Team: DEC 1702A
Algona Distribution System Design

Client: Algona Municipal Utility
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Introduction

- Iowa
  - Midwestern U.S. state
- Algona
  - A growing city of 5560 people.
  - Location in the north of Iowa
  - Algona Municipal Utilities
- Industrial Consumer Electric Geographic Information System (GIS) Map
  - Second largest Industrial Consumer
  - Primary Feeder EB 5 - Green Line
  - Secondary Feeder 1 - Pink line
  - Old conductor and vegetation problem
  - Two transformers and meters

Figure 1 Iowa google map

Figure 2 Algona google map


Figure 3 Industrial Consumer GIS Map

Current data

- North meter average daily Power Factor
  - 0.832
- South meter average daily Power Factor
  - 0.89

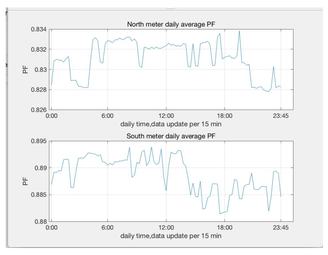

Figure 3 Two meter daily PF

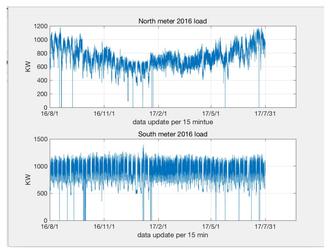

Figure 4 Two meter 2016 KW consumption

- North meter 2016 load
  - Max 1196.8 KW
  - 8 outages events
  - Total 15 hours
- South meter 2016 load
  - Max 1395.2 KW
  - 17 outages events
  - Total 35 hours

Power Distribution System

- The final state of delivery of electric power
- Directly carry electricity from upper level system to individual consumers

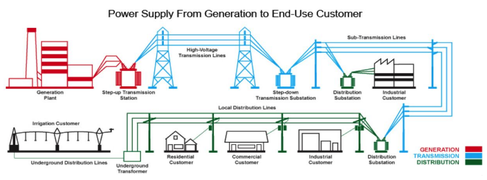

Figure 5 Brief power system process

Simulation Detail

Figure 11 Milsoft Utility Solutions

Figure 12 DGR Engineering

Milsoft
- provides more than a thousand electric utilities

DGR Engineering
- DeWild Grant Reckert

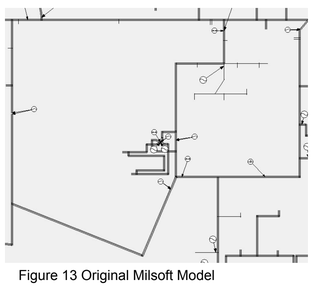
Figure 13 Original Milsoft Model

Origin Modell information:
- Operational
  - Primary Feeder EB5 normal Close
  - Feeder 1 normal Open
- Transformer 2000KVA and 1500KVA

Model I(AMI Data):
- Operational
  - Feeder EB5 normal Closed
  - Primary Feeder 1 normal Closed
- Transformer 4200 KVA and 1500KVA.
- Feeder 1: 350AL 220 EPR 1/3-90.
  - Capacity 408A
- EB5: 4/0AL 220 EPR 1/3-90.
  - Capacity 326A

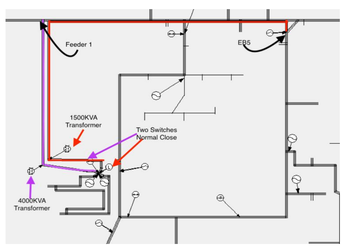

Figure 14 Model I

Model II(DGR model data):
- Operational
  - Feeder EB5 normal Close
  - Primary Feeder 1 normal Open
- Transformer 4000 KVA and 1500KVA.
- Feeder 1: 4/0AL 220 EPR FUL 105.
  - Capacity 350A
- EB5: 4/0AL 220 EPR 1/3-90.
  - Capacity 326A

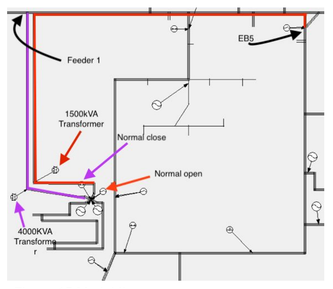

Figure 15 Model II

Transformer

United States Department of Agriculture Rural Utility Service (RUS) as the construction standards of pad mounted transformer.

Pad Mounted Transformer:
- Around $17/KVA
- 4200 KVA
  Around total $71,400
- 4000 KVA
  Around total $68,000
- 1500 KVA
  Around total $25,500

Other Parameter Data:
- Three Phase
- 60 HZ
- Percentage of Impedance: 5%-7%
- Cooling type:
  OA/FA (Oil-Immersed, forced cool)

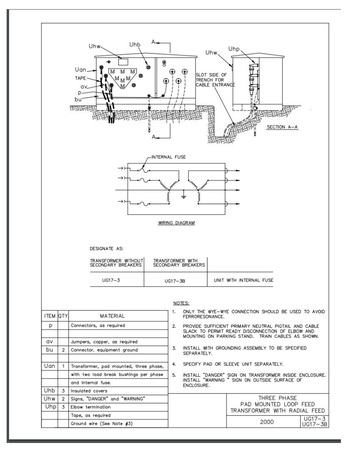

Figure 6 Pad Mounted Transformer Specifications


Figure 7 Pad Mounted Transformer

ABB

Figure 8 ABB Inc.

Feeder Type

United States Department of Agriculture Rural Utility Service (RUS) as the construction standards of Underground and Overhead riser.

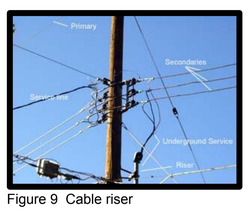

Figure 9 Cable riser

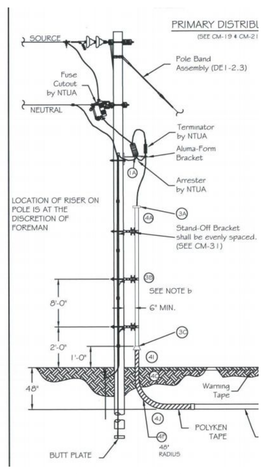

Figure 10 Cable riser Specifications

Advantage of Underground cable:
- Low Transmission loss
- Absorb Emergency power loads
- Less Susceptible to the impacts of severe weather
- Less Maintenance Cost

Cable Type

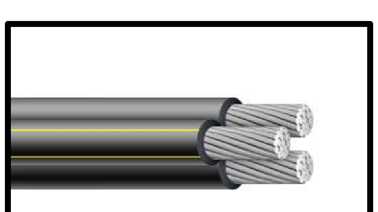
Figure 16 15 kv distribution Underground Cable

- 15KV
- Underground
- Distribution Cable
- Okonite Production

WESCO

Figure 17 WESCO Distribution Inc.

Cable Type Data:
- 4/0, 220 mils, Al, EPR, ⅓ neutral $4.63/ft
- 4/0, 220 mils, Al, EPR, full neutral Special Order
- 350, 220 mils,Al, EPR, ⅓ neutral $6.04/ft

* EPR: Ethylene Propylene Rubber (Type of Synthetic Elastomer)
* ⅓ Neutral & Full Neutral: Different carrying current


Figure 18 Conduit pipeline

Conduit Pipe:
- Sch 40 PVC $1.15/ft
- Sch 13.5 HDPE Special Order

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