LEVERAGING THE CLOUD TO DRIVE OPERATIONAL EXCELLENCE

Christophe Chouraki
Business Developer Manager
Connected Performance Services
Honeywell UOP

October 3, 2018
Entering a New Generation: What’s Changed?

Technology Enabling a New Inflection Point

CLOUD
Enables collaboration among experts

ANALYTICS
Deriving new insights from data

DIGITIZATION
Simplifies processes across business activities

CONNECTIVITY
Gives access to all data across facility

VIRTUAL REALITY
Enhances user experience and efficiency
**IIoT Promises Solutions to Address Unmet Customer Needs**

- Greater than **40% of process upsets** caused by human error*
  - *ARC Smart Operations,* 2015

- Fewer than **24% of operators** describe their maintenance approach as **predictive/proactive**
  - *Kimberlite, 2015

- Safeguard against the over **50,000 cyber intrusion attempts** per day*
  - *BP CEO Bob Dudley at IHS CERA week

- **45% of respondents** admit to having **little or only basic supply chain data**
  - *Bain & Co – Supply Chain Survey

- **50% of oil and gas professionals** set to retire over next 5 to 10 yrs.
  - *Mercer, 2014*
Future is the Connected Plant

Data is changing the industrial landscape…and Honeywell is in key position as a software-industrial to help extract value
Honeywell Commitment to Connected

**Connected Plant**
Increase profitability by up to $0.50 per barrel with connected performance monitoring while deterring 50,000 cyber threats per day

**Connected Aircraft**
Stream movies up to 100x faster. Reduce fuel costs by 5% ($500K per plane)

**Connected Supply Chain**
Voice-directed activities from the warehouse to the retailer increases productivity by up to 20%

**Honeywell Sentience™ Platform**

**Connected Automobile**
Integrated vehicle health management helps drivers arrive safely and can reduce unnecessary repairs 50%

**Connected Home**
Comfort, convenience & security for 1.6+ million end-users

**Connected Building**
Reduce maintenance cost by up to 30% by migrating from preventive to predictive maintenance

Leveraging Global Installed Base
Connectivity is Transforming Our Offering

**Build on Our Installed Base Heritage and Create New Offerings**

**CYBER SECURITY**

- Predictability in end-to-end process performance with licensor expertise
- Production optimization via advanced machine learning analytics
- Open and collaborative platform

- Superior equipment performance through connectivity
- Preventive and predictive maintenance
- Open and collaborative platform

- Knowledge transfer and competency management across generations
- Real time collaboration to improve productivity
- Worker safety & compliance at all times

**CONNECTED PLANT**

Optimization from enterprise and industry level insights

**PLAN PERFORMANCE**

Optimization from plant level insights

- Regulatory Control
- Advanced Control / Optimization
- UOP Processes

- Control & Safety Systems
- UOP Process Units
- Devices (FI, burners, etc.)

- Operator Training
- Operator interaction with process
- Alarm Management
- Mobile Workers
UOP perspective on servicing our licensee base

Key Customer Issues

Unplanned Downtime
- Process issues
- Equipment failures

Human Capital Challenges
- Knowledge gaps
- Operational excellence

Underperforming Assets
- Sub-optimal operations
- Performance vs peers

Energy and Emissions
- Emission standards
- Energy reduction

Historic Challenges to meet Customer Needs

- Expertise-driven workforce, challenging to scale up
- IP leakage concerns with proprietary models
- On-site presence required for analysis, troubleshooting & interactions

Customer Value: $0.30-$0.50 / bbl. Refining & $10-$20/MT Petrochemicals
Honeywell Connected Plant Solutions from UOP

**Process Reliability Advisor**
- Pre-empt process issues with embedded root cause analysis
- Operate closer to constraints
- Drive best operating practices

**Process Optimization Advisor**
- Maximize profitability through changing process and economic conditions
- Evaluate new opportunities with “what-if” analysis
Cloud Platform Architecture

Customer Site

Ongoing capture of plant (process/lab) data

Data Collection

Access through UOP Portal with secure login with identified users

Secure Honeywell Cloud

Data Cleansing

Advanced Computation

Visualization

Gross Error Detection
Data Conditioning
Data Reconciliation

Solution-specific calculations and models
UOP expert reviews

Proactive, ongoing dialogue and recommendations. UOP expert review

Data Purity
Production Energy Capacity

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Data Purity
Production Energy Capacity
CPS Evolution – 2.0

- Building out partner ecosystem
- Focusing on key complementary process licensors & equipment vendors
- Enable deployment of solutions across full customer plant to deliver best knowledge & insights
Case Study: *Process Reliability Advisor*

**AL WAHA Petrochemicals Company**
- To produce propylene for 450 kmta production of Polypropylene
- Located in Saudi Arabia

**In 1st month, uncovered $1+ M/year:**
- *Identification* and *Mitigation* of operational gaps
- Application of advanced monitoring techniques with *machine learning*
Background: **UOP Oleflex™ Process**

On-purpose propylene technology to meet growing demand

Propane dehydrogenation combined with selective hydrogenation

Utilize CCR technology for continuous operation
Addressing Operational Gaps

Relaxing Constraints

Leveraging a rigorous flowsheet:
• Analyze & validate cold box constraint
• Provided operational guidance of DeC$_2$ to improve production

Improving Effectiveness

Using the process model:
• Identified gap with Rx pressure
• Provided mitigation techniques to meet operating best practice
Enabling Improved Profitability

Drive higher uptime and process performance through diagnostics & prognostics in real time

Enabled by rigorous process models, tuned kinetic models, and fault models with embedded UOP insights
Customer Engagements To Date

Americas
- 2x FCC
- 1x CCR Platforming
- 2x Oleflex
- 3x Gas Plants
- 1x Aromatics Complex

Reliability Advisor
Optimization Advisor

Europe
- 3x CCR Platforming
- 1x FB Reformer
- 1x Oleflex
- 2x FCC
- 1x CCR Platforming
- 1x Oleflex
- 3x Gas Plants
- 1x Aromatics Complex

Middle East
- 1x Oleflex
- 1x Aromatics Complex
- 2x CCR Platforming
- 3x Gas Plants
- 1x Aromatics Complex
- 5x CCR Platforming
- 2x Penex

Africa
- 2x CCR Platforming

CIS
- 1x Gas Plant

Asia
- 1x Gas Plant
- 3x Aromatics Complex
- 5x CCR Platforming
- 2x Penex
- 2x Naphtha Complex
- 1x CCR Platforming
- 1x Aromatics Complex

30+ Signed Up Units Around The World And Counting…
Thank You