STEM-Corrosion™

2022 December Edition: Newsletter 27

5D to 5R

Integrity management requires development of various solutions. Most solutions are based on laboratory data or from field experience. Certain data, e.g., corrosion data, may easily be generated in the laboratory following the "5D" principle: You "Dip" something (metal), "Drip" something (solution), to generate "Data", with which you provide lengthy "Discussion" and take quick "Decision". Innumerable articles are published based on the "5D" principle which are neither useful nor required.

Meaningful, tested, and proven solutions, on the other hand, are developed following "5R" principle:

- Research: Collect, as much as possible, background information of the problem.
- Relevant: Develop solutions (data or information) that are relevant to the problem.
- Reliable: Establish that the solution is reliable to solve the problem.
- Repeatable: The solution can be implemented by the same person (i.e., a person with certain skill) in similar situations.
- Reproducible: The solution can be implemented by multiple persons (i.e., variety of persons can be trained to develop the skill) in similar situations.

ASTM E691, “Standard Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method”, provides guidelines to test, develop, and select solutions such as material, corrosion inhibitor, coating, and other corrosion control strategies. Only solutions developed based on such rigorous procedures/tests can be confidently implemented and used in the field.

More than 5,500 standards have been developed following ASTM E691. One and only standard test method that currently exists for qualifying corrosion inhibitors for oil and gas industry is ASTM G202, "Standard Test Method for Using Atmospheric Pressure **Rotating Cage**". Referring to the figure, the variation in the methodology 1 is very high whereas that of methodology 5 is low. Therefore, methodology or solution 5 (in this example rotating cage) is more reliable. Other laboratory methodologies (1 through 4) produced so many variations in the results that they could not meet ASTM E691 requirements.

- It is the professional responsibility of solution providers to disclose the variations in the methodologies they used to develop the solution.

- It is the right of users to demand solution providers to disclose the variations.

Raising Star of This Newsletter:

Brett Johnson

My Story

I started my journey as a Computer Engineer with big dreams to work for a top-end microchip company like Intel or Nvidia. Of course, that never happened and in fact school taught me very little about the world of microchip design. When I graduated in 2005, I entered the world of software development with dreams of one-day working for Google or Microsoft.

When the financial crash came in 2008, my dreams were pushed to the side again and I was left job searching with very few software opportunities available to me.

Then through a friend-of-a-friend connection, I was able to land an interview at an Engineering firm (Cimarron Engineering) who were looking for a junior software engineer to backfill in their Integrity department. At this time, I had little knowledge of what asset integrity was or even how to spell cathodic protection, but I was able to convince them to give me a chance.

Through the projects I worked on at Cimmaron, I was able to grow my knowledge of the industry and discover the vast (yet small) network of great industry people. After a few years, I took a position at Plains Midstream to get some owner/operator experience where I learned how to build and manage programs, identify pipeline threats, and find the balance between conservatism and good engineering.

I've now been with Pembina Pipeline for over four years. I joined on to help guide and lead the Pipeline Integrity Risk Project. My job requires me to develop new and better ways to manage and analyze large amounts of data and provide summarized results so that good pipeline integrity plans can be built from them. I enjoy the work that I do as it allows me to contribute in a meaningful way and bring all my skills of integrity knowledge and software development to table to help solve problems. Pembina may not have been the dream company of my younger years, but it is a great destination on a much different path. There's a lesson here about the typical road to happiness and success is not typically a straight line or something….

My Style

I'm a very detailed oriented person. I love getting into the nitty-gritty details and understanding something in their fullest. I don't like half-committing to things. Doing this allows me to look for opportunities to automate and simplify my life down the road. My work objectives are often focused on how I can 'do more with less'. Of course, it also can be a curse because of the larger time investment up front on something that may not pay off down the road.

One thing I've learned over the last decade is that life at this stage is always too busy. It's important to maintain a balance between your work, your health, your family, and your relationships. This is very hard to do because work often requires an 'immediate' attention with deadlines, requests, performance reviews, etc. while the other elements are more long term focused without that immediate consequence. Unfortunately, there will always be more work (especially in the integrity world) and more responsibilities. The other elements will be impossible to come back from if too neglected. Therefore, you'll see me request an alternative time to a last-minute meeting invite that is booked over my gym-time or why I'll ignore a non-urgent e-mail over my family time. Making time for my other needs helps me become a more productive worker over the long-term.

Things That Excite Me to Continue in the Industry

The most exciting thing about the integrity world is the passion and need to continuously improve and grow. There has been a significant increase in the amount of scrutiny in the industry over the last decade and we all need to collectively reduce our failure rates. The community that has been built up as a direct result is a community of sharing and cross-learning. Just look at the quality of conferences, presentations and papers through several channels including the International Pipeline Conference, AMPP/NACE, PRCI and the now defunct CEPA. Most people who get involved in the Integrity industry end up staying in it indefinitely because of how great the culture and community is. People are excited to contribute and teach others about what they've learned. That's a big reason why I expect to stay in this industry for the rest of my career.

Changes I would Like to Make in the Industry

I would love to see the oil and gas industry invest more money into industry research. Many of the studies and best practices were established several decades ago and I think we can do a lot to better to understand the failure mechanisms and develop better assessment methods of our pipeline threats to inevitably create better pipeline management programs. While research investments do happen, they happen slowly. There are only a few think-tank companies in the country doing this type of research and only a handful of operators who are funding them. With modern technology, we have an opportunity to do so much more research and can modernize our threat assessments to be more accurate, less conservative, and hopefully provide engineers with strong impactful mitigation measures that can be quantified instead of using SME input and best judgement.

But I won't be able to lead that change through the next 20 years. While companies fund more money towards emission control and ESG, integrity research funding will potentially become even harder to find and everyone will need to develop their own ways of doing more with less. Personally, I will be focused in making small differences through mentoring and education, so that the next generation of engineers will be better equipped and excited to take the torch through their career.

Advice to Attract Youngsters to the Industry

When I think back when I was a 'youngster', I could probably tell you that corrosion control is about as boring of a topic as they come. You don't get to build anything. A successful program looks like having nothing happen over a period longer than you've been alive. What teenager dreams of this for their future?

But that's the challenge…. we don't teach about corrosion in school beyond the basics. We need to continue attracting young people to the industry by talking about why corrosion control is a fantastic field to get into. We need to talk about the challenges the industry faces, the career growth potential, the societal impact, the job security. AMPP and ASM puts together an annual Teacher's Camp that sponsors high-school teachers to come and learn about corrosion so they can in-turn teach it to their classes. AMPP also hosts student sections at university campuses to help promote the industry to undergrads and graduate students. Several years ago, NACE had put together their study on the 'cost of corrosion' which outlines the sheer cost of the failing infrastructure that we all depend on. There is real long-term financial value for industry to invest in education in this field.