Role of Asset Knowledge & Information Management in Enhancing Public Safety

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Company Background

- Incorporated in California in 1905
- One of the largest combined natural gas and electric utilities in the United States
- Serves approximately 15 million people throughout a 70,000-square-mile service area

- ~5,800 miles of DOT classified gas transmission pipeline\(^1\)
- ~42,000 miles of gas distribution pipeline
- 4.3 million natural gas customer accounts
- Deliver 970 BCF/year

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1. ~6,800 miles based on criteria using greater than 60 psig operating pressure
Aging Infrastructure is Leading to Low Probability, High Consequence Incidents

<table>
<thead>
<tr>
<th>Year</th>
<th>Incident</th>
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<tbody>
<tr>
<td>2011</td>
<td>Gas line explosion, Allen Town, PA</td>
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<td>Minneapolis MN, NG transmission</td>
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<td>Fairport Harbor OH, NG distribution</td>
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<td>2010</td>
<td>Pipeline explosion, San Bruno, CA</td>
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<td>BP Gulf of Mexico oil spill</td>
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<td>Kalamazoo River MI, liquid pipeline failure and oil spill</td>
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<td>2007</td>
<td>I-35W Mississippi River bridge, Minneapolis, MN</td>
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<td>2000</td>
<td>Alaska Air crash</td>
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NTSB Chairwoman Hersman: “Accident investigations highlight the need for a new perspective on safety culture, record-keeping and aging infrastructure” – January, 2011
San Bruno Pipeline Rupture

Background
(Sep, 2010)

- 30” diameter gas pipeline ruptured near San Francisco, CA
- 3000-lb 28-ft pipe section buried 4-ft deep was ejected ~100-ft in distance
- 8 deaths, 38 injuries, 108 houses and 74 vehicles damaged or destroyed

NTSB and Regulatory Actions
(Sep, 2010 to Aug, 2011)

- NTSB investigation identified:
  - Inaccurate records that showed pipeline as seamless which had longitudinal welds
  - Inadequate quality assurance and quality control at time of installation
  - Exemptions of testing protocols allowed in industry regulations for older pipelines
- NTSB issued 29 safety recommendations

PG&E Actions
(Sep, 2010 to present)

- Immediate measures to increase safety margins (e.g. pressure reductions)
- MAOP Validation of more than 6,500 miles in ~ 2 years
- Unprecedented hydrostatic strength testing
- Stand-up Gas Operations Organization as a Line of Business within PG&E
Alaska Air: A Model for Improving Public Safety

Jan 31: Alaska Air flight from Puerto Vallarta to Seattle crashed off coast of California; All 88 passengers and crew killed

NTSB investigation findings:
• Failure of jackscrew assembly
• Had excessive wear due to no lubrication
• Safety breakdowns at Alaska, “less coincidence than culture”

PG&E is benchmarking with Alaska Air to employ best practices

J.D. Power and Associates
#1 Traditional Network Airline; 2008-2012 North America Airline Satisfaction Studies(SM).

FAA Diamond Award
For maintenance training excellence for 2001 - 2011

2001 – 2012 CAGR
- Alaska Airlines, +8.6%
- AMEX Airline Index, -9.8%
Key Learnings from Alaska Airlines

- Elevate safety to the Board level
- Build an internal reporting culture based on employee trust
- Ensure clarity of safety mission

Safety Culture

- Embed safety into all processes
- Manage based on high quality data
- Build strong tracking and reporting systems

Process Safety & Controls

- Clarify safety roles and responsibilities
- Diligence on risk based decisions
- Conduct rigorous Maintenance / Operations briefings

Public Safety

Execution Focus
PG&E Data Management - Current and Future State

Current Data Management Processes:
- Mark & Locate
- Leak Survey
- Corrosion Protection
- A-Forms
- Daily Leak Log
- Plat Map
- Can't Get In (CGI) Log
- GIS
- SAP
- IGIS/NLIS
- Synergee
- Integrity Management, Planning, & Engineering
- Valve and Regulator Maintenance

Future Data Management Processes:
- Safety Equation
- Unified platform of automated solutions and robust governance to provide and sustain real time, accurate, traceable, verifiable, and complete asset information

Multiple systems with manual and automated methods
Enhance safety by targeting current business pain points and implementing improved capabilities in three key areas:

**WORK PROCESSES**
Automated, optimized scheduling and electronic forms on mobile devices

**DATA & RECORDS**
Traceable, verifiable & complete asset data in core enterprise integrated systems

**DECISION MAKING**
Real-time system updates and automated risk analysis & ranking

= **ENHANCED SAFETY**
Complete, accurate, real-time information that facilitates safe operations and prompt decision making
In-flight Initiatives

**Work Processes**
- Leak Survey
- Preventive Maintenance
- Corrective Maintenance – Mobile Ready
- Locate & Mark

**Data and Records**
- Corrective Maintenance – Doc. & Data Cleanup
- Documentum Implementation
- Transmission Pipeline Asset Management Sandbox

**Decision Making**
- Integrity Management Analysis Applications
PROJECT RESULTS

• Improvements in data quality by using selection lists & printed Leak Logs – reduced error rates
• Reduced need for rework by Supervisors, Surveyors, and Mappers

LESSONS LEARNED

• Baseline “As-Is” and develop “End State” prior to deploying a technology
• Define requirements, develop plans for User Acceptance Testing, piloting, training, and deployment support including focus on post deployment process stabilization
**In-flight Initiatives**

**Improved Work Processes**
- Leak Survey
- Preventive Maintenance
- Corrective Maintenance – Mobile Ready
- Locate & Mark

**Data and Records**
- Corrective Maintenance – Doc. & Data Cleanup
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**Enhanced Safety**

**Decision Making**
- Integrity Management Analysis Applications
PG&E is Focused on Three Areas to Improve its Asset Knowledge Management

**As-Installed Data**

Retrieved documents are digitized and compiled allowing for robust analysis and MAOP validation.

**Geospatial Data**

Consolidated PFLs, MAOPs, and associated documents accessed through a component-based GIS System of Record.

**Pipeline Data Model (PODS) Management**

**Pipeline Data Repository**

**ESRI ArcGIS and Spatial Data Engine (SDE)**

**Maintenance & Inspection**

Accessibility and reliability of pipeline condition information to enable real-time analysis and robust decision making.
Asset Management System Integration Strategy

Pipeline Data Repository based on Pipeline Open Data Standard (PODS)

- Engineering
- Risk & Integrity Management

Pipeline Linear Reference Measurement Support

- Industry Requirements
- Basis for Data Exchange
- Vendor Neutral Support

Real-time Synchronization of
- Pipeline Hierarchy
- Master Data
- Pipeline Centerline
  - Linear Referencing System
- Physical Pipeline Assets

Ability to Maintain PODS & Keep PODS & SAP Synchronized
GIS/SAP Integration Test Cases

**GIS**

**Install a New Pipeline**
- New Facility
- New Pipeline

**Replace Section of Existing Pipe (Re-route)**
- Station
- Station

**Record a Work Event on Route**
- Station
- Station

**SAP**

**Create Notification**
- Station
- Station

**Create Work Order**
- Station
- Station

**Generate Maps**
- Work Order 1
- Work Order 2
Closing Thoughts

Strategic Objectives

Safe, Reliable, and Affordable

Traceable, Verifiable, Complete Data

Minimize Risk

Easily Accessible Information

Focused, Passionate, and Relentless

People

Technology

Process