Overcoming Challenging CAD Conversion Issues

at

Gulf Power

Tuesday, October 15
2:00 – 3:00 pm

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www.southernco.com

&

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www.safe.com
**Safe Software**

- **Provide spatial data access to every user, organization and application.**

**Company Facts**
- **Founded:** 1993
- **Ownership:** Private
- **Based:** Vancouver, Canada
- **Product focus:** Semantic data translation

**Target markets:**
- GIS & GPS vendors
- Telecom and utilities
- Oil & Gas
- Gov’t agencies
# Quick Facts

**Reseller Network:**
- 100 resellers
- 30 countries

**FME Usage:**
- 2,100+ FME licenses
- 100,000+ OEM licenses

**Revenue Sources:**
- Product sales
- Maintenance fees
- Royalties
- Consulting
- Training
FME Translation

- 100+ formats supported
- Highly configurable
- Provides semantic data translation capability
- Graphically create workflow from source data to destination data.
- Includes wide variety of data processing functions
- Manipulate geometry and attribution for all FME formats.
Southern Company

- Headquartered in Atlanta, GA
- [www.southerncompany.com](http://www.southerncompany.com)
- Service territory is 120,000 square miles
- Over 4,000,000 customers in 4 states
Gulf Power

- Headquartered in Pensacola, FL
- www.gulfpower.com
- 1,064 square miles in 10 counties
- Transmission miles of line: 1,562
- Distribution miles of line: 6,673
  - 831 miles are underground
- Substations: 139
- Approximately 375,000 customers.
Gulf Power AutoCAD tiles
Gulf Power AutoCAD tiles

- 674 individual tiles of data
- AutoCAD 12 custom application
- Drafting board contained buttons for actions and the different types of devices
- System in use for about 12 years
- Facing a conversion to either a current version of AutoCAD or another format
Gulf Power AutoCAD data
Gulf Power AutoCAD data
Gulf Power AutoCAD: recloser

BLOCK REFERENCE  Layer: "1200E-XXX9222M"
    Space: Model space
    Handle = 490D
    "OE-REC3"
Gulf Power AutoCAD: conductor

POLYLINE Layer: "12OCK-XOO9222T"

Space: Model space

Handle = 4236
Gulf Power AutoCAD: transformer

BLOCK REFERENCE  Layer: "120XF-OX09222-

Space: Model space

Handle = 48C4

"XF-O1NN"
Gulf Power AutoCAD: *street light*

**BLOCK REFERENCE**
Layer: "--MSL--------"

Space: Model space

Handle = 44AF

"SL-46000"
Gulf Power AutoCAD: fuse

BLOCK REFERENCE Layer: "120ST-OX09222T"
Space: Model space
Handle = 48B5
"SW-TF"
Translation from AutoCAD to SDE

- **Main steps of the conversion:**
  - Use layer code to determine feature class

<table>
<thead>
<tr>
<th>Device Description (feature class and subtype)</th>
<th>CODE</th>
<th>BLOCK NAME</th>
<th>Geodatabase Feature Class</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary - Overhead 1 phase</strong></td>
<td>??OCK-XOO?????-</td>
<td>(or Block Reference)</td>
<td>primary</td>
</tr>
<tr>
<td><strong>Primary - Overhead 2 phase</strong></td>
<td>??OCK-XOX?????-</td>
<td>primary</td>
<td></td>
</tr>
<tr>
<td><strong>Primary - Overhead 3 phase</strong></td>
<td>??OCK-XXX?????-</td>
<td>primary</td>
<td></td>
</tr>
<tr>
<td><strong>Primary - Underground 1 phase</strong></td>
<td>??UCK-XOO?????-</td>
<td>primary</td>
<td></td>
</tr>
<tr>
<td><strong>Primary - Underground 2 phase</strong></td>
<td>??UCK-XOX?????-</td>
<td>primary</td>
<td></td>
</tr>
<tr>
<td><strong>Primary - Underground 3 phase</strong></td>
<td>??UCK-XXX?????-</td>
<td>primary</td>
<td></td>
</tr>
<tr>
<td><strong>Points</strong></td>
<td></td>
<td>BLOCK NAME</td>
<td>(Symbol)</td>
</tr>
<tr>
<td><strong>Capacitor Unit</strong></td>
<td>??OE-XXX?????-</td>
<td>OE-CAP</td>
<td>101 capacitor</td>
</tr>
<tr>
<td><strong>CATV Power Supply</strong></td>
<td>??OE-XXX?????-</td>
<td>TV-AMP/TV-DOT</td>
<td>100 cabletv_obj</td>
</tr>
<tr>
<td><strong>Critical Customer also see Key Account</strong></td>
<td>--MCC--------'</td>
<td>CR-CUS</td>
<td>148 critcust &amp; ssp</td>
</tr>
<tr>
<td><strong>Distribution Getaway</strong></td>
<td>--MSBT--------</td>
<td>165 getaway</td>
<td></td>
</tr>
<tr>
<td><strong>Key Account</strong></td>
<td>--MCC--------</td>
<td>167 keyacct &amp; ssp</td>
<td></td>
</tr>
<tr>
<td><strong>Light - Governmental</strong></td>
<td>--MSL--------</td>
<td>153 light</td>
<td></td>
</tr>
<tr>
<td><strong>Pole</strong></td>
<td>??-PG-XXX?????-</td>
<td>138 pole</td>
<td></td>
</tr>
<tr>
<td><strong>Pothead/Riser - Primary (Simple)</strong></td>
<td>??URS-XXX?????-</td>
<td>OE-RS or OE-R2</td>
<td>140 pothead</td>
</tr>
<tr>
<td><strong>Pothead/Riser - Primary (w/ fuse) (Most common)</strong></td>
<td>??URS-XXX?????-</td>
<td>OE-RS or OE-R2</td>
<td>140 pothead</td>
</tr>
<tr>
<td><strong>- fuse</strong></td>
<td>??OST-XOX?????-</td>
<td>SW-RF</td>
<td>switch</td>
</tr>
</tbody>
</table>
Translation from AutoCAD to SDE

– Assign default attributes

– Associate text to the related feature attribute

– Create unit records
  transformers, reclosers, regulators, capacitors

– Join lines over tiles
Data Issues: TRANSFORMERS

Issue 1: CAD text vs. GIS attributes

Feature Type: TRANSFORMER

<table>
<thead>
<tr>
<th>ATTRIBUTE_NAME</th>
<th>ATTRIBUTE_VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>KVA_RATING_1</td>
<td>50</td>
</tr>
<tr>
<td>KVA_RATING_2</td>
<td>75</td>
</tr>
<tr>
<td>KVA_RATING_3</td>
<td>50</td>
</tr>
<tr>
<td>LOC_NUM</td>
<td>1619</td>
</tr>
<tr>
<td>PHASES_1</td>
<td>3</td>
</tr>
<tr>
<td>PHASES_2</td>
<td>2</td>
</tr>
<tr>
<td>PHASES_3</td>
<td>1</td>
</tr>
</tbody>
</table>
Data Issues: RECLOSERS

Issue 1: CAD text vs. GIS attributes

- Associate amperage and type with recloser device
- Determine source, load and bypass switch numbers
- Link switches to the recloser
Data Issues: FUSE/RISER

**Issue 2: Incorrect insertion points**

The riser and fuse insertion points are on top of each other in the wrong location. The insertion point for the riser was moved to the centre of the riser, and the insertion point for the fuse was moved to where the fuse meets the primary.
Gulf Power used gaps in the primary conductor as part of the switch symbolization. However, these gaps invalidate topology in the geometric network. During the conversion, this gap was closed to make a continuous primary line.
Data Issues: PRIMARY

Issue 4: Joining and splitting lines...

The upper portion of the line is selected to show that there are two physical pieces of lines. But, having two separate lines is unnecessary because the attributes of the primary are the same on both sides. During the conversion, the primary line was joined together anywhere the attributes were the same.
Data Issues: TRANSFORMER

Issue 5: Rotating symbols...

Here is a shot of the original FAMS data showing 2 transformers and their insertion points. They do not have any rotation stored with them. In the ESRI database transformers are rotated to match the orientation of the line on which they appear. FME was used to calculate the new rotation at the time of conversion.
Data Issues: OPEN CIRCUITS

Issue 6: New features...

In FAMS a hash is used for 3 features: wire changes, dead ends, and transformer open circuits. The open circuit feature would always appear within a certain distance of an underground transformer. During conversion any hash on a broken line within 25 feet of an underground transformer becomes an open circuit point and the gap is closed.
Summary

– Translated 674 AutoCAD tiles into seamless SDE layers.
– Changed the visual attributes to GIS attributes.
– Created both bank and unit records.
– Stitched together primary conductors between devices and mapsheet boundaries to create valid ArcGIS topology.
– Cleaned up the CAD data programmatically during the conversion:
  • Drastically reduced time compared to manual cleanup
  • Reduced risk of manual errors or data loss
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