

News about corrosion and the corrosion industry produced quarterly for members of NACE International in the Calgary area

## Everyone a Winner at NACE Calgary 2010 Annual Golf Tournament

On August 20, NACE Calgary section hosted 200 golfers for the annual golf classic at Elbow Springs Golf Club. Players of all levels enjoyed breakfast, a day of golf, networking and great on-course refreshments, followed by a delicious barbecue with prizes for everyone!



Winners of this year's Dave Scott Memorial Trophy for top team are: (l to r) Vladimir Sadetsky, Wes Suhai, Adrian Neal, and Rob Nadalutti.



Hole-in-one winner Travis Young, Field Operations, Nexen Canada (left), receives congratulations and a cheque for \$10,000 from hole sponsor James North of Mi-Swaco.

## Of Courses...

### 2011 NACE International Courses in Calgary

- ▶ **CIP Level 1:** Jan. 23-28
- ▶ **CIP Level 2:** Jan. 30-Feb. 4
- ▶ **CIP Peer Review:** Feb. 4-6

[Click here](#) for information.

## Upcoming Events

- ▶ **NACE Northern Area Western Conference,** Feb.6-8,2011,Regina
- ▶ **CORROSION 2011** - March 13-17, Houston
- ▶ **Banff Pipeline Workshop** - April 3-7, Banff
- ▶ **ATI CSC11 Corrosion Solutions,** Sept 25-30, 2011, Lake Louise

Watch for announcements of **more NACE Calgary and other events** in the next few months. Also check the **CATS Alberta** website for other technical society events.

## NACE CALGARY EXECUTIVE NEWS

### Evan Bloomfield passes the gavel to new chair

Thane Schaffer is taking over the reins as NACE Calgary Chair because current Chair Evan Bloomfield will be living and working in the south of France for the next four years. Evan has left Penn West for a new position with Vermilion Energy as Asset Integrity Manager for France and the Netherlands. Evan says he looks forward to continuing his connections with NACE Calgary when he and his family return to Calgary. Evan has been a member of the NACE Calgary Executive for the past nine years, holding positions on the arrangements and program committees, as well as Vice-Chair for the Section the past two years. Evan wishes all the best to the new executive and is excited to hear about all the plans and changes they will execute for the benefit of the NACE Calgary membership.

### New NACE Calgary Chair Thane Schaffer



Thane has been a member of NACE since 1997, and a member of the NACE Calgary Executive committee since 2004. He has always participated on the Program Committee, primarily focused on satellite meetings, technical sessions and tradeshow events. He also served on the 2007 and 2010 NACE Western Region Conference committees.

Thane works as Manager of the Applied Solutions Group at Multichem where he focuses on internal corrosion identification, evaluation and mitigation, as well as other production chemical design and implementation. Thane says he looks forward to serving NACE Membership in this new position with the support and enthusiasm of a great 2010-2011 Executive Committee.

### Executive Planning Session sets tone for 2010

NACE Executive Committee members participated in a day long session on October 1 to review roles and responsibilities to plan for the coming year. Discussion included:

- Results of the biennial **member survey** conducted in June/July
- Plans for **courses and events** in 2011, including satellite seminars in Red Deer and Medicine Hat, as well as review and consideration of many ideas offered in the survey.
- **Communication**, including refreshing the Calgary website, enhanced regular communication with NACE Edmonton, and new ideas for taking the story of corrosion control and corrosion careers further into the community.
- Interaction with **post secondary students** through student bursaries, informative student mixers, student memberships and a NACE Calgary Student Chapter
- Continued involvement in **K-12 Education** through the Calgary Science Fair and Teachers Camps, and consideration of other ideas from the survey.

## 2010-1011 NACE Calgary Executive

While positions are still being solidified, the Executive Members include:

<b>Thane Schaffer (NACE Calgary Section Chair) – Multi-Chem</b>
<b>Doug Kellow (NACE Calgary Trustee) – Weatherford</b>
<b>Neil Park (NACE Calgary Vice-chair) – Husky</b>
<b>Bob Lotwin (NACE Calgary Treasurer) – Pipe-Tech</b>
<b>Craig Ball – Pipe-Tech</b>
<b>Prabhu Srinivasan – Skystone Engineering</b>
<b>Beth Daniel – Ammonite Engineering</b>
<b>Irina Ward – Shell Canada</b>
<b>Steve Love – Pembina Pipelines</b>
<b>Neil Hay – Suncor Energy</b>
<b>Dave Grzyb – ERCB</b>
<b>Jana Haggins – Talisman Energy</b>
<b>Matt Stroh – CIMARRON Engineering</b>
<b>Thaier Al Issa – Sulfa Treat</b>
<b>Sam Cauchi – FOX-TEK</b>
<b>Evan Bloomfield (NACE Calgary Past Chair) – Vermilion Energy</b>
<b>Wayne Sudds – Baker Hughes</b>
<b>James North – MI SWACO</b>
<b>Mike Westlund – GE Oil and Gas</b>
<b>Janet Willson (NACE Calgary Administrator) – Insight Communications</b>

## NACE Northern Area works... for Members

Members of the NACE Northern Area Board of Trustees met during the Northern Area Eastern Conference in Montreal. The purpose of the Trustee Meeting is to discuss the successes and needs of the individual Canadian Sections as well as to organize and plan for future events that will add value to our NACE membership.



In attendance at the Montreal Conference are (starting in the front row l to r):

- Warren Graves – Montreal Trustee
- Jenny Been – Vice Chair
- Debra Boisvert – Chair
- Scott MacIntyre – Halifax Trustee
- Winston Revie – NACE Foundation Chair
- Sankara Papavinasam – Ottawa Trustee
- Bob Chalker – NACE International Executive Director
- Doug Kellow – Calgary Trustee
- Dennis Dutton – Career Development
- Kevin Reaville – Edmonton Trust

The NACE Northern Area Board of Executives is continually in the process of working with the individual Section Trustees to evaluate new opportunities to assist in program development and identification of revenue generating opportunities that bring value to their memberships. The vitality of the Sections is a critical mission for NACE, as this directly enhances the educational and professional networking opportunities, along with student scholarship offerings, which are the mandate of our professional society.



## Teacher Camps Stimulate Corrosion Education

Jenny Been, Northern Area Vice Chair, gives Winston Revie, Chair of the NACE Foundation of Canada, a cheque for \$5000 towards continuation and support of the ASM/NACE Materials Camps for Teachers.

The camp is a five day workshop combining innovative classroom instruction and laboratory experiences. The sponsored workshops are designed to help teachers to:

- Engage their students with hands-on science experiences
- Help students explore material science in everyday life
- Introduce new ideas and technologies to excite student interest
- Encourage students to pursue education in corrosion sciences and engineering

NACE Calgary has been involved in teacher camps and workshops for many years.

## Sulfur Mini Symposium a great success!

NACE Calgary recently held a day long mini symposium on Elemental Sulfur Corrosion and Its Mitigation at the Calgary Chamber of Commerce.

The topic was chosen because Alberta is known as a world leader in sour gas production and processing, with specialised expertise for dealing with the severe conditions associated with elemental sulphur corrosion. NACE Calgary Section provided an opportunity for 118 registrants to learn from subject matter experts located in Calgary.

Thanks to all speakers for their great presentations...

- Sulfur Species Associated With Sour Gas – Joe Bojes (Baker Hughes Inc.)
- Sulfur Related Corrosion Mechanisms – Norm Dowling (Alberta Research Sulfur Ltd.)
- Managing Corrosion and Sulfur Deposition in Sour Gathering Systems – Reg MacDonald (Shell Canada Energy)
- Amine Sulfur Related Corrosion – Ben Spooner (Amine Experts)
- Impact of Carbon Steel Metallurgy on Sour System Corrosion – Ray Goodfellow (Pangea Engineering)
- ERCB Pipeline Regulatory Review – Russ Deacon & Nabin Sharma (ERCB)
- Sulfur Failures in Low H<sub>2</sub>S Systems – Joe Boivin (Corometrics Ltd.)

[Click here](#) to view all Symposium papers on the NACE Calgary website.



A panel discussion about the morning presentations featured (l to r) Joe Bojes from Baker Hughes, Norm Dowling from Alberta Research Sulfur Ltd., and Reg MacDonald from Shell Canada Energy.

## Thanks... to mini symposium sponsors

NACE Calgary thanks the following sponsors for their contributions of time and resources to the success of the mini symposium.



Doug Kellow from sponsor Weatherford Engineered Chemistry thanks Leslie May from sponsor Baker Hughes, on behalf of the NACE Calgary Executive, for her role in the planning of the symposium.

## NACE Calgary Biennial Survey captures member views

Every two years, NACE Calgary conducts a member survey to get section member views and suggestions about NACE International and NACE Calgary. This information is very helpful to the Calgary Executive as they plan for events, courses, community initiatives, and member communication. The survey conducted in June/July of this year is the third biennial survey. The next one will be in 2012. Below are some highlights from the survey results.

### NACE International:

- Members for less than a year - In 2008, 0% - in 2010, 10.2%.
- Most joined NACE for professional development (76%). Next came networking and then publications (same in 2008).
- 95.3% plan to continue their membership, compared to 99.1% in 2008.
- NACE Intl. offerings ranked highest in publications and seminars/workshops, and lowest in NACE International intranet.

### NACE Calgary

Many members provided suggestions for future member offerings and improvements. The executive has a considerable amount of useful ideas and perceptions in these suggestions. In particular, it is interesting to read the suggestions regarding seminars, workshops, and events.

- 85% of members are satisfied overall with NACE Calgary - in 2008 the figure was 79%.
- 86.7 % rank the website as good to excellent, 93% rank the newsletter as good to excellent, 88.1% rank seminars and workshops as good to excellent, and 87.3 rank networking opps as good to excellent.
- 75% visit the NACE Calgary website, compared to 54% in 2008.
- 75% read the newsletter.
- 68.3% attend technical seminars or courses.
- 48.4% of members feel the number of workshops and other events during the year are just right, while 28.2% don't know and 23.4% say there are too few. No one said there are too many, same as in 2008.
- 88.8% feel that NACE has been good to excellent in promoting the corrosion industry. In 2008 the figure was 81.6%.
- 62.4 % say they would volunteer in the future, compared with 55.8% in 2008. Most of these people are interested in working on a board committee.

To view a pdf of the full report, [click here](#).

To offer further comments and suggestions, contact Executive Chair [Thane Schaffer](#).

## For Your Information...

Featuring some of the worst corrosion related failures recorded around the world, along with historical references and lessons learned.

Assembled by Thayer Al-Issa, SulfaTreat Canada

### Corrosion and Stress Corrosion Cracking of Steel Pipeline under Disbonded Coating

Case – 3: Interprovincial Pipe Line Inc. (Now ENBRIDGE PIPELINE Inc.), Line 3, Mile Post 506.6830, Near Glenavon, Saskatchewan - 27 February 1996

“On 27 February 1996, IPL main crude oil pipeline, designated as Line 3, suddenly experienced a simultaneous loss of operating pressure and increase in crude oil flow rates at both the Glenavon pump station, and at the Langbank pump station, located near the towns of Glenavon and Langbank, Saskatchewan (please refer to Fig.1). Line 3 is an 864-millimetre (mm) outside diameter (NPS 34 inches) main crude oil pipeline, designated as Line 3 that was constructed in 1968.

Line 3 carries heavy and sulfur-rich crude from northern Alberta to refineries in the Midwest. The line ruptured near Glenavon, Saskatchewan, a village 120 km east of Regina.

No injuries resulted from this incident. “Damage to Line 3 consisted of 1.760 m (approximately 5.8 feet) of ruptured pipe which had split open in the longitudinal direction, in proximity to the longitudinal seam weld”. (TSB, P96H0008 – 1996)

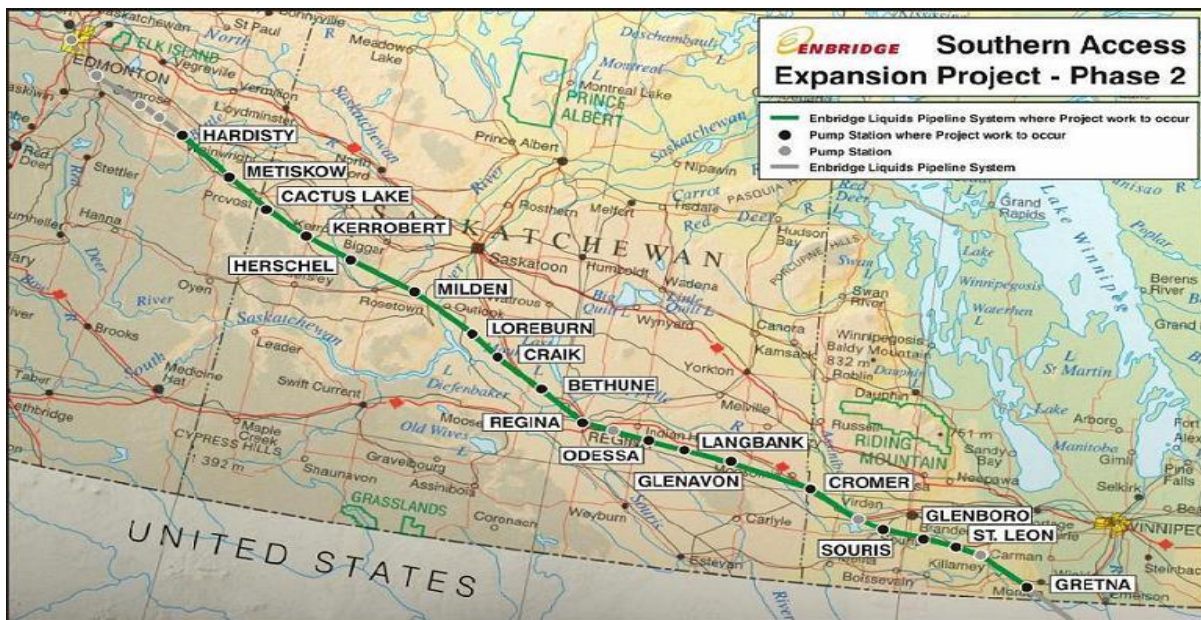


Fig.1 – Enbridge Pipeline Map

#### INCIDENT ANALYSIS:

“Soil analysis showed high level of dissolved solids, gypsum based with slightly alkaline pH (7.35 – 7.95) “consistent with a near-neutral solution and was controlled by carbonates” (TSB, P96H0008 – 1996).

The metallurgical examination of the fracture area indicated:

1. The pipe fractured along the longitudinal seam, and opened up over a length of 1.87 m.
2. The tape wrap showed poor bonding in some areas, with wrinkles and tape seam separations.
3. Removal of the tape revealed general corrosion along the longitudinal seam weld with the heaviest corrosion corresponding to the centre of the failure.
4. Non-destructive testing of the failure found 27 regions of indications of small colonies of cracking within 150 mm of the longitudinal seam weld, many within the corroded areas of the pipe.
5. Eight similar regions of colonies of cracking were found adjacent to the downstream circumferential weld.
6. All the cracks within the colonies were oriented in the axial direction. Several corroded areas were found to contain shallow colonies of near-neutral-pH SCC.

7. Two large flat areas corresponding to the areas of deepest corrosion were observed on the fracture surface, which revealed inter-granular corrosion features as well as secondary cracking.
8. The material analysis indicated that the primary cracking mechanism was trans-granular.
9. Stress overload at a pre-existing external surface defect, referred to as a Narrow Axial External Corrosion (NAEC) type defect, in the pipe wall of Line 3, assisted by near-neutral-pH SCC, developed under disbonded polyethylene exterior coatings in the presence of a carbonate/bicarbonate solution” (ENME 619.90, TECHNICAL REPORT – GROUP ASSIGNMENT, 2009)

#### OBSERVATIONS

“Synergistic effects of disbonding, ineffective input of CP current under the disbonded coating, and an environment favorable for the active growth of SRB and APB are the corrosion mechanism. Continuous and thorough monitoring and repair programs such as CP level survey, polarized potential (off-potential) measurement and DCVG survey are needed at these sites.” (Corrosion 2000 – Paper # 379)

“In this case study some of the proven causes for failure were found while investigation:

- NAEC defect proved to exist at ruptured pipeline segment, which was accelerated by near neutral-pH SCC and could not be identified by ILI tools.
- External coating of self adhesive poly-ethylene is proved to be susceptible to NAEC under certain environments and has been found to experience disbondment and/or deterioration over the body of pipeline.
- CP current denied access to metal at disbonded area giving the chance to environmental parameters to penetrate and accelerate corrosion.
- Soil surrounding the pipeline was evident to promote corrosion. (Corrosion 96 – Paper # 208).” (ENME 619.90, TECHNICAL REPORT – GROUP ASSIGNMENT, 2009)

#### CONCLUSIONS

“Conclusions can be summarized as follows & based upon TSB report:

- Rupture was due to NAEC adjacent to longitudinal seam weld assisted by near neutral-pH SCC (Fig – 2).
- SCC colonies proved to be existing which led to rupture of pipeline (Fig – 2).
- Impaired ability of CP protection due to disbonded coating which assisted SCC propagation and NAEC (Fig – 3).
- External environment and its constituents of mineral salts and bacteria that are the major contributors to initiate and propagate NAEC and EAC.
- Using only ILI tools can not be the main source of judgment and decision making basis to develop preventive maintenance programs. Other means should be incorporated with ILI reports i.e. ROW inspection, Aerial inspection, Hydrostatic Tests and Open ditch inspection along with operator’s daily observations.
- Many cracks, but not all cracks, were associated with pits.
- Crack density increased with increase in applied load.
- Plasticity localization and localized dissolution are the two major aspects of crack development. These two processes occur on the same crystallographic planes, and thus, mutually enhance each other during crack development.
- Hydrogen is discharged and enters the steel under the exposure conditions, possibly influencing the cracking process by facilitating plasticity localization.” (ENME 619.90, TECHNICAL REPORT – GROUP ASSIGNMENT, 2009)

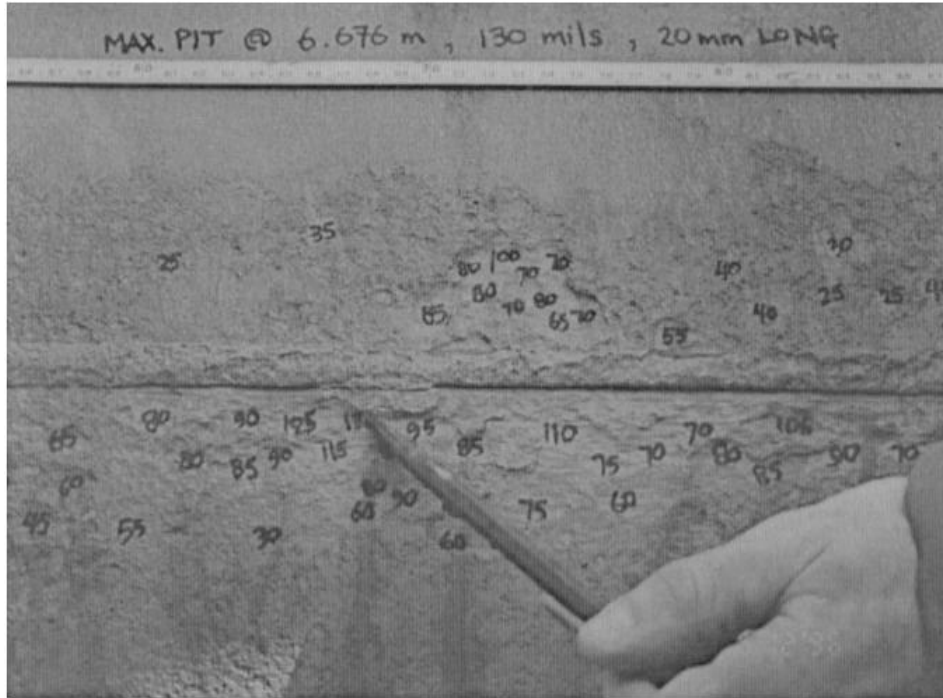


Fig-2, Picture of Typical Narrow Axial External Corrosion – NACE, Corrosion 99 – Paper no. 533

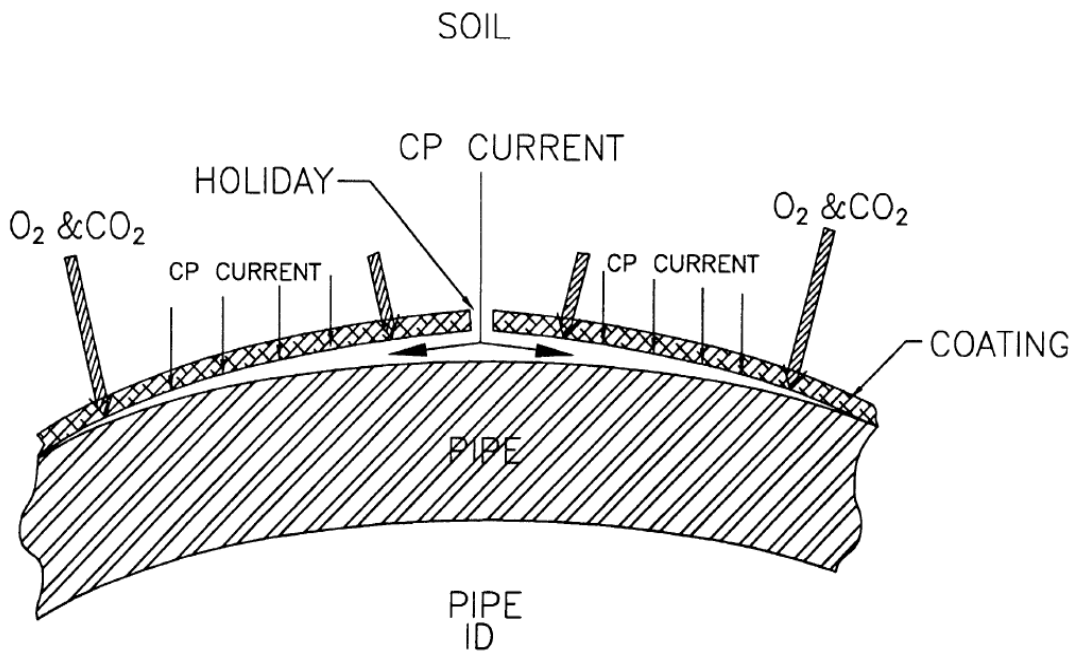


Fig.8 – Schematic shows CP current and flow and gas diffusion through coating (Corrosion 96 – P. No. 208)

## RECOMMENDATIONS

- “Several coating systems are available for the corrosion protection of buried pipelines. These include FBE, coal tar enamel, tape, extruded polyethylene, multi-layer coatings and others. While pipeline industry has a number of performance tests to evaluate and guide selection of coatings, the connection between laboratory test results and service is often not clear. Pipeline industry uses immersion tests and cathodic disbondment tests for the evaluation of coatings for buried pipelines.
- Common practices for pipeline coating evaluations examine the coating behavior for single properties in isolation, e.g. adhesion, blisters, cathodic disbondment and flexibility. In addition, these tests are typically done on as-coated specimens. Here the combined effects of water soak and cathodic disbondment (both at elevated temperature) are examined. Coating performance are determined for water soak and cathodic disbondment exposures alone and for combined exposures of water soak periods and cathodic disbondment periods.
- When selecting a pipeline coating, the "Fail Safe" characteristics may be more important than other issues that are normally considered. A "Fail Safe" coating system is defined as one that will allow cathodic protection (CP) current to pass through it to protect the substrate – not shield it – should the coating bond fail and adequate CP is available. Therefore, coatings will reduce or eliminate corrosion, including stress corrosion cracking (SCC), on the pipe under the coating if a bond failure occurs, water penetrates and cathodic protection is adequate.” (ENME 619.90, TECHNICAL REPORT – GROUP ASSIGNMENT, 2009)

## REFERENCES

1. ENME 619.90, U of Calgary, winter 2009, *Interprovincial Pipe Line Inc. (Now ENBRIDGE PIPELINE Inc.), Line 3, Mile Post 506.6830, Near Glenavon, Saskatchewan - 27 February 1996, Stress Corrosion Cracking, TECHNICAL REPORT – GROUP ASSIGNMENT.*
2. ASTM STP 1298, W.A Van Der Sluys, R.S. Piascik, and R. Zawierucha, Eds., ASTM, 1997. *Corrosion Mitigation Under Disbonded Coating - 1998* by NACE International, Paper # 611.
3. B.N. Leis and J.A. Colwell, "Initiation of Stress-Corrosion Cracking on Gas Transmission Piping, Effect of the Environment on the Initiation of Crack Growth".
4. Engen, Donald & Jaarah, Mohammad – *Identification and Repair of Narrow Axial External Corrosion*, NACE, Corrosion 99/ Paper no. 533
5. ENME 619.55 IMP, winter 2009 – Group 2 presentation, *Case 2 SCC 1996 Near Glenavon, SK IPL.*
6. ENME 619.90, *STRESS CORROSION CRACKING BEHAVIOR*, Dr. FRANK CHENG, WINTER 2009
7. G. Munger and R. C. Robinson, "Coatings And Cathodic Protection," *Materials Performance*, Volume 20, Number 7, p. 46, July, 1981.
8. H. M. Smith, M. F. Bird, and R. H. Pena, "Factors Affecting The Cathodic Disbonding Of Pipe Coatings," NACE, CORROSION/88, Paper No. 441, 1988.
9. <http://www.enbridge-expansion.com/expansion/main.aspx?id=2608&tmi=396&tmt=4> – downloaded 03/07/2009
10. <http://www.tsb.gc.ca/eng/rapports-reports/pipeline/1996/p96h0008/p96h0008.asp> - PIPELINE REPORTS - 1996 - P96H0008 -
11. [http://en.wikipedia.org/wiki/Stress\\_corrosion\\_cracking](http://en.wikipedia.org/wiki/Stress_corrosion_cracking) - downloaded 03/07/2009
12. J.A. Beavers and B.A. Harle, "Mechanisms of High-pH and Near Neutral-pH SCC of Underground Pipelines", Proceedings of the 1 s, International Pipeline Conference, Edited by M. Yoon, M. Mensik and M. Mohitpour, pp.555-564. (Corrosion 96 – Paper # 208)
13. Oliver C. Moghissi, Darrell S. Dunn & Narasi Sridhar of South West Research Institute 'Concept development of Disbonded Coating Cathodic Protection Monitoring Coupon,' (Paper 20-9216) 2001.
14. R.N. Parkins, W.K. Blanchard, and B.S. Belanty, "Tran granular Stress Corrosion Cracking of High-Pressure Pipelines in Contact with Solutions of near Neutral pH", Corrosion, 50, 394 (1994)
15. R.N. Parkins and P.M. Singh, "Stress-Corrosion Crack Coalescence," Corrosion, 46, 485 (1990).
16. [www.neb.gc.ca/clf-nsi/rsftyndthnvrnmnt/sfty/pplnrptrs/pplnrptr-eng.xls](http://www.neb.gc.ca/clf-nsi/rsftyndthnvrnmnt/sfty/pplnrptrs/pplnrptr-eng.xls)- downloaded 03/07/2009.



**NACE**  
CALGARY SECTION  
**NEWS**

*NACE News is produced four times a year by the Executive Committee of NACE Calgary Section, in December, March, June and September.*

*To provide feedback or to submit an article or story idea, email: [nacenews@nacecalgary.ca](mailto:nacenews@nacecalgary.ca).*