
AVEVAWORLD

Saudi Aramco's Journey in Unlocking Operational Excellence with Advanced Process Solutions

Presented by:

Ali Altayeb

Date: April 9, 2025

Agenda

1. Introduction: Advanced Process Solutions Program
2. Process Simulation Twin APO Journey
3. Real Time Optimizer APO Journey
4. Conclusion

Saudi Aramco: Company General Use

Introduction: Advanced Process Solution Program

01

Driver & Objective

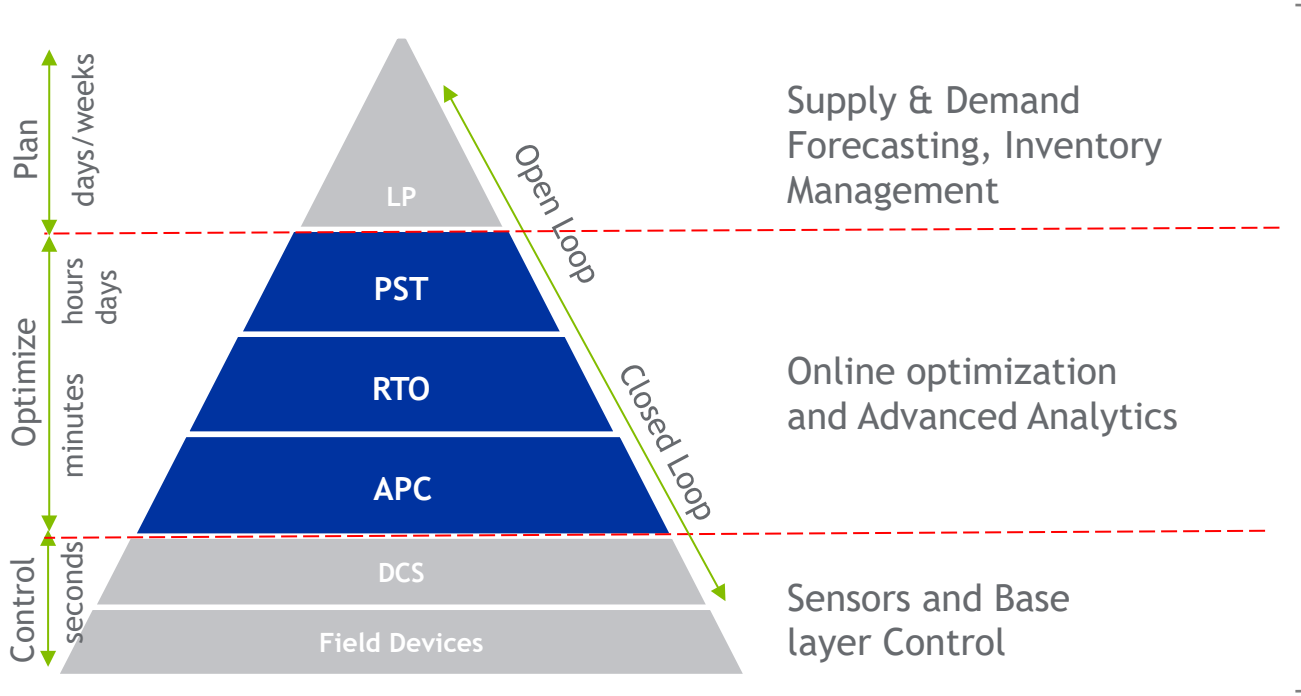
Driver

Value Creation Maximizing added value by continuous optimization of process operations

Objectives

Deployment of proven and emerging solutions & technologies to perform end-to-end optimization.

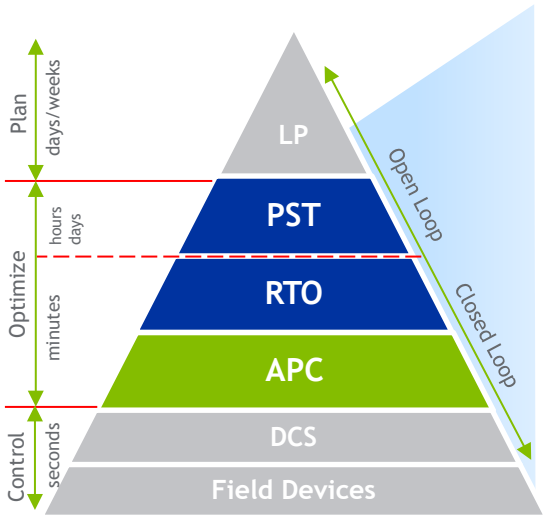
Advanced Process Solutions

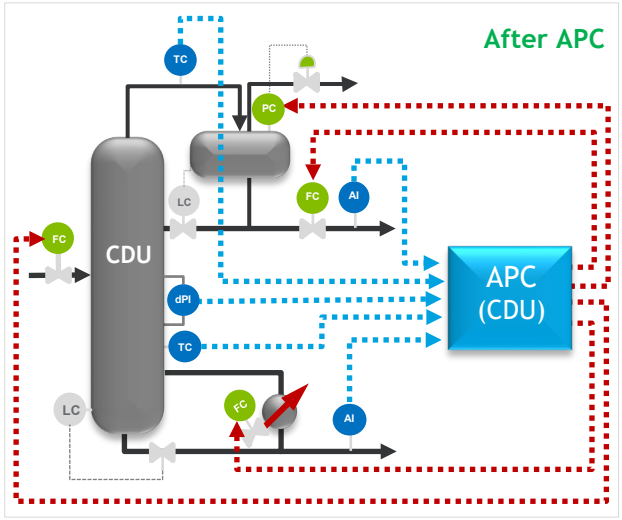


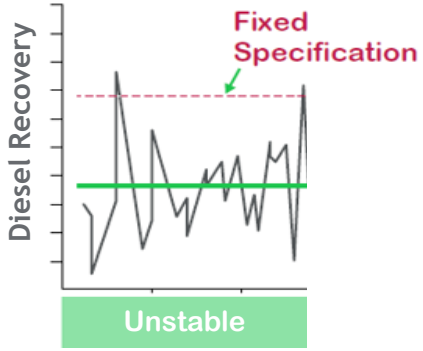
All layers can integrate to minimize manual interventions to streamline operations optimization

Saudi Aramco: Company General Use

Advanced Process Solutions

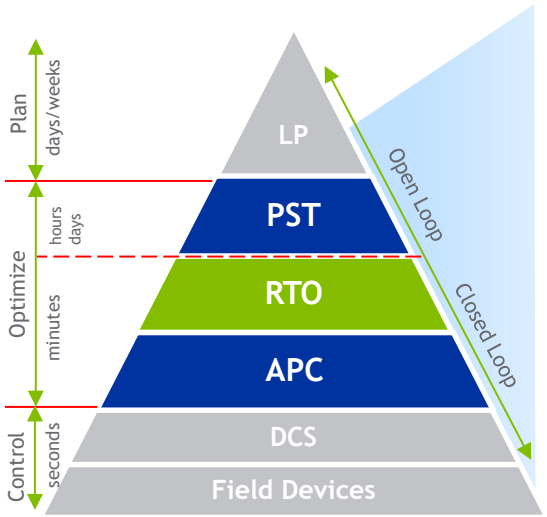






Saudi Aramco: Company General Use

Advanced Process Solutions

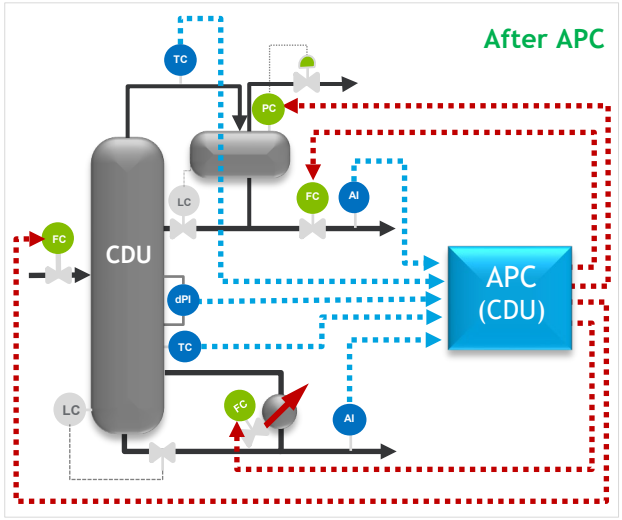


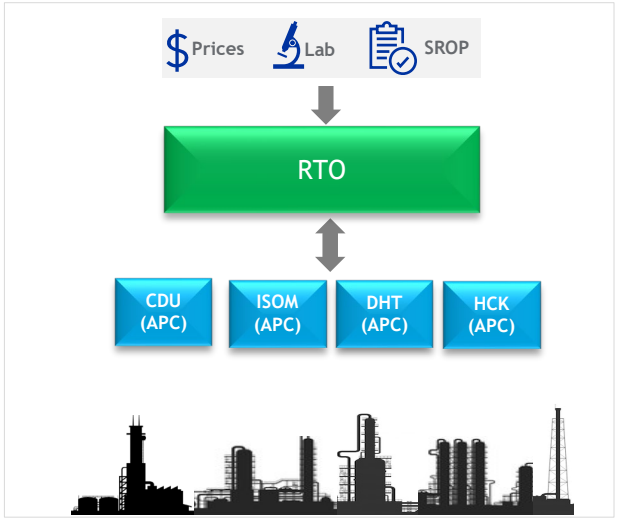
Advanced Process Control (APC)

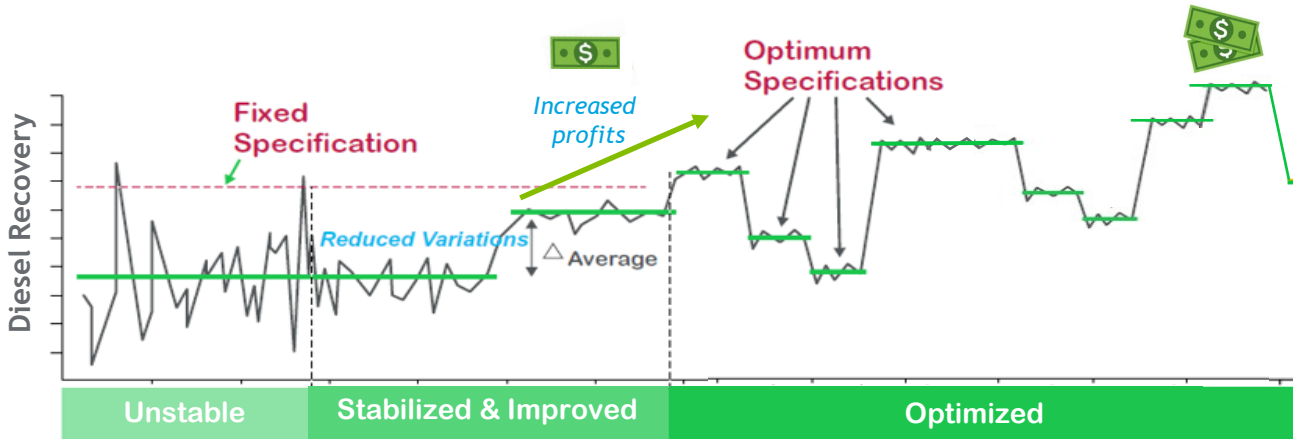
- Process Stabilization
- Higher yields and Lower variations
- Improve economics (maximize diesel…)

Real Time Optimization (RTO)

- Optimize product flows
- Continuous trade-off (diesel vs. gasoline)
- Move APCs to economic mode

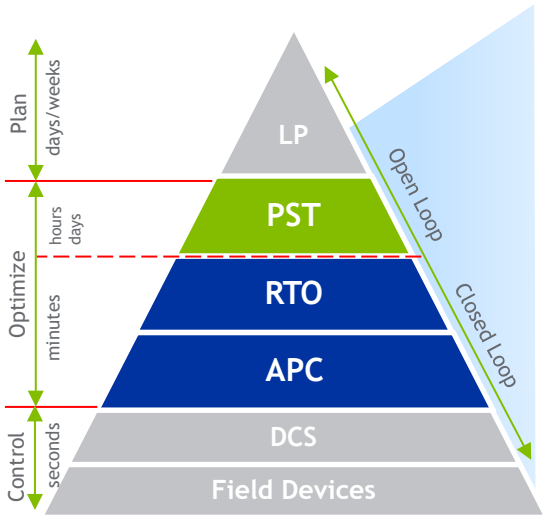






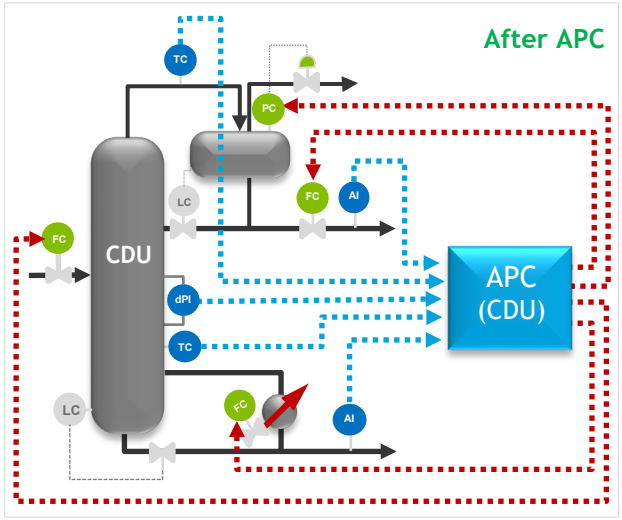
Saudi Aramco: Company General Use

Advanced Process Solutions



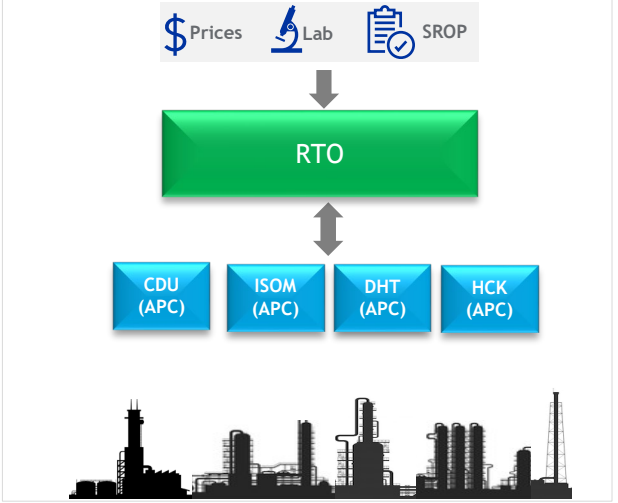
Advanced Process Control (APC)

- Process Stabilization
- Higher yields and Lower variations
- Improve economics (maximize diesel…)



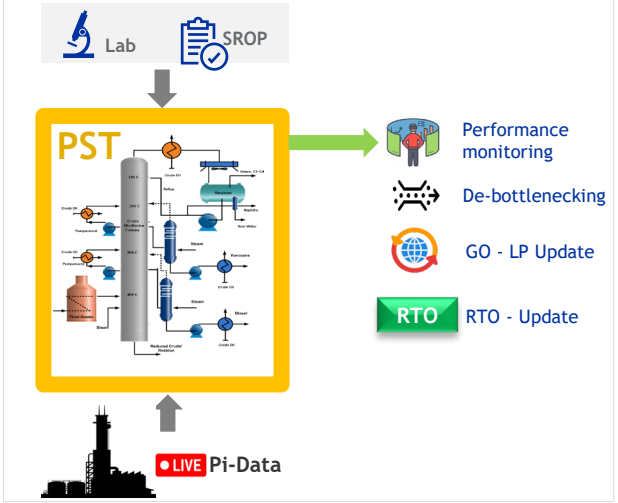
Real Time Optimization (RTO)

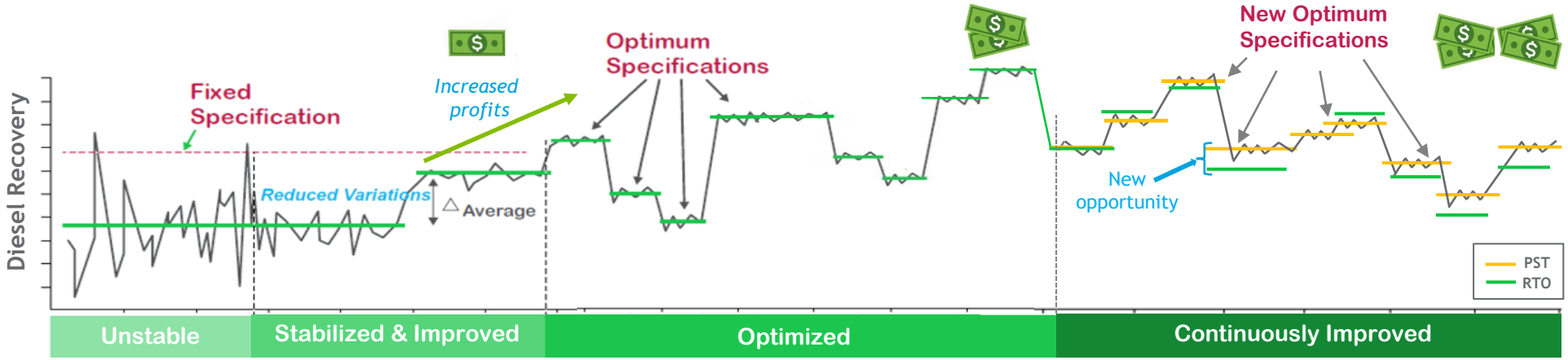
- Optimize product flows
- Continuous trade-off (diesel vs. gasoline)
- Move APCs to economic mode



Process Simulation Twin (PST)

- Online Digital replica of Process units
- Simulate / predict Fouling, Catalyst lifetime
- Opportunity Identification & Validation





Saudi Aramco: Company General Use

Ras Tanura Refinery Process Simulation Twin

02

About Ras Tanura Refinery

- The oldest refinery (1940s)
- The largest refinery (550,000 BPD)
- Large scale complex with NGL processing and crude stabilization

Saudi Aramco: Company General Use

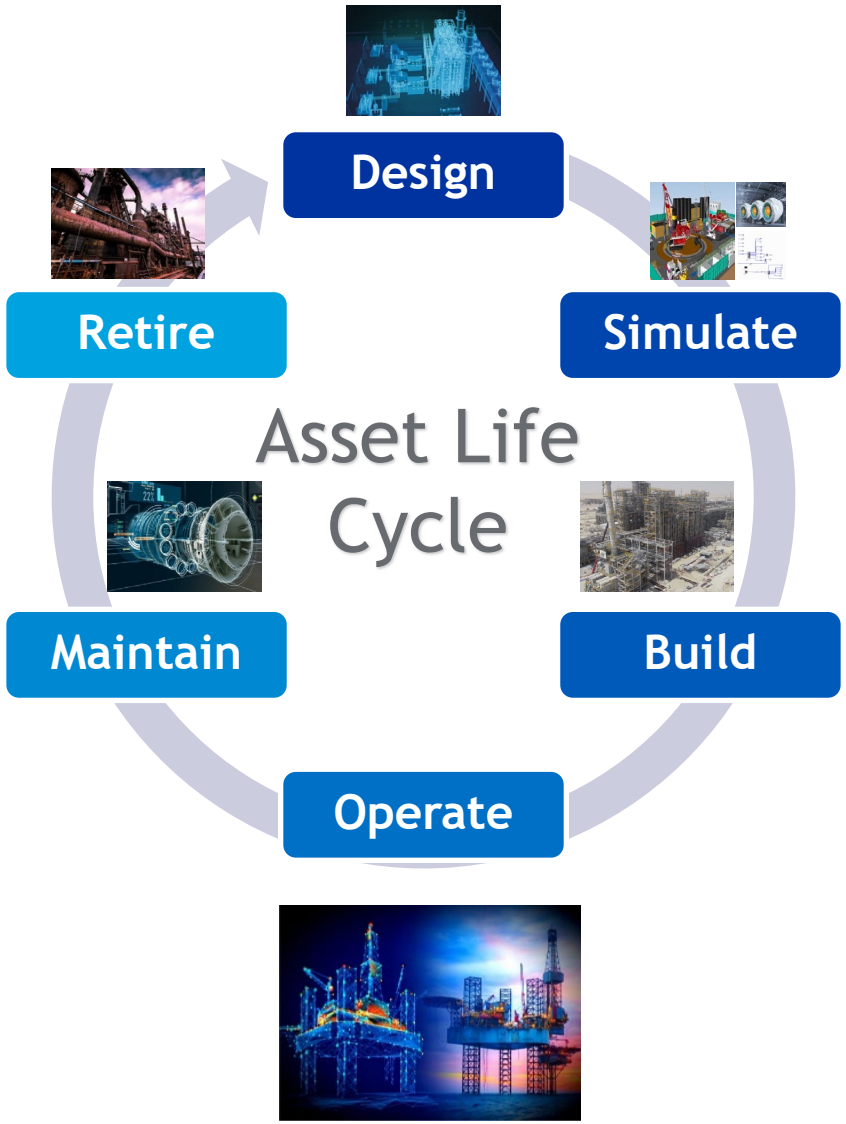
Definition & Scope

Digital twin
Virtual representation of the manufacturing plant's assets

Goal: Connect Information Technology, Engineering Technology and Operational Technology

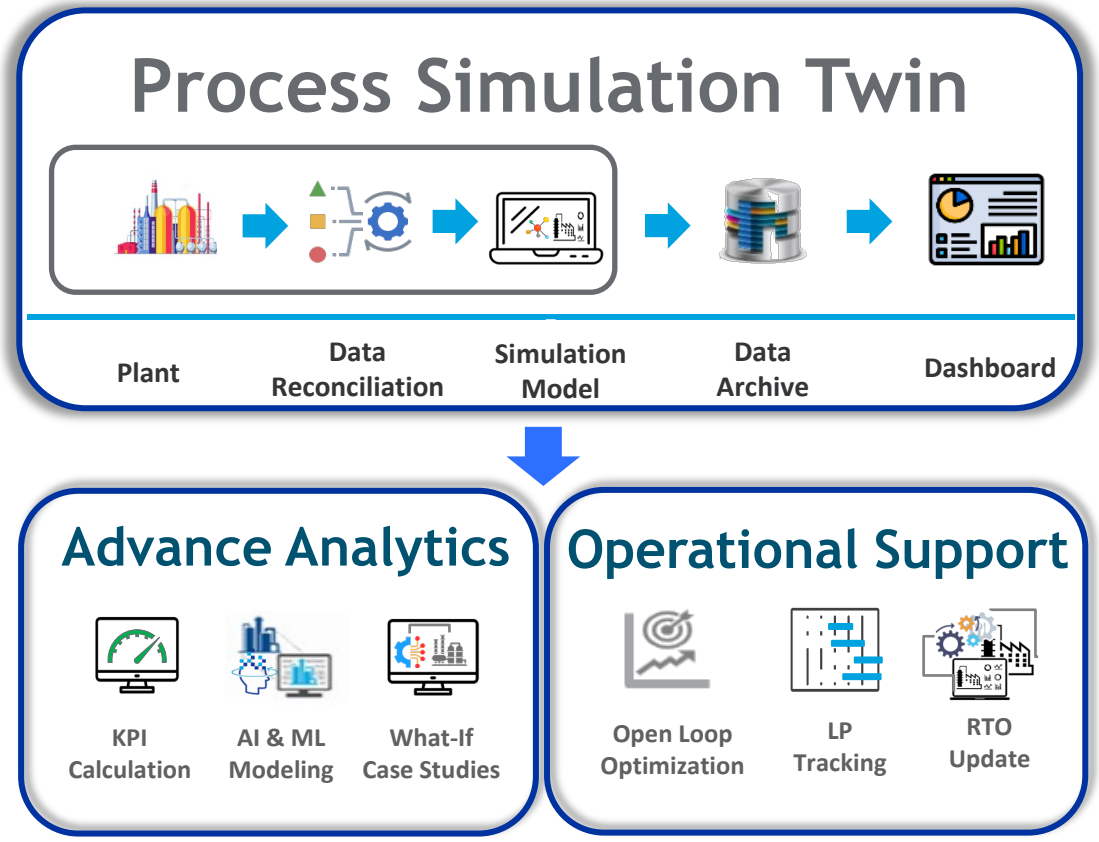
Process Simulation Twin (PST)
Virtual representation of integrated equipment or facilities, which represent a process

Goal: Simulate, predict or optimize the behavior of the process.



Saudi Aramco: Company General Use

PST Benefits



Enhanced data analytics

Access 100-1,000s virtual sensors powered by rigorous thermodynamic models

Open Loop Advisories

Continuous plant optimization opportunities identification

Facilitated Decision Making

Streamline operational analysis through What-If cases

Enhanced monitoring

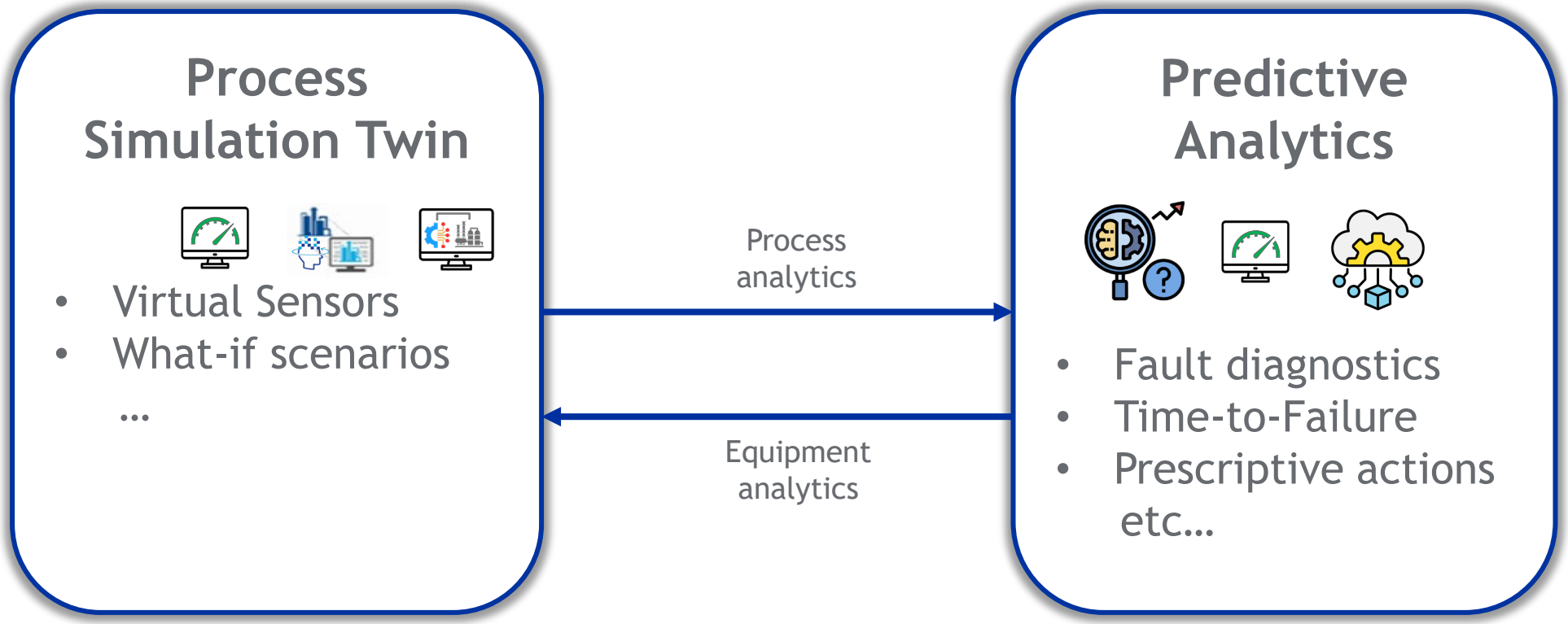
Through Dashboards comparing plant measurement and PST virtual sensors

AI Enhancements

Flexible technology stack can be enhanced through predictive analytics and ML.

Saudi Aramco: Company General Use

PST Integration with APA



Saudi Aramco: Company General Use

Ras Tanura Refinery PST Model

Integrated Refinery Model

Unit Monitoring

- Automated Unit Monitoring
- Intrinsic KPI Calculation
- Opportunities Implementation

Profit Improvement

- Opportunity Identification & Evaluation
- Facility wide Economic Evaluation
- Sustained Benefits via open loop Advisory

Planning Support

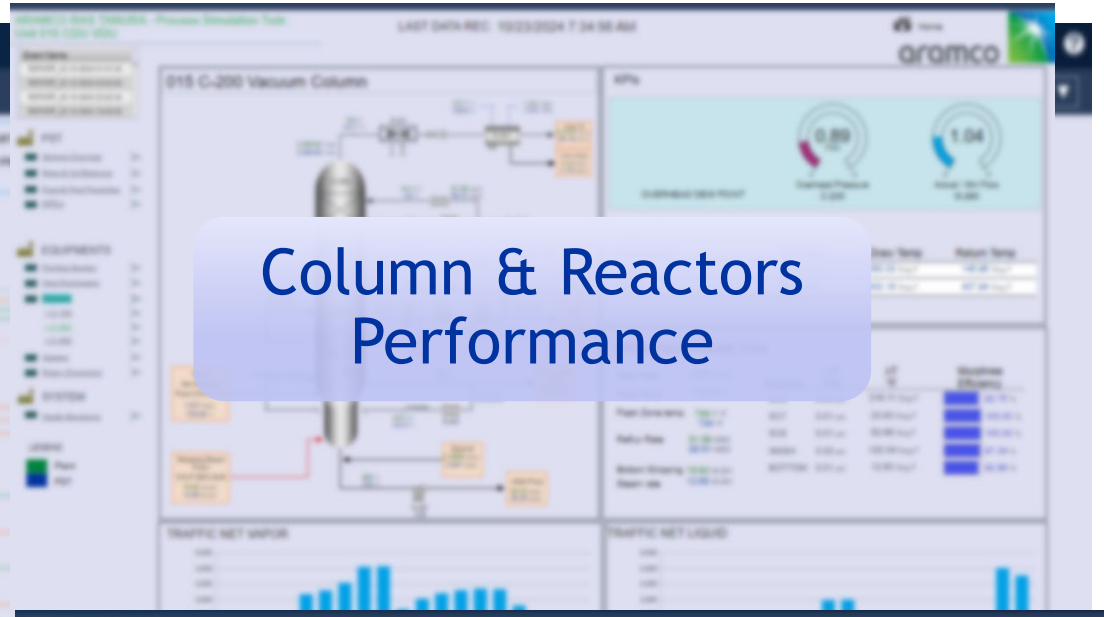
- LP Accuracy
- Always up-to-date Models

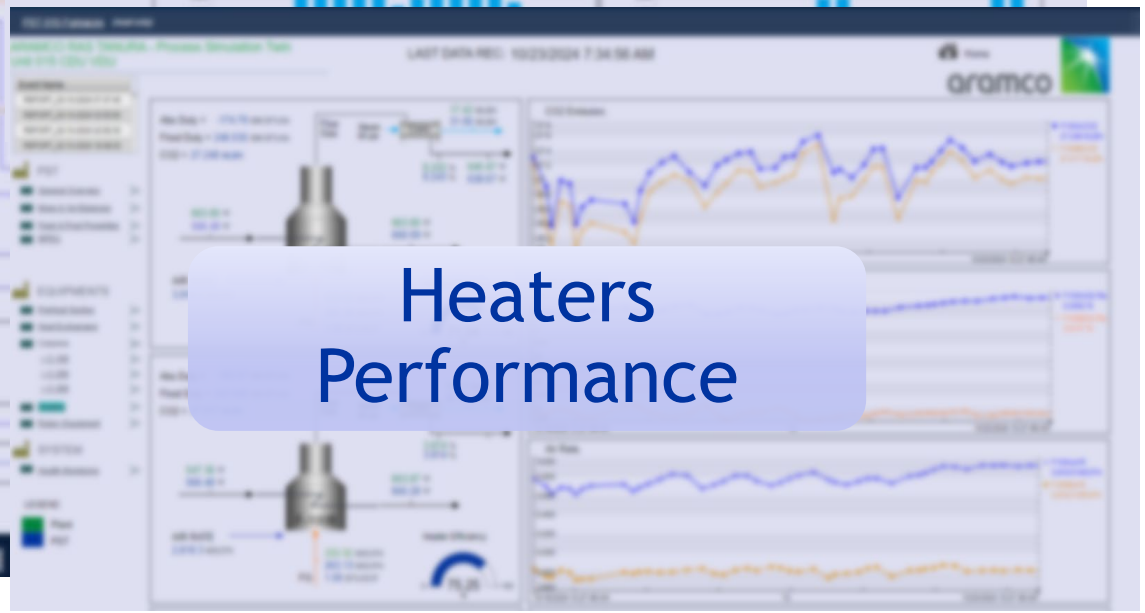
Engineering support

- Troubleshooting
- Plant Debottlenecking
- Revamp studies

Saudi Aramco: Company General Use

Ras Tanura Refinery PST Dashboards





Saudi Aramco: Company General Use

PST Ras Tanura Refinery Use Case

The Challenge

The complexity of tracking properties and prices of intermediate products that contribute to blended products can be a challenge. For Example, to reach desired proposed properties of fuel oil several “cutters” are blended in, but the key properties of the blend are not available in relevant time.

The Solution

The deployed Process Simulation Twin simulation twin enables real-time monitoring of blending processes, predicting properties and facilitating quick sensitivity studies to continuously optimize production and improve product quality.

The Results

Initial studies suggest recovery **around 10% more of higher value produce** rather using them as cutter projected to deliver sizable economic benefits.

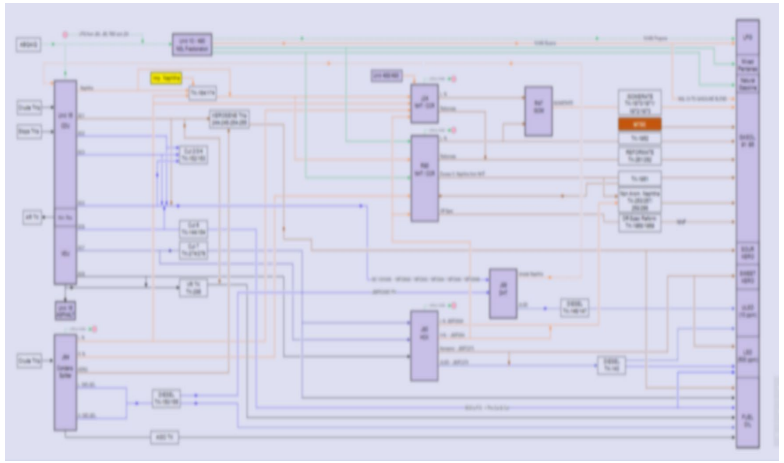
Ras Tanura Refinery Real-time Optimizer

03

RTO Background

Real Time Optimizer

- Multi-Unit Scope
- Simulation Model for Columns & Reactors
- Blending Model



- Product Prices
- Production Targets
- Operating Constraints

Optimum Targets

- Plant CDU/VDU APC
- Plant NHT/CCR APC
- Plant DHT APC
- Plant HCK APC
- Plant ISOM APC

Saudi Aramco: Company General Use

RTO Ras Tanura Refinery Use Case

The Challenge

Managing the gasoline envelope, comprised of many interconnected units is a complex task, making relevant-time monitoring and global optimization a significant challenge.

The Solution

A Real Time Optimization system is being deployed, allowing for the analysis of multiple systems contributing to the same goal, and finding the best overall solution to maximize revenue.

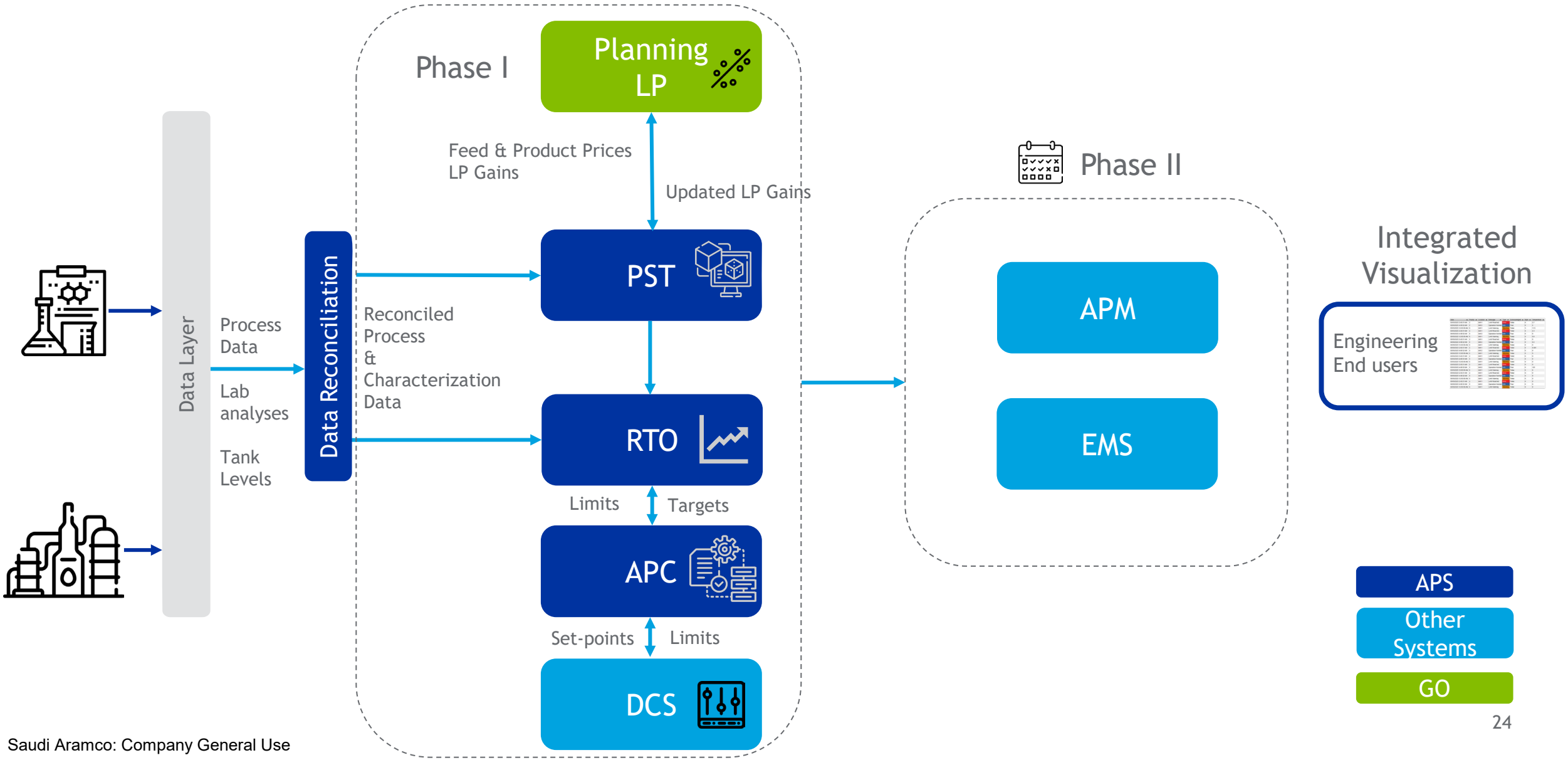
The Results

Initial studies suggest an **reduction of 12% of the** additive **consumption.**

Conclusion

04

Overall Integration Vision



Saudi Aramco: Company General Use

Q&A

Thank You

OIL AND GAS | SAUDI ARABIA

Unlock operational excellence with advanced process solutions and predictive analytics

Challenge

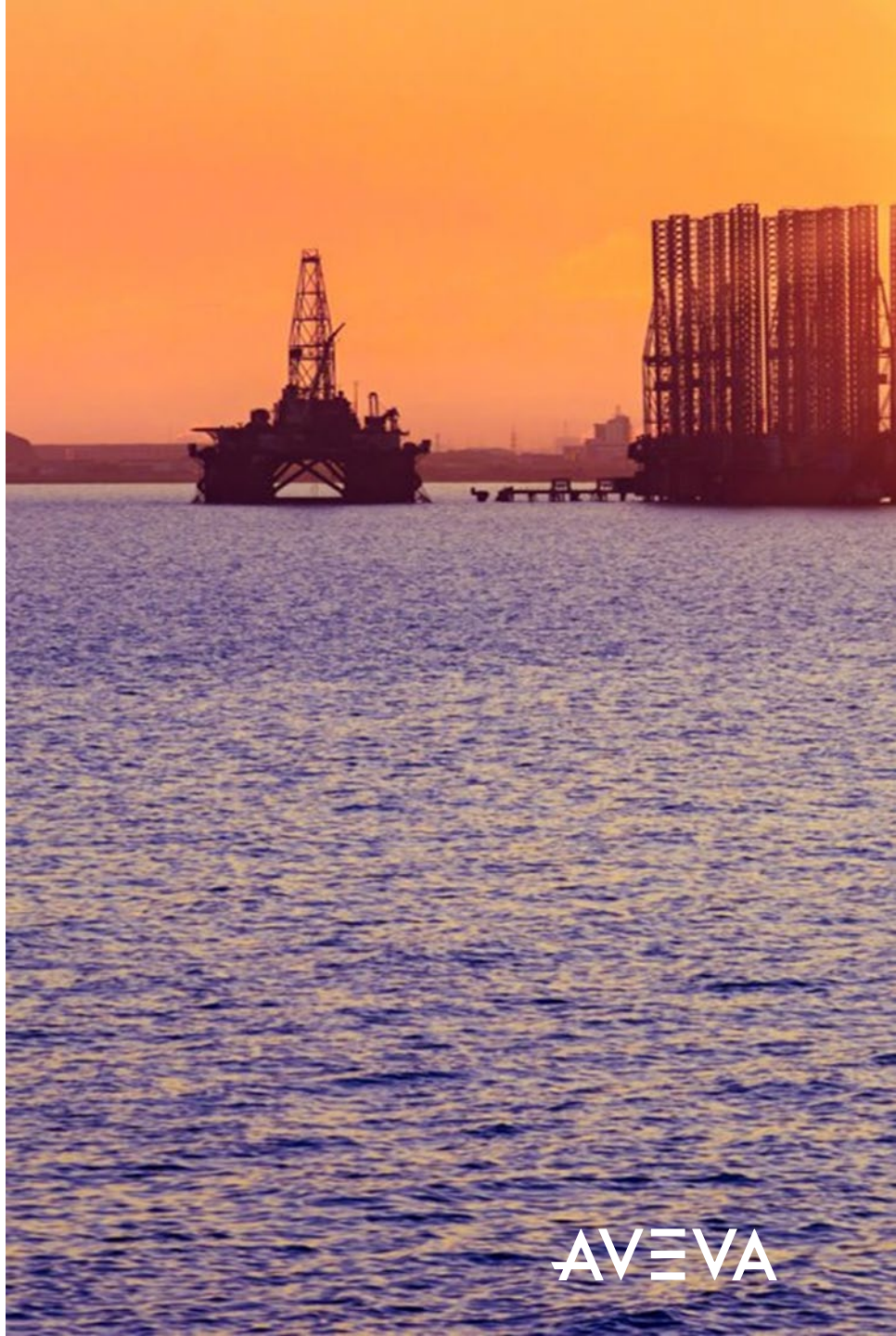
- Operational efficiency: Improve performance, increase yields, and eliminate bottlenecks.
- Decision-making: Break data silos for proactive, data-driven actions.
- Preventing failures: Reduce downtime with predictive maintenance and analytics.
- Complex operations: Integrate real-time optimization and scheduling for consistent performance.
- Standardizing operations: Unify data and processes across multiple sites.

Solution

- Saudi Aramco's APS program unifies real-time optimization, AVEVA process simulation and AVEVA predictive analytics fuelled by AVEVA PI System to boost efficiency and reduce downtime. A centralized platform enables proactive decision-making and consistent performance across sites.

Results

- **10% production increase at high value production line**
- **Reduction of 12% of the additive consumption.**



© 2025 AVEVA Group Limited and its subsidiaries. All rights reserved.