

**Honeywell**  
THE POWER OF **CONNECTED**

# LEVERAGING THE CLOUD TO DRIVE PROFITABILITY THROUGHOUT YOUR COMPLEX



## Abstract

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In an increasingly competitive environment, asset utilization for Refining and Petrochemical operations is more critical than ever. The challenge to find the best operating conditions to meet targets and maximize profits is difficult when conditions outside of their control change, and it's amplified even more when considering asset utilization across an entire complex.

To address the asset utilization challenge, many Refining and Petrochemical producers are looking to technology and software. With the industry's longest history of process technology, largest installed base of process units, and an immense library of collected data, Honeywell UOP is uniquely positioned to help Refining and Petrochemical producers maximize their assets. One way that UOP's singular capabilities are utilized is through the Honeywell Connected Plant, a family of cloud-based services that deliver continuous insights and recommendations directly to the right person – whether that person is the unit engineer or the plant owner or someone in between.

Housed within the Honeywell Connected Plant is the Process Insight suite of solutions. One offering within this family is Optimization Advisor, which continuously analyzes current data for the entire complex and identifies the optimal operation based on that data, current economic information and detailed tuned process models. Recommendations showing the appropriate operational changes for optimized performance, as well as the economic impact, are then communicated to users.

To understand not only how the Optimization Advisor works but also why it's an essential development, we'll take a brief look at the growth of optimization. Then we'll cover the Optimization Advisor, including how it was used to debottleneck operations to increase throughput by an additional 4% to maximize profitability.

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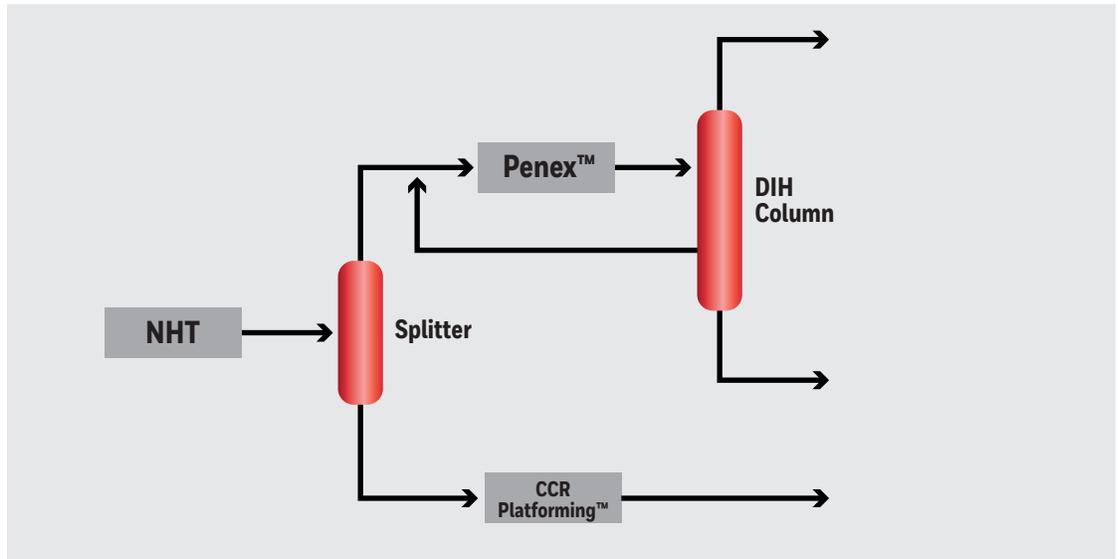
## Background



When crude oil prices shifted dramatically at the end of 2014, many oil & gas producers scaled back large CAPEX investments. As a result, improving profitability requires operators to increase the utilization of their current assets. In turn, this requires the operators to be better informed through real-time data, so they began looking at data analytics and considering the Industrial Internet of Things (IIoT) to help protect and grow their bottom lines.

An area in which Big Data and IIoT can enable a refinery or petrochemical site to improve its profitability is with a connected optimization solution that uses live process data, economic information, and models using actual dynamic constraints. The connectivity between the real-time inputs and rigorous modeling provides the appropriate operating conditions to maximize profits as external fluctuations occur.

## Optimization Makes an Impact



For many refineries, feed quality can change on a weekly or even daily basis, depending on how crude oil is sourced. This makes it a challenge to determine the appropriate operation settings, often resulting in producers operating conservatively and leaving money on the table.

To demonstrate the importance of optimizing operations on a regular basis, Honeywell UOP conducted a study by varying the feed quality to a typical Naphtha Complex and using proprietary process models with an optimization engine to determine the maximum profitability. Three naphtha feed qualities were examined. The optimization engine was set up with a Naphtha Complex capacity of 120m<sup>3</sup>/hr at design conditions and commercial blending product specifications. An additional gasoline blending stream with a constant quality was also available to blend for the overall gasoline blending pool.

In all three cases, Honeywell UOP uncovered additional profit that could be achieved by making key operating changes. The results of each feed case are shown in the table below.

VALUE UNCOVERED BY OPTIMIZATION		
FEED DETAILS	HOW?	PROFIT DIFFERENCE
Feed A N+2A: 32%	Adjusting the Naphtha Splitter and pushing less heavies to the Penex unit, enables the final blending product to meet the Benzene limit. This alleviates the Octane blending constraint and enables the increase of the total gasoline make by +6% through increasing the flow of the other blending components.	+3%
Feed B N+2A: 48%	At baseline conditions, the customer producing a final gasoline product above the target octane. Reducing the severity of the CCR Platforming unit increases the yields but still makes on-spec product.	+7%
Feed C N+2A: 38%	Similar to feed A, the final blending product is well below the Benzene limit. The optimization engine identifies the optimal Naphtha Splitter operation that enables +4% increase of the total gasoline make.	+5%

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### High-Fidelity Models

To accurately predict plant performance, these models incorporate:

- **Detailed Process**

**Models** – configured for each process unit to match current operation and reflect the kinetic reactions that occur in reactor systems

- **Rigorous**

**Distillation** – specified to match actual configuration with settings such as tray dimensions, tray to tray calculations, and tray ratings

- **Equipment**

**Details** – key equipment customized with specific configuration including compressor curves, pump sizing and exchanger areas

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Though the profits generated through this method of optimization are significant, it simply isn't practical to implement for ongoing use. Conducting a full study for every change in feedstock, product prices or asset performance (catalyst activity, heater/column fouling, etc.) isn't feasible. The studies take months and the conditions will have changed by the time the results of each study are in. The information will always be out of date.

In addition, the operating conditions used as the basis for study work are typically a snapshot of operations or represent a limited number of cases to simplify the study scope. Assumptions need to be made and variables need to be limited. So while the goal of optimization made perfect sense, the traditional means of achieving it weren't feasible on a day-to-day basis.

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*Traditional optimization methods were effective but impractical, leading Honeywell to develop The Connected Plant.*

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### Moving To a Connected Optimization

Managing external fluctuations isn't new for most refining and petrochemical facilities. Many planning and scheduling groups use a variety of tools and systems, such as a linear program (LP) model using simple correlations to determine the production targets for each process unit for a specified period, to determine how the changes in external factors will impact overall site profitability. But because these tools need to be simple due to the scale, interdependencies and timing needs, it's challenging to predict performance over a wide range of operational conditions. Plus, as the models are pushed to the edge of correlations, the accuracy of the prediction decreases.

Additionally, the underlying correlations of the LP model should be updated as operations change. As part of a LP model update study, Honeywell UOP compared a customer's current LP model to an updated

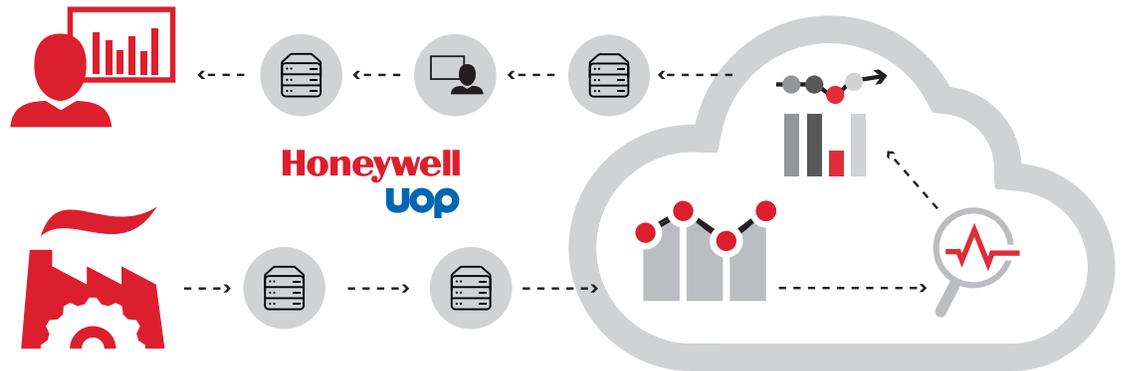
model that reflects current conditions. The study identified more than \$20 million in added profits when using the new LP model.

Those added profits show the value of optimization, yet they also show the untapped potential of optimization if the results are more current and more accurate than is possible with LP modeling. That led to the use of high-fidelity modeling, which can more accurately predict plant performance over a much wider range of operating conditions.

Though an improvement over LP models, high-fidelity models aren't robust enough to provide optimization details based on current operating conditions. The accuracy of the models deteriorates over time as equipment performance degrades, process economics change, and plant configurations evolve. Therefore, high-fidelity models require extensive ongoing maintenance efforts to retain their value. Performing this maintenance in-house is often challenging for most refining and petrochemical companies because:

- Building fit-for-purpose models is time consuming and difficult to justify
- The models are likely only appropriate to the operating data on which they have been based
- Although commercially available models can be purchased, they still require extensive tuning on an ongoing basis — a specialized skillset that is difficult to sustain at a plant site
- Feeding plant data directly to such models can be problematic as it is often internally inconsistent and inherently 'noisy', thus requiring extensive pre-processing

For all those reasons, Honeywell UOP recognized that modeling alone simply isn't enough. A solution was needed that truly incorporated real-time data to make ongoing optimization a reality. That solution is made possible through Honeywell Connected Plant.



## Delivering Connected Optimization

Honeywell UOP addresses the need for connected optimization with the Optimization Advisor. Part of Process Insight, a family of services from the Honeywell Connected Plant that leverages an advanced, cloud-hosted software platform, the Optimization Advisor achieves optimization through:

- **Constant Data Processing** – The underlying software captures process and analytical data directly from the site data historian and laboratory information system. Data collection occurs on an automated, continuous basis to ensure results always reflect current operations.
- **Underlying High-Fidelity Models** – The full complex is configured using Honeywell UOP Process models plus rigorous distillation to create an integrated model. This includes using Honeywell UniSim™ Design simulation software and its incorporated Optimizer to optimize the units based on the specific operating constraints, independent variables and process economics.

- **Ongoing Feedback** – The results of the optimization engine are provided through the Optimization Advisor dashboard interface, highlighting key process economics and relevant operational changes.

In addition, Honeywell UOP experts support the Optimization Advisor by reviewing the data and ensuring that all proper adjustments are being made. Plants no longer need to recruit and keep skilled optimization personnel on site, and they have the assurance that their optimization efforts are in the hands of a trained, experienced team with full access to the collective knowledge of Honeywell UOP. With the combination of real-time data, integrated modeling, and an expert team, the Optimization Advisor answers the challenge for an accurate, up-to-date and continuous optimization solution.

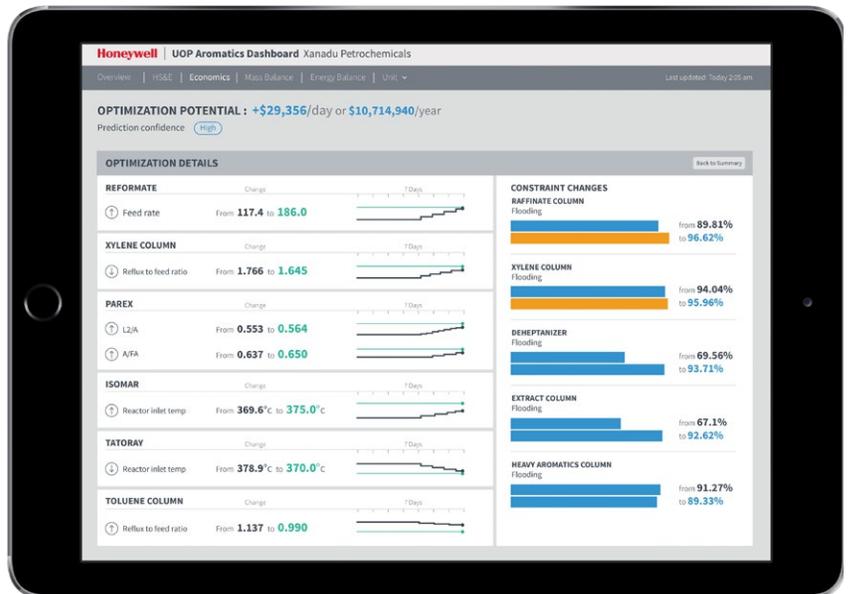
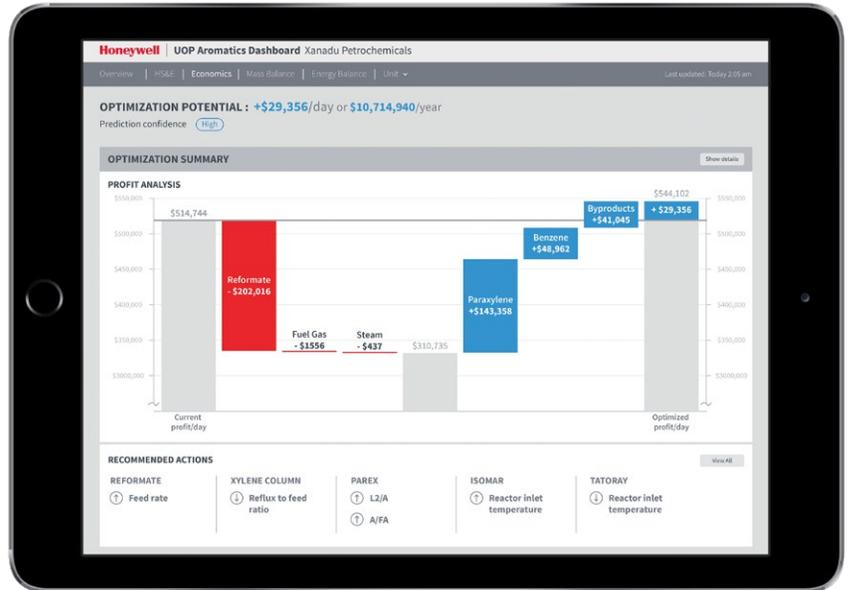
## High Impact. Low Maintenance.

The cloud-based infrastructure of the Optimization Advisor lets Refining and Petrochemical operators benefit from Honeywell UOP's solution and experience without the hassle of maintaining the underlying models and infrastructure.

Significant time and resources are saved through UOP's service because UOP handles maintenance of the entire hardware and software infrastructure, including all updates and migrations, backups, disaster recovery and more, freeing refining and petrochemical operators to focus on running units to peak performance.

Overall, the ongoing service from the dedicated team covers three areas:

- **Recommendations:** Along with recommendations shown on the dashboard, the Honeywell UOP optimization specialist regularly reviews the value achieved through the Optimization Advisor, makes additional recommendations, and provides reports and regular contact as needed.
- **Modifications:** Continuous innovation ensures that the latest enhancements are in use. Functionality and relevance of the Optimization Advisor are kept current through ongoing updates to the process and fault models as new iterations become available.
- **Maintenance:** As covered above, Honeywell UOP covers ongoing maintenance of the entire hardware and software infrastructure.



## Easy-View Data & Solutions

The dashboard of the Optimization Advisor incorporates drill-down capabilities to further explain the basis for the optimum solution as well as the required operational adjustments.

# Case Study: Optimization Advisor in Action

While configuring the underlying models for the Optimization Advisor for a multi-unit complex, Honeywell UOP identified several opportunities for the customer to push the complex capacity by over 4%. In preliminary stages of the configuration, Honeywell UOP recommended several operational changes to increase capacity by 1.7%. The customer confirmed achieving this increase in a test run.

During implementation, Honeywell UOP utilized the customer's recent test run data to tune

the process models and set up the objective function. In configuring and running the optimization engine, additional opportunities were identified to increase capacity by another 2.6%. To support the customer, Honeywell UOP outlined the optimization recommendations and potential constraints that the customer should monitor closely.

The customer confirmed the increase in capacity was achieved.

## Conclusion

With the advent of cloud-based computing and new advances in instrumentation, oil & gas producers see that Big Data and IIoT are a reality. Our industry is at an exciting juncture in which we are now able to start reaping the benefits of these technologies. Data analytics techniques like machine learning and artificial intelligence will be used to uncover the next operating insights and lead to improvements in operational agility.

However, the use of these techniques cannot be applied in isolation. Keen understanding of the process is key to uncovering these insights and truly impacting process performance.

Cloud-based services provide that keen understanding and allow oil and gas producers to benefit from continuous improvements. The Honeywell Connected Plant uses the power of the IIoT to unite people, processes and assets to improve collaboration within an organization and leverage external expertise and knowledge to improve profitability. It provides a family of cloud-based services, such as Process Insight Optimization Advisor, that utilizes Honeywell UOP domain knowledge to deliver unique visibility into the performance of the refinery or petrochemical plant without the maintenance hassle.

## References

B. Blanchette, Implementing the Industrial Internet of Things – Industrial organizations need an effective way to get started with the IIoT, Control Engineering, 2016

M. Caracotsios, T.J. Crowe, and A.B. Coon, Opportunities in Meeting the Challenges of Gasoline Specifications – Innovations for Naphtha Complex Optimization, ERTC, 2000.

"Data's Big Impact on Manufacturing: A Study of Executive Opinions," study by Honeywell and KRC Research Inc., 2016

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