates sulfur concentration throughout the reactor circuit
	Catalyst Imaging Sensor and Analytic	• Estimates catalyst health properties including Combi activity in near real-time

Figure 5

Exception-based alerts

Overview

A continuous data connection through Process Monitor enables UOP to offer Exception-Based Alerts (EBA) by our UOP specialists. With EBA, UOP regularly assesses and evaluates an expanded set of critical composite operating variables and parameters to detect potential problems early and provide proactive advice to our customers. By helping our customers identify and preemptively address issues before they become problems, we can help avoid costly deterioration of operations and help you maximize the reliability of your operations.

Each technology has a set of UOP proprietary composite-critical variables to assess operations. The EBA uses core operational variables, UOP proprietary model based KPI calculations, and advanced analytics to evaluate each technology to provide you with proactive alerts. EBA frequency of notifications is tailored to your preferences to support your operations effectively (see Figure 6).

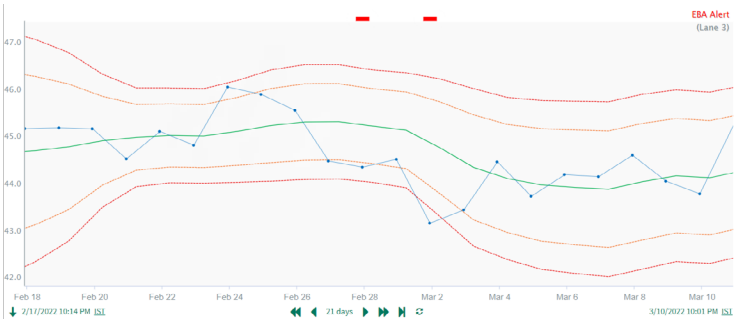


Figure 6

Benchmarking

Overview

Performance Benchmarking provides insights into your operations by comparing your unit's by comparing your unit's key operating parameters with other facilities operating similar process units.

Performance Benchmarking draws upon data from UOP's extensive global customer base - aggregated and anonymized to protect customer privacy - to give UOP Connected Services customers new targets for operational excellence based on actual results from similar units. The quartile-based approach for the benchmarking indices ensures a relevant assessment and identification of improvement opportunities.

When customers are already at the top of operating efficiency, Performance Benchmarking provides evidence that you are on the right track and highlights the opportunity for further improvements through technology advancements and performance upgrades. An example snapshot of a typical benchmarking report for a platforming unit is shown below (see Figure 7).

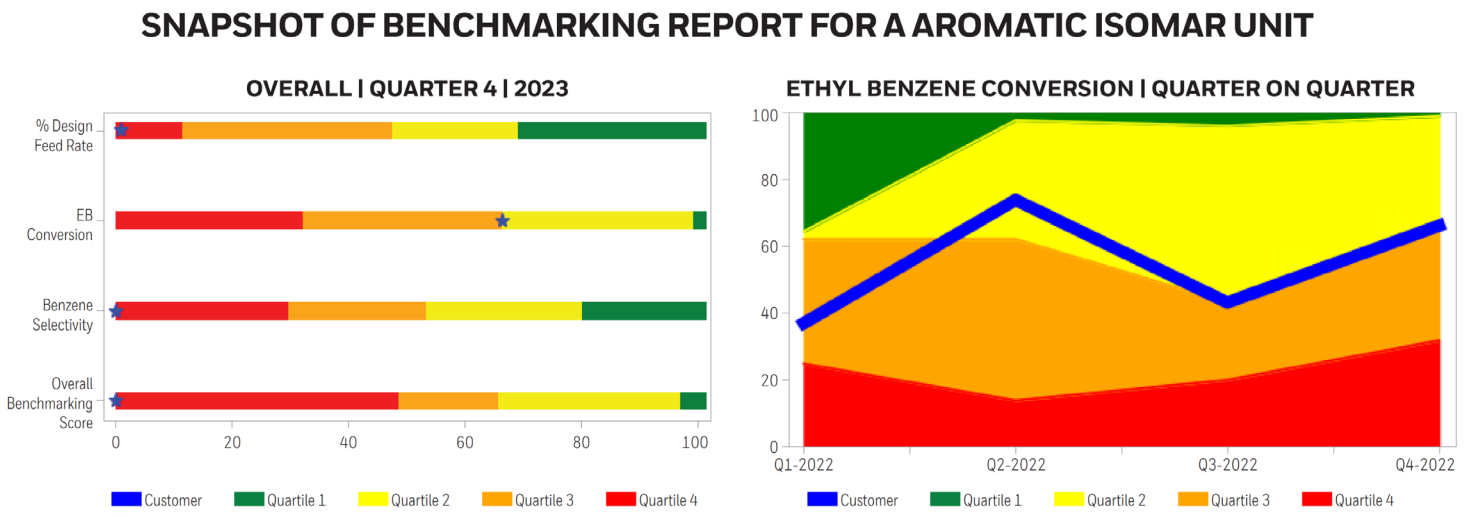


Figure 7

Case Study 1

Improved Catalyst Health

The Challenge: A CCR Platforming operating unit traditionally provides an offline catalyst sample to estimate catalyst health on a quarterly basis; however, catalyst health decline can be slow moving and if not resolved quickly can result in sub-optimal performance.

The Results: With the Catalyst Imaging PTA, the customer was able to quantify the slow decline in catalyst health before it started to impact overall unit performance. Paired with Process Monitor, UOP and the customer investigated the CCR operations and confirmed plugging of the regenerator inner screen. UOP collaborated with the customer to determine the optimum timing to perform a quick CCR turn around to clean the screen. **By taking action quickly instead of waiting for the planned turn around, the customer avoided ~2 months of sub-optimal performance.**

Case Study 2

Application of Performance Predictor

The Challenge: A CCR Platforming operator understood the potential value of operating the unit with staggered reactor inlet temperatures but elected to operate all reactors at the same inlet temperature to avoid possible unit upsets.

The Results: Through the application of the CCR Platforming Performance Predictor, UOP was able to demonstrate what staggering the inlet temperatures would enable the end user to achieve while identifying what constraints the unit would operate at these new conditions. **By using the PTA, the end user was able to achieve $3.4M/yr by maximizing the aromatics yields of the CCR Platforming unit.**

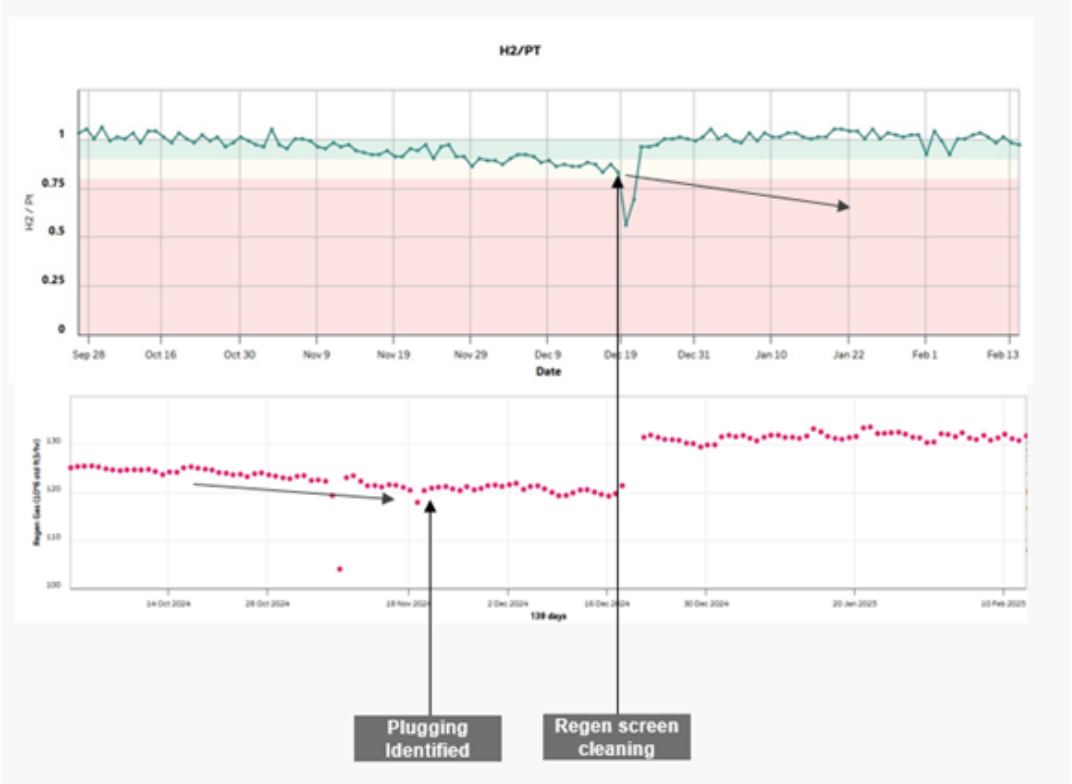


Figure 8

Additional digital capabilities

Additional digital capabilities from Honeywell Process Solutions (HPS) can be incorporated into Performance+ Service Agreements. These solutions integrate Honeywell UOP process expertise with Honeywell's automation platforms, offering a superior solution that significantly enhances the customer's bottom line by allowing the plant to start up sooner, reach full capacity more quickly, and operate optimally throughout its lifecycle.

The different digital offerings include:

- **Operator Training Simulators**
  High fidelity operator training simulators (OTS) for the key process units with embedded UOP reactor models, scenarios and exercises and Abnormal Situation Management (ASM) Consortium compliant graphics that match the DCS graphics to train the operators in a safe environment well before plant start-up. These operator training simulators leverage UOP's process design models and can also be used to test out control strategies for the distributed control systems (DCS) and develop seed models for the Advanced Process Control (APC).

Advanced process control

UOP's expertise is built into every APC application in multiple ways:

- **The P&IDs are marked up for the additional instrumentation** that is needed to enable an earlier and better APC implementation.
- **UOP's design and operating philosophy are captured** in the APC controller design.
- **UOP's design correlations are encapsulated in toolkits** that capture the nonlinearity of the process units and work in conjunction with the APC application. The toolkits can also calculate variables that are difficult to measure directly using other measurements allowing the APC application to push the process unit closer to its limits.
- **Process Technology Analytics and Process Digital Twins** can update the gains, limits and setpoints to the APC on a regular basis to keep the APC evergreen.
- **For complex or site level optimization**, UOP can offer the Plantwide Optimizer, which is based on the patented proxy-limit technology and can provide effective coordination and optimization across multiple process units and downstream blending if applicable.
- **Asset Performance Management (APM)** Honeywell's Asset Performance Management software provides continuous process performance monitoring and equipment health surveillance covering every aspect of the plant from instruments, valves, and compressors to an entire process unit. The software enabled with AI/ML techniques, UOP know-how (for UOP designed and delivered equipment and modular units), and /or vast OEM correlation database



offers performance and fault models to detect and predict equipment health and process performance issues to help avoid unexpected plant downtime.

- **Process Digital Twins (PDT)**
  Operators are often in situations where they need to understand what operational adjustments would do to their environment, without actually making real changes to a unit. PTAs and PDTs are steady state or dynamic first principles-based models (augmented by hybrid and data driven models) that are connected to curated live plant data and automatically tuned to reflect current plant conditions and performance. The PTAs and PDTs are used by the customers and UOP experts to troubleshoot and simulate plant performance, perform scenario analysis, get optimization recommendations, and provide soft sensing in cases where there are no analyzers or when the analyzers need to be taken offline for maintenance and recalibration. The PTAs and PDTs leverage UOP's process design model and can be used to update the gains and set points of the advanced process control application.
- **HPS Distributed Control System (DCS)**
  HPS is a leader in providing DCS to refining and petrochemical producers globally. We capture UOP's know-how in the pre-packaged Experion Solution Suite templates and deliver them in Honeywell's state-of-the-art distributed control system using Honeywell's Lean Execution of Automation Projects (LEAP) methodology. This includes (remote) universal channel technology, cloud engineering and virtualization.
- **HPS Emergency Shutdown (ESD)**
  We capture the cause and effect information from the UOP Schedule A in Honeywell's safety platform. In addition, the F&G system for the process units can also be delivered on the same Safety Manager platform.

The integrated solutions described above reduce project risk, enable early start-up, improve the reliability and availability of the plant, and improve efficiency.

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