

## **Overcoming Challenging CAD Conversion Issues at Gulf Power**

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### **Introduction**

Gulf Power is using a system called FAMS (Florida Automated Mapping System) which runs on AutoCAD Release 12 in a DOS environment. Faced with rewriting the code to use AutoCAD Release 13 technology or switching to an ESRI GIS solution, Gulf opted for the latter. Thus began a long process of automating the capture of information from the FAMS system to put into a Geodatabase. Along the way, serious issues were encountered: symbol insertion points differing from their intended location, deciphering of the CAD layer codes, stitching together over 650 tiles, closing gaps in the lines, setting symbol rotations, matching text to the correct graphical elements, etc. Using the tools in SAFE's Feature Manipulation Engine (FME) Southern Company was able to dramatically reduce the amount of manual cleanup required for conversion and to successfully produce both bank and unit records with attributes from the graphical information in FAMS.

### **Southern Company**

With 4 million customers and nearly 37,000 megawatts of generating capacity, Atlanta-based Southern Company (NYSE: SO) is the premier super-regional energy company in the Southeast and a leading U.S. producer of electricity. Southern Company owns electric utilities in four states, a fast-growing competitive generation company and an energy services business, a competitive retail natural gas business, as well as fiber optics and wireless communications. Southern Company brands are known for excellent customer service, high reliability and retail electric prices that are 15 percent below the national average. Southern Company has been named No. 1 on Fortune magazine's 2002 "America's Most Admired Companies" list in the Electric and Gas Utility industry. Southern Company has more than 500,000 shareholders, making its common stock one of the most widely held in the United States.

### **Gulf Power**

Gulf Power Company, a subsidiary of Southern Company and one of its electric utilities, sells electricity throughout Northwest Florida, serving 372,000 retail customers in residential, commercial and industrial areas. In the year 2000, Gulf Power earned a net income of \$51.8 million and employed more than 1,415 people.

Gulf Power is headquartered in Pensacola and employs around 10 drafters and map designers who edit Power Delivery maps. The maps are drawn using rigorous standards so that extractions can be created and fed into a planning application and a trouble call

application. The current system, Florida Automated Mapping System (FAMS), has been in use for approximately 12 years.

### **The Situation**

Gulf Power's spatial data resided in AutoCAD DWG version 12 drawings. AutoCAD Version 12 drawings can only be manipulated using their DOS mapping system. Unfortunately this system was becoming antiquated as newer releases of AutoCAD continue to be developed. Ultimately Gulf Power faced using a production mapping system no longer supported by the software developer.

Three other Southern Company power companies are also facing a mapping system conversion at the same time. These companies use an ESRI ArcInfo system referred to as SEGIS which runs on UNIX boxes. SEGIS is approximately 10 years old. While not facing imminent obsolescence, it is clear the developer (ESRI) is also moving to the windows 32-bit platform.

These 3 companies therefore decided to go ahead and move to the ESRI SDE Geodatabase. One of the companies is still using an AutoCAD system; however this system is more up to date than Gulf Power's DOS system and is not in danger of losing vendor support. Based on the tools that the new applications using SDE can provide, Gulf Power decided to move to the Geodatabase.

This conversion would help improve both Gulf Power and Southern Company's response systems and decision-making processes in trouble call management, and management planning. In the long-run, this strategic decision would facilitate access to a wider range of file formats and to pertinent GIS information.

Southern requested Safe Software's Consulting Services to implement its FME (Feature Manipulation Engine) software: to design and develop custom mapping files used to convert Gulf Power AutoCAD landbase data into an ArcSDE 8 database, and to merge key features across map sheets (i.e. match road edges and primary cables). Safe Software's development group enhanced the core functionality of FME to add additional processing tools for CAD data.

### **The Difference Between CAD and GIS formats**

AutoCAD drawing files (DWG) consist of graphic elements and graphic groups, organized in layers. DWG is a display format that is visually appealing to users because symbols and text are displayed directly on the maps. ArcSDE enables a relational database to store spatial geographic information seamlessly for an entire area of interest. ArcSDE allows the user to query a single point or a line on a map and view the information (attributes) behind it. The map-sheets and layers in CAD formats are tile-based and their features are not continuous across the map sheets. GIS formats tend to have layers stitched together and information is merged into a continuous layer enabling connectivity and network processing.

## **The Solution**

Safe Software presented a solution using both its consulting division, and its FME software to clean-up the source AutoCAD data and convert to ArcSDE. This solution involved creating mapping files to convert the data and move block insertion points, close gaps in the line work and pull floating text together to populate feature attributes.

The Mapping files perform the following functions:

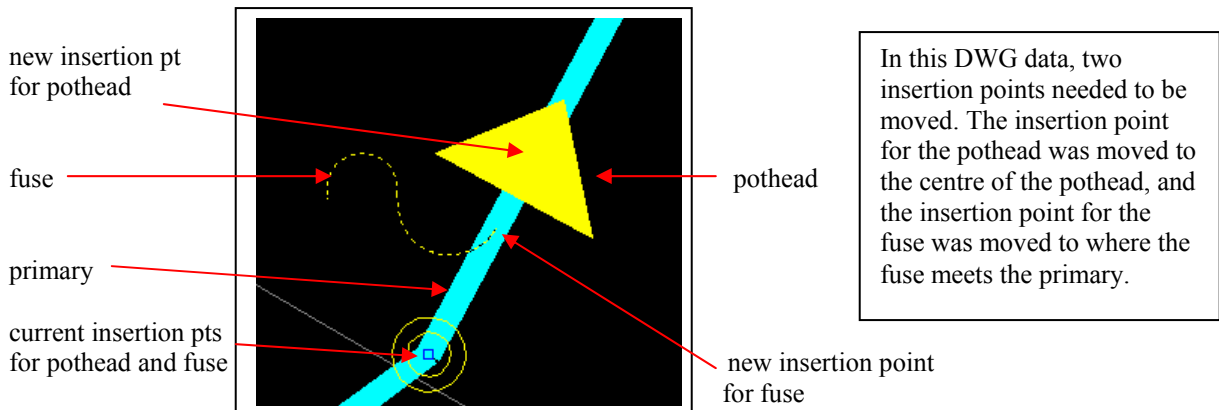
- 1) Edit and Fix Problems with Original Data
  - *Moving Block Insertion Points*
  - *Closing Gaps*
  - *Joining or Splitting the Lines*
- 2) Convert AutoCAD DWG to ArcSDE 8
- 3) Conduct Quality Control and Quality Assurance (QC/QA)

### **Edit and Fix Problems with Original Data**

The following problems were identified, during the translation, which would have impacted the effectiveness of the imported data:

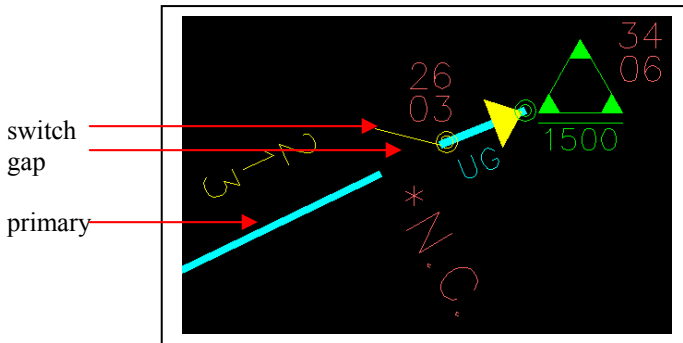
#### ***Moving Block Insertion Points***

There were three features that had insertion points that did not reflect the exact physical location of the device. Safe Software used FME to move them to the correct location. This rectified the problems with the original DWG data so that the features were in the correct locations on the map when viewed in SDE format.



### ***Closing Gaps***

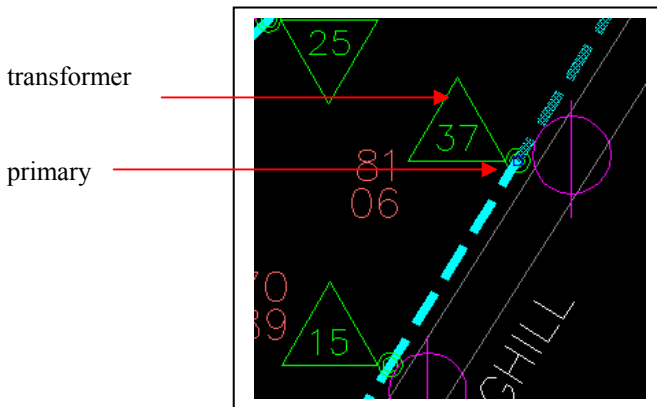
In the original DWG drawings a physical gap in the line work was inserted where the switch block symbol was displayed. This is visually appealing in DWG format, but realistically, the gaps do not physically exist and they break the connectivity of the primary cable. Using GIS systems, queries can be done to track all the transformers on a specific primary, if there is connectivity. FME was used to close the gaps on two features.



This DWG data indicates the physical gap in the primary with the inserted switch. During the conversion, this gap was closed to make a continuous primary line.

### ***Joining or Splitting the Lines***

The primary cable was split into two separate lines at many locations along the cable. To maintain connectivity of the primary cable, lines should only be split where the attributes of the cable change. FME was used to join together the cables that were split at incorrect locations. Alternatively, the cable needs to be split when the attributes are changing. For example, a pothead device signifies that the cable is changing from underground to overhead or visa versa. Therefore, at the pothead devices the primary cable must be split so the attributes, underground or overhead, can be different.



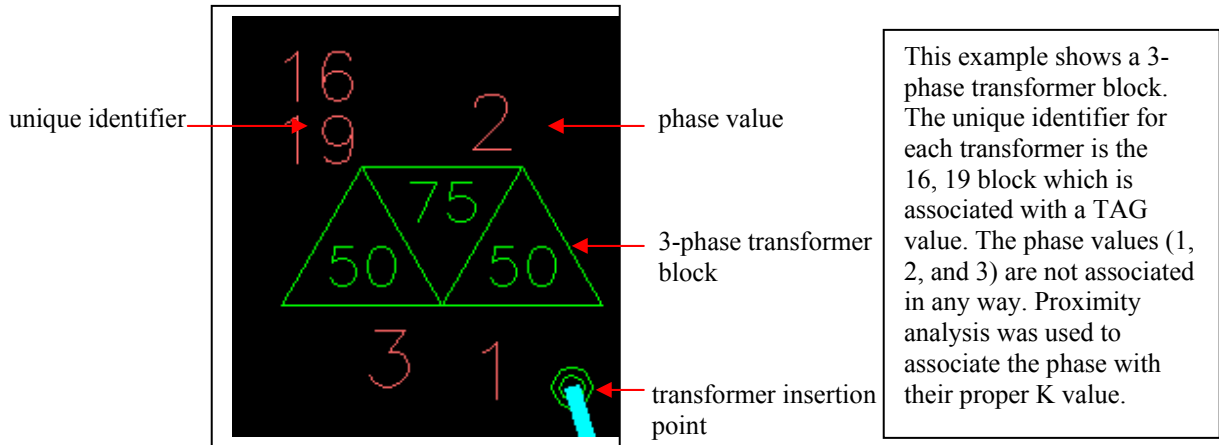
This DWG data shows the primary as the dashed line. The upper portion of the line is selected to show that there are two physical pieces of lines. But, having two separate lines is unnecessary because the attributes of the primary are the same on both sides. During the conversion, the primary line was joined together.

### **Converting AutoCAD DWG to ArcSDE 8 using FME**

Safe Software used the FME Translator to regenerate all AutoCAD DWG layers to the corresponding ArcSDE 8 layers.

**Step 1:** FME was used to read from a MS Excel spreadsheet which listed how the DWG layers would map to the ArcSDE layers. A second spreadsheet listed the attributes to be created for SDE each layer and the default attributes to use.

**Step 2:** All block information was pulled together using DWG TAG values or matching based on the spatial relationship between features.



**Step 3:** Attributes were populated for the SDE layers using the spreadsheet of default values or calculating the attributes based on other attributes.

Feature Type: TRANSFORMER	
ATTRIBUTE_NAME	ATTRIBUTE_VALUE
KVA_RATING_1	50
KVA_RATING_2	75
KVA_RATING_3	50
LOC_NUM	1619
PHASES_1	3
PHASES_2	2
PHASES_3	1

This table shows how the above transformer is converted into SDE. All the text values have been used to populate attributes.

### ***Merging Key Features across Maps***

FME was used to merge line work across the tile-based DWG maps. This merging of features such as primary cables, road networks and water boundaries enhance the GIS data by allowing users to query information. This value-added information improves decision-making.

### **Conducted Quality Control and Quality Assurance (QC/QA)**

Safe Software conducted extensive Quality Control and Quality Assurance (QC/QA) tests on the data. The FME mapping files produce translation statistics, the number of features by DWG layer read in and the number of features on each SDE layer written out. Any processing done on the features is also logged. For example, the number of water boundaries being read in and the number of water boundaries after the merging is listed.

## **Results**

- Fast and accurate data translation
- Features have more intuitive names and attributes
- Features can easily be matched by joining end points of the similar linear feature attributes
- FME mapping files report translation statistics, such as the number of features read, number of features merged, and any features rejected
- Cost-effective solution

## **Benefits**

Southern Company will now support two GIS mapping systems, instead of three. The data conversion helps to standardize the spatial data formats across Southern Company's power companies, and will enable them to utilize their resources in an integrated system. Original data is being cleaned-up and datasets are being merged to enhance decision-making at several levels within the organization.

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