SMARTER OPERATIONS WITH REALTIME PERFORMANCE MONITORING
Agenda

1. Challenge
2. Solution overview
3. Benefits
4. Real world scenario
5. Case studies
6. Why Honeywell?
7. Next Steps
The Evolution of Operational Excellence

The Instrumentation & Process Automation Age
- Automation beget all types of data points
- Massive data archival
- Value added applications

The Data Access & Visualization Age
- Semi-Optimized Plant Operations
- Reactive not Predictive
- Information Overload

The Action Age
- Anticipate
- Collaborate
- Act
- Integrated Global Enterprise

1990’s & 2000’s
- Operating Margin
- People Efficiency
- Support Costs

Today
- Operating Margin
- People Efficiency
- Support Costs

Tomorrow
- Operating Margin
- People Efficiency
- Support Costs

Honeywell Confidential - © 2016 by Honeywell International Inc. All rights reserved.
Business Challenge…

Stakeholders have goals

- Operations Manager
- Operator
- Maintenance Manager
- Process Engineer
- Stakeholder Challenges
  - Are we taking right decisions at the right time with the right information?
  - Are we reactive or pro-active?
  - Are we losing opportunity?
  - Are we closing the loop?

Applications & Work processes

- ERP
- CMMS
- Operations Monitoring
- Condition Monitoring
- Historian
- Lab
- Excel

Need Real time Business Insight

Application Challenges

- Dis-connected point solutions
- Duplication of information
- Work processes optimized locally

Functional and Application Silos

Lack of real time insight into business
Current State?

Current State

- Isolated & duplicated information sources
- Lack of collaboration & knowledge management tools
- Emphasis on lagging indicators and reports
- Lack of clear linkage from business goals to operational metrics

Consequence

- Creates inconsistent metrics
- Creates functional silos and does not allow knowledge dissemination
- Results in missed opportunities due to lack of real time monitoring
- Lack of business insight and visibility

Need for Integrated Real-time Performance Monitoring
The Performance Management Challenge

You need Real-time Performance Management!

Faster and Better Decisions

Challenges

• Taking right decisions at the right time with the right information…

• Linking business goals to operational decisions and actions…

• Visibility of information anytime anywhere across functions & enable collaboration…

• Calculating KPI’s (leading & lagging) in consistent manner…

Disparate and varied data
Honeywell Real-Time Performance Management

Provides decision makers at all levels of the organization with relevant, timely performance information enabling them to make decisions and take actions in line with business goals.
Honeywell Real-Time Performance management

- Converts business and process data to leading and lagging KPI's
- Provides linkage between business and process

Collaboration
- Powerful Visualization, analysis
- Enables collaboration

Metrics Management
- Monitors improvements
- Captures knowledge

Continuous Improvement

Actionable workflows
- Workflows to ensure appropriate actions are implemented
- Progress tracking

Operational Action

Closes the Loop & Enables Smart Operations!
Time to Make the Next Step

FROM

- **Gaps** in data availability and accuracy
- **Slow** Response to unplanned events due to lagging indicators
- **Disconnected** Point Solutions for individual functions
- **Open Loop** where decisions are made without looking back

TO

- **Complete Visibility** through near real-time information
- **Agility** and coordinated execution with leading indicators
- **Connected** Enterprise Solution supporting operational work processes and collaboration
- **Closed Loop** where decisions are always matched to outcomes and continuous improvement is realised
Benefits

Higher operations efficiency and agility by:

- Increasing utilization
- Improving product mix
- Reducing energy consumption
- Achieving higher margins
Solution overview
Solution Overview

- KPI Repository
- Role Based Dashboards
- Notifications and Alerts
- Collaboration
- Workflow and Knowledge management
<table>
<thead>
<tr>
<th>Category</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOALS</td>
<td>What are the Business Objectives?</td>
</tr>
<tr>
<td>STRATEGIES</td>
<td>How can we achieve the Business Objectives?</td>
</tr>
<tr>
<td>CSF*</td>
<td>What actions must we do to reach Objectives?</td>
</tr>
<tr>
<td>KPIs</td>
<td>What must we measure to monitor the CSFs?</td>
</tr>
<tr>
<td>LIMITS</td>
<td>What are the targets or limits for the KPIs?</td>
</tr>
<tr>
<td>COST</td>
<td>What is the cost of the deviation, if any?</td>
</tr>
<tr>
<td>ROLE</td>
<td>Who is responsible for the KPI?</td>
</tr>
<tr>
<td>ACTIONS</td>
<td>What should we do if the KPI is not on target?</td>
</tr>
</tbody>
</table>

* Critical Success Factors

**Executive Management**

**Plant Management**

**Plant Functions (ops, Mtce...)**

Effective KPI’s provide strong linkage between business goals and Actions.
Goals to KPIs – An Example

**Goal:**
- Increase Shareholder Value

**KPIs:**
- Plant Availability; Plant Throughput; Plant Occupancy; Feed Quality
- Energy Index; Specific Consumptions

**Strategy:**
- Improve operational profitability of manufacturing

**Critical success factor (CSF):**
- Maintain reliability target
- Reduce specific energy consumption
Honeywell KPI Repository

- KPI’s for major functional groups
- Leading and Lagging indicators
- KPI’s for Executive Management, Plant Management & Functions

KPI Definitions standardized across the organization

<table>
<thead>
<tr>
<th>KPI</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td># of lost time accidents</td>
<td>HSE</td>
</tr>
<tr>
<td># of environmental incidents</td>
<td>HSE</td>
</tr>
<tr>
<td>APC utilization</td>
<td>Process</td>
</tr>
<tr>
<td>Critical process parameters</td>
<td>Process</td>
</tr>
<tr>
<td>Alarms per operator per shift</td>
<td>Safety</td>
</tr>
<tr>
<td>Unplanned downtime</td>
<td>Reliability</td>
</tr>
<tr>
<td>Operating envelope exceptions</td>
<td>Reliability</td>
</tr>
<tr>
<td>Variable cost</td>
<td>Financial</td>
</tr>
<tr>
<td>Energy/ton of product</td>
<td>Energy</td>
</tr>
<tr>
<td>Quality giveaway</td>
<td>Quality</td>
</tr>
<tr>
<td>Unit Throughput</td>
<td>Feed &amp; Product</td>
</tr>
<tr>
<td>…..</td>
<td>…..</td>
</tr>
</tbody>
</table>
KPI Drilldown Options

Drilldowns by Material, Business, Organization and Time

SITE
- Fired Equipment
  - Monthly Fuel Usage

Fuel
- Nat Gas
- Fuel Gas
- Fuel Oil Monthly Fuel Usage
- Naphtha

Equipment
- Boilers
- Dryers
- Fired Heaters
- Incinerators

Plant
- CDU
- FCCU
- Coker
- Sulphur

Fired Heaters
- Charge Heater
- Coker
- Crude Heater
- Reboiler

CDU
- Unit
  - CDU - 1
  - CDU - 2
KPI Hierarchy – Linking Business to Process

Drill down from High level Business KPI to lower level Operational and Process KPI’s

Allows quick identification of issues
Role Based Dashboards

- Dashboards based on roles – drives standardization
- KPI’s from multiple applications integrated in an intuitive dashboard
- Can be accessed on mobile devices such as tablets

Deviations highlighted in red
Rich drill-downs enable effective analysis.
Events & Notification

- Drive actions based on events
- Rule based system can notify users via E-mail / Sharepoint list / Desktop alert
Collaborate with Experts

Tools for the end-user to collaborate with other peers and experts

- Initiate discussion with peers and experts right from the dashboard
- Capture the knowledge of your experts with collaborative tools
- Improve personnel productivity
  - Searchable information resides in document libraries, wikis
Workflow management

- Use SharePoint collaboration and work flow
- Use tasks, notes, links, documents
- Drive actions, best practices
- Create Escalations

Close the loop with clear actions and tracking
Real World Scenario
Scenario

- Refinery manager
- Crude unit – Plant manager
- Crude unit – Process Engineer
- Crude unit - Operator
- Refinery Blending COE engineer
Refinery manager sees issue with overall site energy usage

HSEF

- Site Environment, #
- Site Incidents, #
- Env. Exceedences, #

Refinery KPIs

- Margin, $/Bbl
- Gasoline Yield, %
- ELS, TS/RF/KT
- Reliability, %
- Utilization, %

Throughput

- CDU, MT
- FCCU, MT
- Coker, MT
- Alkylation, MT
- Platformer, MT
- VGO, MT
- Hydrotreater, MT
- Diesel HDT, MT
- LCOHC, MT

Financial

- Contribution 30 Days
- Site Contribution, $
- Contribution Var., $
- Power Cost, $/KWH
- Steam Cost, $/MT

Maintenance

- Cat_Chem_Cost, $
- Maintenance_Cost, $
- Service_Cost, $
- Spare_Cost, $

Feed Inv % Full

- Crude
- Malibu

Prod. Inv

- Diesel, MT
- Gasoline, MT
- HSD, MT
- Naphtha
- Propylene
Refinery manager uses drill-down dashboards to look at trends and charts.
Refinery manager navigates to the CDU unit. Discusses the issue with CDU plant manager.
Plant manager along with process engineer quickly looks at KPI drill-downs and determines the cause of the problem – Heat exchanger efficiency

<table>
<thead>
<tr>
<th>KPI</th>
<th>UOM</th>
<th>Value</th>
<th>Low</th>
<th>High</th>
<th>Last 60 Days Trend</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDU ENERGY INDEX</td>
<td>TSRE/KT</td>
<td>12.5</td>
<td>9.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDU ENERGY INDEX - Level 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KPI</td>
<td>UOM</td>
<td>Value</td>
<td>Low</td>
<td>High</td>
<td>Last 60 Days Trend</td>
<td>Comments</td>
</tr>
<tr>
<td>FUEL GAS CONSUMPTION</td>
<td>kg/hr</td>
<td>30,854.0</td>
<td>25,000.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAT EXCHANGER TRAIN EFF..</td>
<td>%</td>
<td>82.6</td>
<td>85.0</td>
<td>90.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAT EXCHANGER TRAIN EFF..</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KPI</td>
<td>UOM</td>
<td>Value</td>
<td>Low</td>
<td>High</td>
<td>Last 60 Days Trend</td>
<td>Comments</td>
</tr>
<tr>
<td>HEAT EXCHANGER E100 EFF</td>
<td>%</td>
<td>61.1</td>
<td>75.0</td>
<td>90.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAT EXCHANGER E101 EFF</td>
<td>%</td>
<td>78.2</td>
<td>75.0</td>
<td>90.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAT EXCHANGER E102 EFF</td>
<td>%</td>
<td>77.4</td>
<td>75.0</td>
<td>90.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAT EXCHANGER E103 EFF</td>
<td>%</td>
<td>70.8</td>
<td>75.0</td>
<td>90.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAT EXCHANGER E104 EFF</td>
<td>%</td>
<td>74.8</td>
<td>75.0</td>
<td>90.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAT EXCHANGER E105 EFF</td>
<td>%</td>
<td>78.3</td>
<td>75.0</td>
<td>90.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HP FUEL GAS</td>
<td>kg/hr</td>
<td>1,791.0</td>
<td>1,500.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HP STEAM RET</td>
<td>kg/hr</td>
<td>8,487.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LP STEAM</td>
<td>kg/hr</td>
<td>36,766.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER</td>
<td>kw</td>
<td>8,907.1</td>
<td>8,000.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tasks are assigned to CDU Operations team to further investigate and resolve the issue.
CDU operator discusses with engineers and finds the root cause; Knowledge related to the issue captured for future reference.

CDUOperator
I observed Crude quality issue this morning. The HE train all showing lower efficiencies. I received an Density High fault event from Intuition system. What is the problem with Crude Blending?

6 hours ago  Reply  Edit  

Blending COE
Yes, we currently having issue with crude analyzer values.

6 hours ago  Reply  Edit  

CDUOperator
In response to Blending COE’s post
This is causing serious problem down here, it impacts production and efficiency. When it will be resolved?

6 hours ago  Reply  Edit  

Refinery manager comes the next day and checks CDU plant dashboard to ensure the Energy KPI is in its desired limit – closes the loop.
Case studies
# Case Study: Major Refiner in Asia Pacific

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Solution</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fact based decision support system with consistent, role based views of key performance indicators</td>
<td>• Consistent and standardized KPI calculations</td>
<td>• Improved unit operations</td>
</tr>
<tr>
<td>• Enable near real time performance monitoring</td>
<td>• Dashboards with actionable information supported by rich drill-downs to identify issues and opportunities</td>
<td>• Energy savings</td>
</tr>
<tr>
<td>• Integration and visibility across functions</td>
<td>• Near real time process and equipment monitoring that link unit level process metrics to higher level business KPI’s supported by rich graphical and tabular drill-downs</td>
<td>• Reduction in process upsets</td>
</tr>
<tr>
<td>• Standardization of KPI definitions</td>
<td>• Collaborative networks for escalation and resolution of issues from plant level users to subject matter experts</td>
<td>• Builds intellectual capital for future generation</td>
</tr>
<tr>
<td>• Enable review and monitoring by subject matter experts in a collaborative environment and platform</td>
<td></td>
<td>• Standardization of performance and process monitoring</td>
</tr>
</tbody>
</table>
Case Study: Specialty Materials, Hopewell, US

Problem
38 production facilities seeking systems to manage shop floor processes and integrate data with SAP for improved inventory and production reporting.

Vision
Connect shop floor to top floor via a platform based on standard tools
Must haves:
• reusable, scalable, flexible (cross site portability)
• SAP compatible
• easy to use
• supported through scheduled software releases (future proof)
• leverage existing technology investments (not “rip & replace”)
• enable enterprise collaboration
• reduce total cost of ownership

Solution
Honeywell solution installed to automate tracking of chemical production; MES solution based on Microsoft technologies was created and executed in 14 weeks – easy integration to SAP and production systems

Results:
• Automated MES solution – shop floor to top floor visibility achieved in 90 days (on time & on budget)
• Improved daily inventory accuracy and visibility reduces under/over promising of shipments and “surprise” financial adjustments
• Standardized workflows and improved data accuracy
• Operating income impact of $1.5M expected over 3 years on single facility
WHY Honeywell
Differentiators

- Proven, Comprehensive & scalable solution for real time performance management

- Built with Honeywell User Experience (HUE) guidelines

- Domain knowledge from Honeywell embedded into solution (e.g. standard KPI repository…)

- Strong consulting, engineering and support organization that will ensure our clients get maximum and quick value realization
Next Steps
# Next Steps

<table>
<thead>
<tr>
<th>Workshop</th>
<th>Pilot</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective</strong></td>
<td>Introduce our approach, understand requirements and provide dashboard mock-ups for key roles</td>
<td>Develop a limited number of dashboards with KPI’s and validate the concept</td>
</tr>
<tr>
<td><strong>Deliverable</strong></td>
<td>Executive summary containing mock-ups (slides with illustrative dashboards built with our solution)</td>
<td>Live pilot connected to client system</td>
</tr>
<tr>
<td><strong>Typical Timeline</strong></td>
<td>~ 3 days</td>
<td>~ 6 weeks</td>
</tr>
</tbody>
</table>
Questions
Thank you