Transforming the Way We Implement, Operate, and Maintain
Operations Transformation – Last Generation

Panel Controls

Supervisory Computers

Enabling Broader Operator Scope While Improving Safety and Reliability
Operator Environment Today

Operator Responsibility Continues to Grow

- 15-Yr.-Old Displays
- Alarms & Limits
- Written Procedures
- CCTV

More Complex Than Ever
Supervisory Computers

Eliminate Complexity, Better Operational Performance, Fewer Consoles

Operations Transformation – New Generation

 Released

Experion Orion Console

Released
Experion Orion Console & HMI

Transformation Similar in Magnitude to Moving from Panel to Supervisory Computer

New Context Based Visualization
Integrated Alarm & Limit Management
Integrated Procedures

More Situational Awareness, Faster Response, Operate Closer to Limits
From a Process Operator to a Business Operator

<table>
<thead>
<tr>
<th>Changing Role of the Operator</th>
<th>Current</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Quality Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online Cost Control</td>
<td></td>
<td></td>
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<tr>
<td>Product Changeovers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response to Quality Upsets</td>
<td></td>
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<tr>
<td>Response to Process Upsets</td>
<td></td>
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</tr>
<tr>
<td>Process Monitoring</td>
<td></td>
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<tr>
<td>Definition of Operating Parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manipulation of Non-automated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logging / Reporting</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Less Process Manipulation & Logging, More Business Decision Making
Scenario #1: Flawless Unit Startups

Have you experienced issues with unit startup?

“...30% of all reports had procedural operations as one of the causes.”

“A Study of Effective Procedural Practices in Refining and Chemical Operations,” Peter T. Bullemer, John R. Hajdukiewicz,

Using Automation, New Visualization & Collaboration
Scenario #2: Flawless Operations

Run Process Closer to Limits for Longer Period of Time
Scenario #3: Reducing Abnormal Situations

Quickly Determine Root Cause of Alarms
Provide Guidance to Recover

Better Visualization & Integrated Alarm Management
Consolidated or Remote Operations

Centralize Operations and Expertise

Orion console, mobile and collaboration stations enable efficiency
EXPERION ORION
Transforming Project Execution

Universal IO
Project Execution

Virtualization
Lifecycle Cost

Operator Environment
Improve Operations
Industry-Wide Capital Project Challenges

- 70% of projects overrun
- Of 47 mega-projects analyzed by PwC, the average cost overrun was 88%\(^1\)

Transforming the Project Execution Model is More Important Than Ever

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What Causes Capital Project Overruns?

Increase in Size and Complexity

- Design Errors = Scope Growth & Late Changes
- Complexity Requires Increased Collaboration Between End User, EPC, Automation Supplier

More Remote Locations

- More Remote Locations
- Lack of Skilled Labor
What If You Could Eliminate a Significant Amount of Work and Take Automation Off the Critical Path of Your Capital Project?
Lean Project Execution Model

Universal IO

Cloud Engineering

Virtualization

LEAP™ – a new paradigm for Automation Project Lean Execution

LEAP Over Time, Cost and Risk
Universal IO

Universal Safety IO

Universal Channel Technology

Universal Process IO

Only Honeywell Offers True Universal Process and Safety IO
What is True Universal IO?

- **Traditional Cabinets**
  - Wait for final definition of instruments and then build custom cabinets

- **Universal Cabinets**
  - Standard cabinet that can adapt to late wiring changes

Eliminate Complexity and Build Standard Cabinets Sooner Based on IO Count, Not Mix
Universal Cabinets Making Projects Simpler

Traditional Cabinets
Standard Work Dramatically Simplifying Order Process, Supply Chain, Project Execution and Lifecycle Support
Traditional Instrumentation and IO Wiring

Significant Cost in Equipment, Labor, Documentation and Checkout

Junction box

DI
AI
DO
AO

DI
AI
DO
AO

DI
AI
DO
AO

DI
AI
DO
AO

Junction box

Marshalling Cabinet

Multi Core Cables

System Integration Cables
Universal IO in the Field

Fewer Wires, Fewer Engineering Hours, Less Space = Greater Savings

Junction box

Multi Core Cables

Marshalling Cabinet

System Integration Cables

Controllers

DI  AI  DO  AO

DI  AI  DO  AO

DI  AI  DO  AO

DI  AI  DO  AO
Virtualization

Before

2 Experion Servers

Sim, VAM, Alm, Mgmt, ACE, Domain Control

18 Operator Stations

5 Engineering Stations

Experion Virtualization

80%+ Reduction in Maintenance, Space, Energy Use and Better Security
Experion Virtualization – Blade

Each blade is a server

Released

Additional 80% reduction

High Reliability, Simpler, Modular and Pre-Configured
LEAP Enabling Technology

- Universal IO
- Cloud Engineering
- Virtualization
Cloud Engineering

Traditional

People and equipment staged early in project in a single location

Cloud Engineering

Project staged in data center & people distributed

Apply the Best Resources Wherever They Are in the World
LEAP Enabling Technology

- Late Binding
- Universal IO
- Enhanced Design
- Flexible Hardware Procurement
- Cloud Engineering
- Virtualization
- Improved Agility and Flexibility
Traditional Project Workflow

- Application
  - Some Generic Controls and Display Templates
- Application
  - Develop Control Strategies, Displays
- Physical
  - Upgrade PCs
- Physical
  - IO Cabinets, Servers, PCs
- Physical
  - Development System
- Instrument Freeze

Honeywell
Traditional Project Workflow

Transformed

- Can start engineering sooner & without travel
- Can work without having physical equipment
- Don’t need system upgrade

- No development system
- Freeze not needed
- Big bang testing eliminated

Instrument Freeze
Lean Execution of Automation Projects (LEAP)

- Application
  - Honeywell Data Center
  - EPC
  - Customer

- Physical
  - Servers
  - Standard Cabinets

Direct to Site!
Minimal Checkout

Work in Parallel, Eliminate FAT and Ship to Site Earlier
Traditional approach is often back end-loaded.

LEAP Project Curve

Reduce Schedule with Lower Risk
Experion SCADA

- Project Efficiency
  - Wellhead Templates, Autogenerated Displays

- Operations Efficiency
  - Pan & Zoom

- Applications
  - Linepack, Flow Calcs, Compressor Modeling, Leak Detection

Experion Orion Enhanced SCADA
Experion Orion Efficiency for Common Assets

Traditional
- Points: 1000’s
- Algorithms: 100’s
- Displays: 100’s
- Trends: 10’s
- Task Filters

New Equipment Template

Replicated Standard Work

Reduce 1000’s of Custom Actions with Equipment Templates
Autogenerated Displays

Equipment Template

Intuitive & Packed with Context

Eliminate Substantial Amount of Work Associated with Custom Graphics
## Experion SCADA Project Efficiency

### Build Displays and Customize Well

<table>
<thead>
<tr>
<th>Task</th>
<th>Time (Hrs)</th>
<th>BEFORE</th>
<th>AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design representations</td>
<td>8</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Build displays &amp; links</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Per Project</strong></td>
<td><strong>20</strong></td>
<td></td>
<td><strong>2</strong></td>
</tr>
</tbody>
</table>

### Add New Well

<table>
<thead>
<tr>
<th>Task</th>
<th>Time (Hrs)</th>
<th>2-6 HOURS</th>
<th>10 MINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk edit instances</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Update displays for instances</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test display and debug</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Per Instance</strong></td>
<td><strong>6</strong></td>
<td></td>
<td><strong>10 min</strong></td>
</tr>
</tbody>
</table>

### Task

- Tailor system template & test: 2 Hours
- Total Per Project: 2 Hours
- Create instances of template: 0.1 Hours
- Load templates: 0.05 Hours
- Total Per Instance: 10 min

---

Eliminating 80-90% of Engineering Work Where You Have Like Assets
RTU2020

- Ultra Low Power
- HART Enabled
- DNP & Modbus
- -40C to 75C; Zone 2
- IEC61131-3 Languages
- Flow Calculations

Released

RTU for Wellhead or Pipeline Applications
GT400 Ultrasonic Gas Flow Metering

Greatest Accuracy with High Precision Calibration

- $70K savings via better measurement
- Eliminates flow conditioning equipment
- Immunity to regulator noise

Precision Flow Metering, Gas Quality Analysis, Full Gas Skids
UOP Modular Gas Processing

Nat Gas Conditioning

NGL Recovery

NGL Upgrading

Designed to Have You Processing as Much as 6 Months Earlier & at Lower Cost
Linking Entire Gas Supply Chain

Wellhead

Pipeline

Honeywell Offering

RTU, SCADA

Gas Metering, Regulation, Quality, Gas Cleanup

End-to-End Optimization of the Natural Supply Chain

Power

Petrochem

LNG Terminal

Experion Orion
Security = Safety

- Universal IO: Project Execution
- Virtualization: Lifecycle Cost
- Operator Environment: Improve Operations
Protecting Open Systems

Released

Upgrade Your Windows XP Systems to Experion R400+

Whitelisting

Secure Services

Certified Device

ISASecure

Continuous Process

ASSESS

REMEDIATE

MANAGE

Secure Products and Secure Processes; Secure Services
Experion Secure Communications

Fault-tolerant Ethernet

Protection Against:
- Man in the Middle Attack
- Unauthorized Nodes on Network
- Tampering with Communications

Encrypted and Authenticated Communications Between Experion PCs and C300 Controllers

Released
A Walk Through Time

Revolutionary Technology...Delivered in an Evolutionary Way

1990s
Experion Station TPS Introduction

Fault-tolerant Ethernet

IP protection: US, GUS, and Experion HMI all in one

New Operational Benefits with Modern Human Interface and Alarming
Experion Station TPS and New C300

Unified Human Interface for TDC/TPS and Experion

Fault-tolerant Ethernet

Experion Station TPS

LCN

HM

NIM

HPM

C300 and Series C

2007
The Evolution Continues: EHPM

Fault-tolerant Ethernet

Experion Station TPS

LCN

EHPM

Preservation of displays and controls:
- US graphics – work as-is
- AM controls – work as-is
- HPM controls and IO – work as-is

C300

HPM Evolves to Modern Ethernet Network – Eliminating UCN

2012
Shift LCN Communication to FTE

Fault-tolerant Ethernet

Experion Station TPS

LCN

ENIM

EHPM

C300

Released – Experion History 2015 – Displays

Eliminate LCN Bottlenecks
TDC Merges into Experion

Fault-tolerant Ethernet

Experion Station

EHPM

C300

Safety Manager

LCN Components Gradually Melt into Experion
Honeywell Delivers the Lowest Lifecycle Costs

**Honeywell**

40+ years of life – avoids costly rip and replace

Year 0

Year 20

Year 40+

HPM, LCN

Current – 2025

Stepwise Migrations That Protect Investments in Control, Graphics & Wiring
Honeywell Delivers the Lowest Lifecycle Costs

- Upgrade to EST
- Upgrade to EHPM/SM
- Lifecycle Contract

Honeywell: 50+ years of life – avoids costly rip and replace

Year 0

Year 20

Year 50+

EHPM

2035!

Ten Additional Years of Life with Upgrade to EST, EHPM/SM and Lifecycle Contract
Hiway Evolution

Fault-tolerant Ethernet

Experion Station TPS

AM  HG

Hiway Boxes

LCN

40 Year Anniversary!
Universal IO – Hiway

Fault-tolerant Ethernet

Experion Station TPS

Mount in Hiway Cabinets
- Preserve Hiway Wiring
- Integrated HART

C300

Released

Universal IO – Hiway

AM

LCN

HG

Simple Zero-Footprint Basic and Extended Controller Cutover to Experion Orion
Hiway Migration

- Migrate Graphics to Experion Station
- Migrate AM Controls to C300

Experion Station TPS

Fault-tolerant Ethernet

- Full Integration Between TDC3000 and Experion Orion
- Decommission HG?

C300

Universal IO – Hiway

LCN

AM

HG

Migrate Graphics to Experion Station, Migrate AM Controls to C300
Experion Hiway Bridge

Fault-tolerant Ethernet

Experion Station TPS

Hiway Gateway Becomes Hiway Bridge to C300

AM

EHB

LCN

Offline Released

Phase 2: 2015 – Online

C300

Universal IO – Hiway

Migrate Hiway But Preserve TPS US Graphics and AM Controls – Simple
Define multi-year automation plan
Justify upgrades with operational benefits

Creating New Benefits and Evolving Equipment – At Your Pace
Assurance 360 Services Program

- **Proactive Managed Services model**
- Maintains system to assure highest levels of reliability
- Assured results with established baseline and defined metrics

Managed Services to Ensure Excellent Operational Condition
Continuous Evolution

Safety, Reliability, Efficiency Solutions

New Field Instrumentation
There had been inadequate training for dealing with a stressful and sustained plant upset.
42% of process incidents are linked to improper operation or action.

New Operator Competency Library
- Structured framework for Competency Management

Reproduce the performance of your best operator...

Learn from others’ mistakes
Train on best practices
Prepare for upcoming operations

Training and Practice are Fundamental to Top Performance in Any Industry
Alarms are Frequently Cited

b. **Manage instrumentation and alarms** in a manner that ensures that they are sufficient and functional for all anticipated potential conditions and that there are no start-ups without tested and documented functioning of these systems.

In the last 11 minutes before the explosion the two operators had to recognize, acknowledge and act on 275 alarms.

Operators Were Overwhelmed by Alarm Floods
## EEMUA Alarm Guidelines

- **Average alarms per day:** 144
- **Average standing alarms:** 9
- **Peak alarms per 10 minutes:** 10
- **Average alarms per 10-minute interval:** 1
- **Distribution % (low/med/high):** 80/15/5

### Plants With Alarms Out of Control

Plants with alarms out of control generally have processes out of control.

### New

**EEMUA Alarm Guidelines**

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- **Average standing alarms:** 9
- **Peak alarms per 10 minutes:** 10
- **Average alarms per 10-minute interval:** 1
- **Distribution % (low/med/high):** 80/15/5

**BENCHMARK, RATIONALIZE, MANAGE CHANGE**

- Improve Plant Safety

**DynAMo Alarm Suite**
Benchmarking indicates 70% of reliability issues are operations related.

Eliminate Process Variability

Correlation Between Uptime and APC Implemented

Profit Suite

- Analyze constraints and operate within them
- Reduce operator manipulation by 80%

Plants with Best Process Control Have Fewer Slowdowns and Shutdowns

Profit Suite Making it Simple

Traditional

- Modeling is an art
- Requires steady state

Gets Turned Off

Profit Suite

- Modeling is a process
- Dynamic optimization

Easy to Setup & Maintain

Profit Suite Delivers Benefits Faster and Stays Online Longer
Profit Suite and UOP Integration

Profit Suite + UOP: $1.5M – $3M

Traditional APC: $0.7M – $1.0M

Integrated UOP Models

Profit Suite and UOP Integration – Achieves 2x Benefits and Reaches it Faster
Intuition KPI

To Improve Efficiency, Need Business Insight

Management Operating System

Proactively Monitor Process Performance and Equipment Metrics
Safety, Reliability, Efficiency Solutions

Continuous Evolution

New Field Instrumentation
SmartLine

A Platform for a New Generation of Smart Transmitters
Simplifying Installation, Operation and Maintenance
Modular Transmitter

Upgrade or Replace Components in Field; Stock Only What You Need

Traditional

Stock full device
Repair in shop, upgrade?

SmartLine

Stock parts
Repair / upgrade in field

Ultimate Flexibility, Faster Maintenance and Lower Inventory Costs
Advanced Display

Graphic Display Lets You See Your Process the Way You Want

- SmartLine
- Traditional

Limited information

Graphic and intuitive – full information
Unique Polarity Insensitivity

Save Time on Start-ups and Avoid Maintenance Errors; Only Supplier to Support This for HART

Either Connection will OPERATE Correctly

Field Wiring

Honeywell

Automatically Corrects Polarity
Transmitter Messaging & Maintenance Mode

Send a Message to the Display
Indicating Device is Available for Maintenance

Traditional

- Is it safe?

SmartLine

- Confidence

Ensures the Right Device, Right Action and Right Mode for Safe Maintenance
SmartLine – Experion Integration

See it here in the field

Deactivate the point here in the control room

Check Out Tamper Alerts and Transmitter Messaging in the Demo Room
SmartLine – Lowest Total Cost of Ownership

- Inventory – stock a single unit versus multiple units
- Field repair vs. rip/replace – reduces process down time
- Field upgrades – upgrade from DE to HART

Modular While Maintaining Calibration
Real-Time Sensor Health

Sensors Degrade...
With SmartLine You Know How Much

Traditional

- Go inspect
- Surprise failures
- Poor yield

Is the sensor good or bad?

SmartLine

Real-time data on display or in control room

Reliable Measurement and Predictable Maintenance
Now Introducing SmartLine Temperature!

Featuring the Same Benefits as SmartLine Pressure:

- Leading Performance
- Smart Connection Suite
- Lowest Total Cost of Ownership

State-of-the-Art Dual Chamber Temperature Transmitter
## SmartLine Temperature – Leading Performance

<table>
<thead>
<tr>
<th>Attribute/Supplier</th>
<th>Honeywell STT850</th>
<th>Emerson 3144</th>
<th>Yokogawa YTA310/320</th>
<th>E+H TMT 162</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output D/A accuracy</td>
<td>0.005% of span</td>
<td>0.02% of span</td>
<td>0.02% of span</td>
<td>0.02% of span</td>
</tr>
<tr>
<td>Stability/Year</td>
<td>0.01% of URL</td>
<td>0.1% of reading</td>
<td>0.1% of reading</td>
<td>0.05% of span</td>
</tr>
<tr>
<td>Speed of response</td>
<td>130 to 230msec</td>
<td>&gt;500 msec</td>
<td>&gt;500 msec</td>
<td>&lt; 1 sec</td>
</tr>
<tr>
<td>Update rate per input</td>
<td>125 msec</td>
<td>500 msec</td>
<td>500 msec</td>
<td>less than 1 sec</td>
</tr>
<tr>
<td>TPE RTD,30°C Ambt,200°C</td>
<td>0.05% of span</td>
<td>0.055% of span</td>
<td>0.077% of span</td>
<td>0.055% of span</td>
</tr>
<tr>
<td>Digital output</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Sensor Health Trend</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Dual range switching</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- **Fewer calibrations and reduced maintenance costs**
- **Tighter control**
- **Lower inventory, weight, and wiring costs**
- **Optimize sensor life and avoid bad PV**
- **Uniform accuracy and control**

**SmartLine Exceeds Industry Specifications**
Single Transmitter – Two Temp Measurements

- Sensor Backup
- Differential / Averaging
- Dual Range Functions

Traditional

- Extra hardware, less accurate

SmartLine

Reduced Installation Cost with Higher Reliability
Digital Output Option

Optional digital output in the terminal block to eliminate a separate switch and associated wiring.

**Traditional**
Transmitter & Switch

**SmartLine**
Single Device, Multi Function

SmartLine Temperature Will Act as Both a Transmitter and a Switch
SmartLine Level Transmitter

Guided Wave Radar Level

Setting a New Standard for Process Level
Now Introducing SmartLine Guided Wave Radar Level

Providing a new level of Benefits from SmartLine

- Out-of-Box Performance taken to a new level
- Lowest Total Cost of Ownership
- Smart Connection Suite

State-of-the-Art Dual Chamber Level Transmitter
Ensures correct level transmitter for your application

- Specify tank parameters
- Select desired transmitter options
- Out-of-box transmitter configured and ready-to-use

Online Tool with Interactive, Collaborative Session Capability
Continuous Evolution

Safety, Reliability, Efficiency Solutions

New Field Instrumentation