NUOVE TENDENZE ED OPPORTUNITA’ ATTRAVERSO L’IIOT (Industrial Internet of things)
a cura di Filippo Zerbini
Agenda

- 1. Honeywell Connected Plant
- 2. Digital Transformation
- 3. Architecture
- 4. Analytics
- 5. Visualization
- 6. Integration
- 7. Infrastructure
- 8. Getting Started
Past Trend

Workflow 1

Workflow 2

Workflow 3

Data

Analytics

Analytics

Analytics

Reactive Insights
Current Trend

People + Process

Data

Technology

Collaboration Enhanced Analytics

Situational Awareness
Future Trend

People + Process

More Data

Technology

More Analytics Better Insights

Situational Awareness

Streaming Insights

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Honeywell Connected Plant - Value Proposition

Deliver and sustain improvements in our customers' profitability by increasing throughput & yield at lower cost via:

- Integrated Safety & Cyber Security
- Increased Production Efficiency
- Improved Process Reliability
- Optimized Supply Chain
- Workforce Competency
Connected Elements

Unequaled Equation For Success

Connected Process
- Domain expertise
- Data in context
- System optimization via analytics

Connected Assets
- External expertise & capabilities
- Aggregate and collaborate on all relevant data w/ analytics

Connected People
- HPS Solutions to execute/ maintain improvements
- Enhanced decisions via data analytics
- Worker safety & compliance

Connected Plant
- Unmatched industry offering
- Unique value prop
- Robust platform to attract “app” development & monetization
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Digital Transformation

Industry 4.0  Cloud  Industrial Internet of Things

Data Analytics  Mobility  Big Data
Distributed Control Systems Are the Earliest Form of IIoT

Thousands of Sensors → Millions of Values per Minute → Analyzed, Processed, and Actioned

Where Can We Go From Here?
Evolving Industrial Internet Landscape

Connectivity Providers

Consultants

CRM/ERP

OEMs

Automation Providers

Disruptors

Success Depends on Connecting Offerings to Customer Outcomes
iIoT Vision

Future

Legacy

iIoT Sensors

Mobility

Cloud iIoT

Control System

Historian

Analytics

MES Operations Framework

Business

• Connected Assets
• Surveillance
• Notifications
• Performance Contracts

Quality, Yields, Safety, Margins
Ecosystem Critical to Add Domain Knowledge to Solve Challenging Problems
Ecosystem Critical to Add Domain Knowledge to Solve Challenging Problems
What does Digital Transformation (IIoT) look like?

**Honeywell IIoT Open & Secure Framework**

- **Advanced Analytics**
- **Smart and Secure Collaboration**
- **Data Management and Onsite Control**
- **Smart & Connected Assets and Devices**

**Honeywell App Store**

- INspire™ (Joint Innovation Program)
- **EDGE**

**External App Developers**

- Knowledge Vendors
  - EPCs
  - OEMs
  - SIs
  - Process Licensors

- **Data Scientists**

**Use Case Examples**

- **Production Efficiency**
  - Optimizing process by connecting external equipment
  - Ex. Shell Furnace Flooding

- **Process Reliability**
  - Predictive maintenance via data analytics
  - Ex. Codelco/ SKF Vibration Monitoring

- **Supply Chain Optimization**
  - Improved monitoring, forecasting & utilization
  - Ex. AirGas asset tracking

**Ecosystem Critical to Add Domain Knowledge to Solve Challenging Problems**

- Equip. Vendors (ex. Flow Serve, MHI, etc.)
- DCS Process Data
- Ancillary System Data (ex. SAP, ERP, LIMS, etc.)
**IIoT by Honeywell – Driving Value**

1. **Disparate Information Systems across Customer Enterprise**
   - Federate siloed information from “data swamps” within individual plants or functions
   - Leverage smart sensors, connected devices to be able to better monitor/ control real time

2. **Enterprise Intelligence Management**
   - Collecting across systems
   - Visualize & Contextualize
   - Alarm Mgmt & Mobile Notification

3. **Data Insight**
   - Advanced algorithms & models to uncover insights from real-time & historical data
   - Incremental improvements previously unseen thru conventional analysis

4. **Expert Support**
   - External support beyond enterprise
   - Enabling collaboration/ secure data exchange with specialized experts (OEMs, Process Licensors, EPCs, etc.)
   - Facilitated by common platform
   - Richer insights, improved asset performance, faster service time

**Cloud Intelligence**
- Secure data transfer & aggregation in cloud
- Single version of truth cross enterprise/ functions
- Tools to contextualize/ share data & deliver insights to stakeholders
- Enables enterprise wide fact based decision support & KPI benchmarking

**Ecosystem Domain Expertise**
- Advanced Analytics
- Collaboration & Visualization
- KPI & Calculation engine
- Enterprise Historian
- Plant Gateway
- Asset Edge Connector
- Sensors

**IIoT Framework**
Connected Performance Services

Key Customer Challenges

- Energy and Emissions
  - Emission standards
  - Energy reduction

- Human Capital Challenges
  - Knowledge gaps
  - Operational excellence

- Underperforming Assets
  - Sub-optimal operations
  - Performance vs peers

- Unplanned Downtime
  - Process issues
  - Equipment failures

CPS Architecture

The Connected Plant Delivered with CPS

- Analyze plant performance to reveal full potential through a cloud-based service
  - Around-the-clock monitoring of plant data and rigorous simulations
  - Provides on-going, operational recommendations to close performance gaps
  - Leveraging UOP Process Models & longstanding experience in operational support and troubleshooting

- Customer value of $0.30-$0.50/bbl in refining & $10-$20/MT in Petrochemicals
Honeywell – iIOT Strategy

Figure 1: The adoption and impact path of the Industrial Internet

1. Operational Efficiency
   - Asset utilization
   - Operational cost reduction
   - Worker productivity

2. New Products & Services
   - Pay-per-use
   - Software-based services
   - Data monetization

3. Outcome Economy
   - Pay-per-outcome
   - New connected ecosystems
   - Platform-enabled marketplace

4. Autonomous, Pull Economy
   - Continuous demand-sensing
   - End-to-end automation
   - Resource optimization & waste reduction

“If you can’t measure it, you can’t manage it.”

World Economic Forum, January 2015, Industrial Internet of Things: Unleashing the Potential of Connected Products and Services
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Digital Intelligence

Advanced Analytics

Smart and Secure Collaboration

Data Management and Onsite Control

Smart & Connected Assets and Devices

Visualization
Across Entire Enterprise
- KPIs Mgmt
- Supply Chain
- Alarm Mgmt
- Predictive Mtnce.

Collaboration
Across Entire Ecosystem
- System Integrators
- Finance & Planning
- Plant Mgr
- CEO
- OEMs
- Operations Ldr
- Maintenance Mgr
- Plant
- Central Engineering
- Core Engineering
- Process Licensors
- Operator
- Consultants
- Enterprise SMEs
- Enterprise Ecosystem

Actions

Apply powerful analytics to detect and predict issues

Connect process intelligence to business KPIs

Organize and visualize data in asset context

Capture real-time process and event data

Driven via instant notifications
Digital Elements

- Competence, leadership and training
- Organisation
- Collaborative work spaces
- Work Processes
- Visualization & Analytics
- Information access, interfaces, integration layer and security
- Communications infrastructure and standards
- Data capture and standards
- Assets and their Equipment

Operational

Organisation & Processes

Enabling

Foundational

Digital Elements
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A Pragmatic Definition of Data Analytics

<table>
<thead>
<tr>
<th>Data Infrastructure or Historian</th>
<th>Data Collection (integration, aggregation, and management)</th>
<th>Data Context (contextualization, modeling &amp; access)</th>
<th>Analysis</th>
<th>Human Input</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Descriptive</td>
<td>What happened?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Diagnostic</td>
<td>Why did it happen?</td>
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<td></td>
<td></td>
<td></td>
<td>Predictive</td>
<td>What will happen?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prescriptive</td>
<td>What should I do?</td>
</tr>
</tbody>
</table>

The goal of analytics is to provide information for **improved decisions and actions** for economic benefit.

Note that maximizing automation and minimizing human input are *not* always the goals → analytics should be suited to the use case.

Analytics: Asset Health, Process Performance and People

- Make faster decisions with better insights
- Convert tacit knowledge into explicit knowledge
- Link day to day actions to high level business goals

People Productivity

- Improve Overall Equipment Effectiveness (OEE)
- Increase asset utilization
- Identify underperforming assets

Excellence by Digital Transformation

Process Performance
- Improve process efficiency
- Reduce capacity loss
- Reduce energy spend

Asset Health
Uniformance Asset Sentinel Goal & Values

**Current Situation**
- Known knowledge are documented and trained but unknown knowledge leading to adhoc actions or failures
- No visibility or understanding on where Operations or maintenance against design at all loads

**Goal**
- Improve the effectiveness of asset, people and process to keep the overall reliability & performance of plant at higher level with optimal cost of running.

**Value**
- Improved performance by triggering appropriate corrective action early
- Knowledge Repository & Reuse
- Reduced Opex & Capex
- SME collaboration in monitor models

**Challenges**
1. Silo Operations, data, decisions
2. Experts are few
3. Continuous improvements automation

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**The Solution**

- Visual Analytics – Rule Search
- Trigger Root Cause Analysis
- What If Analysis
- Experts & Engineers
- Large pool of data

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**Continuous Equipment Monitoring**

- Data Analytics & Fault Diagnosis
- Data Analytics & prediction

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**Alert**

- Investigation & Decision
- Take actions
- No Action

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Type of Monitoring & Examples

• **Equipment Performance Monitoring (Reliance)**
  Example: Compressor Performance Monitoring

• **Overall Equipment Monitoring (Aramco)**
  Example: Fired Heater Performance (1st Principle), Fault monitoring: simple rules, time window based rules, predict time to fail based on online real time regression function in Sentinel

• **Equipment Health Monitoring (Shell Bridge)**
  Example: Choke Value Leak detection using dynamic pattern detection (dynamic PCA)

• **Instrument Health Monitoring (Suncor)**
  Example: Smart Temperature control valve (device diagnostics & NAMUR)

• **Process Performance Monitoring (Glatfelter)**
  Example: Generate control limits based on user baseline definition of a golden run in Sentinel and report deviation to operator

• **Energy Monitoring (RepSol)**
  Example: Dynamic target model for CDU, energy aggregation and identify actionable events to improve overall energy efficiency

• **Rigorous Optimization service (CPS-UOP)**
  Example: Platforming model – data preprocessing, Fault detection and leverage Unisim Link for data reconciliation, Parameter estimation, Optimization
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Typical Integration Challenges

- Information integration between data sources
- Collaboration between individuals
- Integration between applications needs intensive consulting & guidance

*not shown in diagram*
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Honeywell Connected Plant – An Integrated approach
Enabling Infrastructure Options
HON Solution – Connecting Workers With Workplace

Real-time data:
- Threat readings
- Alarms
- Man-down status
- Compliance status
- Worker location

Workers Field Collaboration

Instant situational awareness – the right information at the right time
CONext safety solution – connectivity options

- WiFi Infrastructure
- MESH Network
- Alarm Notifications
- Map Displays
- Decision Aid
- Plume Modeling
- Data Integration
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Getting Started

**Industry 4.0**

- From talk to action
- Digitisation drives quantum leaps in performance
- Deepen digital relationships with more empowered customers
- Big investments with big impacts: it's time to commit
- Industry 4.0 is accelerating globalisation, but with a distinctly regional flavour
- Robust, enterprise-wide data analytics capabilities require significant change
- Data analytics and digital trust are the foundation of Industry 4.0
- Focus on people and culture to drive transformation

**Blueprint for digital success**

1. Map out your Industry 4.0 strategy
2. Create initial pilot projects
3. Define the capabilities you need
4. Become a virtuoso in data analytics
5. Transform into a digital enterprise
6. Actively plan an ecosystem approach

**PWC: Industry 4.0: Building the digital enterprise**
Digital Transformation to help improve performance, availability, reliability and safety

www.hwll.co/IIoT