SUPPLEMENTAL SCC QUESTIONNAIRE
GAS TRANSMISSION OR LIQUID PIPELINE

1. Pipeline Safety Advisory Bulletin - ADB-03-05 - October 8, 2003
   - Review Bulletin with operator, if operator is not familiar with.
   - Reference also Baker Stress Corrosion Cracking Study at:
   http://primis.phmsa.dot.gov/gasimp/docs/SCC_Report-Final_Report_with_Database.pdf

Comments: The operator is aware of the Advisory Bulletin and the Baker Stress Corrosion Cracking Study.

2. Has the pipeline system ever experienced SCC (in service, out of service, leak, non-leak)?
   - Type of SCC?
     Classical - high pH
     Non-classical – low or near neutral pH
   - What are the known risk indicators that may have contributed to the SCC?

Comments: There is no documented record of having found SCC on any of the three pipeline sections that make up Puget Sound System.

3. Does the operator have a written program in place to evaluate the pipeline system for the presence of SCC? If no, have operator explain. If operator has not considered SCC as a possible safety risk, go to #10.

Comments: As part of the operator's field investigation procedures, Kinder Morgan investigates each anomaly dig site using NDT processes suitable to detect any linear or crack like fields on the pipe.

4. Has/does the operator evaluate the pipeline system for the presence of SCC risk indicators?

Comments: The risk indicators evaluated include: pipe age, coating type and quality (based on excavation program), cathodic protection, soil type, topography, operating stresses and pressure cycling.

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5. Has the operator identified pipeline segments that are susceptible to SCC?

Comments: Based on risk indicators, the entire Puget Sound System is susceptible to SCC (i.e. coating type - Coal Tar Enamel), system age - >10 years).

6. If conditions for SCC are present, are written inspection, examination and evaluation procedures in place?

Comments: Yes written procedures are in place to deal with all crack-like indications.

7. Does the operator have written remediation measures in place for addressing SCC when discovered?

Comments: The procedure is not specific to SCC remediation, but rather all crack-like indications.

8. What preventive measures has the operator taken to prevent recurrence of SCC?
    - Modeling?
        - Crack growth rate?
        - Comparing pipe/environ./cp data vs. established factors?
        - Other?
    - Hydrotest program?
    - Intelligent pigging program?
    - Pipe re-coating?
    - Operational changes?
    - Inspection program?
    - Other?

Comments: Kinder Morgan (KM) has not found SCC on any of the Puget Sound pipeline sections. However, KM completed a system hydro-test and KM has been using In-Line Inspection (ILI) tools (although not crack detection tools) since 1991.

9. Does the operator incorporate the risk assessment of SCC into a comprehensive risk management program?

Comments: Yes KM is in the process of updating/revising the section of the risk algorithm that addresses SCC.

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Continue below for those operators who have not considered SCC as a possible safety risk.

10. Does the operator know of pipeline and right of way conditions that would match the risk indicators for either classical or non-classical SCC? See typical risk indicators below.

Comments: Yes. (Notes: The operator has considered SCC as a possible safety risk.)

High pH SCC Potential Risk Indicators

- Known SCC history (failure, non-failure, in service, and during testing)
- Pipeline and Coating Characteristics
- Steel grades X-52, X-60, X-65, X-70, and possibly X-42
    - Age ≥ 10 years
    - Operating stress > 60% SMYS
    - Pipe temperature >100 deg. F (typically < 20 miles d/s of compression)
    - Damaged pipe coating
- Soil Characteristics
    - Soil pH range: 8.5 to 11
    - Alkaline carbonate/bicarbonate solution in the soil
    - Elevated soil temperature contributing to elevated pipe temperature
- Polarized cathodic potential range: -600 to -750 mV, $Cu/CuSO_4$

Low or Near-Neutral pH SCC Potential Risk Indicators

- Known SCC history (failure, non-failure, in service, and during testing)
- Pipeline and Coating Characteristics
- Steel grades X-52, X-60, X-65, X-70, and possibly X-42
    - Age ≥ 10 years
    - Frequently associated with metallurgical features, such as mechanical damage, longitudinal seams, etc.
    - Protective coatings that may be susceptible to disbondment
        - Any coating **other than** correctly applied fusion bonded epoxy, field applied epoxies, or coal tar urethane . . .
        - Coal tar
        - Asphalt enamels
        - Tapes
        - Others
- Soil Characteristics
    - Soil pH range: 4 to 8
    - Dissolved CO_2 and carbonate chemicals present in soil

- Organic decay
- Soil leaching (in rice fields, for example)

- "Normal" cathodic protection readings (disbonded coating shields the pipe from cp current)