SustainAbility.

Paul Yap
Enhancing and Sustaining APC Benefits
Agenda

• APC Benefits
• Industry Challenges
• Meeting the Challenges
• How Can Honeywell Help?
• Case Studies
• Wrap-up
Tangible APC Benefits

Advanced Control and Optimization benefits are field proven and generate high rates of return on investment.

Typical Benefits:
- Increased Throughput
- Improved Yields
- Decreased Operating Costs
- Improved Quality Consistency
- Increased Operating Flexibility
- Improved Process Stability

Typical Payback:

<table>
<thead>
<tr>
<th>Industry</th>
<th>Payback Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and Gas</td>
<td>0 to 2 months</td>
</tr>
<tr>
<td>Refining</td>
<td>3 to 6 months</td>
</tr>
<tr>
<td>Chemicals</td>
<td>3 to 6 months</td>
</tr>
<tr>
<td>Petrochem</td>
<td>4 to 6 months</td>
</tr>
<tr>
<td>MMM</td>
<td>4 to 6 months</td>
</tr>
<tr>
<td>Pulping/Paper</td>
<td>6 to 8 months</td>
</tr>
<tr>
<td>Industrial Power</td>
<td>10 to 12 months</td>
</tr>
</tbody>
</table>

Advanced Process Control provides lucrative returns in any economy.
Intangible APC Benefits

Intangible benefits are harder to quantify but can be quite significant depending on the project under evaluation.

• **Improved Process Safety**
  - Process Watchdog
  - Earlier Identification of Problems

• **Improved Operator Effectiveness**
  - Focuses on key operating parameters

• **Reduced Downstream Unit Variability**
  - Fewer Process Upsets

• **Better Process Information**
  - Increased Process Understanding
Why aren’t these benefits sustained?

- Attractive investment with good initial benefits
- Potential for rapid degradation of benefits without proper monitoring/maintenance
- Combination of tools and work process needed to sustain benefits

“…applications which are designed to make money can quickly degrade over a period of 18 months to yield nominal benefits (<25%) if they are not properly monitored and maintained from the time of installation.”

Honeywell APC Customer, Profit Suite Strategic User Forum
Agenda

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Current Challenges

• Scarce Capital

• “Qualified” Resource Pool

• Sustaining Application Acceptance and Benefits

• Leveraging APC investments – Beyond the traditional benefit areas
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Meeting the Challenges

- Cost Effective Deployment and Sustainment
- Making the Operator More Effective
- Renewed focus on support infrastructure
- Integration of Applications
- Leveraging Enabling Technology
- Multi Unit / Plant Wide Optimization
- Streamlining Work Flow
Cost Effective Deployment / Sustainment

- Tools for
  - Reducing overall plant test time
  - Closed-loop Automated Step Testing
  - Model quality, diagnostics
- Leverage estimated matrices from simulations
- Faster deployment because of a quicker ‘diagnose/analyze-identify-update’ work flow during commissioning
Making the Operator More Effective

- **Analytical Tools and Decision Support Capabilities**
  - What-if scenario support
  - Easier problem identification and faster diagnostics

- **Visualization**
  - Presentation of information
  - Integration / Access to “non-APC” information
Integration of Applications – Simulation

• **Steady state simulation**
  – Off-line simulation of control schemes
  – Leverage models on-line for control and optimization

• **Dynamic Simulation**
  – Re-use investment in the virtual plant
    • Design ➔ Deploy ➔ Maintain
  – Advanced integration features for testing

• **Reduce implementation time**
  – Testing control schemes
  – Initial controller models

• **Improve APC Uptime**
  – Operator training – improve acceptance
  – Performance validation / troubleshooting

*Common tools drive improved efficiency and long-term sustainability*
Leveraging Enabling Technology

Virtualization
- Reduce hardware footprint and maintenance costs
- Needs to be supported by DCS for on-process use

Remote Collaboration
- Cost effective sustainment
- Knowledge Management within an organization
Multi Unit / Plant-Wide Optimization

- Beyond single unit optimization to maximize business results
- Global optimization of constrained and unconstrained systems
- Dynamic optimization can deliver significant sustained benefits, especially when integrated with APC
Unified Technology Platform

- Technology based on a common workflow
- Control to user specified constraints (limits)
- Optimize operations (economics)
- Standard infrastructure and common features
- Extensible and customizable

Continuum of Control Solutions

Flexible, scalable solution to cover a wide range of applications
Streamlining Workflow

Automate tasks where sensible

Result:
- Improve Overall Sustainability
- Enable Remote Serviceability
- Enable Remote Collaboration
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How can Honeywell help?

- Experienced personnel
- Familiar with the right technology
- Deliver the necessary services
- Ensure long-term sustained benefits
Profit Suite for Control & Optimization

Honeywell is the Market Leader in APC and RTO*

150+ Higher Level Optimization Applications
3200+ Multivariable Controller Applications
1000+ Major Unit Implementations (MPC-Based Optimization)
550+ Industrial Sites
300+ Customers Worldwide

Estimated $5 Billion in Benefits since 1996

Profit Suite Services & Support

- Development/Product Management
  - 50+ developers world-wide
- Project Services
  - 150+ representatives globally
- Advanced Application Aftermarket and Support Services
  - 60+ dedicated AppTech personnel

- Depth of education, experience and knowledge in technology and domain expertise spread across all functions

"Local expertise, globally networked"

(3rd Party implementation where appropriate)
# Honeywell APC Experience

<table>
<thead>
<tr>
<th>Refining Processes</th>
<th>Pulp &amp; Paper</th>
<th>Chemicals</th>
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<tbody>
<tr>
<td>Alkylation</td>
<td>MD Control</td>
<td>Acetic Anhydride</td>
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<tr>
<td>Catalytic Cracking</td>
<td>Bleaching</td>
<td>Methanol</td>
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<tr>
<td>Coking</td>
<td>Lime Kiln</td>
<td>Ammonia</td>
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<tr>
<td>Crude Distillation</td>
<td>CIO2 Generation</td>
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<td>Hydrocracking</td>
<td>O2 Delignification</td>
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<td>Hydrotreating</td>
<td>Kamyr Digester (R&amp;D)</td>
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<td>Isomerization</td>
<td>Thermo-Mechanical Pulping (TMP)</td>
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<td>Lubes</td>
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<td>Reforming</td>
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<td>Semiconductor</td>
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<td>Aromatics</td>
<td>Nylon</td>
<td>Discrete Manufacturing Control</td>
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<td>Butadiene</td>
<td>Polyethylene</td>
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<td>Polystyrene</td>
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<td>Industrial Utilities</td>
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<td>Co-Generation</td>
<td>NGL Plants</td>
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<td>Power/Steam</td>
<td>LNG Plants</td>
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<td>Off-Shore Production</td>
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Profit Suite® for Control & Optimization

Advanced Control and Optimization Layers

Non-Linear Control & Plant Optimization
- Profit Optimizer
- Profi Bridge
- UniSim Optimization

Model Predictive Control & Unit Optimization
- Profit Controller
- Profit Controller Express

Soft Sensor Technology
- Profit SensorPro
- UOP Toolkits

Advanced Regulatory Control
- Profit Loop
- TaiJi PID

Integrated & Scalable Optimization Solutions

Business Integration

Control Performance Monitor / Profit Expert
- Embedded History
- Performance Reports
- Performance Monitoring & Diagnostics

Process Solutions Systems, Services & Services
Delivering Value as a Cohesive Solution

- **Profit Controller**
- **UniSim Lifecycle Simulation Tools**
- **Control Performance Monitor**
- **TaiJi PID Profit Stepper**

- Past
- Future
- Optimal Response
- Setpoint
- CV
- MV
- Optimum
- Minimum Effort Move
- Predicted Unforced Response
- Optimal Response
- Setpoint
- CV
- MV
- Dynamic Optimization
- Steady-State Optimization
- Additional $ Benefits
- Optimum Operation
- Current Operation
- Wait for Steady State
- Time
Profit Suite R410 – Major Release

Increase Engineering Efficiency
- Simplify Migration
- New Engineering Environment
- Automate key tasks

Increase Process Performance
- Novel MVC for Power, OAG
- Enhanced Operator Interface

Sustain
- Simplified Maintenance
- Integrate Matrikon and HPS Technologies
- Collaborative Remote Services Programs

New
Design for Migration/Maintainability

• Deliver high-value functionality faster
  – Functional enhancements delivered as incremental release*
  – Cumulative over release cycle

• Reduce Migration Effort/Risk
  – Final update provides all new release functionality
  – No uninstall/reinstall

Planned R430 General Release: Q2-2014
Profit Suite Roadmap

Profit Suite R320
- Model-based Nonlinear Control
- Embedded Historian
- Enhanced Operator Visualization
- Improved Engineering Efficiency
- L4 Visualization

Profit Suite R400
- Control Engine Enhancements
- Empirical Nonlinear Control
- Virtualization Support
- Profit Design Studio Modernization
- Web Service Visualization
- Full (Legacy) LCN NW Support
- Profit XL Bridge (new!)
- Training Integration with UniSim
- UOP Inside

Profit Suite R410
- PSES Extensions
- Knowledge management
- Industrial Adaptive Workflow
- USD Integration Improvements
- Operator Effectiveness

Profit Suite R430
- PSES Extensions for Soft Sensor, Profit Optimizer, NLC
- UOP Inside
- CPM/Profit Expert Integration
- Real-time Business Optimization
- Experion Integration
- Embedded Algorithms
- Energy Management
- “One Model” Lifecycle Support

Unified technology platform,
Engineering & Ops tools, User Interface
to drive and sustain benefits across the enterprise

Honeywell leads the way in solution innovation
Advanced Application Project Services

Consulting
Feasibility Studies
Master Plans
Benefits Audits

Project Implementation
Design
Implementation
Commissioning
Start-up

More than 3,500 Man-Years Process Industry Experience

Training Programs
• Operator Training
• Process Simulation

SAFE Programs
• Outsourced Automation
• Technology Refresh
Optimal Performance Services

Application Upgrade Services
  On-site Features Training
  On-site Services Migration

Sustained Benefits Programs
  Remote Monitoring
    Onsite Services
    Site Resident Engineering
    Application Services Agreements
      (combined licensing and services)

Expanded Training Offerings
  Profit Controller Maintenance Course
    Advanced Profit Controller Implementation
    Profit SensorPro
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Case Studies

• Saudi Aramco: “Finding the Needle in the Haystack”
  – *Effective use of Technology and Work Processes*

• Kairos: “A Partnership Model for Life Cycle Support”
  – *Remote Collaboration*
Saudi Aramco – Process Optimization

Saudi Aramco, Saudi Arabia:

- Issues with base level regulatory control availability (>50% of loops in non-normal mode) at various facilities
  - 5 refineries
  - 8 gas plants
- Impact on performance of existing APC applications (over 130)
- No standard processes for monitoring and maintaining critical assets
- No processes to prioritize maintenance

Solution Applied

- Standard, consistent program to monitor APC as ‘assets’ across facilities
- CPM dashboard to allow for wide access to results

Key Benefits

- Significant increase in loops in ‘normal’ mode
- Significant increase in APC service factors
- Measurable increase in economic performance of key automation assets (PID, APC) across enterprise
Objective
  – Improved alumina refining process automation through a long term, co-sourced service agreement.

Spans 7 alumina refineries in Australia, Brazil, Jamaica, Spain, and Suriname.

Common suite of control and information applications

Support Services
  – Virtual services organization using ITIL Service Management Framework
  – Consisting of Alcoa & Honeywell resources
  – Service Level Agreement focused at sustaining (and extending) benefits
Mission Statement
To deliver integration, installation and startup services, plus the lifecycle support of the automation and control systems that ensure satisfactory results to the clients.

Foundation date
December 12th, 2006

Business Area
Automation processes for mining industry
Remote Collaboration – Monitoring and Support

- Real time access to Concentrator Plants Automation systems
- Technical Support 7 x 24
- Continuous monitoring of the Advanced Control infrastructure
- Integrated vision of Processes and KPI's
- Lifecycle support for Advanced Control applications
- Platform for development of Operators and Process Knowledge
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Wrap-up

• APC benefits are clear, but are often not sustained

• A workflow that integrates all aspects of the APC lifecycle is necessary to sustain APC benefits

• Honeywell has the personnel, experience and technology to help you sustain and improve APC benefits