Maximise Productivity through Technology

Geospatial Automation, Asset Lifecycle Management & Risk Management

Dr. Piyush K Pandey
Objective of Presentation

Use of
Intelligent character recognition (ICR) technology
in
Business Automation
to capture
Engineering Legacy data
and populate it in
Data model – APDM/POD
With
Automatic Validation
Oklahoma Natural Gas Operations

- 2,800 miles transmission lines
  - Gathering system from 128 fields
  - Distribution system feeds 38 plants

- 2000 MMcfd peak capacity
  - 4–42 inch pipeline diameter
  - 1100 psi MAOP
  - Five underground storage facilities
  - 8 interstate receipt connections with combined capacity of 375 MMcfd
Oklahoma Gas – Objective

- Optimize the project scheduling, project maintenance & expansion
- Integrity Management
- Real time update of Network information
- Knowledge based intelligent operation of Network
- Data sharing with Local and Federal Govt.
- Centralized database of the assets for planning and maintenance
- Ad-hock integration of operational/maintenance work order with network
Current State

- **Old data:**
  - paper print - type writer, Computer print
  - Electronic records – word, Xls files, PDFs

- **Old drawings:**
  - Paper print – PDFs, Alignment sheets, As-build, plot plan etc
  - Electronic format – AutoCAD (CAD not GIS)

- **Quantum:**
  - A4 Size ~ 84,000
  - A3 Size ~ 12,000
  - A1 Size ~ 800
  - A0 Size ~ 120
  - Electronic records files ~ 23,000
  - Electronic drawings ~ 8,000
Overall Goals

- Capture the data from every source and match it
- Migrate the final data in to Pipe Data model – APDM (GDB)
- After field verification move the data in to POD (made as per integrity application compliance)
Biggest Challenge

- Paper based legacy data
- Data digitization

Business intelligence spread across the document?
Smart Technological Automation

Technology: Intelligent Character Recognition (ICR)

- Recognizes the image patterns
  - Type writer fade words
  - Alpha numeric combination
  - Signature
  - Ink Stamp on paper
  - Check box (tick and Cross)
  - Hand writing
  - Local language (not used in current project)

Deployment
- ICR was included in the program to apply the ICR routine at predefined location on the "paper form"
- Probability matrix was allocated to every field of ICR operation
Logical Grouping of Data

Following records were scanned/linked to assets life cycle model

1. Alignment Sheets
2. Memorandums
3. AFE (Authorization for expenditure)
4. Material Estimates
5. Construction Job Orders
6. Plats
7. Capital Job Orders
8. Bill of Materials (BOM)/ Estimate Sheets
9. Construction and Retirement Job Orders
10. Retirement Job Orders
11. Pressure Test Reports.
12. Pressure Control Reports
13. Completion reports
Data Grouping as per Business

i. ..../pipe_name/AFE/
ii. .../......../Alignment Sheets
iii. .../......../BOM (Bill of Materials)
iv. .../......../CJO_1 (Construction Job Order )
v. .../......../CJO_2 (Capital Job Order )
vi. .../......../CR (Completion Report)
vii. .../......../CRJO (Completion and Retirement Joborder)
viii. .../......../GIR (Gate Installation Report)
ix. .../......../IR (Improvement Requisition)
x. .../......../JCR (Job completion report)
xi. .../......../ME (Material Estimate)
xii. .../......../Memorandum
xiii. .../......../MTO (Material Transfer Order)
xiv. .../......../Others
 xv. .../......../Pressure Control
xvi. .../......../PTD (Pressure and Transmission Division)
xvii. .../......../PTR (Pressure Test Reports)
xviii. .../......../RJO (Removal Job Orders)
xix. .../......../RTJO (Removal and transfer Job Orders)
xx. .../......../WIR (Weld Inspection Reports)
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<thead>
<tr>
<th>Job Order Number</th>
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<tr>
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<tr>
<th>Installed Length</th>
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<td>12.3M</td>
<td>0.056</td>
<td>8TD. 00.1564.00.285</td>
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Automation to capture the data

- Probability Matrix
  - P1: xxx  65% confidence
  - P2: yyy  35% confidence

- Stared with 71%
- In 7 days
- Reached to 94%

- Double Entry Comparison ➔ Manual Validation

- 2% error in Data model
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<td>COATINGTYPE</td>
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<td>PRETEST</td>
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<td>FIELDFABRICATED</td>
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<td>3 Reinforcing Saddle</td>
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<td>4 Reinforcement Pad</td>
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<td>SCRAPERBARS</td>
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<td>2 Cap</td>
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<td>3 Closure</td>
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<td>4 Orange Peel</td>
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Drawing Grouping as per Business

Source of Spatial Information (CAD)
- Single GIS Grid
- Field Layouts
- Plot plans
- Line Routing Plans
- Site Layouts & Field Area Layouts
- General Facilities
- Electrical layout plans from 132Kv to 33kV
- Profile & Alignment Sheets
- Third Parties data
- Satellite Imagery \(\rightarrow\) updated track and asphalt roads
- FFDs \(\rightarrow\) to be on current

OUTPUT Spatial Data
- Existing / Future Stations
- Existing / Future Facilities
- MOLs
- Transfer Lines
- Trunk Lines
- Water Lines
- Corridors
- Overhead Transmission Lines
- Main Roads / Tracks
- Cables
- Survey Control Points
- Customer line
Automation in Drawing

- Scaling → Rotation → joining → Zoning (AOI) → registered image for Digitization
- Automatic extraction of text features (data) from Drawing → in data model

Reference Grids (TSR Sections)

Capturing Point Feature Written on Drawing
Say TP coordinate

Capturing Attribute of Point Feature as Object data

NAD83, UTM Zone 14N
Pipeline Risk Assessment Process

Data Validation & Quality assurance

GIS - Dwgs

CP, ILI, CIS

Attribute Data

Data Loader

Risk Algorithm

Risk Model

Risk Analysis

Maintenance Planning
Any Question Please ?
Essential business agility for the digital oilfield

innovate  inspire

For further query please contact
+ 44 (01603) 706900
+ 44 (01603) 706901
ppandey@geologix.com
For further query Please contact

Geologix Limited - Head Office
Rosebery Court
St Andrews Business Park
Norwich
NR7 0HS
United Kingdom

+ 44 (01603) 706900
+ 44 (01603) 706901
ppandey@geologix.com
Architectural Vision

Spatial Data model
POD
Attribute RDBMS
Business Data

Maps
Assets
Network
Customer

Operation
Engg.
Maint.
ERP
CRM

Overlay
Report
Query

GIS Enabled Network Management System

Assets life Cycle Management
Application Middle ware

Modeling, Simulation & Analysis

GIS Enabled Network Management System

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