A GIS-Centric Approach to Risk and Pipeline Safety Management Systems

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Agenda

• Who is GTI?
• Efforts in Pipeline Safety Management Systems
• Efforts in Risk Management
• Using Esri-Based GIS Tools as a Centralized Approach
• Examples and Results
• Next Steps
75-year+ History of Turning Raw Technology into Practical Energy Solutions

FOR A BETTER ECONOMY AND A BETTER ENVIRONMENT
SUPPLY ➤ CONVERSION ➤ DELIVERY ➤ UTILIZATION

World-class piloting facilities headquartered in Chicago area
Smart Utilities Key Programs

- GNSS Testing & Evaluation
- Enhanced/Digital Data Collection
- Tracking & Traceability
- GIS Analysis & Mapping
- Process-Based Business Analysis & Intelligence
- Excavation Encroachment Notification System
- Emerging Technologies
PDCA & API RP 1173

- Ten Essential Elements are categorized
- Where do you start?
Realized PSMS

Validate Existing
Implements Existing
Creates New

API RP 1173 PSMS Framework

Describes

Realized

Safety Culture

Implements Existing

Requires

Existing Activities
Getting Started: A New Approach

> Treat the first “Plan” phase as a “Create” phase

> “Plan” becomes instead a “Re-Plan” phase based on the “Act” from the previous cycle
Getting Started: A New Approach

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Business Process Modeling and Notation (BPMN)

- ISO 19510

- Business Process Model and Notation (BPMN) is a graphical representation for specifying business processes in a business process model

- The objective of BPMN is to support business process management, for both technical users and business users, by providing a notation that is intuitive to business users, yet able to represent complex process semantics

- The BPMN specification also provides a mapping between the graphics of the notation and the underlying constructs of execution languages, particularly Business Process Execution Language (BPEL)

- BPMN bridges the gap between process intention and implementation by providing sufficient detail and clarity into the sequence of business activities
Process-Based Design of PSMS

- Reduce API RP 1173 to its core “shall” statements (i.e. requirements)
- Document business processes
  - The diagram to the right identifies each of the business processes that need to be mapped related to Risk Management
  - Similar diagrams map each of the other core elements
Process-Based Design for PSMS & Risk Management

Enables Enterprise Decision Support

- Global Planning
- Global Checking
- Global Action
- Real-time Do Checks
GIS-Centric Data Collection & Analysis

— Smart Forms/Intelligent Field Data Collection
  > Risk-based calculations provide real-time feedback, requesting additional data
— Integration with real-time GIS & web mapping
— Enterprise Analytics
  > Incorporation of Risk Analysis
  > Subject Matter Expert Input
Use Case: Vintage Plastic Pipe Replacement Program

Esri tools used:

- Survey123
- GeoProcessing tools
- ArcGIS for Desktop
- ArcGIS Server
- ArcGIS API for JavaScript
- Web AppBuilder
- UPDM
Objective

> Build web map incorporating predictive analytics for pipeline lifetime risk assessment
  - Sample pilot area to validate and/or refine results
  - Visualize and interact with data
  - Display results for decision-makers
Build Custom Web Map

> Focus on basic functionality
Risk Integration
Bayesian Risk Assessment in GIS
Direct Sampling

> Back-end visualization
  > Sample locations
  > Images and data from Survey123
  > Query capabilities
Post-Analytics/Results

> Predictive life expectancy results
> Compare with direct sampling analysis
Risk & PSMS – GIS-Centric Approach: Next Steps

- Enterprise Decision Support
- Holistic View of Business Activities
  - Cross database integration/analytics
  - GIS as centralized data repository – visualization tools can support
- PSMS Cannot Exist Without Safety Culture!
- Combination of Business Process Documentation, GIS tools, and Subject Matter Expertise

- Global Planning
- Global Checking
- Global Action
- Real-time Do Checks
Discussion

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