



APETT E-MAGAZINE

EVOLVE

VOL.1 • ISSUE 01 • DEC 2025 - MARCH 2026

FORWARD EVER, BACKWARD NEVER...

Discusses national development plans; the vital role of engineering in successful project implementation.

THE CRISIS OF WIND- RESISTANT ROOF CONSTRUCTION IN TRINIDAD AND TOBAGO

Addressing T&T's storm vulnerability, urging adherence to wind-resistant roof construction standards.

CYBERSECURITY IN ENGINEERING

How Increased Awareness can Safeguard the Future and Integrity of Projects in Trinidad & Tobago.

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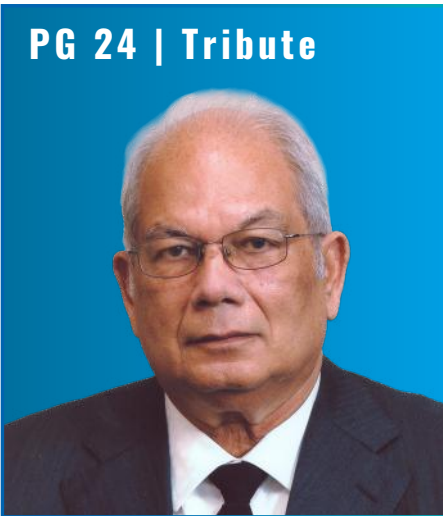
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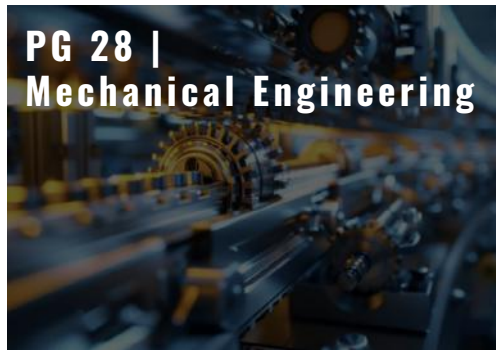
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THE FOYER

APETT Publications
Committee

Welcome to EVOLVE

APETT's renewed magazine
– a meeting place for every
engineering discipline

Promotion of the proficiency, knowledge, and skill of professional engineers is one of the four pillars of APETT's mandate. A key way we deliver on that mandate is by providing a platform for engineers to share ideas, opinions, innovative concepts, design methodologies, new materials, and general knowledge with the wider engineering community.

For many years, that platform was APETT's magazine, typically published once a year, with the last issue released in February 2020. The 2025/2026 Council of the Association of Professional Engineers of Trinidad and Tobago is therefore proud to announce the revival of our magazine in a new digital format, aptly named EVOLVE.

Why EVOLVE? Because the name reflects what engineering is at its core: continuous progress and growth. It signals innovation, adaptability, and a commitment to lifelong professional development. It also represents the evolution of APETT's own voice and brand as we step confidently into a more visible, future-oriented role in the national conversation.

APETT has embarked on a renewed journey to significantly ramp up its activities — not only by maintaining flagship events such as the Honours and Awards and the Biennial Technical Conference,

but by strengthening other pillars of engagement. One of these is the publications arm of the Association: the PEN newsletter and now the reborn APETT magazine, EVOLVE.

The goals set out in the Association's strategic plan are ambitious and demand sustained effort. However, the payoff is clear: stronger, more meaningful representation of engineers — members and non-members alike — across multiple sectors of the national community. Through its publications, APETT intends to stimulate members to contribute editorials, technical articles, and thought pieces, and in so doing, inspire non-members to see the value of joining the Association.

Many APETT members also belong to professional institutions in the US, UK, and Canada, all of which maintain strong publication traditions. Their newsletters and magazines are released regularly to global memberships and provide educational content, updates on technological advances, job opportunities, case studies, and more. A notable feature of many of these publications is that they are discipline-specific.

EVOLVE, by contrast, will serve as a hub where all engineering disciplines converge. It will be a shared space for civil, electrical, mechanical, process, structural, environmental, geotechnical, industrial, and other specialisations to exchange knowledge and perspectives. The Publications Committee will actively engage with each discipline chair, encouraging them to mobilise their members and bring this relaunch to life with a strong pipeline of quality content.

We have also been paying attention to the growing activity on platforms such as LinkedIn. Engineers are already using social media to share viewpoints, highlight achievements, and make important announcements. EVOLVE aims to harness that same energy and “take it up a notch” — channelling it into a curated medium with deeper technical content and a longer shelf life, for the benefit of the entire profession.



“

EVOLVE is APETT's commitment to keep pace with that change and to lead where we must. It is a space where engineers can think aloud, document what works and what doesn't, challenge assumptions, and record the technical story of Trinidad and Tobago's development in our own words.

APETT's membership drive is likewise gaining momentum, with student applications increasing at career days and outreach events in secondary schools and at the University of Trinidad and Tobago. These students are eager to begin their journeys of professional growth, and they are looking for communities that will support and challenge them.

The familiar question, "What does APETT do for me?" is one the current Council is actively reframing. In the spirit of the late John F. Kennedy, we invite a shift in perspective:

"Ask not what APETT can do for you, but what you can do for APETT."

In a national context where professional membership is not mandatory, adopting this mindset can trigger a positive shift in

participation, ownership, and pride in the profession. That shift is essential if APETT is to occupy the space it truly should in national development.

We have already seen how quickly formats can change. Motion pictures moved from drive-ins and single-screen cinemas to multiplexes and now on-demand streaming. Likewise, the way we share professional knowledge is evolving — from occasional in-person seminars and word-of-mouth to digital platforms, webinars, and now this revived e-magazine.

As we step into this new chapter, we invite every reader — student, practising engineer, academic, manager, or retiree — to see EVOLVE not as a finished product, but as a living work in progress. The more we contribute, critique, and engage, the stronger it will become. Together, we can ensure that the voice of the engineering profession not only keeps up with the times, but helps to shape the future of this country.

EVOLVE is both a symbol and a tool in that process. This is your magazine, your platform, and your invitation to help shape the next chapter of engineering in Trinidad and Tobago.

How you can contribute

EVOLVE will only live up to its name if it reflects the diversity of thought, experience, and expertise within APETT's membership. Every member has something to offer — whether it is a project case study, a reflection on a design challenge, a summary of research, or an insight from practice that could help others avoid costly mistakes.

The Publications Committee invites contributions from all disciplines and at all career stages. Articles may take the form of technical features, thought pieces, interviews, project spotlights, or collaborative round-ups from discipline groups. Clear submission guidelines, suggested word counts, and timelines will be shared through APETT's usual communication channels.

Members who may not have the time to write full articles can still participate by suggesting topics, highlighting noteworthy projects, or recommending colleagues whose work should be profiled. EVOLVE is not “someone else's magazine” — it is a shared platform, and its quality will mirror the level of ownership we collectively take.



FORWARD EVER, BACKWARD NEVER...

Article by Eng. Ian Cox



Jamaican singer and song writer Jacob

Miller did not create the term “Forward Ever, Backward Never,” but he famously sang it in his 1978 reggae song “Forward Ever”. Its origin is further East and attributed to Dr. Kwame Nkrumah who used it as the motto of his ideology for national development in a then nascent Ghana of the 1940’s.

The hope was to inspire his countrymen to support the nation’s development efforts after gaining independence. It has since become a West Indian anthem exported far and wide bringing with it similar hopes. Whilst Trinidad and Tobago has long celebrated its independence our development continues onwards...

Trinidad and Tobago’s development has seen many plans with several tiers of execution through the decades. The city of Port of Spain alone can boast as many as 16. Many arguments can be made regarding the quality and impact of national development plans; however, no argument can be made which denies much has occurred during this country’s post-colonial history and that many have benefited. Engineering has long played a role in advancing society and remains in service to do so. One only has to look at the record of national awards since independence to appreciate these contributions.

The newest incarnation of a development plan sees itself in the current administration’s presentation of the TT Revitalization Blueprint. A thrust which makes its own promise to launch the country forward on the vehicle of 129 projects. The plan signifies bold steps forward and dares to shout out its great ambition in the face of economic uncertainty.

Ever analytical; the engineering community’s unique perspective as standard bearers for public interest, procurement, design and execution forces it to be cautious with its embrace. One such caution is fiscal and echoes the sentiments of many an economist in the public domain; the prudent sentiment of “where is the money coming from?” remains unanswered. The other caution is with implementation, from initiation to final delivery of promised value.

Presentation of grand plans is not a strange occurrence nor is it necessarily far-fetched. Many initiatives begin with a dream which when brought into focus becomes a goal. The first steps on the trail towards achieving a goal are what allows you to recognize where your next steps should be, what resources are needed and how the resources will be acquired. Therefore, setting aside the usual refrain lest it becomes a restraint will allow focus to be placed on promoting a role in taking those necessary steps forward so that any realization of revitalization has a fair chance of being impactful.

For engineers the focus on ensuring valid implementation is of paramount interest. It is understood that the main intention is to move past planning, avoiding analysis paralysis and barrel swiftly towards implementation. The delivery of tangible

outcomes is always the goal, outcomes are often what are remembered, especially when they are transformative. Given the scope and diversity of the projects proposed coupled with the stated accelerated timeline, focus must be given not only to doing it but doing it well.

The engineering community has long been a contributor to the development process and is forward facing in this role. It is resolute and confident that it can be a responsible driver of transformation and national growth whilst delivering valid services.

We are at another juncture where the country's project implementation history must be brought to bear, lessons documented must be learnt and the perception that the train of progress will be slowed by appropriate systems of assurance; is soundly rejected. There exists proactive, process-oriented frameworks which ensure projects meet their tenets from start to finish thereby achieving value for expenditure from the public purse. These must be properly enabled, maintained

and respected during the journey and not jettisoned in pursuit of speedy project delivery. Failure to learn from past errors would definitely constitute stepping in the wrong direction well against the mantra of BACKWARD NEVER.

The country has seen the rise, entrenchment and dominance of the design-build project delivery method. It allows for an efficient singular delivery package with one point of contact between the hirer and the hired. This promotes service provider originating project financing instead of employer-based financing as is the case with the traditional design - bid - build method. Shifting of risk is another significant reason for the adoption of one method over another given the usual lethargic movement of state machinery. There are recent significant examples in the public domain which showcase that the single package approach for all its benefits fall drastically short of the necessary engineering and oversight needed to obtain the promised value. This type of outcome costs the state due to loss of project value, litigation, re-construction, the impact on the citizenry who are denied, lost time of state employees whose attention is directed at matters which are now delayed. All of these combine and create systemic stagnation threatening the ability to move FORWARD EVER.

An undebatable result of mass adoption of design-build is the erosion of engineering inputs from design to independent oversight and ultimately quality assurance as technical project decisions have become dominated more and more by the fiscal, temporal and legal agenda. Engineering and the role of the engineer must be moved away from the imposed diminishing perception of being a mildly necessary, tolerated activity. It is an integral multi-faceted role whose contribution,



once enabled can only be an asset for any undertaking. In many quarters the fiscal narrative cuts out necessary engineering presence, lancing at it almost like an unwanted diseased appendage whilst preserving aspects which do not truly contribute to longevity and resilience. This lacks foresight as it fails to accommodate in its consideration the scale of possible loss engineering input actually prevents.

Valid inclusion not exclusion at all levels of national development initiatives is a forward strategy. Engineering contribution is found in all industries with many disciplines, a fact which shows its prominent role as a pillar of societal growth and advancement across sectors. In this regard and where possible the industry should stand ready to respond to the calls of government for all hands-on deck regardless of ideological orientation.

Looking ahead to the possibilities this plan brings for the country and industries. One recognizes opportunities for real and purposeful inclusion of the engineering community in projects at all levels such that real employment opportunities will help to reignite the sector, creating opportunities not only to sustain existing talent pools but for graduates as well. Continued development of a



proud, venerable technical tradition which has stood as an example for the rest of the region for decades is certainly a critical component in maintaining the momentum of growth and assuring that the steps taken are in fact always Forward Ever, Backward Never...



Ian Cox is a Civil Engineer with over 20 years of experience in the construction industry. His career path has traversed a diverse but balanced blend of private and public sector projects as both the client and service provider allowing ground up understanding of the construction industry. This is firmly planted having begun his career as a Civil Engineering Technician at the then John Donaldson Technical Institute. Advancement came from attaining a B.Sc. (Hons) in Civil Engineering and a Post graduate Diploma in Construction Management from the University of the West Indies; these were followed later by PMP

certification and other short courses.

His service to APETT began on the civil division council as a supporting member followed by council chair for two terms and progressed to service on the executive as Vice President for two terms; he is currently the President Elect of APETT for the 2026-2027 term.



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THE CRISIS OF WIND-RESISTANT ROOF CONSTRUCTION IN TRINIDAD AND TOBAGO

Article by Eng. Vaughn I. Lezama

Trinidad and Tobago is no stranger to nature's fury. Over the past decade, the country has faced increasingly severe weather events—torrential rains, flash flooding, and powerful windstorms that sweep across communities leaving trails of destruction. What is particularly alarming, however, is that many of these roof-related disasters occur even during moderate wind events, far below the strength of a hurricane or tropical storm. Time and again, images circulate of houses stripped bare—entire roofs torn off, rafters and all—revealing a crisis that is both widespread and entirely preventable.

An Avoidable Failure

When a roof is blown away, the loss is not limited to metal sheeting. In countless cases, the entire roof structure—framing, rafters, purlins, and sheeting intact—is lifted clean off the walls and thrown aside. This kind of catastrophic failure is not a mystery. It points to a single, recurring flaw: inadequate anchorage between the roof framing system and the supporting wall plate or reinforced concrete (RC) ring beam. Sometimes, shockingly, the wall plate or ring beam is missing altogether.

Proper anchorage serves as the critical link between a home's superstructure (the roof) and its foundation. Without it, even a gusty day can generate uplift forces that separate the roof from the walls. If roofs were properly designed and anchored, strong winds would only dislodge individual sheets—a repairable inconvenience. But when entire roofs take flight, homeowners face crippling financial losses. While replacing a few sheets might cost a few thousand dollars, reconstructing a full roof system can be very costly—a devastating blow for working families.

A Costly and Repetitive Cycle

A weather event a few years ago saw hundreds of homes across the country lose their roofs in a single weekend. More recently, a number of houses in north-western Trinidad lost their roofs as a result of what can be described as

rare, but moderately intense tornado winds. The scenes of destruction were eerily familiar: entire roofs blown off, plywood ceilings dangling, furniture ruined by rain, and families displaced. Yet, in the rush to rebuild, the same mistakes are often repeated. The roof is quickly replaced—without proper anchorage, without trained oversight, and without adherence to standards—leaving the same structural weakness in place. The next windstorm then repeats the cycle of loss, repair, and loss again.

This pattern reveals a dangerous complacency. Climate change is already bringing more intense rainfall and unpredictable wind events to our region. The question is no longer if another storm will test our roofs, but when—and how prepared we will be when it happens.

The Weak Link: Informal Construction

The greatest vulnerability lies within our informal housing sector, which represents a significant portion of the national building stock. Many homes are constructed by small-scale contractors, tradesmen, or even homeowners themselves—people who may be skilled in general construction but lack formal training in structural design principles. These projects often bypass municipal approval processes or are carried out without professional oversight.

In too many cases, what guides these builders is not engineering judgment but “experience”—often passed down informally, and too often based on repetition of poor practices. Nails are substituted for bolts, hurricane straps are omitted, and roof frames are attached to unreinforced blockwork instead of properly tied ring beams. The result is a silent epidemic of unsafe roofs waiting to fail under stress.



Regulation Without Reach

It is important to recognize that Trinidad and Tobago already has the technical tools to address this crisis. The Trinidad and Tobago Bureau of Standards (TTBS) published TTS 599:2006 – Guide to the Design and Construction of Small Buildings, a document that clearly outlines safe and economical methods for constructing walls, foundations, floors, and roofs. However, its impact has been limited, largely because it remains unknown, unused, or inaccessible to the very people who need it most.

In addition, local building authorities often lack the manpower to inspect small residential projects, especially in rural or informal areas. The result is a regulatory vacuum—standards exist, but compliance is voluntary.

A Way Forward: Education, Enforcement, and Empowerment

The solution, fortunately, is not a mystery. We must bridge the gap between formal standards and everyday building practice through targeted education and practical outreach.

1. Public Awareness and Education
Builders, tradesmen, and homeowners must be made aware of the basic principles of wind-resistant roof design. An effective way to start is through a highly visual and easy-to-understand booklet focused specifically on Wind-Resistant Roof Construction for Residential Buildings. This publication should move beyond traditional timber-only examples and address modern systems using steel joist rafters and Z-purlin framing, which now dominate residential construction.

2. Institutional Collaboration

The initiative should be a joint effort among the Office of Disaster Preparedness and Management (ODPM), TTBS, and the Association of Professional Engineers of Trinidad and Tobago (APETT), supported by practicing structural engineers to ensure both technical accuracy and accessibility.

3. Community-Level Distribution

Information must reach builders where they live and work. Booklets and posters should be distributed through regional corporations, fire services, local hardware stores, and community development offices. Public service announcements, short training videos, and social media campaigns can also make a

of structural compliance before final disbursement of housing loans.

5. Training and Certification

Small contractors and tradesmen should be encouraged to undergo basic certification programmes in safe building practices. A tiered training and recognition system could give them an incentive—both professional and financial—to adopt higher standards.

Building Resilience Through Better Construction

Every time a roof fails, it exposes not only structural weakness but also social vulnerability. Families lose shelter, belongings, and peace of mind. Children's education is

disrupted, and entire communities face economic strain. These are not just engineering failures—they are failures of national resilience.

True disaster preparedness begins not with emergency shelters or relief funds but with stronger homes. A roof properly tied down is a family protected. By prioritizing public education, enforcing existing standards, and fostering a culture of responsible construction, Trinidad and Tobago can break free from the costly cycle of rebuilding after every storm.

The time to act is now. Weak roofs are not acts of nature—they're failures of construction. It's time for Trinidad and Tobago to build smarter. With climate change ensuring that high-wind events will become more frequent and more severe, we can no longer afford to build—and rebuild—on a foundation of weak practices. Investing in resilient roof construction today will pay dividends in safety, savings, and national stability tomorrow.



significant impact, especially among younger tradesmen. Such campaigns can be facilitated through the Government Information Services Limited (GISL) which has access to a wide range of media platforms.

4. Professional Oversight and Enforcement

Government ministries and municipal corporations must insist that all housing projects comply with the minimum requirements for roof anchorage and construction detailing. Similarly, mortgage institutions could help by requiring proof



Vaughn Lezama is a Civil Engineer in engineering practice for over 45 years. He is the Chairman and Principal Engineer in the Engineering Consultancy practice of Consulting Engineers Associates 2005 Ltd.

Eng. Lezama is a registered Engineer with the Board of Engineering of Trinidad and Tobago, a Fellow and Past President of the Association of Professional Engineers of Trinidad and Tobago and a Member of the American Society of Civil Engineers.

Eng. Lezama has considerable experience in the execution and management of Engineering Designs, Technical Studies, Construction Supervision and Contract Administration and is widely trained and experienced in the practice and use of the FIDIC suite of Contracts.

Eng. Lezama currently serves as the Registrar of the Board of Engineering of Trinidad and Tobago (BOETT) with responsibility for maintaining the Register of Engineers in accordance with the Engineering Profession Act No. 34 of 1985



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CYBERSECURITY IN ENGINEERING:

How Increased Awareness
can Safeguard the Future
and Integrity of Projects in
Trinidad & Tobago

Article by Eng. Brendon Inniss

Introducing Dr. Jekyll

We have witnessed and embraced the evolution of technology on a global scale in the field of engineering.

From the early days of large computers that occupy significant floor space in a room, to graphical Texas Instruments calculators, to laptop computers, drones, artificial intelligence and everything in between. We've certainly come a long way from the slide rule that only the very mature among us have actually seen and used in practice. There is no denial that technology has made our lives and our profession much easier and we cannot (and rather not) imagine life without it. It has made a profound impact on the speed, efficiency, quality and accuracy of our output across all disciplines in engineering and it continues to evolve at an incredible rate as global tech companies aggressively compete in a never-ending race for technological dominance.



Engineering professionals enjoy reaping the benefits of technology and their jobs are made easier through the access of;

- Using drones to perform inspection of structures and equipment that are in locations with limited access
- 3D scanning technology such as LiDAR or photogrammetry to develop a point cloud or 3D coordinates to identify potential clashes – a feature not available with standard land surveying equipment
- Engineering discipline specific software applications for design analyses, chemical process simulations, scheduling, procurement, inventory control and management

Notwithstanding the availability of sophisticated technological tools too numerous to mention, there is a dark side that has always been there and it too, has been upgrading at a similar rate.

His Alter-Ego Mr. Hyde

In the early days, we would hear about “viruses” and no, not the medical kind – viruses that affect your computers. Who would have thought that an inanimate object can be “infected”? So of course, you now had to invest in anti-virus software packages and install “firewalls” to protect your computer and your files from “trojan horses”, “worms” and other types of “malware” created and peddled by “black-hats” who are incredibly difficult to trace and detain. The technological advancement also applied to the dangerous side of information technology so quickly that not only did it come with its own glossary of terms but its own industry as well. Cybersecurity is an entire division within information technology, that is in a constant battle with nefarious entities so powerful and unscrupulous, that laws have been passed to

prosecute those guilty of cybercrimes. Some countries have managed to stay abreast with those hell-bent on malicious intent, by creating new divisions within law enforcement with highly trained personnel to investigate, arrest and prosecute those guilty of cybercrimes. However, many countries, including Trinidad and Tobago have remained behind the curve and extremely vulnerable to cyber-attacks.

Data Collection Issues

According to the Trinidad and Tobago Cybersecurity Incident Response Team (TT-CSIRT) website, for the period 2019 to 2025 there has been 145 and 236 reported cyber security incidents in the private and public sector respectively at the time of writing this article.

These incidents include, but are not limited to cyber threat activities such as “phishing” and “ransomware” attacks. In the public sector, TSTT was hit by a massive cyber attack in November 2023. Likewise, the National Insurance Board (NIB) was hit by a ransomware attack in December 2023. Private sector firm Massy Stores was hit by a cyber attack in April 2022 resulting a data leak that saw the release



of personal information of staff and customers into the public domain. These attacks are being orchestrated by highly organized international groups that even have names like Hive Ransomware Group and RansomExx.

In a TT Newsday (January 2024) article, it was revealed that there are no laws currently in place that mandate private sector companies to report data breaches, successful or not. This means that data collection will not only be a challenging exercise, but collected data will not be a true representation of the facts.

Data collection is important because it can:

- Aid with the assessment and cataloguing of threats (helps local cybersecurity professionals determine what are the active threats in the region so that they can develop mitigation measures)
- Simplify the investigation process (due to a collation of patterns and trends)
- Improve on likelihood of detention and prosecution of cyber criminals (assessment of patterns and trends may assist with the capture of amateur black hats)
- Provide justification for the implementation and enforcement of critical legislation



Low-Hanging Fruit

Manufacturing, engineering or construction firms who are either service providers, product distributors or those responsible for the processing and sale of commodities need to be aware of these attacks. The numbers quoted by the TT-CSIRT can be significantly underestimated and as a result cause us to collectively make light of a very serious situation. Many are guilty of going about their business thinking that cyber criminals are only interested in large firms whereby a successful breach can result in major disruption. This is a poor mindset to rely on because cyber criminals tend to seek out any business that has weak or even zero data protection infrastructure. Not all cyber criminals engage in these activities for financial gain (even though most do), some “Cyber Activists” do it because they enjoy chaos and others do it because they have their own moral compass, such as in the case of the infamous Ashley Madison data dump in July 2015 by the hacker group that called themselves the “Impact Team”. Local engineering and construction firms who fail to upgrade their network security, make themselves easy targets for local, regional and international cyber criminals. Cyber-attacks are typically automated, meaning that someone does not necessarily have to be physically sitting at a computer searching for low-hanging fruit – instead software applications surf the internet seeking out vulnerabilities to exploit.

Cyber Threat Vulnerability Assessment

Engineering service providers must understand that vulnerability is not just limited to IT infrastructure, but standard operating procedures and personnel as well. IT infrastructure is perhaps the simplest to apply defensive measures for, but what about staff

training? It is imperative for staff to be trained in how to recognize and report phishing attempts/scams to IT management as well as to adhere to recommended authentication measures regardless of how much of a hassle it may be. An engineering service provider will have several gigabytes of intellectual property (namely drawing files, design spreadsheets etc.) on its server that can be permanently seized by a ransomware group, causing irreparable damage, closure and immediate retrenchment of staff. You can argue that this can be avoided by simply paying the ransom, but the counter-argument will be, how? Most local firms do not invest in crypto-currency, so even if they had the funds, they would not be able to pay the ransom within the stipulated deadline and all ransomware groups, who are notorious for keeping communication to a minimum, conduct transactions using some form of untraceable currency. Other forms of data at risk include;

- Sensitive and highly confidential proprietary material
- Client personal data
- Financial records
- Inspection reports
- Equipment and material test results.

Data, that if captured and held for ransom or maliciously deleted can result in huge direct and indirect financial losses, not to mention major disruption. Imagine if a successful cyber-attack were to strike an MEP engineering consultancy firm that is part of a design-build team currently waist deep in a high profile, multi-million dollar national construction project...Imagine what the fallout would be.

Perhaps the most important asset of any construction and/or engineering company is its intellectual property. This typically comprises customized, proprietary design-aids, special charts, specifications, short-cuts, algorithms,

and all forms of original technical content generated and accumulated over several years. Essentially a treasure chest of information that is extremely difficult to replace if lost, stolen or destroyed. Depending on the type of business, example a structural engineering consultancy firm – the most critical data would be design engineering spreadsheets which have been developed to expedite complicated and iterative design processes. Draughting details used by technicians to streamline the delivery of construction drawings are also classed as high-value and must be protected. Should this data become comprised or lost in a cyber-attack, the immediate fallout would be costly delays on active projects. The medium-term impact would be a loss of a competitive advantage when it comes to bidding for new and/or effectively servicing newly awarded projects. Long-term impact would essentially be the permanent closure of the company



due to clients taking their business elsewhere due to poor performance.

Preventative measures are not only important for obvious reasons, but another reason for implementing these measures is to avoid inefficiency borne out of crisis. In the wake of a data breach, a company may instruct the IT department to invoke stringent measures (overcorrect) to avoid a possible recurrence. This action almost always results in making standard operating procedures more onerous. Therefore, it is in the company's best interest to be more proactive with its cybersecurity measures.

It is important to note however, that although the above-mentioned contingency measures would significantly improve the cybersecurity of a typical firm, it does not necessarily mean that there is a zero chance of a breach. The comfort lies in the fact that data recovery would be much easier and the impact of the breach (assuming ransomware) would be minimal, resulting in a reduced Recovery Time Objective (RTO) – the time it takes to be fully operational after an incident. According to IT certification body CompTIA, “if a given service must be recovered within two hours of a failure, then 24-hour support must be made available and funded.

Contingency Measures

To date, there are still several small and medium enterprises (SMEs) within the engineering and manufacturing sectors that are still adopting the reactive approach – engaging IT consultants to address breaches after they occur (also known as the “Break-Fix Model”). It is imperative that a more proactive approach is adopted to mitigate the impacts of cyber threats and avoid costly disruptions. Contingency measures and safeguards engineering firms can employ to protect their data, network and personnel are:

- Routinely back-up all data on a cloud-based file storage server with secondary back-up on site and tertiary back-up off-site to cater for potential hardware failure, theft, flood/fire damage or sabotage
- Upgrade of standard IT operating procedures and company policies regarding the appropriate use of company workstations, email and the internet
- Regular staff training in cybersecurity awareness, forbidden websites, suspicious virtual activities and newly developed malicious tactics
- Conduct routine network threat assessments (penetration Testing) and gap analyses to identify potential vulnerabilities and patch accordingly
- Routinely patch and update endpoint and network defense systems such as EDR, Firewalls etc.

Conclusion

Cyber security and protection is no longer strictly the job and responsibility of IT support. It is now the responsibility of all stakeholders, and as such we all have a collective duty to do what is required to ensure top notch cyber protection of corporate systems are maintained.



Brendon Inniss, principal and chief executive, quality assurance and business development manager at Aleron Limited,

is a registered professional structural engineer with 22 years post-graduate experience. He has been the engineer of record on a broad spectrum of projects from small (<\$100K) to mega (>TT\$300M), in Trinidad and Tobago as well as; Eastern Caribbean. He has worked on a wide range of projects which includes: multi-storey commercial & residential buildings; schools, hotels, warehouses private residences and even an international airport. Brendon also has extensive

experience in the energy sector, having delivered projects for clients with a background in oil, gas, chemical and power.

Brendon earned his BSc (Civil & Environmental Engineering) in 2002 and his MSc (Construction Engineering & Management) in 2010 at the University of the West Indies, St. Augustine. He was recently elevated to the grade of Fellow with the Association of Professional Engineers of Trinidad & Tobago (APETT) and is currently serving as Assistant Treasurer on the Executive Council as well as an ordinary member on the APETT Civil Division. In 2021, Brendon became a Chartered Engineer with the Engineering Council (UK) and is a Fellow with both the Institution of Civil Engineers (UK) and the American Society of Civil Engineers (ASCE). He has his Level 1 PT installer (field fundamentals) certification with the Post Tensioning Institute.

THE ENGINEER... THE NATION BUILDER...

Eng. Dr. Lenny Saith



The Association of Professional Engineers of Trinidad and Tobago (APETT) mourns the passing of Eng. Dr. Lenny Saith, ORTT, who died on 25 August 2025 at his home in Sumadh Gardens, San Fernando, at the age of 90.

Across the political aisle and throughout the national community, tributes were strikingly consistent: before he was a minister, chairman or acting prime minister, he was an engineer by profession, who brought technical discipline and calm, methodical judgement to every role he held.

This article focuses on that engineering life—on the roads, industrial estates and institutions he helped to build, and on the professional standards he set for generations of Trinidad and Tobago engineers.

An education built around roads and movement

From the outset, Saith chose the hardest, most essential problems in engineering: how people and goods move. APETT's tributes record that he earned a Bachelor of Science in Civil Engineering from the University of Roorkee in India (now the Indian Institute of Technology Roorkee), followed by a Diploma of Highway Engineering from the University of Durham in the United Kingdom.

He then specialised even further, completing a Master of Science in Highway Engineering and an Engineering Doctorate in Transportation Planning at the University of Toronto in Canada—high-level training that combined deep theory with real-world transport systems.

In recognition of his achievements, his alma mater later awarded him a Doctor of Engineering (Honoris Causa) in 1994, underscoring how far that early civil engineering student from Roorkee had travelled in the profession.

The Ministry of Works years: carving the country's arteries

Armed with that expertise, Saith returned home and joined the Ministry of Works in 1958, serving there until 1971. APETT notes that these were his foundational professional years as a civil engineer in public service.

A Newsday editorial written when he received the Order of the Republic of Trinidad and Tobago highlighted his time as a construction engineer in the Ministry while it was building some of the country's most critical roadways: the Lady Young Road, the Beetham Highway, the Sir Solomon Hochoy Highway and the Churchill–Roosevelt Highway.

These projects were not abstract lines on a drawing board. The Churchill–Roosevelt Highway forms the main east–west spine across the island's densely populated corridor, while the broader highway network maintained by the Ministry of Works and Transport now links communities, ports and industrial zones across Trinidad and Tobago.

When senators rose in September 2025 to pay tribute after his passing, they explicitly linked his name to the Beetham Highway, the Lady Young Road and other major works, recognising that the modern road system people complain about in traffic every morning was, in large part, laid down under his watch as a young engineer.

Trintoplan and the technocrats of Point Lisas

After leaving the Ministry of Works, Saith moved into the private sector, becoming Managing Director of Trintoplan Consultants Limited. APETT records that he helped develop Trintoplan into the largest nationally owned, multi-disciplinary planning and engineering consultancy in Trinidad and Tobago, with a portfolio that extended throughout the Caribbean.

Trintoplan was not just a successful firm; it was a vehicle for building local engineering capacity. Saith played a key role in establishing and growing the company, giving Trinidad and Tobago engineers leadership roles on complex projects rather than relegating them to the sidelines behind foreign consultants.

His work is also woven into the story of Point Lisas. The Trinidad Guardian, in its obituary, described him as part of the cadre of “legendary technocrats” who crafted the Point Lisas Industrial Estate during the era of Prime Minister Dr Eric Williams.

Today, Point Lisas is recognised as the heart of Trinidad and Tobago's petrochemical sector, home to major ammonia, methanol and steel plants that anchor the downstream gas economy. Saith's technical leadership in planning and infrastructure helped create the conditions for that industrial complex to exist at all.

Engineering thinking in the corridors of power

Although he later became best known to the public as a senior minister and political strategist, his approach in office never stopped being an engineer's approach.

The official biography on the Parliament's website and statements from the Office of the President and national media trace his political trajectory: he entered Parliament as a temporary senator in 1987, became a minister in 1992, and over nearly two decades held portfolios including Planning and Development, Public Administration and Information, Energy and Energy Industries, Trade and Industry, and Minister in the Office of the Prime Minister.

Colleagues repeatedly pointed out that even in Cabinet he operated like a chief engineer: focused on systems, timelines and execution. He chaired and guided inter-ministerial work on construction and industrial development and was widely regarded as the government's *de facto* chief planning and construction engineer in the broader sense—someone who understood both the drawings and the national budget.

Earlier in his career he also served as vice-chairman of the Public Transport Service Corporation, bringing his transport engineering background directly into the governance of public transit.

Industry associations such as the Energy Chamber of Trinidad and Tobago have recalled working closely with him during industrial disputes affecting major energy projects, and emphasised his habit of using data, dialogue and structured problem-solving to reach solutions that balanced competing interests.

Honours from the profession and the nation

For the engineering community, one of the most meaningful recognitions of Saith's career came in 2016, when APETT presented him with its "Career of Excellence" award at the 56th Honours and Awards Ceremony, recognising a lifetime of technical leadership and service.

A year later, the country followed suit. In 2017, he received the Order of the Republic of Trinidad and Tobago (ORTT), the nation's highest honour, as a civil engineer whose work in roads, highways, Trintoplan and national development had reshaped the physical and economic landscape of Trinidad and Tobago.

News coverage of that award explicitly linked it to his engineering contributions, including his role in establishing Trintoplan and his work on the country's major highways.

Political tributes have also noted that he received the People's National Movement's Dr Eric Williams Medal of Honour, underlining how both the profession and the political movement he served viewed him as a benchmark of integrity and competence.

A quiet, rigorous legacy for engineers

Across tributes—from the President, from former prime ministers, from colleagues in Parliament—the same personal qualities recur: humility, calm, patience, an aversion to airs and theatrics, and a relentless focus on getting complex work done properly.

In the Senate on 17 September 2025, members described him as a distinguished son of the nation whose legacy could literally be traced along the nation's highways and through its industrial estates.

For APETT and for engineers across Trinidad and Tobago, Eng. Dr. Lenny Saith's life offers a demanding but clear template: master the fundamentals; specialise deeply;

insist on high standards in both public and private sectors; and be prepared to carry that same engineering rigour into any arena where the country's future is being designed.

He did not just comment on national development—he helped draw its plans and pour its foundations. That is the legacy this profession now inherits.

References and key sources

1. APETT (Association of Professional Engineers of Trinidad and Tobago) tributes and Honours & Awards documentation on Eng. Dr. Lenny Saith's academic qualifications, Ministry of Works service, Trintoplan leadership and receipt of the 2016 "Career of Excellence" award.
2. Newsday coverage and editorials on Dr. Saith's national awards and career, including articles on his role in the construction of major highways, his leadership at Trintoplan and his receipt of the ORTT in 2017.
3. Trinidad Guardian obituary describing him as part of the "legendary technocrats" responsible for the creation of the Point Lisas Industrial Estate and outlining his engineering and political career.
4. Official statements from the Office of the President of the Republic of Trinidad and Tobago and the Parliament of Trinidad and Tobago, including his national award citation and parliamentary biography.
5. Reporting from national media outlets such as CNC3, TTT and AZP News on his passing on 25 August 2025, his age, place of death and Senate tributes highlighting his engineering contributions.
6. Background material on Trinidad and Tobago's national highway network, the economic role of the Point Lisas Industrial Estate and the status of the Order of the Republic of Trinidad and Tobago as the country's highest national honour, from official government and recognised institutional sources.

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CAN WE AVOID INDUSTRIAL LUBRICANT DEGRADATION?

Article by Eng. Sanya Mathura

This paper seeks to provide clear guidelines to readers about ways in which industrial lubricant degradation can be avoided. To do so, the author has set out to cover the fundamental information as it applies to industrial lubricants, their functions, and the concepts of degradation.

The six basic modes of lubricant degradation will be covered as well as various ways of identifying each of the modes and possible methods of managing each. In this section both field tests and observations will be noted as well as laboratory tests which can assist in determining the mode of degradation.

A closer look at one of the most popular degradation modes, oxidation will be covered which includes a logic tree for this mechanism. This logic tree will cover the physical, human and systemic / latent root causes for oxidation as it occurs in lubricants.

Information from global case studies will also be presented where lubricant degradation has occurred and measures that were put in place for their avoidance in the future.

1.0 What are the main functions of a lubricant?

Degradation is a form of the lubricant failing its function. In fact, there are many functions of a lubricant and if something does not perform its intended function, then it has failed. Before discussing degradation, the basic functions of a lubricant must first be identified and understood.

There are five main functions of a lubricant; to reduce friction, remove contaminants, improve efficiency, minimize wear and distribute heat as shown in figure 1. These are not the only functions of a lubricant. Depending on the application in which the lubricant is involved, it can adapt to various functionalities.

In hydraulic oil, the function of the lubricant is the transmission of power while for oil analysis, oil functions as a conduit of information. However, in each of its functions, it has the ability to protect the machine and its internals once it is in a healthy state.

From the moment that oil enters a machine, it will begin to degrade due to its sacrificial nature. Additives will deplete over time as they get used up and will no longer be able to protect the base oil and degradation will occur.

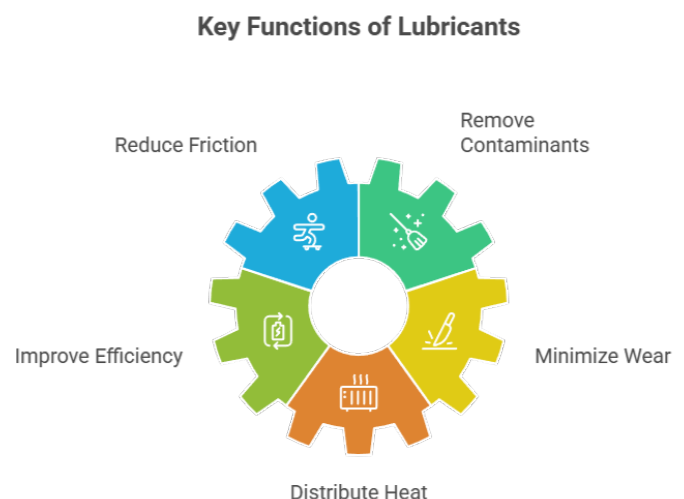


Figure 1: Key functions of a lubricant

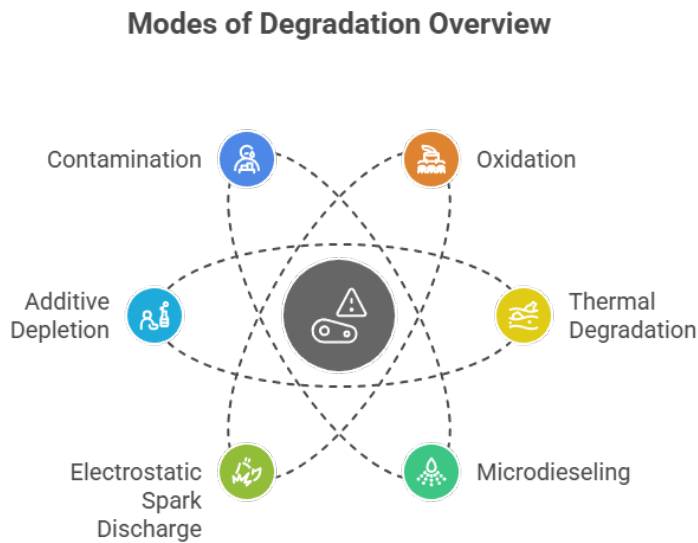
2.0 Lubricant Degradation

As noted above, lubricants are sacrificial in nature. They contain additives which are used to help protect the insides of the machines from corrosion, wear or to reduce the friction between these surfaces. There are also additives which help to improve certain characteristics of the oil through increased oxidation protection, improved demulsibility and aeration properties.

When a lubricant goes into service, degradation occurs as the additives are used up while the lubricant is performing its many functions. The challenge occurs when degradation reaches the point such that the lubricant is no longer able to perform its functions and fails. This is the outcome that everyone is trying to avoid.

There are six modes of degradation which can be classified based on their environmental

Figure 2: Modes of Lubricant Degradation



conditions and the deposits which form during those mechanisms as per Mathura S. (2021) shown in figure 2. These include; oxidation, thermal degradation, microdieseling, electrostatic spark discharge, additive depletion and contamination.

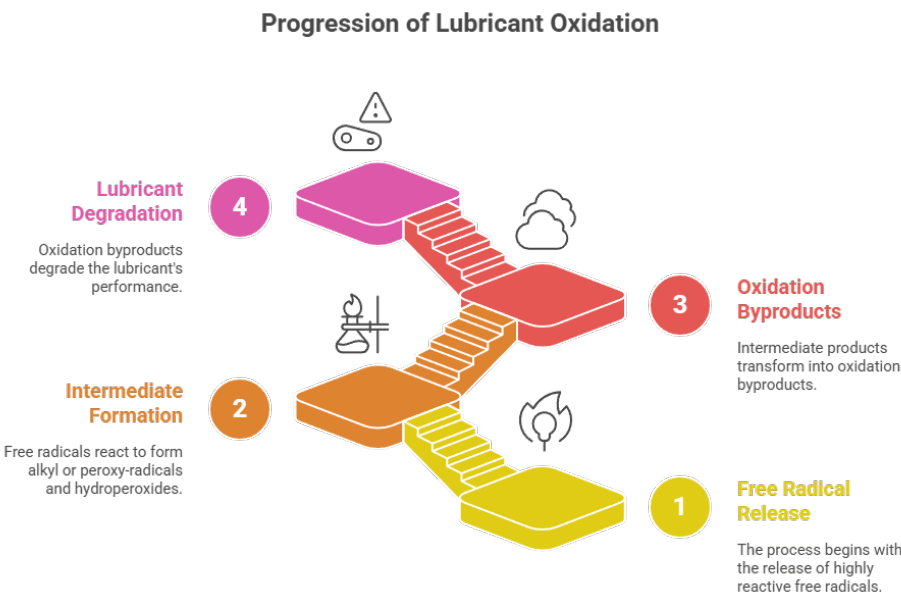


Figure 3: Progression of Lubricant Oxidation

2.1 Oxidation

This is the most popular form of degradation or rather the one that has received the most attention. Quite often, it is used incorrectly to describe any form of degradation simply due to the lack of knowledge about the various other mechanisms.

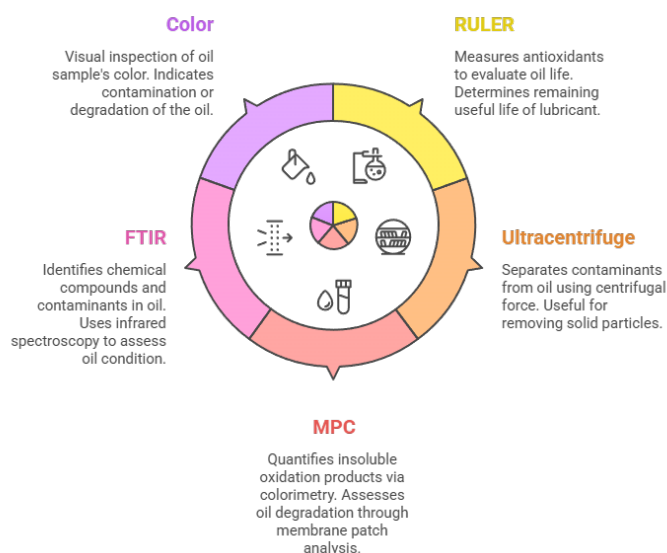
Oxidation occurs when there is a free radical released in the lubricant. These free radicals are quite reactive and propagate to form alkyl or peroxy-radicals and hydroperoxides. These eventually go on to form oxidation by products as per Ameye, Livingstone and Wooton, 2015 as shown in figure 3.

During oxidation, antioxidants are lost as they try to neutralize the very reactive free radicals. This is one of the key differentiators of this mechanism as it can help identify if it is occurring. Another key identifier is the production of varnish and sludge as the final result of this mechanism.

Some of the key tests to identify if oxidation has or is currently occurring include; RULER® (Remaining Useful Life Evaluation Routine) where the quantity of remaining antioxidants are measured, Ultracentrifuge which gives an indication of the oil's ability to form varnish, MPC (Membrane Patch Colorimetry) where a patch test is used to determine the oil's ability to form varnish, FTIR (Fourier Transform Infrared) which gives an indication of the molecules present and colour which is not a very indicative test but can provide some guidance.

Testing for changes in viscosity and acid number will have some merit however, these changes are only prevalent after the antioxidants have significantly depleted. As such, these tests do not offer much warning to the operators and should not be used as early indicators. Some of these tests are shown in figure 4.

Figure 4: Tests for Oxidation
Oxidation Detection Methods



Another test which was not mentioned is RPVOT (Rotating Pressure Vessel Oxidation Test). While this is an industry standard test, it has a low rate of repeatability which means that the same oil undergoing the same test will produce varying results and these results are not easily quantifiable to operators as the value is given in minutes. Hence, it is not a preferred test to perform when determining if oxidation is present.

2.2 Thermal Degradation

This mechanism is often confused with oxidation but they are very different. For this mechanism to occur, the lubricant should experience a temperature of above 200°C. At these temperatures, the lubricant is cracked as this exceeds its thermal stability point.

During this process, the shearing of molecules occurs which eventually leads to polymerization and a decrease in viscosity. In oxidation however, there is an eventual increase in viscosity. This is one differentiating characteristic.

As the molecules are sheared, there are two processes which occur in the lubricant during thermal degradation. These small molecules will cleave off and either volatilize or become condensed. When they are volatilized, they do not leave any deposit. However, if they become condensed then dehydrogenation occurs (in the absence of air) and coke is formed as the final deposit. There can be other deposits which occur between the start and completion of the process.

The two key differentiators between oxidation and thermal degradation is that oxidation experiences an increase in viscosity and produces sludge or varnish as the final deposit while thermal degradation experiences a decrease in viscosity with lacquer and carbonaceous deposits as the final results.

There are a few lab tests which can help

in the identification of Thermal Degradation which include; a decrease in viscosity (around 5%), rapid changes in colour and the use of FTIR for identifying the presence of carbonaceous deposits as shown in figure 5.

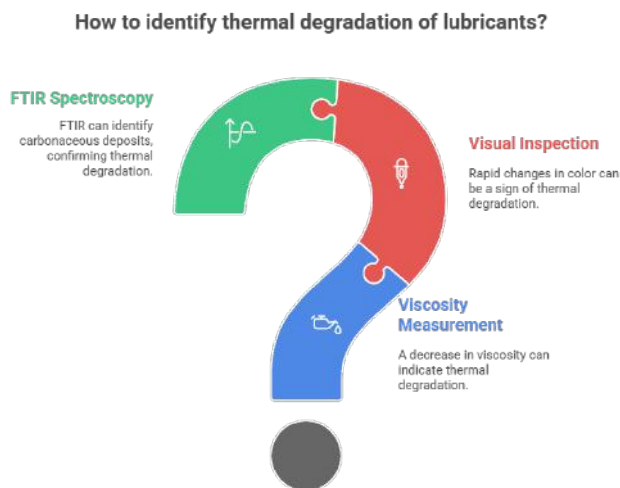


Figure 5: Lab tests for Thermal Degradation

2.3 Microdieseling

This mechanism is very similar to cavitation experienced in pumps except it occurs within the lubricant. Microdieseling is also known as compressive heating and can be considered a form of pressure induced thermal degradation.

During microdieseling, air entrained in the oil transitions from a low-pressure zone to a high-pressure zone. This produces localized temperatures in excess of 1,000°C. At this temperature, the interface of the entrained air bubble becomes carbonized and the oil begins to darken rapidly.

There are two main conditions which can occur during microdieseling either, a low flashpoint with low implosion pressure or a low flash point with high implosion pressure. Both will produce different types of deposits.

For a low flashpoint with low implosion pressure, this ignition produces incomplete combustion products such as soot, tar, and sludge. For a low flashpoint with high implosion pressure, these products experience

adiabatic compressive thermal heating degradation and produce varnish from carbon insoluble including coke, tar, and resins as seen in figure 6.

To confirm the presence of microdieseling, one can perform a physical inspection of the components. Due to the small explosions of the entrained air, one will see a surface resembling small pits similar to cavitation. FTIR can aid in confirming the presence of the aforementioned by-products (coke, soot, tar, sludge, resins).

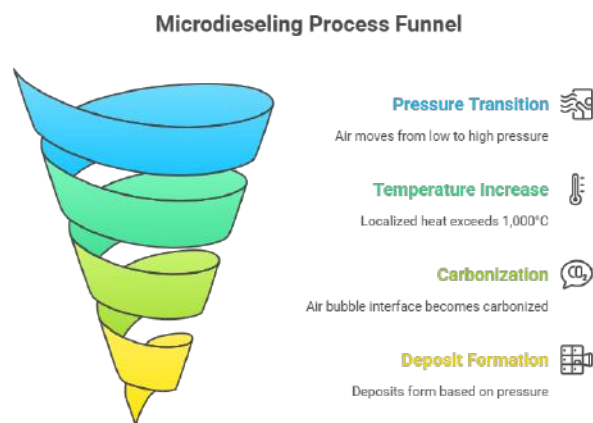


Figure 6: Microdieseling Process Funnel

2.4 Electrostatic Spark Discharge

Static electricity is not just confined to our immediate environment, it can occur at a molecular level as well. In a lubricant, static electricity can build up to a point where it produces a spark. This spark can induce temperatures in excess of 10,000°C.

There are three main stages of this mechanism. In the first stage, the static electricity builds up to produce a spark. Next free radicals are formed which contribute to the polymerization of the lubricant. Finally, this leads to uncontrolled polymerization which produces varnish and sludge which can either remain in solution or be deposited. During this final stage one can also see elevated fluid degradation and the presence of insoluble

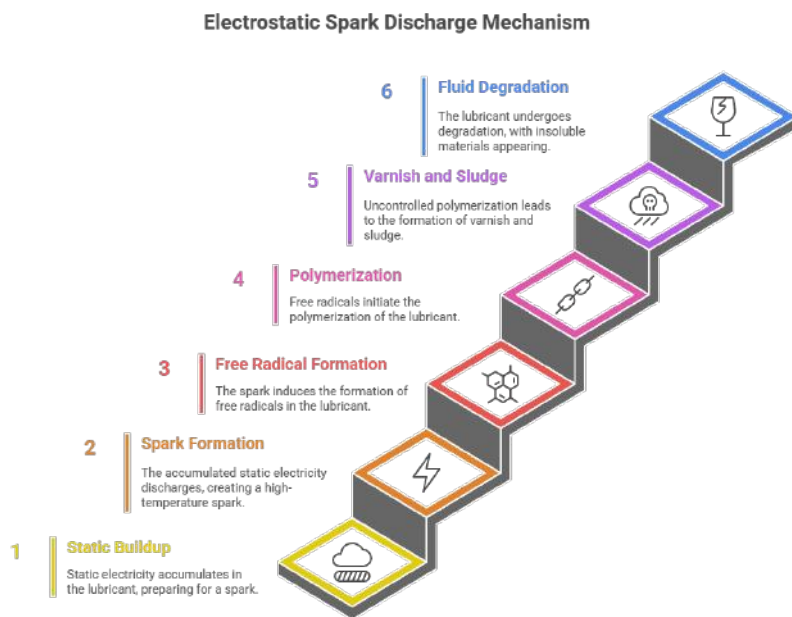


Figure 7: Electrostatic Spark Discharge Mechanism

materials as indicated in figure 7.

One can perform a physical inspection of the filter membranes of the equipment to verify if electrostatic spark discharge has occurred as one will notice small burnt patches on the membrane. These are the areas in which the spark occurred after the build up of static electricity and discharged on the filters.

FTIR and QSA (Quantitative Spectrophotometric Analysis) can aid in identifying the presence of varnish, sludge or other insolubles. The RULER test can also identify remaining antioxidants after the free radicals were released which they will try to neutralize.

2.5 Additive Depletion

Additives are placed in the oil as a sacrificial component to protect the oil. However, if they deplete too quickly, this can be a form of degradation as the oil can no longer perform its intended function. When the additives deplete there are two types of deposits which form: organic and inorganic.

Organic deposits are the rust and oxidation additives which drop out of the oil. These react to form primary antioxidant species. On the other hand, inorganic deposits are the additives which dropped out but did not react with anything in the oil. These are usually the ZDDP (Zinc dithiophosphate) additives used as antiwear or antioxidants.

Some tests which can be performed to determine if additive depletion has occurred include; FTIR (which will determine the presence or absence of particular molecules), Colour (various additives have particular colours) and RULER (determines the remaining antioxidants in the oil).

2.6 Contamination

This type of degradation mechanism does not get much attention as some may not consider it to be a degradation mechanism. On the contrary, the presence of contaminants in an oil can actually lead to three varying degradation mechanisms, namely; oxidation, thermal degradation or microdieseling.

Contamination can be defined as any material that is foreign to the lubricant. These are usually classified in three categories; metals, air or water. These contaminants can also act as catalysts to increase the rate of degradation.

The lab tests used to confirm the presence of contaminants include colour (as defined by laboratory guidelines), presence of water or fuel (which gives the indication of a foreign material) and FTIR which can help in identifying the molecules present and whether or not they should be a part of the lubricant's profile.

3.0 Factors affecting lubricant degradation

Lubricant degradation can occur in various mechanisms as noted above. While this paper will not go into details of avoiding each of these mechanisms, it will provide the reader with the knowledge to develop their own method of determining the real root causes to further put measures in place to avoid lubricant degradation.

Based on global case studies, (Mathura, S. and Latino, R. 2022), the following logic tree was developed to assist users in determining the real root causes of oxidation. This tree will be broken up into several pieces before it is fully pulled together to allow the readers to get a full grasp of the method involved for these types of investigations.

Before this investigation begins, one must understand, “What is oxidation?”, “How can it occur?” and “How can it be identified?”. The answers to these questions can be found in section 2.1 above. The question remains, “How can Oxidation be prevented?” which will be investigated.

Essentially, this mechanism occurs due to the release of free radicals and can be identified / verified through lab tests such as RULER or MPC. To prevent its occurrence, one must perform a full Root Cause Analysis to ensure that all aspects have been investigated.

3.1 Building a logic tree for Oxidation

For any investigation to begin, there must have been a significant event, in this case, we will use the event of an unplanned shutdown which has a critical pump failure. In our hypothesis, we will investigate the reasons for the pump failure as it relates to a bearing failure which has experienced lubricant degradation. The beginning of our tree is shown in figure 8.

In a real event, one would have to hypothesize that all the six degradation mechanisms would be present. These hypotheses will be verified through laboratory tests using the listed tests in section 2 of this paper. In this case, we are following the path of oxidation being present.

Instead of asking “Why?”, we will ask the question, “How could?” as this leads to more factual answers rather than opinions. In this case, the question of “How could oxidation occur?” will be asked. There are two main ways for this to occur, either there is the presence of oxygen and Temperature in Excess of the operating temperature or there is a Less Than Adequate (LTA) presence of Antioxidants as shown in Figure 9.

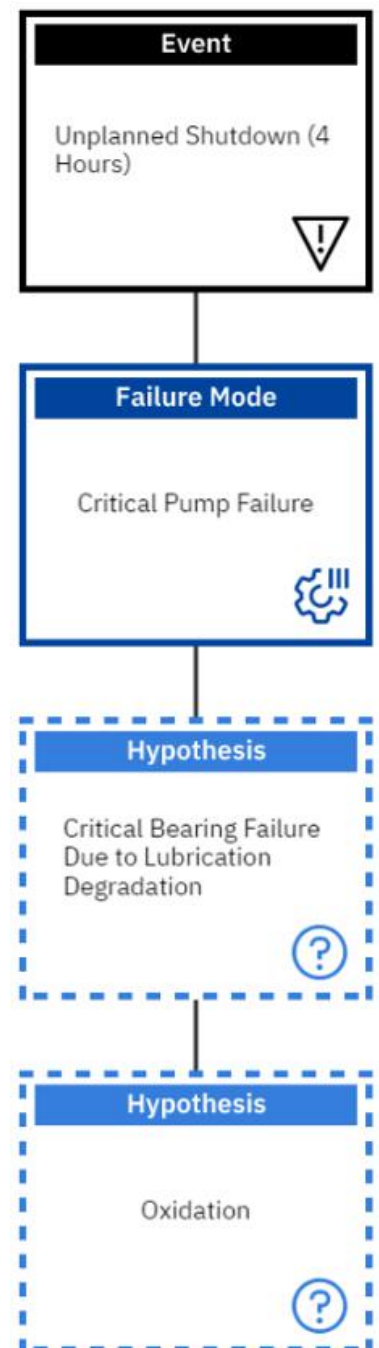


Figure 8: Beginning of logic tree for oxidation

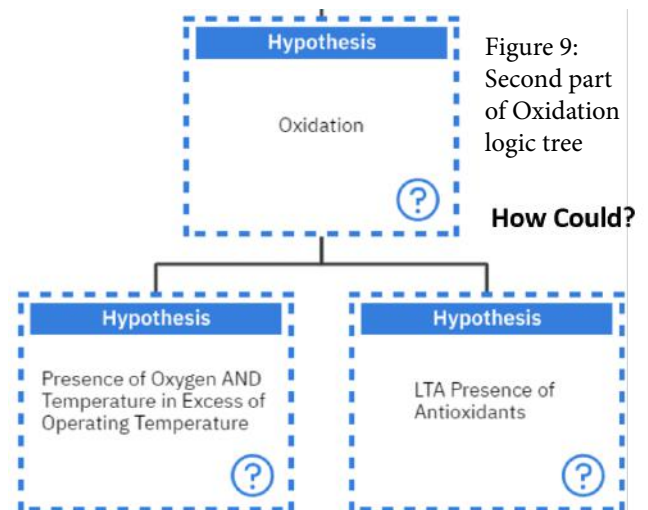


Figure 9: Second part of Oxidation logic tree

Again, the question of “How could the presence of oxygen and temperature in Excess of Operating temperature occur?” is asked. This can occur if there is an air leak into the system or if the system is being pushed beyond operating limits.

When the question of “How could there be an air leak in the system?” is asked, two main answers could be that the components are damaged or there was a Less Than Adequate system design which allowed air to enter the system. These two hypotheses should be further investigated and verified. Since these are mechanical elements, they will not be investigated in this discussion as we are focused on the lubricant degradation aspects.

On the other hand, if the question of, “How could the system be pushed beyond its operational limits?” is asked, then two suggested hypotheses can be generated. Either an increase in production was required or there were some malfunctions of components which caused strain to other components thus pushing these beyond their operational limits as seen in figure 10 below.

If an increase in production was required then this needs to be investigated with the teams involved to determine how the decision was made to increase production. This hypothesis will not be followed in this paper but should be followed during the investigation.

The team should also investigate whether malfunctions of components caused strain to other components pushing them outside of their operating limits. This is a mechanical investigation which would require some physical inspections as well as other condition monitoring tests to determine if this was indeed the case. This hypothesis will not be followed for this paper.

The second major hypothesis of “Less than adequate Presence of antioxidants” will now be investigated. When the “How could?” question is asked, there are two main ways, either there was a presence of free radicals or less than adequate lubricant specifications. These hypotheses will now be investigated.

“How could there be a presence of free radicals?”. These are usually produced when some chemical reaction has occurred. “How could a chemical reaction occur?”. Typically, these can occur if there was contamination of the lubricant to introduce catalysts for chemical reactions or there were some adverse operating conditions giving rise to chemical conditions.

In the case of the latter, adverse operating conditions may be the normal operating conditions of this piece of equipment. In this case, it is called a “contributing factor” and does not need to be investigated.

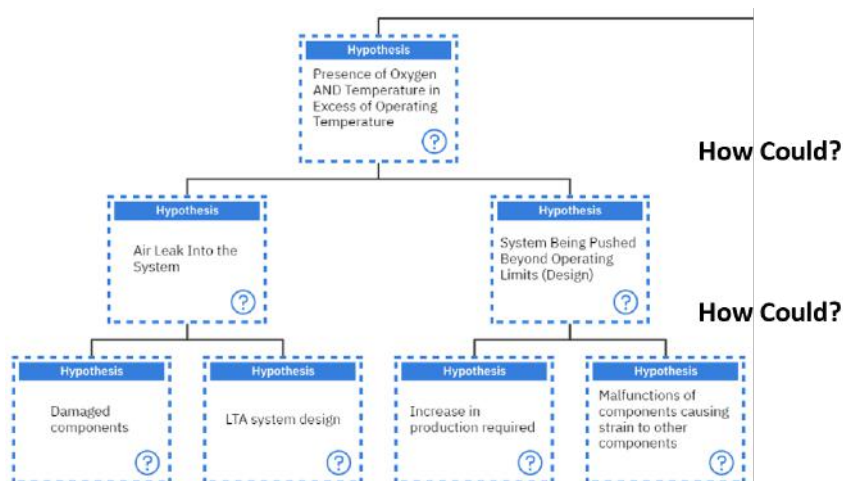
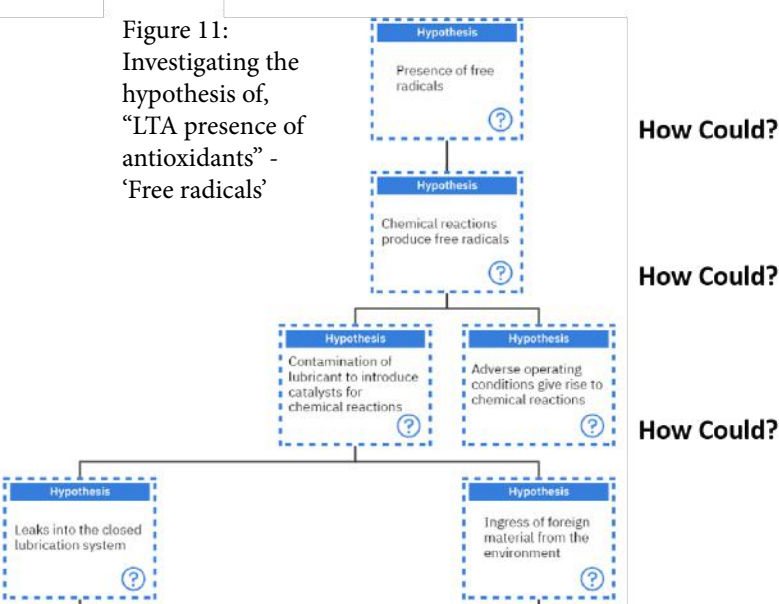


Figure 10: Investigating the hypothesis of, “Presence of Oxygen AND Temperature in Excess of Operating temperature”

The question of, “How could the contamination of the lubricant to introduce catalysts for chemical reactions occur?” is asked. There are two main ways this can occur; either the contaminants came from the outside or the inside of the system. In this case, two hypotheses could be formed, which question if there were leaks into the closed lubrication system or if there was ingress of foreign material from the environment as shown in figure 11.

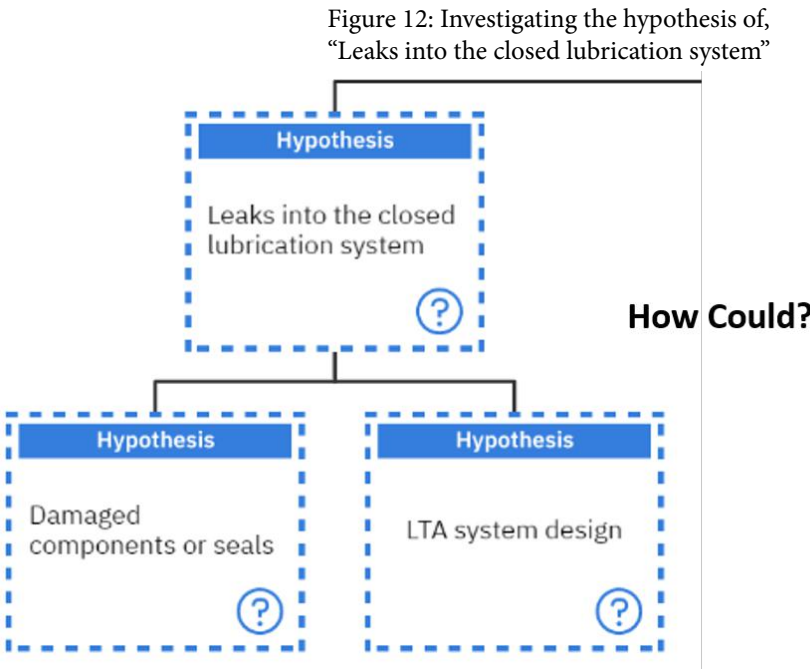


By following the hypothesis of whether there were leaks into the closed system, the question of “How could?” is asked again. In this case, two hypotheses can be formed: either there were damaged components or seals or there was a less than adequate system design which allowed leaks into the closed system as seen in figure 12.

The damaged components are a physical root cause which must be investigated and verified in this investigation. On the other hand, the LTA system design is labelled as a systemic root cause for this example.

On the other hand, by asking the question of, “How could there be ingress of foreign material from the environment?”, there are three possible hypotheses. Either there were openings which allowed material into the system, or the wrong lubricant was placed into the system or contaminated lubricant was placed into the system. Each of these will be investigated.

“How could openings allow



material to enter the system?”. Either the openings were not closed after use, or the safety latches malfunctioned causing them not to be closed after their use. This further prompts the question of, “How could the safety latches malfunction?” This can happen if there are less than adequate checks to verify the functioning of the safety latches which is a systemic root cause.

The question arises again “How could the opening not be closed?”. This can be as a result of less than adequate inspections to verify if these were indeed closed which

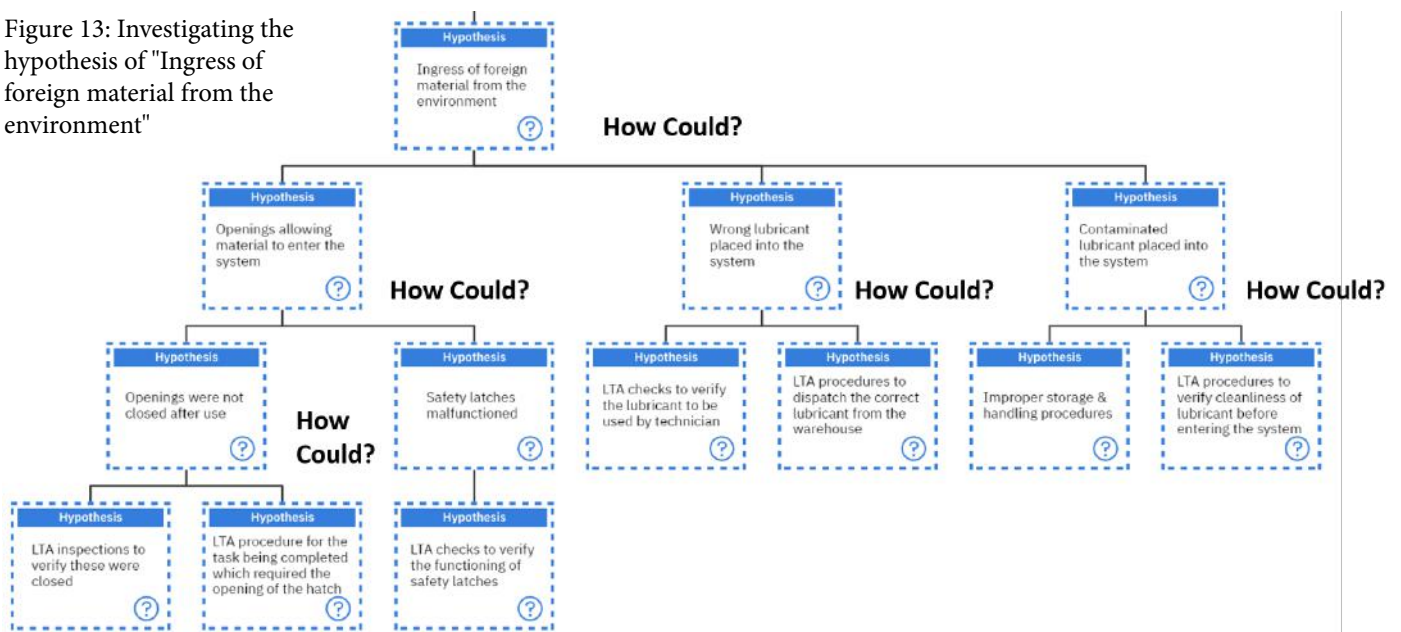
is a systemic root cause or there was a less than adequate procedure for the task being completed which required the opening of the hatch which is also a systemic root cause.

Following the hypothesis of, “How could the wrong lubricant be placed in the system?”, this leads us to, less than adequate checks being used to verify if the technician is using the correct lubricant or less than adequate procedures being used to dispatch the correct lubricant from the warehouse. Neither of these

are human root causes, rather systemic root causes.

Finally, on to the question of, “How could contaminated lubricant be placed in the system?”. Either there are improper storage and handling procedures which is a systemic root cause. Or there are less than adequate procedures to verify the cleanliness of the lubricant before entering the system which is also a systemic root cause covered in figure 13.

Figure 13: Investigating the hypothesis of "Ingress of foreign material from the environment"



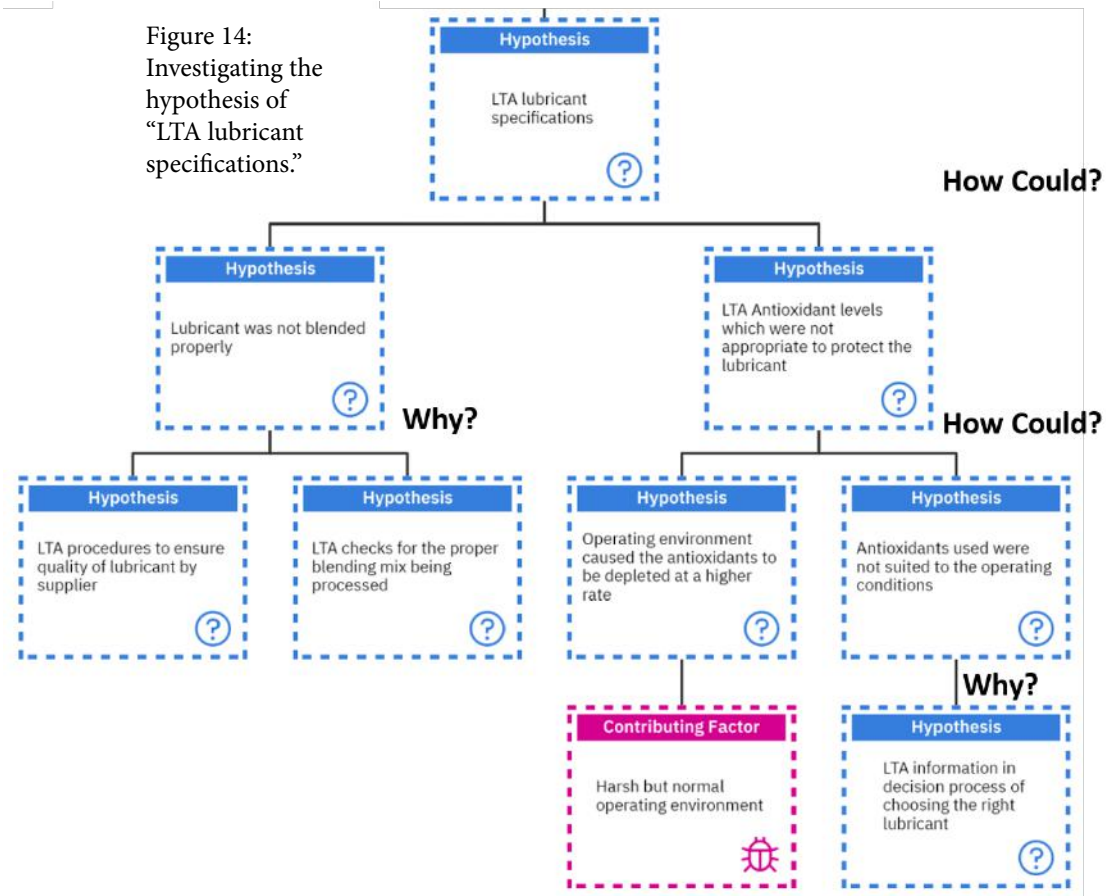
On to the last hypothesis of, “How could there be less than adequate lubricant specifications?”. This can occur if the lubricant was not blended properly or there were less than adequate antioxidant levels which were not appropriate to protect the lubricant.

“How could the lubricant not be blended properly?”. This can occur if there were less than adequate procedures to ensure the quality of the lubricant by the supplier, which is a systemic root cause and up to the supplier to investigate. Or there were less than adequate checks for the proper blending mix being processed, which is also a systemic root cause which must be investigated by the supplier.

On the other hand, “How could less than

adequate antioxidant levels exist which were not appropriate to protect the lubricant?”. Either the operating environment caused the antioxidants to deplete at a faster rate which could have been as a result of a harsh operating environment. This harsh operating environment is a contributing factor of which we have no control.

Or the antioxidants used were not suited for operating conditions. How can this happen? If there was less than adequate information in the decision process of choosing the right lubricant. This can be a human root cause as a decision was taken by a human in this process to not get more information before making the final decision on the process as shown in figure 14.



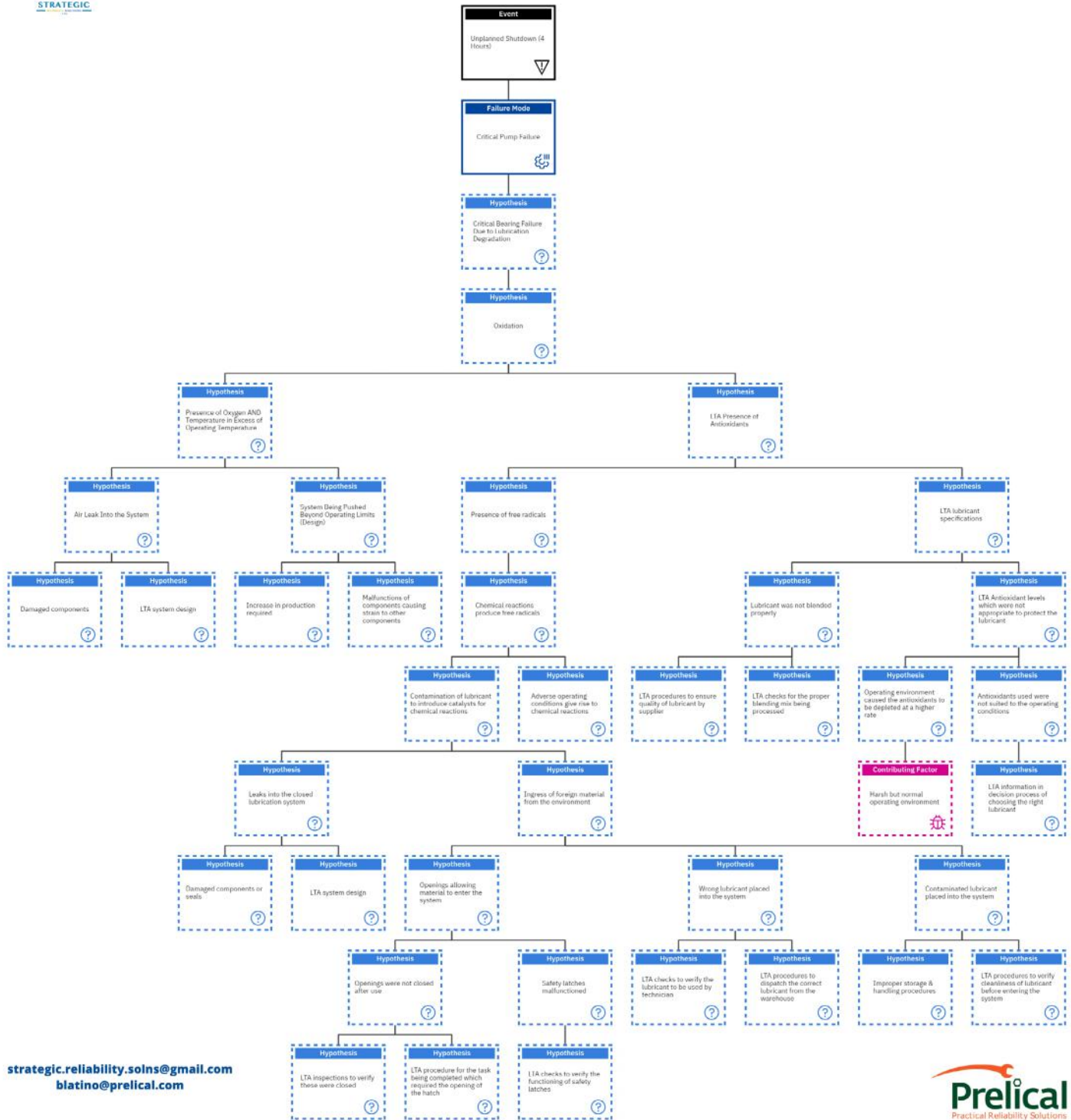
FINDINGS & DISCUSSION

Each of the aforementioned mechanisms produce unique characteristics which can aid in identifying its occurrence in a lubricant. Also, as noted above, there are various lab tests for each of the mechanisms. These can help to identify if the mechanism has occurred; however, we should examine ways to avoid the mechanism from occurring. This can be done if we understand the root causes of the mechanism and investigate beyond the physical elements.

For this paper, the author developed a logic tree for the most prevalent degradation mode, oxidation. Based on the definition of how oxidation occurs from the methodology, the attached logic tree can be developed shown in figure 15.



Guideline RCA Tree for Oxidation



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Figure 15: Full Logic Tree for Oxidation

Ideally, to avoid industrial lubricant degradation, one must be able to properly identify the degradation mechanism which is occurring and assess the physical, human and systemic root causes to ensure that this method of degradation does not occur again. This is not a standardized set of root causes as each system will have unique processes or operating environments which are specific to that machine. As such, the logic tree in this example was developed as a guide to allow readers to become more familiar with the technique of finding the real root causes. Therefore, this technique can be applied to the other degradation mechanisms and by extension to other processes which require further investigation.

CONCLUSION

Quite often, industry personnel focus on the tests which can be done to identify if a degradation mechanism is occurring and then implement physical changes to the system to ensure that degradation does not happen again in the future. From the extensive logic tree developed above, it is quite clear that by stopping at the physical roots, there are still human and systemic roots which occur. If these human and systemic roots are not properly addressed, then the degradation process will continue to occur. It is the intention of the author to shed some light on the deeper analysis which must be executed to fully understand the lubricant degradation mechanisms before addressing it and eliminating it from the system.

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Sanya Mathura is an accomplished engineering professional and CEO of Strategic Reliability Solutions Ltd, a global consulting firm specializing in reliability and asset management. With over 15 years of experience, she holds a BSc in Electrical & Computer Engineering and a Master's in Engineering Asset Management from UWI.

Sanya is internationally recognized for her expertise in lubrication and reliability engineering, being the first female in the Caribbean to achieve the ICML MLE certification and the first female globally to earn the ICML Varnish Badges (VIM & VPR) and Mobius Institute FL CAT I

certification. She serves on multiple editorial and advisory boards.

A published author of several technical books and articles, she promotes knowledge-sharing across the STEAM community. As series editor of the “Empowering Women in STEM” books, she champions mentorship, representation, and collaboration among women in technical fields. Sanya is also the external steward of the EDIMC of UWI’s DECE.

Her leadership and advocacy have earned her the 2024 Engineer of the Year Award from Empowering Industry (United States). She spoke about “How do we get more women involved in Engineering and Asset Management” in Australia (2025) and has been part of the discussion panel “Women in Engineering” hosted by APETT. Sanya wrote an article “Why are there so few registered female engineers in Trinidad & Tobago” for BOETT. Through mentoring, public speaking, and educational outreach, Sanya continues to inspire women and youth across the Caribbean and beyond, demonstrating excellence, innovation, and commitment to community development in the STEAM disciplines.

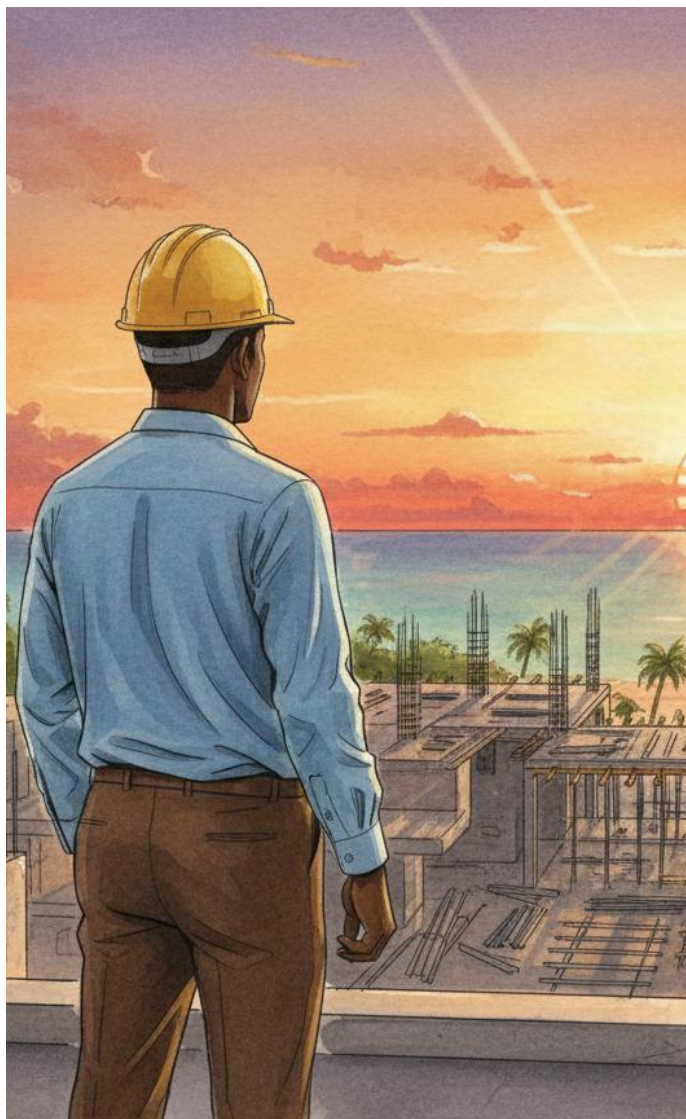
ALLAN CUNNINGHAM'S EVOLVE EXPERIENCE: CAREER TRANSITIONS

Article by Eng. Allan Cunningham

“I can do nothing by myself. Nothing is impossible for him who believes: you evolve.”

There are moments in every professional life when one must reinvent oneself—not through ambition alone, but through faith, learning, and the humility of being corrected by others.

My evolution has been a slow and deliberate construction of self, built brick by brick through persistence and grace.



My earliest struggle was with writing. Dyslexia made English composition a trial, and expressing technical thought felt impossible. Yet weakness became my foundation. Every report and drawing was an act of resistance against confusion, and every correction a lesson in patience.

My wife has shaped both my writing and my life. I hated her reviews. I remember my first professional condition report for a client—it took three weeks and the combined help of an editor, my wife, and an English teacher. I rewrote that report more than twenty times. Each revision came with instructions: fix the grammar, clarify the content, refine the professional jargon, align the format, remove vagueness, shorten the sentences, and simplify the technical language. We fought often; I wanted it to end.

Now I long for her reviews. She taught me that love and criticism can coexist—and that the closest things to a man's heart are his money, his children, his marriage, criticism, and his writing style. You know someone is near when you allow them into those spaces. I have been mentored in all of them; it has been painful, but transformative.

The theme of this new APETT Evolve magazine inspired me to write this article. I share my journey as I continue to evolve—personally, spiritually, and professionally. After decades in civil and structural engineering, I realised that many failures originate at multiple points in the project cycle: poor design, incorrect assumptions, inadequate material selection, unclear scope, weak communication,

and the absence of qualified Building Surveyors to provide pre-construction advice, post-diagnosis, building-pathology services, and performance monitoring.

Professor Kit Fai Pun still teaches me today. His patient mentorship continues to guide my clarity of thought and writing, reminding me that progress is a lifelong discipline. The Evolve theme therefore resonates deeply: it is not only about technological change but about moral and intellectual transformation—becoming more precise, more patient, and more purposeful each year.

Learning Through Service

I began my career in 1980 as a draughtsman and soil technician. Those formative years taught me patience, precision, and respect for accuracy. I advanced through construction and civil-engineering posts before earning my BEng (Hons) from Kingston University (UK) in 1992, where I completed a project report supervised by Dr. A. Fried on Brick and Block Behaviour Subjected to Lateral Loads Using Research Data.

Dr. Fried impressed upon me the importance of finishing well. I struggled deeply with writing—anxiously, because I could not pay my school fees, and emotionally, because I feared failure. There were moments when I felt frozen, unable to move forward. Yet I was not alone. My supervisor, friends, and family offered both financial and emotional support, reminding me that perseverance is rarely solitary.

I did not learn then that writing is editing in motion—that there is no perfection the first time, that it requires drafting, patience, and the discipline of setting time aside to write regularly. Those lessons came later, through



struggle and reflection, and they now guide my approach to every report, article, and manual I produce.

That experience taught me one of life's most enduring truths: no one evolves in isolation. Every professional journey is sustained by a community of faith, friendship, and encouragement. My community came through for me, and their belief in me became the foundation for my belief in others. It is the reason I now dedicate myself to mentoring and serving—to be for others what so many were for me.

Professor Kit Fai Pun: Gentle Precision

At the University of the West Indies, Professor Kit Fai Pun remains one of the most influential mentors in my life. His guidance exemplifies disciplined curiosity. His patient mentorship still shapes my clarity of thought and writing, reminding me that progress is a lifelong discipline. He never corrects with criticism but with questions.

“Keep it up, keep going,” he would say—and still says today. Whenever I feel scattered among too many ideas, I hear his voice reminding me that persistence, not perfection, brings clarity.

I have broad interests and often struggle to focus, but his steady encouragement reminds

me that growth is rarely immediate—it is iterative, reflective, and earned. Professor Pun’s influence extends beyond academia; it touches my attitude toward leadership, writing, and the ethics of professionalism. He shows that evolution is not a sudden leap but a disciplined rhythm of learning, refining, and sharing what one has learned.

Dr Richard Clarke: The Engineer’s Calm

Dr Richard Clarke, whose seismic-design lectures I attended at UWI, showed that absolute authority is quiet. His technical precision and calm confidence illustrated that great engineers stabilise both structures and people.

I was privileged to work alongside him for two years. He was disciplined, measured, and unwavering in his pursuit of excellence. His feedback was exacting but kind—he expected clarity, integrity, and humility from everyone on the team.

We have since lost Dr Clarke, but his influence endures. I shall forever remember the lessons he embodied: focus, discipline, and quiet strength. He is gone, but not forgotten. His example reminds me that the truest engineers are not those who build the most visible structures but those who leave invisible imprints of excellence on the people they teach.

Professor Ivor Seeley: The Unseen Mentor

I never met Professor Ivor H. Seeley, yet his textbooks mentored me from afar. Beginning as a quantity surveyor, he earned a BSc in Estate Management, an MA, and a PhD in Building Economics, rising to FRICS and FICE.

His mastery lay in turning experience into teaching—books like *Quantity Surveying*

Practice and Building Economics that blended theory, application, and moral purpose. He used his prior learning to evolve, and I have tried to follow that pattern: documenting Caribbean practice, mentoring others, and writing with honesty rather than grandeur.

Dr Robert Ratay: Integrity in Forensic Practice

Dr Robert Ratay, author of *Forensic Structural Engineering Handbook*, became an unexpected mentor through correspondence after I reviewed one of his papers. He told me: “Never write for your client; write for the truth.”

He reminded me that the courtroom is not a battlefield but a classroom, where the expert’s role is to teach facts clearly. His influence refined my forensic writing and reaffirmed that every report is a moral act.

Evolving Through Faith and Learning

I am now pursuing postgraduate studies in Forensic Structural Engineering while completing my CAL Forensic Geotechnical and Architectural Engineering Practice Manual (2025 Edition).

The manual blends Seeley’s structure, Ashworth’s practicality, and Ratay’s ethics into a Caribbean framework addressing our soils, codes, and courts. Writing it has deepened my conviction that technical truth must rest on moral courage.

My goal is to publish a Caribbean Primer on Forensic and Building Surveying Practice, bridging academic research with regional reality. As Seeley did for Britain, I hope to strengthen Caribbean literature in our field—turning experience into evidence and evidence into education.

The Transition to Building Surveying

Recognising the root causes of building failure

drew me toward Building Surveying—a profession that unites technical knowledge with human care.

Through Cunningham & Associates Ltd., I introduced condition surveys, forensic inspections, and expert reports. Each assignment reaffirmed my belief that buildings are living environments.

In 2024 I became a Full Member of the Institute of Surveyors of Trinidad and Tobago, and in 2025 I was appointed Building Surveying Convenor. At our conference I reminded peers:

“Buildings are more than concrete and steel; they are homes and sanctuaries for lives. A resilient Building Surveyor protects both people and property—creating trust, stability, and hope.”

That conviction continues to shape my integration of technical inspection with mental-health awareness and positive psychology in practice.

Mentoring and the Cycle of Growth

Mentorship has become my way of giving back. Using the IStructE IPD framework, I guide young engineers and surveyors through reflection, record-keeping, and ethical reasoning.

I often begin with a simple question: “What did you learn this week that made you uncomfortable?”

Growth begins at the edge of discomfort.

Each mentee reminds me of my own mentors—Pun’s patience, Ratay’s integrity, Seeley’s scholarship. Their voices echo through every conversation as I encourage others to “keep going” even when progress feels slow. Mentoring is not a one-way act of giving; it is shared transformation.

Writing as Redemption

Writing, once my torment, has become my testimony. Every manual, article, or forensic

report is a lesson in humility and structure. I now see the page as a drawing board: every word must carry load, align, and bear stress without failure.

Editing is reinforcement; clarity is design code.

Through my work with ISTT, APETT, and ICE Proceedings, I have learned that writing refines not only expression but character. It trains patience, precision, and truth.

What began with frustration and late-night rewrites with my wife has become a discipline of peace.



Faith and Resilience in Career Transitions

Each career transition—technician to engineer, manager to mentor, practitioner to author—has required faith.

Faith that effort guided by purpose produces growth; faith that service to others clarifies your own calling.

I look to those who inspire me—Frank Lloyd Wright, W. G. Curtin, Seeley, Pun, and Ratay—and see one shared trait: relentless curiosity. They never stopped learning or sharing. Their example reminds me that evolution is the reward of humility.

Faith also informs my advocacy for mental-health awareness in engineering. A healthy mind, like a stable foundation, sustains every structure built upon it.

Why We Evolve

We evolve because curiosity outpaces comfort, and gratitude demands generosity.

From dyslexic draughtsman to professional engineer and Building Surveying Convenor, my

journey has not been a ladder of titles but a spiral of transformation—each turn shaped by mentorship, faith, and perseverance.

I now see professional life as stewardship: of knowledge, integrity, and the people who trust our judgment. The Caribbean can and must produce scholarship equal to any region in the world—if we commit to excellence with humility and use our learning to uplift others.

Closing Reflection: The Architecture of Hope

If my journey carries one message, it is this: your challenges are the scaffolds of your purpose.

The measure of success is not height achieved but strength imparted to others.

I remain a student—still refining my focus, still hearing my mentors' voices, still believing that transformation is never complete.

You evolve when you turn hardship into help for others.

“I can do nothing by myself. Nothing is impossible for him who believes: you evolve.”



Allan Cunningham is a Trinidad and Tobago-based Professional Civil Engineer and Building Surveyor with over forty years of multidisciplinary experience across civil, structural, and building surveying practice. He holds a BEng (Hons) in Civil Engineering from Kingston University (UK) and serves as Building Surveying Convenor of the Institute of Surveyors of Trinidad and Tobago (ISTT). Allan leads Cunningham & Associates Ltd., offering engineering, building surveying, and forensic consultancy services.

He is also a professional mentor, aspiring author, and life coach dedicated to integrating technical excellence with emotional and spiritual well-being in professional life. His writing and mentorship emphasise lifelong learning, service to others, and resilience through faith. Allan's guiding belief—“You evolve when you turn hardship into help for others”—defines both his career and his calling.

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