

PIPELINE TALES

ISSUE 3: SEPTEMBER 2022



A CANADIAN MAGAZINE FOR PIPELINERS

Table Of Contents

Table of Contents	1
Publisher's Notes.....	2
Readers' Comments	3
Wildlife Conflict Management Services - A Company Tale.....	4
Apache Pipeline Products - Company Advertisement	10
Safety Culture - What it was Like for me in the Past and What it's Like Today II.....	11
Heartland Coating - Company Advertisement	15
Metallurgical Requirements For Pipeline Steel - An Article	17
DroneBiz Aerial Imaging Inc. - Company Advertisement	22
Skin Effect Heat Management System For A Pipeline - An Article.....	23
CCI Solutions - Company Advertisement	26
Applying Risk-Based Thinking to Pipeline Projects - An Article	27
McElhanney - Company Advertisement	29
Power Infrastructures for Pipelines - An Article	30
Pipestone Projects - Company Advertisement	32
Competency - An Article	34
Sure Print - Company Advertisement ..	35
Comedy Corner.....	37
Gangotri Bhayana - Personal Advertisement.....	38
Pipeline Jargon.....	38
Piasha Pipelines - Company Advertisement	38
Contributors & Advertisers	40
Advertising Rates	42

Publisher's Note

Our first two issues of this **Pipeline Tales** reached over 35,000+ readers digitally. We are overwhelmed by such a response from our readers, and we thank our readers for supporting our vision of promoting the pipeline industry.

Through this magazine, we showcase pipeline projects in Canada and worldwide, promote pipeline and pipeline-related companies with their products and stories; and encourage our readers to share their personal stories, adventures, success, and failures.

We, the pipeliners, take our craft seriously as we pride ourselves in building efficient and reliable pipelines with our smarts, dedication, and hard work.

So please help us to help you. We hope to hear from you soon, as we will publish our next issue in **December 2022**, and we genuinely appreciate your support.



Hiran Ganguli, P.Eng. Publisher

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Readers' Comments

- ✚ Great magazine, Hiran and Sugata; thanks for sharing! - Claudia Gomez-Villeneuve, P.Eng. M.Eng. PMP DTM FEC; Professor, Pipeline Construction and Project Management
- ✚ “This magazine seems to be a wonderful step towards making pipeline services more familiar and popular among people.... we know so little about this.. keep it up. I am proud of you....” Dr. Sue Deb, Kolkata, India.
- ✚ “Hello Hiran, Thank you for the offer. I would like to contribute to the extent possible. Please guide me on how I could contribute. Thank You.”- Rameshkumar, Muscat, Oman.
- ✚ “Hello, I have been a pipelayer since 1958. In February 1982, I had the chance to witness a project called “TransCanada,” where the layout temperature of the pipeline was almost -50 degrees Celsius, whereas, in Algeria, we installed the pipes at +50 degrees Celsius. (Just pointing out the big temperature difference) I’ve been retired since 1998, and I just wanted to say that it’s been a pleasure to see people still working hard and being active in this field. Greetings from Algeria, and good luck with your work.” - Yahamed Yaker, Algeria.
- ✚ “Hiran, we will rerun our ad. Please send a link so that I can pay. Thanks.” - Garrett Dietrich, VP, Business Development, Cyntech Group, Houston, USA.
- ✚ “Well done, Hiran! - Vahid Ayan P.Eng., MBA., Edmonton, Canada.
- ✚ “Hi Hiran, it’s been a long time since we did not chat. Recently I have been back to Calgary. This magazine is a very good initiative from you to publish New Pipeline Magazine to share the professional experience with other professionals.” - Muhammad Ali Siddiqui, Calgary
- ✚ “Hi Hiran, very good pipeline magazine, Congrats.” Luis de Benito, Barrio Santa Lucía, San Juan, Argentina.
- ✚ Good morning, Hiran, Thank you for the good read. Have a great day! Darrel Ziehr, President, Midwest Pipelines Inc.; Suite 314, 7 Tri Leisure Way | Spruce Grove, AB | T7X-0T3 Canada.

A Company Tale

Wildlife Conflict Management Services When Employee Safety is Your Priority

Understanding Predatory Wildlife and Options for Protecting Your Workforce

By Kevin Wilson, President & CEO of Wild Encounters Ltd.

Not long ago, an average of three people were killed in bear attacks each year across North America, and recently that number has increased – a lot. With a burgeoning grizzly bear and thriving black bear populations over the last decade, companies operating in wilderness locations are confronting a mounting safety challenge. Here is how one of Canada’s top wildlife conflict mitigation services meets the need.

Placing professional wildlife safety consultants, or bear monitors, on worksites isn’t new, but it came to the forefront following a tragic incident in which a bear mauled a woman to death on a northern Alberta oil & gas site in 2014. With no firearm available, no non-lethal defense tools at their disposal, and most critically, no designated wildlife expert on-site, workers did what they could to deter a predacious black bear using a shovel and little more. Sadly, the attack was fatal.



Since then, and with the contemporary shift toward all things safety, most companies either employ their wildlife safety workers or hire professional wildlife/bear monitors on a per-project basis to mitigate conflicts. In comes **Wild Encounters Ltd. and its President & CEO, Kevin Wilson.**

We started his business in 2015 when I met a young fellow accompanying a survey crew and was watching for bears. I questioned what he would do if they encountered a bear, and he wasted no time saying he’d shoot it. That never sat well with me. With no consideration of the Wildlife Act, official wildlife regulations, or even recognition of the government’s predator response protocols and with only a focus on using lethal force, I knew there had to be a better, more professional way.

Fast forward seven years, and Wild Encounters is now a thriving company. We specialize in a variety of wildlife conflict mitigation services, including bear monitoring, industrial wildlife awareness & bear safety training and certification, worksite hazard assessment including drone services, worksite wildlife safety audits, wildlife defense supply sales & rentals, wildlife policy development, and Karelian bear dog and hound hazing services.

We realize that no two jobs are the same and cater to a wide variety of industries, from oil and gas to forestry, construction, tourism, and much more. Wild Encounters was involved with an assignment to monitor cougars following workers at a mountain ski resort. Staff would be out working on the snow-making equipment at night and see two mountain lions following them each night. They dispatched a consultant, met with management and staff, GPS mapped and assessed wildlife movement, kill-sites, and attractants, provided a risk assessment, and offered suggestions for mitigation.



Kevin Wilson

A Unique Business Model

Our business model is unique. While most smaller companies focus on bear conflict solutions, we saw a need to address the bigger picture. This allowed us to focus on educating the industry and the public about wildlife conflict, emphasizing western Canada's top predatory species. We are big on teaching workers, and the public, how to interpret and navigate encounters and attacks by grizzly bears, black bears, cougars, wolves, and even coyotes. We even address high-risk circumstances in which moose, elk, and other ungulates may present a threat.

Training & Certifying Employees

Nowadays, almost all employees on remote worksites must be certified with some type of wildlife awareness and bear safety training. The problem is that most online courses are short and provide no real-life experience or hands-on learning. Wild Encounter, however, is incredibly proud of our course curricula. We have designed our industrial courses to address a comprehensive list of critical topics from ecology to regulatory concerns, worksite design, human/wildlife interactions and conflict, understanding defensive and non-defensive encounters and attacks, and non-lethal and even lethal defense. There's much more to it than that, but another critical aspect of our course is the opportunity to receive hands-on training with inert sprays with our one-of-a-kind remote-controlled bear attack simulator.

Fish and Wildlife authorities have complimented us, saying they've never seen anything like it. Couple that with the overwhelming response from our clients who take the course, and we know we have a winner. Our clients called to thank us after their staff had an encounter with a charging grizzly where they could; resolve a dangerous encounter because of the various real-life encounters and advice we shared in classrooms.

We believe learning how to assess or interpret an encounter or attack accurately could save your life – and that's why we think that simply checking a box by having employees take short online training isn't enough. We firmly believe in face-to-face, hands-on training where employees can ask questions and learn about response options. Textbook information is excellent, but employees need to understand how to react to what happens if the scenario they encounter is different than what the textbook says.

Most often, bears aren't an issue until they are. Most long-time oilfield workers are accustomed to seeing bears, but the point is apathy. Most bears aren't a problem, but those what-if scenarios can, and sometimes do, have serious consequences. Those consequences can cause injury and even death. Practically speaking, when those incidents occur, there's a significant expense to companies. Whether one in 10 or 1,000, a predacious bear enters the scene now and then, and that's when things can turn serious in a hurry.

Bears will act instinctively to defend food, their space, or their young. Sows with cubs can be incredibly aggressive as they protect their young. The best option for companies to keep their employees safe is to educate them and influence their behaviour through wildlife safety policy development that

includes reasonable Standard Operating Procedures (SOPs) and efficient reporting protocols.

Placing Wildlife/Bear Safety Monitors on Worksites

The wildlife safety risk is real and ever-present on most remote worksites. Many employees say they don't feel safe with an increasing number of bears and other potentially dangerous wildlife showing up on remote worksites. Additionally, many say that productivity decreases when they constantly need to look for bears and other wildlife.

Wild Encounters' professional monitors actively participate in safety meetings, conduct daily on-site hazard assessments, accompany workers directly or peripherally, and document & report on sightings or actions to haze or respond to wildlife conflict. Most importantly, they intervene when problem wildlife shows up on the work site. Every monitor wears a chest pack with an InReach, or equivalent, a satellite communication device capable of beckoning immediate emergency response. They have communication capabilities with site medics and supervisors. They also carry a VHF radio and non-lethal defense tools like bangers, screamers, and bear spray. An industry standard for bear monitors includes carrying a suitable firearm with suitable ammunition as our critical PPE.



We have noticed a disturbing trend with some more prominent companies. It is a move toward banning monitors from carrying firearms, which we find confusing. While these same companies acknowledge a dangerous field-level hazard, some choose to handcuff monitors by taking away the very tool they need to navigate the ultimate risk. Thankfully, we've seen considerable progress with some of our larger clients moving to re-establish formal firearms policies. It concerns us greatly to think that it may take more fatalities for some of these companies to realize the necessity for firearms.

Our monitors are well-equipped to navigate bad encounters for themselves. Still, without the right tools, our ability to respond accordingly to protect work crews becomes limited physically, not just ours, but every monitor with every other company. For this reason, we have been meeting with government policy regulators to work toward establishing standards and guidelines to require proper PPE on every worksite. The key lies in ensuring that monitors have the appropriate training and skills to ensure implementation of Best Management Practices (BMPs) and safe carry/use on every worksite.”

Conducting Wildlife Hazard Assessments

Identifying and mitigating potential wildlife risk at the field level begins with a worksite and surrounding area assessment, and wild Encounters also offer comprehensive solutions there. We provide valuable feedback for clients seeking professional evaluations to identify wildlife risks and the need for answers. Our assessment tool addresses natural and artificial attractants, topographic features and wildlife



movement corridors, area wildlife population concerns, proximity to nature, worksite security, attractant management, employee education, and site security. Deliverables generally include detailed observations, area mapping, recommendations, suggested mitigation measures, and an overall risk rating.”

Wildlife Defense Supply Sales, Rentals & Installations

We recommend that companies not only equip their employees with wildlife defense supplies but also maintain an inventory and track those supplies. Many companies use practical equipment such as bear sprays, holsters, bear bangers, bear defense kits, and even electric fencing. The challenge, Wilson says, is ensuring that this equipment is in good working order, current, and/or installed correctly. We encourage companies to use brands like Counter Assault and Defense Aerosols because they tend to have the highest capsaicin (pepper irritant) count. We also recommend that asset managers ensure all bear sprays are viable. Each canister has a shelf-life of up to four years to be replaced after the expiration date.

We also rent and install portable and more substantial electric wildlife fencing for companies that don't want to purchase larger infrastructure items.

Wildlife Policy Development

Most companies recognize that they can't ignore wildlife risks. While many have existing policies in place, a lot don't. We strongly recommend that companies have a written standard to protect the company and its employees.

We believe that it is a matter of due diligence. Employees struggle with ambiguity, and it creates unnecessary risks. Everyone gets the same guidelines by drafting formal policies, procedures, and terms of reference around how workers respond to wildlife encounters. Our company can write and customize these policies to best suit the client's corporate culture and day-to-day work activities.

Dog Hazing Services

With recurring problem-wildlife, sometimes the best solution is to move them away from the work area. While translocating troublesome bears, or other wildlife, is usually a last resort, in some situations, hazing or educating that wildlife to avoid a work site is a good option. These decisions are typically made to prevent habituation or deprogram habituated bears or other wildlife. Following protocol, Wild Encounters Ltd. representatives work closely with area Fish and Wildlife authorities to ensure compliance with government regulations and to secure proper approvals. With these in place, either Karelian Bear Dogs (KBD) or hounds are brought on-site to haze the problem wildlife. The dogs are highly effective at not just moving them off-site but pushing them a long distance and letting them know they need to avoid the work area.



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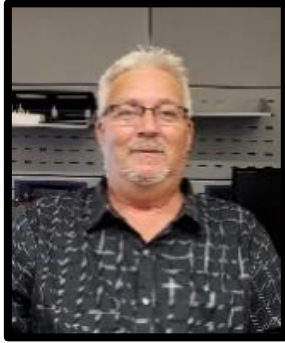
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An Article - Safety Culture

What it was Like for me in the Past and What it's Like Today – Part II

By Andy Systema



The Occupational Health and Safety Act entitles all workers to three rights:

1. The right to know about health and safety matters,
2. the right to participate in decisions that could affect their health and safety, and
3. the right to refuse work that could affect their health and safety and that of others.

Employers have duties under health and safety laws to assess risks in the workplace by identifying work activities that could cause injury or illness and taking actions to eliminate the hazard or, if not possible, control the risk.

I have listed below some of the policies, procedures, and laws used by employers to provide training and written documents to protect employees' rights and help identify risk and risk mitigations for specific tasks and project work. The employees can find most, if not all, of the following documents, in the employer's Health, Safety, Environment, and Security Management Plans.

Note: There are many different names and acronyms for the following list, and I am paraphrasing some of the wording.

- ✚ Occupational Health and Safety Act.
- ✚ Occupational Regulations and Code.
- ✚ Safe Work Procedures.
- ✚ Safe Work Policies.
- ✚ Job Safety Analysis.
- ✚ New and Young Worker Awareness, Orientations, and Training.
- ✚ Certificates of Recognition (COR) Certification and Audits.
- ✚ Safety Opportunity Reporting.
- ✚ Hazard Identifications.
- ✚ Near Miss Reporting.
- ✚ Incident Investigations.
- ✚ Incident Root Cause Analysis.

- ✚ Remedial Action Plans.
- ✚ Management of Change.
- ✚ Emergency Response Planning.
- ✚ Project Specific Safety Plans.
- ✚ Project Specific Safety Training.
- ✚ Employee Safety Training.
- ✚ Employee Competency Standards.



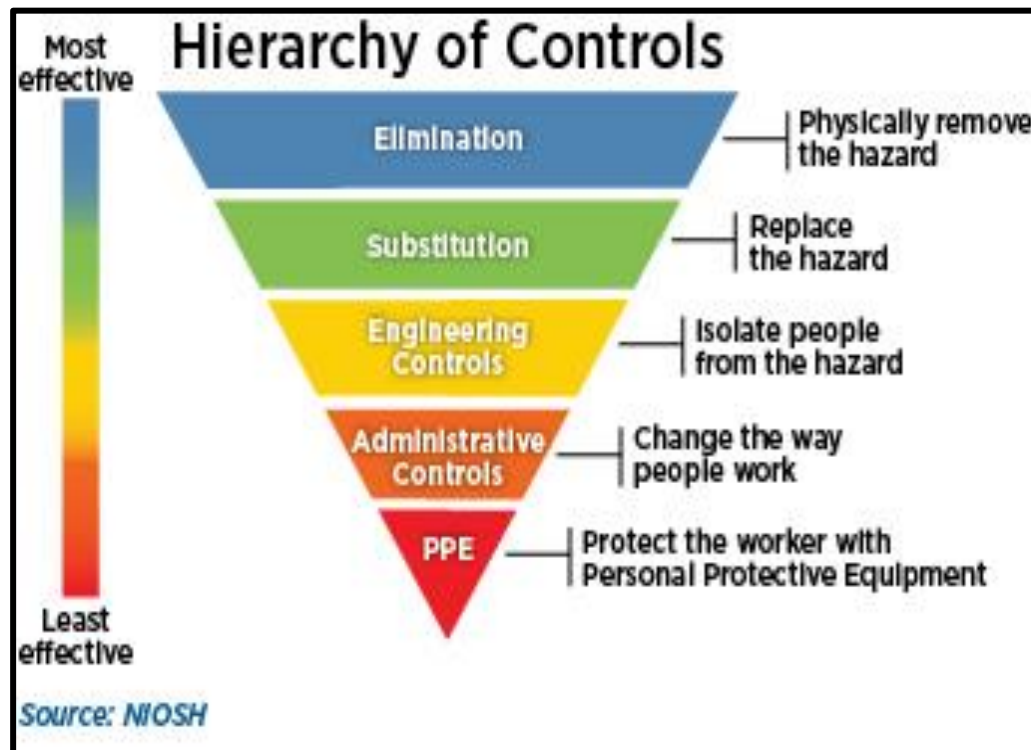
1998 Pipeline Construction, River Crossing As-built Survey, Smokey River, Alberta

This picture shows the survey team completing one of the last open-cut large-diameter pipe crossings I have worked on. The challenges were unique to this crossing.

During our pre-job meeting, we identified the hazards of working in water and the required life jackets to perform the task. The task was surveying the pipe location after lowering the river crossing pipe.

We also identified an additional hazard if one or all of us fell into the water. The underlying dangers were:

- ✚ Freezing water temperatures and the time required to rescue.
- ✚ Hypothermia.
- ✚ Standard life jackets are not sufficient to reduce the consequences of hypothermia.



We concluded that we would require personal survival suits instead of standard life jackets. In these water temperatures, hypothermia can occur within minutes, making a rescue exceedingly difficult and creating additional risks for personnel tasked with a rescue. Full personal survival suits are not that common in the province of Alberta. We found a company that sold the suits and had them sent to the site for use during the survey. As per the Hierarchy of controls shown, we could isolate people from the hazard by utilizing a boat, but we required personal protective equipment to reduce the risk of us falling into the water.

The helicopter is truly a great gift of kindness to the surveyor. Utilizing the aircraft for transportation can reduce the travel time required to get to the job site in some of the most remote parts of Canada. It reduces time and the safety risks that the workers who drive all-terrain vehicles (ATVs) to access the work site, which could be two to three hours in one way. The picture below may look

like I am the pilot for the day, which would be incorrect thinking; the passenger door is open for a reason.

Once this someone took this picture, our pilot conducted a safety orientation for the passengers. The orientation included:

- ✚ Operation of the helicopter
- ✚ The emergency beacon location
- ✚ The location of the tail rotor
- ✚ Survival gear
- ✚ How to board the helicopter
- ✚ Ensure the landing and loading areas were free of loose material
- ✚ Removing the hard hat, etc.



Throughout my years as a pipeline geomatics specialist, I have tried to utilize my education, safety training, and lived experiences to develop safety knowledge. When I combine that knowledge with the wisdom of others in the safety field, I know that I can impact the safe execution of projects. In mentoring others in safety and sharing my experience, I try to help others gain more knowledge about safety in the pipeline geomatics industry. When you take your knowledge and experience and put it into action, it becomes your wisdom. Share your safety wisdom freely and often.

Photo Credit: US Department of Labour. Andy Sytsema on a pipeline route selection in Montreal, Quebec in 2013

“That third-grade dropout, the wisest person I ever met in my life, who taught me to combine knowledge and wisdom to make an impact, was my father, a simple cook, the wisest man I ever met. He was a simple cook, left school in the third grade to help out on the family farm, but just because he left school doesn’t mean his education stopped.” Dr. Rick Rigsby from ‘Lessons from a Third Grade Dropout.’

Andy Sytsema is a Geomatics Technologist who has worked in the Geomatics industry for close to forty years, and the last thirty years have been in the Pipeline Geomatics Industry. The opinions expressed here are his own.

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An Article

Metallurgical Requirements For Pipeline Steel

By Hari Barari

Ductile fracture is always a desirable failure mode because brittle fracture causes catastrophic failure. The sinking of the Titanic is an example. One of the most critical factors in controlling the transition temperature is the chemistry of the steel. During the maiden voyage of the Titanic so many years ago, and in the subzero weather conditions in North Atlantic, the transition temperature of the steel used in the ship's hull was not suitable to survive the impact of hitting the iceberg. Also, the steel mills most likely produced the steel by the acid Bessemer process (the basic method was still not practiced then), which could not remove much phosphorus and sulfur. That played a significant role in the fracture.

The exact selection of microalloying in high strength low alloy grades and Thermo mechanical rolling are preferred methods to refine the grain and obtain high strength and toughness in large diameter pipes. The metallurgical quality requirements for these pipes are very stringent. And if used in a frigid environment, the material can become even more susceptible to brittle fracture. Therefore close attention must be given right from the beginning of the production processes, including in the selection of scrap mix as well as melting and refining and casting of the heat of steel. Every effort must be made to ensure that the steel has the right chemistry and is clean.

Steel Chemistry for Pipe

Various materials are suitable for pipelines, and these are selected based on specific applications. Temperature, pressure, corrosive environments, or fluids through these pipes make a big difference.

Let us consider three different commonly used ASTM specifications. ASTM A53 is used for both low/medium temperatures and pressure, ASTM A106 is used for higher temperatures and pressure, and ASTM A333 covers seamless and welded carbon and alloy steel pipe used at low temperatures.

A53 is best suited for transporting air, water, steam, and oil and for structural applications. A106 pipe is used for power generation applications at higher temperatures, and A333 Gr 6 has higher yield strength than A106 Gr B.

The following are the chemical compositions:

Seamless and ERW are both available in grades A and B. There is a slight difference between Carbon and Manganese because the yield and tensile strengths are slightly different. A53 and A106 are very similar in chemistry; therefore, as a producer, they produce these as a dual grade for increased flexibility.

ELEMENTS IN STEEL	Min/Max (%)	ASTM - A106 Grade B	ASTM A333 – Grade 6	ASTM A53 – Grade A	ASTM A53 – Grade B
Carbon (C)	Max	0.30	0.30	0.25	0.30
Manganese (Mn)	Max	0.29/1.06	0.29/1.06	0.95	1.20
Phosphorus (P)	Max	0.035	0.025	0.05	0.05
Sulphur (S)	Max	0.035	0.035	0.045	0.045
Silicon (Si)	Min	0.10	0.10	0.10	0.10
Niobium (Nb)					
Vanadium (V)	Max	0.08	0.08	0.08	0.08
Titanium (Ti)					
Aluminum (Al)					
Copper (Cu)	Max	0.40	0.40	0.40	0.40
Chromium (Cr)	Max	0.40	0.30	0.40	0.40
Molybdenum (Mo)	Max	0.15	0.12	0.15	0.15
Nickel (Ni)	Max	0.40	0.40	0.40	0.40
Calcium (Ca)					
Cerium (Ce)					
Boron (B)					

Manufacture of such steels in Melt Shop EAF & Continuous Casting

Consider a UHP electric arc furnace with a good carbon and oxygen injection arrangement. Also, the steels are made to a fine-grained practice with finished aluminum in the liquid steel shall be at .025-.045%. The ladle must be preheated, assuming the EAF and LMF have a mechanized alloy addition system.

Based on the chemistry here, the liquids of the steel are about 2,830 degrees F, and the tapping temperature is 3,040 degrees F. The scrap mix should be carefully chosen, so the residual elements are not too high. Those intentionally added, like Ni, Cr, Mo, V, etc., must be calculated with knowledge of their respective recovery rates. These are added in the ladle at chosen time and sequence in the tapping stream. The addition of fluxes (High Calcined lime and dolomite) are also an essential part of the scrap mix.

The Importance of Carbon Boil

An effective carbon boil must occur during the oxygen lancing in the furnace to produce clean steel. The melt-in carbon percentage could be aimed at 0.20-0.25%, then blew it down and promoted an excellent carbon/oxygen reaction. This boil is easily visible through the furnace door and the flames all around the roof. Then send a sample to the lab and check the %C. The heat should be tapped at around .10-.12%C, tapping temperature of 3040 degrees F with an Oxygen reading of about 1,000 ppm. At about a third of the heat poured, precalculated Al notched bars are added. This is needed for the production of fine grains. The ladle is then lifted and taken to LMF and rinsed for 5 to 7 minutes to obtain homogeneous temperature and chemistry. The carbon boil helps clean the steel by removing the impurities from molten steel to the slag phase, which is then de-slugged into the slag pit. Slag carry-over to the ladle is kept to a minimum, and the oxygen in the slag is reduced to zero. Calcium wire feeding is also employed for inclusion shape control.

Production of Clean Steels and its effect on Mechanical Properties

Clean steels contain minimal non-metallic inclusions, and their size, shape, and composition are controlled by having low amounts of sulfur, phosphorus, oxygen, nitrogen, and hydrogen. Thus, clean steel is necessary to develop superior mechanical properties like strength and toughness, even at a very low temperature.

The most common inclusions are oxides, sulfides, nitrides, and carbides. The source of these inclusions could be indigenous or exogenous. The indigenous are formed by precipitation in the liquid steel as the solubility of the solutes decreases as temperature drops. And the exogenous is formed from slags, refractory or different powders used in tundish during casting.

It is well known that the sulfide and oxide inclusions have highly detrimental effects on low-temperature toughness, fatigue strength, and Charpy impact value. Therefore, during the steel melting and casting process, the mills will:

- ✚ Minimize the total inclusions.
- ✚ Keep the partial pressure of hydrogen, nitrogen, and carbon monoxide at less than one to eliminate bubble formation, which causes pinholes.

Desirable Microstructures of Pipeline Steels for Low-Temperature Use

The pipeline company can reduce the cost of long pipelines by decreasing the wall thickness of the pipe. Similarly, they can improve the pipeline's performance by increasing the pipes' strength and toughness by designing the best microstructures using low carbon and microalloying controlled rolling.

Adding Ni, Cr, Mo, B, Nb, and V or Ti significantly increases yield strength. Also, the usual ferrite-pearlite microstructure could be changed to ferrite-bainite. It is best to have the bainite in spherical form and make the grain size much finer, about ASTM 10/11. Interestingly, by slightly increasing the Ni %, the nose of the T-T-T curve shifts to the right, thus allowing a longer cooling time resulting in desirable bainite in the structure.

Selecting the correct soaking temperature in the reheating furnace, proper reduction ratios through the rolling mill, and the accurate finishing temperature are critical to developing the desirable microstructure.

During rolling, close attention is given to the reduction ratios, as mentioned earlier. In particular, the finishing temperature out of the final pass determines the final grain size. Reduce the amount of pearlite (for better weldability) and replace it with ferrite/bainite. This may reduce the strength somewhat but is offset by precipitation strengthening and work hardening due to increased dislocation density.

The ductile to brittle transition temperature is a temperature below which the steel can fail abruptly, and no one wants that to happen. So, for steels used in subzero conditions, it is essential to ensure there is no brittle fracture in trans granular cleavage mode. The Charpy impact values are met during mechanical lab testing as the specifications recommended, and there should be sufficient necking in the tensile testing samples during plastic deformation.

Acronyms

ASTM: American Society for testing materials

EAF: Electric Arc Furnace

UHP: Ultra High Power

ERW: Electrical Resistance Welding.

Hari Barari did his undergraduate degree in Metallurgical engineering from the Indian Institute of Technology (IIT, KHARAGPUR) and a Master's degree from the National Institute of Technology (NIT, DURGAPUR), specializing in the production of alloy steels. His career started with the Steel Authority of India Ltd. (SAIL) at their Durgapur plant with the Research & Control Laboratory. His experience focused on the relationship between microstructures and the various metallic properties while working in the Metallographic Laboratory.

Later Barari moved to the USA and continued working in the steel industry. From this time onwards, for the next 36 years, he was engaged in high-speed mini mills, mainly in Structural products. He was responsible for alloy and chemistry design and development of final finished products' quality and performance. Product failure investigation was an essential part of Barari's Metallurgical responsibility.

Barari spent his last two years as a VP (Quality) as an ex-pat in India when the GERDAU STEEL from Brazil operated their Special Steel Division. This company used to work in 14 countries and is one of the largest steel companies.

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An Article

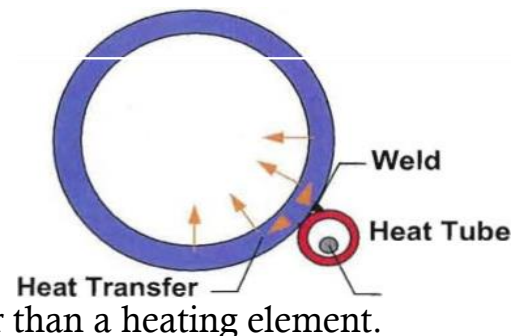
SKIN EFFECT HEAT MANAGEMENT SYSTEM (SEHMS) FOR A PIPELINE

By Tushar Joshi

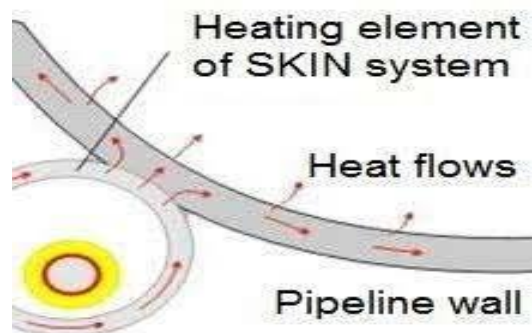


Transportation of waxy crude through the pipeline requires heating. To heat the pipeline, the SEHMS plays a crucial role in providing easy transportation of waxy crude.

A Skin traced heating system consists of a heat-release-element-heat-tube (Carbon steel Seamless) strapped or welded to the carrier pipe (See figure below). The heat tube is continuously welded to the carrier pipe to produce heat and maintain the specified waxy crude oil temperature. The weld is “non-structural” and strictly required as a heat transfer media to the carrier pipe. Running through the heat tube is a custom-insulated, high-temperature nickel-plated copper cable that serves as an electrical power carrier rather than a heating element.

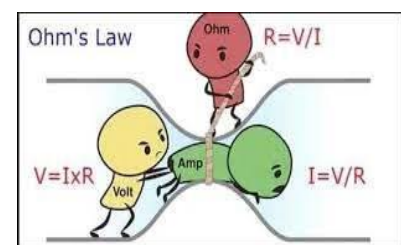


In an ideal circuit, all the power applied to the input terminals would reach the critical load with no energy wasted or dissipated in the wiring or components along the power path; however, these components always have some resistance. This occurs with AC and DC supplies, causing electrical losses to dissipate as heat losses. These losses can be calculated as below:



Ohm's Law: $V = IR$ where V = voltage (Volts) across a component, R is the component's resistance (in Ohms), and I is the current in Amps through it.

Power Law: $W = VI$ where V and I are as above, and W = power dissipated in Watts.

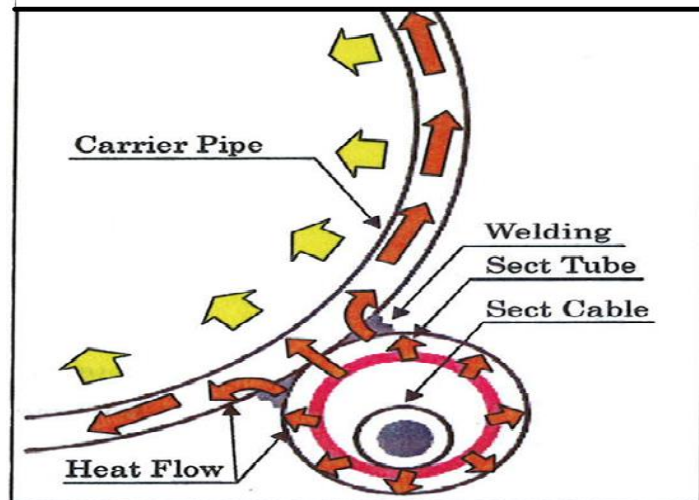


Combining these, we can see that the loss $W = (IR)I$ or I^2R . This equation is known as heat loss for SEHMS.

Skin effect is the tendency of an alternating electric current (AC) to become distributed within a conductor such that the current density is largest near the surface of the conductor (Heat tube) and decreases with greater depths in the conductor.

The same phenomena are used and applied for SEHMS, whereby the path of the power is from the Main source to the STS cable to the heat tube by providing solid earth at the end junction box.

In this system, a tube (referred to as 'heat tube') attached to the main pipeline is heated by a current-carrying conductor running inside the tube. The heat



tube, in turn, conducts heat to the main pipeline. Heat is generated on the inner surface of a ferromagnetic heat tube by I^2R loss of the return current flow and by hysteresis and eddy currents induced by the alternating magnetic field around the insulated conductor attached to the pipeline.

SEHMS system is the only cost-effective industrial system with the low maintenance of heat tracing of long and extra-long pipelines to ensure regular product flow.

The heating element is a low carbon steel tube with a wall thickness of less than 3 mm inside which a non-magnetic copper conductor is placed. At the end of the run, the conductor connects to the steel pipe. At the beginning of the run, an alternating voltage is applied between the pipe and the conductor.

The voltage value is calculated considering the heat generation required and the length of the heated segment.

Alternating current runs through the whole inner conductor (Cable) section, and no significant surface effect arises in non-magnetic material with good conductivity.

In the outer ferromagnetic conductor (heat tube), the "SKIN Effect" is clear-cut, and the whole current runs through the internal tube layer with about 1 mm thickness.

The potential of the external surface of the heat tube keeps on being virtually ZERO. Due to the light thickness of the Skin layer, primary heat generating (up to 80%) is performed in the heat tube. At the beginning and end of the circuit, the outer surface of the heat tube is grounded, ensuring additional safety of the SEHMS systems.

It means the SEHMS is safe and reliable because:

- ✚ The external surface of the heating element (heat tube) has zero potential against the earth, and it is grounded and completely protects the current-carrying conductor inside the heat tube.
- ✚ Strong heat-generating elements in the heat tube provide mechanical strength and protect the conductor from damage.
- ✚ Heat-generating elements do not have outer insulation, which can be damaged during installation.
- ✚ It is a more reliable system with less investment than other heat tracing systems for long and extra-long pipelines.

SEHMS Terminology and Powerup:

One end of the STS cable is at the Power Junction Box (PJB), and the other at the END Box (Approx 15 km), in between power stations. The system current passes through the Skin effect Traced heating System (STS) conductor and returns through the heat tube.

Since the insulated copper wire is inside the hollow steel conductor, the inductive interaction between the “GO” and “RETURN” Current in the Carbon steel pipe (heat tube) concentrates at its inner surface.

The resistance to the current flow in the carbon steel pipe (heat tube) produces heat, which the carrier pipe conducts through its continuous weld system.

Tushar Joshi is a SEHMS Specialist with expertise in system Installation, commissioning & testing, Operation & maintenance with troubleshooting.

A Memorable Quote

“You'll need to learn to work for free before you work for money.” Arthur Andrews.

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COLLABORATION. COMMITMENT. INNOVATION.

An Article

By Akhilesh Manchanda, P.Eng., CMQ-OE



Applying Risk-based Thinking to Pipeline Construction Projects
 A White Paper with Red Marks
 By Akhilesh Manchanda, P.Eng., CMQ-OE

Management Systems
focus

ADDRESSING THE NEEDS TO APPLY RISK-BASED THINKING (RBT) TO PIPELINE CONSTRUCTION PROJECTS TO FORMALIZING VALUE ADDING DECISION MAKING APPROACH AND COST SAVINGS.

COVID-19 has taught us that the VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) World has become more prominent and relevant now than ever before; many organizations are facing challenges they had never encountered in the past (learn more on VUCA at <https://hbr.org/2014/01/what-vuca-really-means-for-you>).

The International Organization for Standardization (<https://www.iso.org/>) published ISO 31000 2018 Risk Management Guidelines to combat the VUCA world and drive organizations toward sustainable success and growth; the guidelines complement the ISO 9001:2015 standard. Risk-Based Thinking also assists an organization in transforming knowledge and experience into strategic insights and competitive advantage. Every process comes with associated risks. Pipeline construction projects possess many potential failure modes. Hence, they must be identified, analyzed, assessed, and mitigated or eliminated to enhance probability of project success and build a reliable asset for the owner.

Applying RBT to manage contractors: understand existing and potential business context and outlook, identify critical prime and sub-contractors, perform risk assessment (see figure) by identifying, analyzing, and evaluating risks. FMEA techniques and high, medium, and low risk rankings may be used to prioritize sub-contractors that need a focused approach to manage them to mitigate organizational risks.

RISK-BASED THINKING (RBT)

What is “Risk Based Thinking”?

A few definitions of “RBT” can be found online, e.g., Risk-Based Thinking is a “mindset to proactively improve the certainty of achieving outcomes utilizing methods that consider threats and opportunities” (Laqua, 2018). However, this definition resonates better with my views: “While considering impact on the entire business, RBT is a systematic inherent thought process of making value adding decisions proactively and integrating risk thinking at all levels of the management”.

Why is “RBT” important for an organization?

RBT improves decision making that could provide many benefits, e.g., preventing internal/external failures and associated costs, improving incident response time, enhancing organizational knowledge, innovating ideas, and opportunities to improve, grow, and sustain in the VUCA world.

KEY STEPS TO INSTILL RBT

1. Discuss needs and benefits of RBT with the leadership and how an environment for risk-based thinking and decision making is vital for an organization; secure and communicate commitment.
2. Engage managers and other stakeholders to develop Risk Management Framework, identify risk profile for all stakeholders, and create awareness to process owners.
3. Evaluate existing processes and procedures, ensure they are aligned with RBT for making decisions, identify critical decision-making steps that should be taken after appropriate RBT.
4. Provide resources to support RBT, including ongoing training, facilitation, coaching, and mentorship.
5. Be agile, facilitate Process-FMEA, and maintain a risk register to demonstrate risk mitigation.
6. Monitor risks (threats/opportunities), outcomes, trends, and risk management program maturity.
7. Discuss risk management outcomes as part of Management Review meetings, improve overall risk management program, and communicate successes based on mitigated/treated risks.

FMEA: Failure Mode and Effects Analysis, RBT: Risk-Based Thinking, ITP: Inspection and Test Plan, NDT: Non-destructive Testing





Getting the most from Risk-Based Thinking

Constant application of risk-based thinking enables an organization to excel under the context of ambiguities and uncertainties. A structured and robust risk management approach applied proactively at an early phase of the project, e.g., FMEA (Failure Mode and Effects Analysis), prior to the execution phase, could prevent errors and provide significant savings for the organization. For example, consider following areas to plan pipeline construction processes' risk analysis:

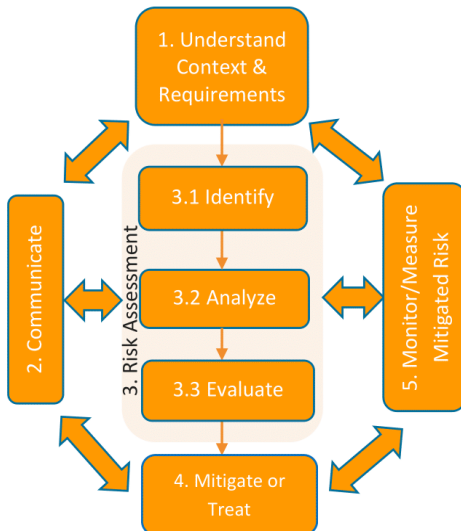
Contributor/Process	Welding	Coating	Bending
Method Effectiveness	Verified welding specs, ITP, and procedures for the asset	Verified coating specs, ITP, and procedures	Verified loading, bending, and unloading steps
Machine Capability	Auto or manual machine challenges to realize consistent intended results	Verified abrasive & blasting air, spray/coating thickness controls	Verified conditions, no sharp parts that could damage the pipe
Manpower Competency	Verified competent welder (girth/repair welding)	Certified and competent applicator (NACE Levels)	Detailed understanding of the machine and process
Measure Conformity	Proven compatible and advanced NDT techniques	Verified coating temp., holiday test, calibration	Verified location, angles, and forces to bend
Material (Raw, Consumables)	Verified material, controlled & monitored storage	Verified correct mix of raw materials	Verified pipe handling protocol on the machine
Working Conditions (Environment)	Variable Weather, how it will be aligned with WPS	Verified storage and pre-heat conditions	Verified process for variable conditions



While making a crucial decision for the business, think what could go wrong and how it can be prevented or protected by effective process design or control(s).

"In today's world, an integrated robust risk-management approach has become imperative to design and deploy an effective quality management system." AKHILESH MANCHANDA, P.Eng.

RISK MANAGEMENT FRAMEWORK



1. Understand dynamic context and client, regulatory, and organizational standards and requirements. Furthermore, understand conformance and compliance requirements as applicable with potential impacts to the Asset.
2. Communicate and Engage Personnel: identify who should be involved, communicate, and engage relevant personnel, create awareness, and set up a closed loop feedback mechanism.
3. Risk Assessment: figure out risks under variable conditions, analyze severities and potential frequencies, prioritize them based on defined criteria, and assess risk tolerance/acceptability from organizational perspective.
4. Mitigate or Treat: What can be done to mitigate identified/prioritized risks? Consider all viable solutions within and outside organizational controls, including engineering, procedural, and administrative controls.
5. Review, Monitor, and Measure: review successes, opportunities for improvement, and instill actions to improve the process to realize a reliable pipeline. Show and publicize progress and successes often.

Framework Reference: ISO 31000 Risk Management - Guidelines

CAUTION:

1. Stakeholder engagement is vital to succeed; ensure engagement at all levels.
2. Be careful while rewarding "firefighters"; promote an inclusive culture of prevention.
3. Avoid considering RBT as a separate concept or approach; it must be inherent within process design and deployment.



Akhilesh Manchanda is a professional engineer registered with APEGA and ASQ Certified Manager of Quality & Organizational Excellence. He possesses leadership experience in management systems development, competency management, digital transformation, and auditing; he works with Midwest Pipelines Inc. as Management Systems Specialist, and with NAIT as CED Instructor. In this White Paper, he shares his ideas and recommendations to assist quality management practitioners engaged in management systems' development and deployment. He does not represent any insight from his employers.

Akhilesh may be contacted through LinkedIn at: <https://www.linkedin.com/in/akhileshmanchanda/> or email: am2016@shaw.ca

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**YOUR CHALLENGE
OUR PASSION**

An Article

The Power Infrastructure for Pipelines

By Mihaela Ciulei, P.Eng., PMP, M.Eng.



A reliable power infrastructure is essential for the pipeline business. Any unplanned power outage creates significant revenue loss. If the unexpected power outage impacts a valve service that is used to shutdown a pipeline, this could result in a significant safety incident. This is because the Pipeline Company will not be able to shutdown in case anything happens during an emergency power outage. This is why the pipeline companies need to work closely with the Utilities on Outage Management and Optimization, Maintenance Planning, Power Forecast, Technology and Innovation, and Business Continuity Program Procedures.

In this article, I will talk about unplanned power outages: reasons and examples of how to be proactive to minimize the impact of these outages.

The main reasons for unplanned power outages are:

- Weather (high winds, storms, snow).
- When cars hit powerpoles or planes come in contact with the power lines.
- Animal contact at the customer and utility substation.
- Unexpected equipment failure, fires.

Sometimes the Utility Distribution System is impacted by another Utility Transmission system. Therefore, the Pipeline Companies need to work not only with their direct Utility providers but also be aware of the indirect impact of the other Utilities, monitor the situation, and take proactive steps to mitigate any potential issues. For example, one valve site is fed from the Distribution Line of Utility A, and Utility A depends on the transmission power grid of Utility B. Therefore, any unplanned outage of Utility B will impact Utility A and its customers.

The first steps for the pipeline companies are to work with the Utilities on the preventative maintenance programs, the five years outlook maintenance planning, and enhancement of the business continuity program (BDP) procedures. The Pipelines and Utility Companies also need to review the Utility Reliability Reports together at least once a year, identify the weak areas and possible associated issues, and take steps to mitigate any potential power issues.

Typically, the Utility Reliability Report shows the standards that the Utility follows, past year operations summary, transmission delivery point interruptions, the power quality events of the past year (if any), investments, planning maintenance, and inspection methods of their assets. In Canada, the Utilities employ the Canadian Electrical Association (CEA) definitions for delivery points and interruptions to track and benchmark their reliability.

Unplanned outages cannot be avoided all the time. However, Pipeline and Utility Companies can take steps to minimize the unexpected power outage:

1. Dual feed – Building and or/upgrading a transmission power line takes between 3 and 4 years. The Pipeline Company needs to identify the sites for which uninterrupted power is critical and plan for this type of project.
2. Back up generation for critical sites
3. Most times, the duration of the unplanned power outage is long because it takes time to find where the damage is. Minimizing this time through the use of modern technology is recommended. Also, it is essential to know that many Utilities do not have 24/7 incident response teams. Even if they have this team, there are situations when the crew is not allowed to work for safety reasons
4. The Pipeline Companies can negotiate with the Utilities and get priority when restoring power.
5. Continuous communication between the Pipeline Company and the Utility is critical. This helps both businesses and also helps with ESG initiatives. It is recommended a Pipeline Company be able to notify the Utility of any significant load drop. Also, if a Pipeline is shutdown during an unplanned power outage and does not need the power right away, it is recommended to communicate this with the Utility so that the other customers who need to use the power immediately are prioritized

Example of planning for an alternate power supply for valve service.

Utility A plans to have a power outage that will impact Utility B and its customers. Pipeline C is Utility's B customer. The best approach is for Utility A to engage Utility B and Utility B to notify Pipeline C as early as possible. All parties need to meet to discuss options for an alternate power supply. Each option will be assessed based on schedule, budget, and other requirements such as regulatory permits and crossing agreements. Sometimes it is possible to install a temporary tie-in switch to feed the Utility's B customer from another source. Other times a backup generator is employed, etc. Any chosen solution may take a few months to implement. If Utility A fails to communicate with Utility B and engage Pipeline C, Utility's A power outage becomes unplanned for Pipeline C. This is why it is critical for Pipeline C to continuously communicate with the Utilities and identify any activity that could create an unplanned outage early.

Mihaela has over 19 years of operations and project leadership experience and a history of building strong, cohesive teams and delivering exceptional results. Mihaela loves volunteering for the Community and Engineering Profession, advancing People, and contributing to creating better workplaces.

Some of Mihaela's professional highlights are:

- ✚ Leading the Canadian Power Infrastructure for the Line 3 Replacement Project, a multibillion-dollar investment.
- ✚ Actively participated in developing the Energy Management Diploma Program of Norquest College and contributing to "Building a safe and resilient Alberta" through her work with APEGA.
- ✚ Mihaela's research contribution to the reliability of the power systems is acknowledged in the Power Distribution System Reliability, Practical Methods and Applications Book by Ali A. Chowdhury and Don O. Koval.

For more about Mihaela's activities, check:

www.linkedin.com/in/mihaela-ciulei-peng-pmp-meng-executive-mba-candidate-950b70a1

A Memorable Quote

**"Get good at a lot of things before you learn what you want to be great at."
Arthur Andrews.**

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An Article

Competency

By Hiran Ganguli, P.Eng.
President of Piasha Pipelines

I am unsure if you have noticed that our entire work culture is slowly shifting to a candidate's competency rather than the years of experience or position they have held.

Canada Energy Regulator's NEB – OPR-99, Clause 54 (2) states that:

“An inspection (pipelines) shall be performed by a person who has sufficient expertise, knowledge, and training to competently carry out the inspection.”

From this statement, we can interpret that our regulators are looking for competent persons with sufficient expertise, knowledge, and training to do a job. We can also interpret that it is not the years of experience or position that are important but how competent a person is. Now, the question is, “What is competency?”

Several years ago, a pipeline company hired me to set up their pipeline hydrotesting program. They wanted to launch this program because the National Energy Board (now Canada Energy Regulator) detected errors while reviewing the Company's Leave to Open (LTO) application documents submitted after completing a few pipeline hydrotests.

Once I started my assignment, I wanted to interview some of their pressure testing inspectors to determine how they conducted the pipeline hydrotests. My requests did not sit well with these inspectors, and some were quite upset because they had been hydrotesting for the company for the last 25-30 years. However, I started my interviews diplomatically, trying not to aggravate them, and found out some of them were hydrotesting the pipelines following the wrong process.

When I mentioned it to them, they angrily told me they had over 25 years of experience and had done over 100 hydrotests. They could not understand they had been doing it wrong all these years.

Now the question is, in spite of all these years of experience, and conducting over 100 tests, are these people competent?

By consulting various sources, we find the following synonyms for competency:

Ability	Knowledge	Capable	Able
Proficient	Adept	Accomplished	Skillful
Gifted	Talented	Masterly	Expert
Qualified	Trained	Efficient	Good
Knowledgeable	Excellent	Brilliant	Great

To simplify the definition of competency, let me share another story.

I was on a pipeline training assignment on a construction site and stayed in a motel for three months. The motel supplied a bar-b-que for the guests. One evening, I took out a couple of burgers and found that I could not open the propane tank's valve, and I was trying to open it with my hands as I did not have any tools. Then I saw another elderly guest walking by and asked if he could help open the valve. He tried to open it but failed. He then told me he would bring a hammer from his truck and open the valve. I was not too keen on using a hammer for the job and asked him if the hammer would work.

He told me very confidently that he was mechanically oriented and would be a piece of cake for him to unlock the valve. He came back with a hammer and started pounding on the small handwheel. Before I realized the handwheel was made of soft metal, he had broken it into pieces with hammer blows. He saw what he did and told me that the valve was already damaged and the motel owner needed to replace the valve or the propane tank. Then he took off in a hurry. My supper ended with me buying a hamburger for the nearby hamburger joint!

This man had many years of mechanical experience, **but was he competent?**

Here is my simple definition of competency.

Competency is not doing the right things but doing things right every time.

My boss asked me to write an article and gave me five days to finish. So, starting Monday morning, I went to work on time, did my research, wrote the first draft, revised the draft, took an exactly one-hour lunch break, and finally, on Friday at 4:00 PM, submitted the article to my boss. I did all the right things to complete the assignment.

My boss called me at 4:15 PM and told me that I had written the article on the wrong subject!!

I did all the right things to complete the assignment, but did I do the things right?

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Comedy Corner

An old golfer was hitting his ball near a water hazard, and his club fell into the water. When he cried out, the Lord appeared and asked, “Why are you crying?”

The golfer replied that his club had fallen into the water, and he needed the club to have a chance to win the tournament and supplement his meager pension.

The Lord went down into the water and reappeared with a golden club. “Is this your club?” the Lord asked. The golfer replied, “No.”

The Lord again went down and came up with a silver club. “Is this your club?” the Lord asked. Furthermore, the golfer replied, “No.”

The Lord went down again and came up with an iron club. “Is this your club?” the Lord asked. The golfer replied, “Yes.”

The Lord was pleased with the golfer’s honesty and gave him all three clubs to keep, and the golfer went home happy.

Sometime later, the golfer was walking along the water hazard with his wife, and she fell into the river. When he cried out, the Lord again appeared and asked him, “Why are you crying?”

“Oh Lord, my woman has fallen into the water!”

The Lord went down into the water and came up with Kate Upton. “Is this your woman?” the Lord asked.

“Yes,” cried the golfer. The Lord was furious. “You lied! That is a lie!”

The golfer replied, “Oh, forgive me, Lord. It is a misunderstanding. If I had said ‘No’ to Kate Upton, you would have come up with Jennifer Anniston. Then if I said ‘No’ to her, you would have come up with my woman. If I said ‘Yes,’ you would have given me all three. And Lord, I am an old man unable to care for all three women in the way they deserve, and that’s why I said ‘Yes’ to Kate Upton.

And God was pleased!

The moral of this story is: If a golfer ever tells a lie, it is for a good and honorable reason and only out of consideration for others!

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Gangotri worked for Piasha Pipelines and helped us set up the online training courses. We wish her all the best in her new endeavor.

Pipeline Jargons

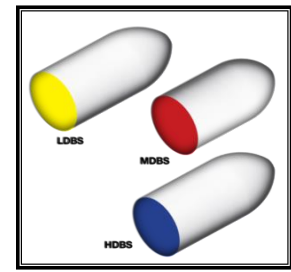
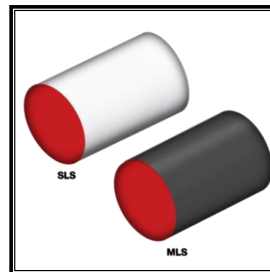
Here are some animal names we use in our Canadian pipeline industry. What happens in your country?

Pup:

A smaller piece of pipe, one to five metres long.

Pig:

A cylindrical piece that used to clean pipelines.



Dog:

These are the clamping shoes on an internal clamp used on automatic welding machines to line up two pipe joints for pipeline welding.



Cat:

Cat is short for the category, which is the specification of a pipe. There are three categories, Cat I, Cat II, and Cat III.

Cat I: Pipe without requirements for proven pipe-body notch toughness properties.

Cat II: Pipe with requirements for proven pipe-body notch toughness properties in energy absorption and fracture appearance.

Cat III: Pipe with requirements for proven pipe-body notch toughness properties in energy absorption.

A Quote

“Sometimes I wish I were a mirror. So that when people come to me, point out my faults, and ask me to change, they get a chance to see themselves in the mirror and change themselves instead.” Hiran Ganguli.

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Piasha Company Profile

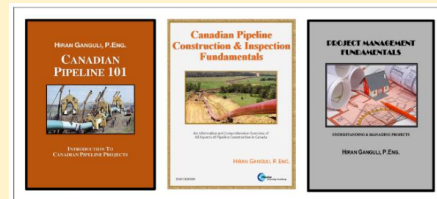
Piasha Pipelines was established in Calgary in 2001 to offer consulting and training services to the Canadian Pipeline industry. Piasha has:

- ❖ Consulted with many pipeline owners, consulting, and construction companies.
- ❖ Developed and provided pipeline-related training courses to over 1,500 students.
- ❖ Certified over 70 pipeline inspectors.
- ❖ Developed numerous procedures, standards, and training courses.



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It is a full-day certified course designed to train the participants in the pressure testing of Canadian pipelines. Through hands-on exercises, the students learn how to calculate hydrotest pressures based on CSA and NEB codes & standards, pressurizing, yield plotting, leak detection, and Test acceptance through a mock in-class hydrotesting exercise.

4. INSPECTOR TRAINING FOR PIPELINE CONSTRUCTION

A six-month in-home 28-module correspondence course with certificates to train individuals about inspecting Canadian pipelines during their construction: the students write multiple-choice exams at the end of each module to receive a certificate of completion.

5. UNDERSTANDING & MANAGING PROJECTS

It is a full-day certified course designed to expose students to Project Management fundamentals, including Planning, Scope, Schedule, Risk, and Cost.

Upcoming Courses

Canadian Pipeline 101 (Online Course)

October 19, 2022, and November 23, 2022

Please register through our website.

www.piashaconsulting.com; info@piashaconsulting.com; 1-844-PIASHA1 (742-7421)

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We sincerely thank our contributors, reviewers, and advertisers for supporting our magazine. We hope to see you again in our future magazines.

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Our next and final 2022 issue will come out in December 2022. **We have decided not to charge our first ten advertisers for this issue.**

Here are our rates for 2023:

- + We will launch six magazines in 2023 starting from February and every second month.
- + For **Personal Tales**, we will charge no money.
- + For a full-page **Company ad** with a .jpf or .png print-ready file, we will charge **\$300 (Canadian) per issue**, payable in advance through our website.
- + For a **Company story/tale with a word count of around 1,600 and a maximum of six photographs**, we will charge a fee of \$600 (Canadian), payable in advance through our website. Our editor will edit the company tales and send them back to the companies for final validation.
- + If your company would like to submit different ads for the six issues, we will charge you a **one-time** discounted fee of **\$1,500**, payable in advance through our website.

We expect that by the end of 2023, we will reach a digital readership of 100,000 all across the globe.

Please get in touch with us if you have any questions.



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