DynAMo® Alarm Management
Secrets to unlocking complete Operational Integrity

Stavros Chrysanthou
Madrid 2018
Defining Operational Integrity

To secure a process plants integrity is to reduce the risk to its people, its process and its assets; to maximize performance and to minimize the impact of abnormal situations.
To define Operational Integrity:

To secure a process plants integrity is to reduce the risk to its people, its process and its assets; to maximize performance and to minimize the impact of abnormal situations.
Defining Operational Integrity

To secure a process plants integrity is to **reduce** the **risk** to its people, its process and its assets; to **maximize performance** and to minimize the impact of abnormal situations.
Defining Operational Integrity

To secure a process plants integrity is to reduce the risk to its people, its process and its assets; to maximize performance and to minimize the impact of abnormal situations.
Alarm Management’s Contribution

25 years of progress
from Alarm Capture, to Alarm Reporting, to Alarm Management
Beyond Alarm Management

Requirements of Operational Integrity

- Plant Limits
- Short Term Alarm Reduction
- Long Term Sustainability
- People Limits
- Profitable Operations
- Dynamic Alarming
- Performance Tracking
- Downtime Reduction
- KPI's
- Regulatory Compliance

To secure a process plants integrity is to reduce the risk to its people, its process and its assets; to maximize performance and to minimize the impact of abnormal situations.
Operational Integrity
Operational Integrity

Alarm Management

Reduce alarm noise

Clarity to operators for real alarms

Guiding operations through abnormal situations

De-risking the process
Operational Integrity

**Alarm Management**
- Reduce alarm noise
- Clarity to operators for real alarms
- Guiding operations through abnormal situations
- De-risking the process

**Combined Value**
- Compliance to industry standards and best practices
- Predict abnormal situations
- Understand the cause of an upset to return to normal, safe control - faster

**Operations Management**
- Defining safe operating limits
- Staying within those operating limits
- Elevating communication for safer operations
- Protecting people, process and assets

Reducing Risk
Minimize Abnormal Situations
Securing Integrity
By integrating alarm management with operations management reduces one of largest causes of incidents in the process industry today:

abnormal situations
Backed by Research from Industry Experts

• 40% of Abnormal Situations caused by Human Error

• 40% caused by Process Violations
  - Operating outside process limits
  - Equipment Failure (75% attributed to above)
  - API Required Practice 584 for Integrity Operating Windows
Honeywell’s Approach to Operational Integrity

DynAMo® Suite

Alarm Management
Reducing alarm noise and operator error through effective alarm management

Operations Management
Driving informed decisions and operational compliance through safe operating practices

Process Safety Analytics
Alarm Management
Risk Reduction
Alarm Management Risk Reduction

**Primary Risk**
- 1250 alarms per day
- Alarms that aren’t really alarms
- What does ‘LC728-1A FAIL’ actually mean?

**Secondary Risk**
- Non-compliance
- Unplanned downtime
- Slow recovery from abnormal situations

**Objective**
- Reduce Alarms Noise by 60-80%
- Provide real-time Alarm Help and Operator Guidance
- Provide Situational Awareness and real-time Collaboration
- Give advanced warning of Abnormal Situations
Step 1: Benchmark and track alarm performance
Step 2: Identify assets most at risk from alarm flooding
### Step 3: Assess operator console workload

#### Alarm Performance Indicator

<table>
<thead>
<tr>
<th>Operator Console</th>
<th>Performance</th>
<th>Average Alarm Rate (15 min)</th>
<th>% Time &gt; 5 Alarms</th>
<th>Peak Alarm Rate (10 min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCS Console</td>
<td>Reactive</td>
<td>0.12</td>
<td>20.27 %</td>
<td>257.00</td>
</tr>
<tr>
<td>FSO Console</td>
<td>Robust</td>
<td>0.13</td>
<td>0.18 %</td>
<td>0.80</td>
</tr>
<tr>
<td>FIA Console</td>
<td>Robust</td>
<td>0.07</td>
<td>4.60 %</td>
<td>00.00</td>
</tr>
<tr>
<td>Utilities</td>
<td>Robust</td>
<td>0.08</td>
<td>1.05 %</td>
<td>18.06</td>
</tr>
<tr>
<td>AOPF Console</td>
<td>Robust</td>
<td>0.50</td>
<td>1.20 %</td>
<td>22.00</td>
</tr>
<tr>
<td>DN Console</td>
<td>Robust</td>
<td>0.77</td>
<td>4.10 %</td>
<td>16.00</td>
</tr>
<tr>
<td>Grid Console</td>
<td>Stable</td>
<td>7.51</td>
<td>22.32 %</td>
<td>125.00</td>
</tr>
<tr>
<td>Pro Console</td>
<td>Overloaded</td>
<td>13.97</td>
<td>53.23 %</td>
<td>46.00</td>
</tr>
<tr>
<td>Arena Console</td>
<td>Robust</td>
<td>0.30</td>
<td>0.46 %</td>
<td>7.30</td>
</tr>
<tr>
<td>Dot Console</td>
<td>Robust</td>
<td>0.59</td>
<td>33.33 %</td>
<td>61.00</td>
</tr>
<tr>
<td>Tank Farm</td>
<td>Robust</td>
<td>0.19</td>
<td>0.20 %</td>
<td>7.30</td>
</tr>
</tbody>
</table>

#### Graphs

- **Peak Alarm Rate (10 min)**
- **% Time > 5 Alarms**
- **Average Alarm Rate (10 min)**

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Alarm Rate (10 min)</th>
<th>Date/Time</th>
<th>% Time &gt; 5 Alarms</th>
<th>Date/Time</th>
<th>Average Alarm Rate (10 min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/15/2015 12:00 AM</td>
<td>0.5</td>
<td>10/15/2015 12:00 AM</td>
<td>0.5</td>
<td>10/15/2015 12:00 AM</td>
<td>0.5</td>
</tr>
</tbody>
</table>
Step 4: Unlock the knowledge and drive the improvement
Step 5: Don’t forget the last 20-40%. They make all the difference
Operator Guidance
Risk Reduction++
Embedded Operator Guidance

Document (or pre-load) detailed Alarm Help and Operator Guidance to assist the Operators decision making process. More thinking time equals safer operations.

<table>
<thead>
<tr>
<th>Asset</th>
<th>Service</th>
<th>Type</th>
<th>Setting</th>
<th>Causes</th>
<th>Consequence</th>
<th>Corrective action</th>
<th>Time to Respond</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFE</td>
<td>Charge Pump A Suction Strainer</td>
<td>PDAH</td>
<td>10kPa</td>
<td>Suction strainer plugged</td>
<td>Reduced flow, possible pump damage</td>
<td>Switch to standby pump, initiate strainer cleaning procedure</td>
<td>&gt; 15 min</td>
</tr>
<tr>
<td>FSD</td>
<td>Feed Surge Drum</td>
<td>LAL</td>
<td>20%</td>
<td>FIC set incorrectly down stream feeding the unit above available feed quantity, feed upset in upstream unit</td>
<td>Unit trip</td>
<td>Confirm flow of fresh feed from upstream and flow to the reactors. Correct imbalance to stabilize and restore level</td>
<td>&lt; 5 min</td>
</tr>
<tr>
<td>FSD</td>
<td>Feed Surge Drum</td>
<td>LAH</td>
<td>80%</td>
<td>Upstream unit feed increased without increasing NHT feed rate, decreased NHT reactor charge</td>
<td>Full Feed Surge Drum</td>
<td>Reduce flow into FSD from upstream unit or increase feed to NHT after Feed Surge Drum</td>
<td>5 - 15 min</td>
</tr>
<tr>
<td>CFE</td>
<td>Charge Pump B Suction Strainer</td>
<td>PDAH</td>
<td>10kPa</td>
<td>Suction strainer plugged</td>
<td>Reduced flow, possible pump damage</td>
<td>Switch to standby pump, initiate strainer cleaning procedure</td>
<td>&gt; 15 min</td>
</tr>
</tbody>
</table>
Document (or pre-load) detailed Alarm Help and Operator Guidance to assist the Operators decision making process. More thinking time equals safer operations.

<table>
<thead>
<tr>
<th>Asset</th>
<th>Service</th>
<th>Type</th>
<th>Setting</th>
<th>Causes</th>
<th>Consequence</th>
<th>Corrective action</th>
<th>Time to Respond</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFE</td>
<td>Charge Pump A Suction Strainer</td>
<td>PDAH</td>
<td>10kPa</td>
<td>Suction strainer plugged</td>
<td>Reduced flow, possible pump damage</td>
<td>Switch to standby pump, initiate strainer cleaning procedure</td>
<td>&gt; 15 min</td>
</tr>
<tr>
<td>FSD</td>
<td>Feed Surge Drum</td>
<td>LAL</td>
<td>20%</td>
<td>FIC set incorrectly down stream</td>
<td>Unit trip</td>
<td>Confirm flow of fresh feed from upstream and flow to the reactors. Correct imbalance to stabilize and restore level</td>
<td>&lt; 5 min</td>
</tr>
<tr>
<td>FSD</td>
<td>Feed Surge Drum</td>
<td>LAH</td>
<td>80%</td>
<td>Upstream unit feed increased without increasing NHT feed rate, decreased NHT reactor charge</td>
<td>Full Feed Surge Drum</td>
<td>Reduce flow into FSD from upstream unit or increase feed to NHT after Feed Surge Drum</td>
<td>5 - 15 min</td>
</tr>
<tr>
<td>CFE</td>
<td>Charge Pump B Suction Strainer</td>
<td>PDAH</td>
<td>10kPa</td>
<td>Suction strainer plugged</td>
<td>Reduced flow, possible pump damage</td>
<td>Switch to standby pump, initiate strainer cleaning procedure</td>
<td>&gt; 15 min</td>
</tr>
</tbody>
</table>
Deliver it Directly to the Operator

Alarm Details

TC_002

- **Block:** DACA
- **Consequence:** MODERATE
- **Condition:** PVHIGH
- **Time To Respond:** 15 min to 45 min
- **Reason:** Drop in consumption
- **Alarm Limit:** $25
- **Impact:** Reduced Efficiency
- **Action:** Reduce Fuel
- **Additional Info:** Check Downstream consumption

Unacknowledged alarms: 4 of 4
Acknowledged alarms: 16 of 16
Shelved alarms: 0 of 0
Suppressed alarms: 0 of 0
Operations Management
Securing Integrity
A Typical Shift Trend
Operating between the alarm limits
What About Those Other Limits
How safe are we really operating?
Before Alarm and Operations Management

How safe are we really operating?

35% Safe Zone Operation

High Risk of Safety Incidents, Equipment Damage and Abnormal Situations

Sub-optimal Performance
After Alarm and Operations Management
Stay within the plants limits for safer operations
After Alarm and Operations Management
Stay within the plants limits for increased safety and production

High Risk of Safety Incidents, Equipment Damage and Abnormal Situations

95% Safe Zone Operation

Sub optimal Performance
Step 1: Operate within safe limits. On every shift.
Step 2: Identify excursions from safe operating windows
Step 3: Document Deviations and Secure Shift Handover Processes
The Power of Integration
The Power of Integration

Reduce Alarms
- Stale and Standing Alarms
- Safety Bypasses and Inhibits
- Critical Alarm Limits
- Boundaries and Constraints

Secure Integrity
- Secure Shift Handover Process

Reduce Risk
- Limit Deviations
- Excursions from Safe Operations
- Windows
The Power of Integration

Alarm and Limit Documentation Visualized in Experion

Direct to Where the Operator Needs It
# The Story So Far..

<table>
<thead>
<tr>
<th>Alarm Management</th>
<th>Combined Value</th>
<th>Operations Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce alarm noise</td>
<td>Compliance to industry standards and best practices</td>
<td>Defining safe operating limits</td>
</tr>
<tr>
<td>Clarity to operators for real alarms</td>
<td>Predict abnormal situations</td>
<td>Staying within those operating limits</td>
</tr>
<tr>
<td>Guiding operations through abnormal situations</td>
<td>Understand the cause of an upset to return to normal, safe control - faster</td>
<td>Elevating communication for safer operations</td>
</tr>
<tr>
<td>De-risking the process</td>
<td></td>
<td>Protecting people, process and assets</td>
</tr>
</tbody>
</table>

**DynAMo® Alarm Management**

**DynAMo® Alarm and Operations**

**DynAMo® Operations Management**
Introducing Process Safety Analytics

DynAMo® Suite

Alarm Management
Reducing alarm noise and operator error through effective alarm management

Operations Management
Driving informed decisions and operational compliance through safe and profitable operating practices

Process Safety Analytics
Introducing Process Safety Analytics

DynAMo® Suite

Alarm Management
Reducing alarm noise and operator error through effective alarm management

Operations Management
Driving informed decisions and operational compliance through safe and profitable operating practices

Process Safety Analytics
Process Safety Analytics

Latest addition to the DynAMo Suite.
Deployed with or without DynAMo.
Leverages any Alarm and Event Database.
Process Safety Analytics

1. Shutdown Cause and Effect Analysis
2. Safety Valve Integrity Analysis
3. SIL Analytics for Demand Rate Assessments
Shutdown Cause and Effect Analysis (Planned and Unplanned)
Safety Valve and Final Element Integrity Analysis

### Table: Safety Valve and Final Element Integrity Analysis

<table>
<thead>
<tr>
<th>Time Stamp</th>
<th>Safety Element</th>
<th>Operation</th>
<th>Group</th>
<th>Is to Safe State</th>
<th>Description</th>
<th>Operation Status</th>
<th>Operation Time (sec)</th>
<th>Max Travel Time (sec)</th>
<th>Mem Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/2015 3:00:00 AM</td>
<td>900XV0007</td>
<td>FCS Open</td>
<td>Process</td>
<td></td>
<td></td>
<td>OK</td>
<td>4000.0</td>
<td>30000.0</td>
<td></td>
</tr>
<tr>
<td>1/1/2015 3:00:00 AM</td>
<td>900XV0007</td>
<td>FCS Open</td>
<td>Process</td>
<td></td>
<td></td>
<td>OK</td>
<td>4000.0</td>
<td>30000.0</td>
<td></td>
</tr>
<tr>
<td>1/1/2015 3:00:00 AM</td>
<td>900XV0007</td>
<td>FCS Open</td>
<td>Process</td>
<td></td>
<td></td>
<td>OK</td>
<td>4000.0</td>
<td>30000.0</td>
<td></td>
</tr>
<tr>
<td>1/1/2015 3:00:00 AM</td>
<td>900XV0007</td>
<td>FCS Open</td>
<td>Process</td>
<td></td>
<td></td>
<td>OK</td>
<td>4000.0</td>
<td>30000.0</td>
<td></td>
</tr>
<tr>
<td>1/1/2015 3:00:00 AM</td>
<td>900XV0007</td>
<td>FCS Open</td>
<td>Process</td>
<td></td>
<td></td>
<td>OK</td>
<td>4000.0</td>
<td>30000.0</td>
<td></td>
</tr>
<tr>
<td>1/1/2015 3:00:00 AM</td>
<td>900XV0007</td>
<td>FCS Open</td>
<td>Process</td>
<td></td>
<td></td>
<td>OK</td>
<td>4000.0</td>
<td>30000.0</td>
<td></td>
</tr>
<tr>
<td>1/1/2015 3:00:00 AM</td>
<td>900XV0007</td>
<td>FCS Open</td>
<td>Process</td>
<td></td>
<td></td>
<td>OK</td>
<td>4000.0</td>
<td>30000.0</td>
<td></td>
</tr>
<tr>
<td>1/1/2015 3:00:00 AM</td>
<td>900XV0007</td>
<td>FCS Open</td>
<td>Process</td>
<td></td>
<td></td>
<td>OK</td>
<td>4000.0</td>
<td>30000.0</td>
<td></td>
</tr>
<tr>
<td>1/1/2015 3:00:00 AM</td>
<td>900XV0007</td>
<td>FCS Open</td>
<td>Process</td>
<td></td>
<td></td>
<td>OK</td>
<td>4000.0</td>
<td>30000.0</td>
<td></td>
</tr>
</tbody>
</table>
Demand Rate Assessments (Safety Instrumented Functions)
Summary
Operations Integrity…Achieved

DynAMo® Suite

Alarm Management

Reducing alarm noise and operator error through effective alarm management

Operations Management

Driving informed decisions and operational compliance through safe and profitable operating practices

Process Safety Analytics
Operations Integrity…Achieved

DynAMo® Suite

Alarm Management
Reducing alarm noise and operator error through effective alarm management

Operations Management
Driving informed decisions and operational compliance through safe and profitable operating practices

Process Safety Analytics
DynAMo® Suite
Alarm Management · Operations Management · Process Safety Analytics

Take the Free 14 Day Test Drive at www.hwll.co/dynamo

Questions?