Induced AC Interference Testing Case History

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Introduction

- Pipelines and Power Lines will be sharing more and more ROW over time.
- Recent research has proven the impact of AC voltage on pipelines.
- Modeling of this phenomenon has become specialized.
- Mitigation systems must consider many factors.

Introduction - continued

- Data requirements for the pipeline include many common datum available from the pipeline company records
- Data requirements from the power company can be difficult
  - Post 9-11 security
  - Reluctant to discuss line capacity and current levels of use and projected growth
  - They do not understand our issues as pipelines
    - But they are getting better !!!
  - May charge you for their time

Case History

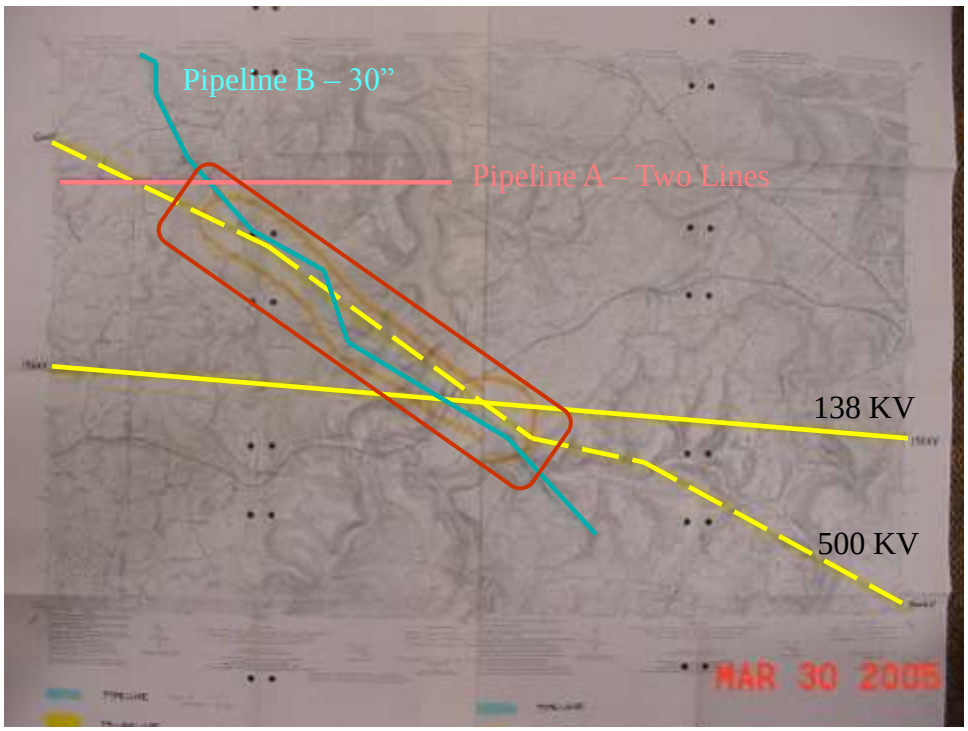
- Operator A has 2 pipelines, one a 20” with an average coating and a 18” with a very good coating. The lines are well protected with an impressed current system. Oriented predominantly west-east.
- Operator B has one pipeline, a 30” with an average coating. The line is well protected with an impressed current system. Oriented mostly north-south.
- The pipelines are buried in rocky/loam soil with a fairly high resistivity.
- Where B’s pipeline crosses A’s pipelines both pipelines are well above criteria and B’s pipeline is also well above his criteria.

Case History - continued

- Both pipelines (A & B) have coating damage that has required excavation and repair.
- The coating failure is random, the pipe steel has burn or scorch marks on it (no damage to the steel) and is typical of AC current discharge as previously observed by both pipeline operators.

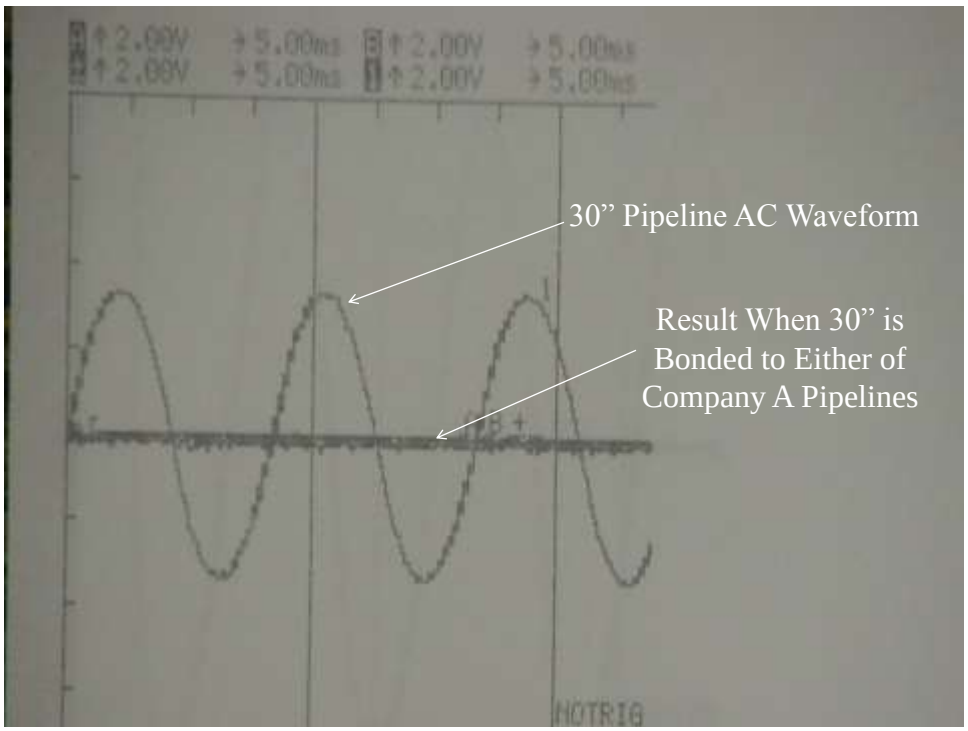
Case History - continued

- Both pipelines A & B parallel and/or ingress/egress high voltage AC power line corridors in this area and there is a large AC interference component on both pipelines.
- Operator A & B schedule some mutual interference testing at the site to determine what is the cause of the coating failures. The testing (AC & DC potentials) is conducted on the site and it is determined that the AC is causing the coating failures. Faults, lightning and other surges along the power lines and pipelines are possible causes for coating failures when the AC currents discharge off the pipeline.


Pipeline B – 30”
Pipeline A – Two Lines
138 KV
500 KV
MAR 30 2005

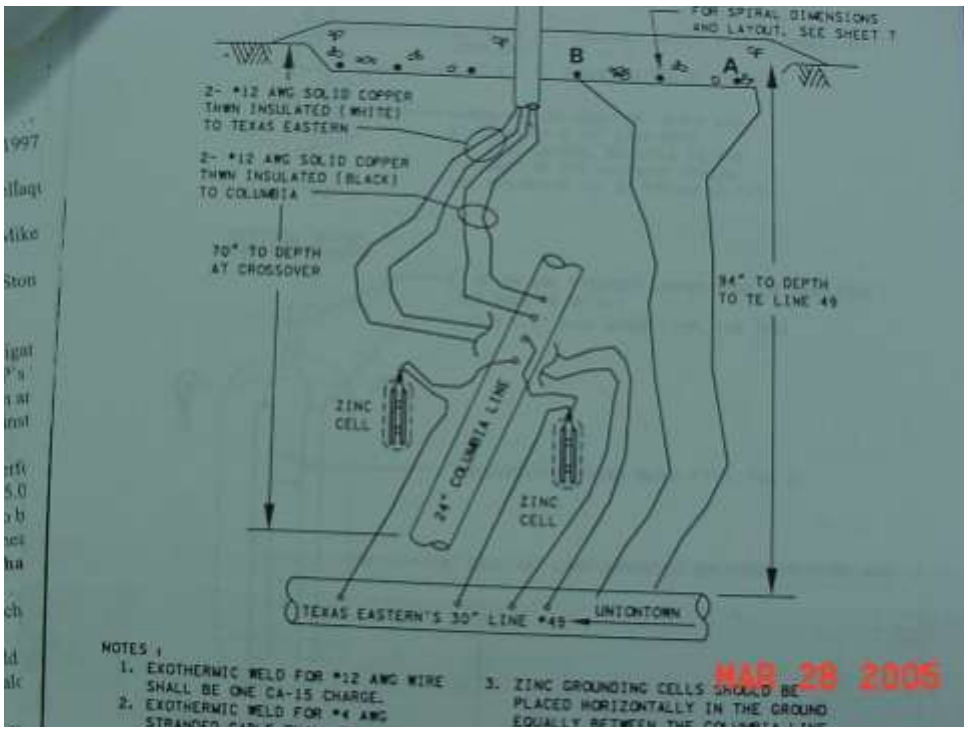
Case History - continued

- Further testing (taking voltage measurements using an oscilloscope) and discussions revealed the following:
- Pipeline A is paralleling a power line different from the power line along Pipeline B.
- The induced AC voltage on Company A's pipelines and Company B's pipeline were practically 180 degrees out of phase. The induced voltages varied between 5 and 45 volts AC.
- Both power lines have a history of faults, lightning and other surges in this area.



Case History - continued

- With the above knowledge of the induced voltages being out of phase, additional testing to determine the approximate magnitude and levels of the AC voltages and currents was performed on Pipelines A & B and the following solutions were recommended:
- Install a zinc grounding cell at the crossing of Pipeline A (both lines) and Pipeline B.
- Connect the zinc cell to each pipeline to allow the AC current to flow between the lines via the cell.
- Install zinc grounding anode beds (10 – 60# zinc anodes at 10' spacings 1' off the line) at the egress and ingress points of Pipeline A & B with the power line corridors to lower the pipeline resistance and allow for a better return path for the AC currents.

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Results

- Zinc grounding cells were installed and allowed to operate. AC current was able to flow through Pipelines A & B via the cells and the discharge points were eliminated. The AC current was discharged via the zinc anode beds back to the power line sources.

Summary

- The above case histories is an actual example of AC interference tests performed. Large amounts of data were taken before during and after the testing. Only the basic information was provided as support.

Conclusions

- Even though satisfactory results were obtained and the system work well for years, there have been recent changes.
- The 30” is now developing AC voltages again ranging around 15 volts (the action level IAW SP 0177). ***Something has changed.***
- Plans for a more intensive model are being made. Modeling will result in a design to be installed later.

Questions ?