The official journal of the Vibrations Association of New Zealand

Spectrum

Autumn 2024 | Issue 111

AN INTRODUCTION TO

Infrared Thermography

Crimping Compacted Cables

PROBLEMS AND SOLUTIONS WITH

Magnetic Stator Wedges

+

IT'S ON...

Conference'24

NEW PLYMOUTH | NZ

Conference tImetables, exhibitor map *and more...*

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CONTENTS

Issue 111 | Autumn 2024

Features

Regulars

Spectrum

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Spectrum is published by the Vibrations Association of New Zealand (VANZ). The magazine is produced in a quarterly cycle annually in both digital and printed mediums.

The magazine is designed to cover all aspects of the Vibration, Condition Monitoring, Reliability and the wider Predictive Asset Management field and distributed to all VANZ members, including corporate members.

Missed an issue?

Simply scan the QR code here to link your device directly to the VANZ website. There you will find Spectrum issues available to view or download*. You can also access previous issues by visiting our website online at: **www.vanz.org.nz**

**QR code reading app need on your device first.*

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VIBRATIONS ASSOCIATION *of* NEW ZEALAND

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VANZ PRESENTS

Conference'24

New Plymouth, NZ

PLYMOUTH INTERNATIONAL

21st - 23rd May 2024

Join us in 2024 at our next VANZ conference, featuring:

- International key-note speakers
- Special package deals for trainees and apprentices
- Special accommodation rates for VANZ members
- A special Wednesday evening dinner event
- Trade stand and exhibitor options

and much more!

Major sponsor: GVS RELIABILITY PRODUCTS

VANZ VIBRATIONS ASSOCIATION *of* NEW ZEALAND

SCAN ME!

For further info or to register, please contact our conference team: email us at secretary@vanz.org.nz

Welcome to New Plymouth

- Host location for the 2024 VANZ Conference

New Plymouth is a vibrant gem in the wider crown known as Taranaki. Here are some fun facts you may not know about the region.

New Plymouth was originally called Ngāmotu (the islands). Pākehā first arrived and set up a trading station at Ngāmotu in 1828, but it was not until 1841–42 that planned settlement brought 868 immigrants from Devon and Cornwall in England to the 'New' Plymouth.

The New Plymouth District, which includes New Plymouth City and several smaller towns, is the 10th largest district in New Zealand, and has a population of approx. 88,900 – about two-thirds of the total population of the Taranaki Region and 1.7% of New Zealand's population.

The city is predominantly a service centre for the region's principal economic activities such as farming, oil, natural gas and petrochemical exploration and production.

Left: Pukekura Park, located approx. 5min from the central CBD. Below left: The Mothers and Daughters stone sculpture, located on the New Plymouth Coastal Walkway. The sculpture was created by local artist Renate Verbrugge.

Notable areas of interest are the botanic garden (Pukekura Park), the critically acclaimed Len Lye Centre and Art Gallery, the 13 km New Plymouth Coastal Walkway, the 45-metre-tall artwork known as the Wind Wand, Paritutu Rock, and of course Mount Taranaki as a picturesque backdrop. Mt. Taranaki is 2,518m high, making it the second highest mountain in the North Island.

New Plymouth was awarded the most liveable city (for a population between 75K–150K) by the International Awards for Liveable Communities in 2021. In 2023, New Plymouth was awarded New Zealand's most beautiful small city, and in 2022 attained the title of most hours of sunshine for any New Zealand location.

Conference'24

HURRY, TIME IS RUNNING OUT!

With not much time to go now, make sure you're registered for...

Conference'24

NEW PLYMOUTH | NZ

21st - 23rd MAY 2024

Australasia's key conference calendar event for asset managers, reliability engineers, technicians, consulting engineers, suppliers and distributors of specialised equipment, engineering students and apprentices!

Don't miss out!

Booking is quick, easy and hassle free, visit:

www.vanz.org.nz

or scan the QR code below to link directly to our booking site.

Major sponsor:

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VANZ VIBRATIONS ASSOCIATION *of* NEW ZEALAND

Conference'24

NEW PLYMOUTH | NZ

21st - 23rd MAY 2024

Book your place online today to avoid missing out tomorrow!

Booking online is simple. Go to **www.vanz.org.nz** and follow the guided steps.

Registration Options

All conference pricing excludes GST.

1-Day Registration — TUE 21st MAY 2024

Package	PRICE PER PERSON
Condition Monitoring Hands On	$350
Condition Monitoring Hands On – Attendance to verified apprentices / trades trainees / university — FREE!	FREE
Asset Management	$350

2-Day Registration — WED 22nd - THU 23rd MAY 2024

Package	PRICE PER PERSON
2-Day Conference – Includes option to register for the full-day Electrical Masterclass stream. (Wednesday)	$900
2-Day Conference – Attendance to verified apprentices / trades trainees / university — 50% OFF!	$450

3-Day Registration — TUES 21st - THU 23rd MAY 2024

Package	PRICE PER PERSON
3-Day Conference – Includes option to register for the full-day Electrical Masterclass stream. (Wednesday)	$1,050

Booking is quick, easy and hassle free! Visit our website www.vanz.org.nz
or scan the QR code below to link directly to our booking site.

Note. Day 2 and 3 registrations includes the annual Wednesday dinner for the delegate.
There will also be provision for extra annual dinner attendee purchases at $125 per person.

Complimentary parking is available at the venue. All conference papers will be available to download from www.vanz.org.nz.
One year membership with VANZ is included with Main Conference (2 or 3-day) attendee pass.

Major sponsor: GVS RELIABILITY PRODUCTS

VANZ VIBRATIONS ASSOCIATION of NEW ZEALAND

SCAN ME!

For further info or to register, please contact our conference team: email us at secretary@vanz.org.nz

-CONFERENCE TIMETABLE -

Major sponsor: GVS RELIABILITY PRODUCTS

Brought to you by: VANZ VIBRATIONS ASSOCIATION of NEW ZEALAND

Tuesday 21st May - Day 1

Practical Condition Monitoring Awareness plus Reliability Improvement

Start	Duration	End		
7:45 AM	**0:45**	**8:30 AM**	**Registration and Exhibition / Trade Stand area is open for viewing, with Tea and Coffee available**	
8:30 AM	0:10	8:40 AM	Welcome to Conference 2024: VANZ President	
8:40 AM	0:10	8:50 AM	Overview of Conference Timetable for the Day and the next 2 days: Vice President	
8:50 AM	0:40	9:30 AM	Key Note Address: Allan Rienstra	
9:30 AM	**0:30**	**10:00 AM**	**Morning Tea in the Exhibition room / Trade Stand area** (With Exhibitor introductions)	
Two Streams of Presentations			**Stream 1: Room One** **The Tradesmans Tools' and Installation Specifications**	**Stream 2: Room Two** **Asset Management and Reliability Program Implementation**
10:00 AM	0:15	10:15 AM	An 'overview' of today's sessions	Root Cause Analysis: By Jeff Naylor
10:15 AM	0:30	10:45 AM	Vibration: By Bruce Shepherd	
10:45 AM	0:30	11:15 AM	Ultrasonics: By Dr James Neale	Change Management vs Management of Change: By Daré Petreski *(Paper time: 45min Approx.)*
11:15 AM	0:30	11:45 AM	Alignment: By Chris O'Leary	
11:45 AM	0:30	12:15 PM	Balancing: By Simon Hurricks	
12:15 PM	**1:00**	**1:15 PM**	**Lunch in the Exhibition room / Trade Stand area**	
1:15 PM	0:30	1:45 PM	Lubrication Dispensing: By Chris Unsworth	How to Justify & get Resources for Your Reliability Program: By Terry Blackman
1:45 PM	0:30	2:15 PM	Oil Analysis: By Mike Wharry	
2:15 PM	0:30	2:45 PM	Root Cause Analysis: By Jeff Naylor	10 Essential Habits For Successful Reliability Programs: By Cameron Blackbourn
2:45 PM	**0:30**	**3:15 PM**	**Afternoon Tea in the Exhibition room / Trade Stand area**	
3:15 PM	0.30	3:45 PM	Infrared: By James Neale	Round Table Discussions Your chance to ask your questions from todays presenters, panel experts and colleagues on a specific subject at an assigned table
3:45 PM	0:30	4:15 PM	Awareness of Counterfeit Products: By Larry Wiechern	
4:15 PM	1:15	5:30 PM	**'Meet & Greet' Networking** | Complimentary Refreshments and Canapés available in the Exhibition Area	

** Note. All times subject to change without notice.*

Wednesday 22nd May - Day 2 Main Conference

Start	Duration	End			
7:30 AM	**0:30**	**8:00 AM**	**Registration and Exhibition / Trade Stand area is open for viewing, with Tea and Coffee available**		
8:00 AM	0:10	8:10 AM	Welcome to Conference 2024: VANZ President		
8:10 AM	0:10	8:20 AM	Today's Agenda: Vice President		
Two Streams of Presentations			**Stream 1: Room One**		**Stream 3: Room Three**
8:20 AM	0:45	9:05 AM	Anti Friction Bearing Lubrication Using Ultrasound: By Allan Rienstra		Electrical and Mechanical Masterclass: By Mike Davis
9:05 AM	**0:45**	**9:50 AM**	**Morning Tea in the Exhibitor room / Trade Stand area** (With trade stand introductions)		
9:50 AM	0:40	10:30 AM	Sequence Engineering Root cause assessment of Flow Induced Vibration in a Thermowell: By Paul Bosauder		*Continues...* Electrical and Mechanical Masterclass: By Mike Davis
10:30 AM	0:40	11:10 AM	How New Zealand Steel reshaped their KOBM Converter reliability strategy with 3D scanning and engineering simulation: By Mark Foster		
11:10 AM	0:40	11:50 AM	Advances in Online Data Acquisition – a Case Study: By Chris Engdahl		
11:50 PM	**0:50**	**12:40 PM**	**Lunch in Exhibitor room / Trade Stand area**		
Three Streams of Presentations			**Stream 1: Room One**	**Stream 2: Room Two**	**Stream 3: Room Three**
12:40 PM	0:40	1:20PM	Oil Whirl Case History: By Simon Mulholland	To Repair or Not to Repair: Analysing Vibration data for wind turbine blades and tower sway: By Qing Ou	*Continues...* Electrical and Mechanical Masterclass: By Mike Davis
1:20 PM	0:40	2:00 PM	'No, it's not an outer race bearing fault': By Bruce Shepherd	Vibration characteristics of rubs in turbomachinery: By Roengchai Chumai	
2:00 PM	0:40	2:40PM	Wireless Online Monitoring Case Studies: By Grant Healy	There & Back again Part 1 (The Technical Solution): By Daré Petreski	
2:40 PM	**0:30**	**3:10 PM**	**Afternoon Tea in the Exhibitor room / Trade Stand area**		
3:10 PM	0:40	3:50 PM	State-based Monitoring and Alarms: By SImon Hurricks	Varnish/Deposit Detection and Mitigation: By Paul Foster	*Continues...* Electrical and Mechanical Masterclass: By Mike Davis
3:50 PM	0:40	4:30 PM	TBA: By James Neale	Translating Asset Mgmt Objectives into Actions: By Harley Kramer	
4:30 PM	1:00	5:30 PM	**'Meet & Greet' Networking** | Complimentary Refreshments and Canapés available in the Exhibition Area		
6:00 PM	**3:30**	**9:30 PM**	**Conference dinner**		

Thursday 23rd May - Day 3
Main Conference

VANZ AGM will be held at 10:00am
PLEASE ATTEND!

Start	Duration	End		
7:30 AM	**0:30**	**8:00 AM**	**Exhibition room / Trade Stand area is open for viewing, with Tea and Coffee available**	
8:00 AM	0:50	8:50 AM	Ultra sound: By Allan Rienstra	
8:50 AM	0:45	9:35AM	MTBF – What Is It Good For?: By Terry Blackman	
9:35 AM	**0:40**	**10:15 AM**	**Morning Tea in Exhibitor area ** VANZ AGM WILL BE HELD IN STREAM-1 ROOM ****	
Two Streams of Presentations			**Stream 1: Room One**	**Stream 2: Room Two**
10:15 AM	0:40	10:55 AM	Three Curly Case Studies. Remember To... Look At ALL The Evidence: By Ian Van der Sar	There & Back again Part 2 (The Technical Solution): By Daré Petreski
10:55 AM	0:40	11:35 AM	Underwear vs Overwear The Naked Truth: By John Clynes	Computerised Maintenance Management in the Internet 4.0 World: By Craig Carlyle
11:35 AM	0:40	12:15 PM	TBA: By James Neale	Field Experience on Torsional Vibration Analysis and Troubleshooting: By Roengchai Chumai
12:15 PM	**0:50**	**1:05 PM**	**Lunch in the Exhibitor room / Trade Stand area**	
1:05 PM	0:40	1:45 PM	'Advanced Maintenance Engineering' product: By Matt Gough	
1:45 PM	0:40	2:25 PM	Electrical Current Signature Analysis technology: By Ben Heywood	
2:25 PM	0:40	3:05 PM	Lithium Battery Fires: By Jonathan Smith	
3:05 PM	0:30	3:35 PM	Condition Monitoring: The Time is Now: By Iain Epps	
3:35 PM	0:15	3:50 PM	**Awards Presentations, Vendor Prize Draws:** You need to be there to claim the prizes & Conference closing address	

Conference officially closed. We look forward to seeing you all again next year in 2025. Please ensure you travel safely home.

Conference'24

Conference Speakers

Like previous conferences, 2024 is shaping up as a wealth of knowledge through outstanding keynote speakers, from both around the globe and here in NZ. Make sure you're registered to join their seminars to find out more about these professionals have to share. Two of our keynote speakers are detailed below.

GUEST SPEAKER - Mr. Allan Rienstra

Rienstra is the director of international business development for SDT Ultrasound Solutions, a 45-year-old company with operations in 5 continents. In his 32 years, Rienstra has helped thousands of organisations establish better practices for condition monitoring and asset health management based on the principles of inspect / detect / measure / trend / analyse / act / report - which follows his 10-step strategy to implement an effective and enduring ultrasound program. He is the author of Hear More, A Guide to Utilising Ultrasound for Predictive Maintenance and Leak Detection (2010) and serves on the Standards Council of Canada as a direct advisor to the International Standards Organisation with specific focus on the ISO 18436-8 working group for ultrasound in condition monitoring.

Mike Davis

With over 50 years experience in rotating equipment, essentially centred on the repair, redesign and maintenance of electrical rotating plant. Mike has developed an intense academic interest in machine failure mechanisms and root cause analysis of electrical machinery failure and has presented papers throughout Australia, New Zealand, United States of America, South East Asia and South Africa. For more than 20 years Mike developed tailored machines training courses which were presented to end-users in USA, NZ, Australia, South Africa, Indonesia, Singapore and Malaysia. Mike now shares his lifetime of engineering experience and knowledge through coaching and mentoring. Mike has won the Australian Small Business of the Year award and Australian Quality Award in 2000.

VANZ
VIBRATIONS ASSOCIATION *of* NEW ZEALAND

Notice of AGM

DATE: Thursday 23rd May 2024

TIME: 10:00am

LOCATION: Plymouth International - Stream Room 1

Please attend if you can, this association is run by you for you.

Conference'24

Conference Speakers

Continued....

Paul Bosauder

Paul specialises in computational fluid dynamics (CFD) and non-linear finite element analysis (FEA). Paul brings well over two decades of CFD and FEA simulation experience. He is a NAFEMS registered Professional Simulation Engineer (PSE) with advanced accreditation for both flow and stress analysis. Paul also holds a current CPEng (Mech) registration with the practice area description (PAD) of computer-based flow and stress analysis for the design, code verification, and fitness for service (FFS) assessment of industrial and process plant and equipment. Paul provides leading-edge delivery of CFD and FEA consulting services to customers around the globe. He brings significant experience from a wide range of industries, problem types, and analysis tools to each project he delivers or supervises. In addition to the practical application of numerical simulation, Paul has authored and presented professional education short courses, led business development for new technology fields, and maintained front-line technical support of advanced engineering analysis software.

Daré Petreski

A Certified Maintenance & Reliability Professional (CMRP) with 30+ years of progressive experience in Physical Asset Management, Maintenance, Reliability, Continuous Improvement, Risk Mitigation, Defect Elimination, Hydrocarbons (FLAC) Management and multi-technique Condition Monitoring. An accomplished public speaker & training facilitator, Daré has delivered technical training workshops, keynote addresses and presented papers at multiple Asset Management, Maintenance & Reliability conferences/events both in Australia and overseas. An experienced change agent with commercial experience and an unwavering commitment to health & safety resulting in a career free from LTI's and MTI's, Daré has steered, managed and supported transitioning organisations across multiple industry sectors, both in Australia and abroad, in taking the next evolutionary step with their approach to physical asset management by creating sustainable performance improvements for both organisations as a whole, as well as targeted individual operations.

Roengchai Chuma

I have been working in the field of machinery diagnostics since 1999 providing various services to identify and correct machine problem in order to make them run better. The services include vibration analysis, rotordynamic modeling and analysis, field balancing, design and install vibration monitoring system, machine/plant performance modeling and analysis, etc. I have experienced serving many industrial types such as power generation (thermal plant, combined cycle plant, geothermal plant, hydro power plant) and oil & gas (upstream, midstream and downstream) mainly in Asia Pacific, Australia and New Zealand regions. My goal is to continuously increase knowledge and experience in identifying and solving machinery malfunctions.

Specialties: Rotordynamic modeling and analysis • Vibration testing and analysis on both rotating and reciprocating machinery • Field balancing both single and multi planes (influence coefficient and static-couple methods) • Structure vibration testing and analysis e.g. impact test, operating deflection shape and modal analysis • Equipment and plant performance modeling, analysis, and optimization • Reciprocating compressor condition monitoring and diagnosis • Hydroturbine-generator vibration monitoring and diagnosis • Static & dynamic pipe stress analysis.

Jeff Naylor

I'm passionate about supporting Aus/NZ industry for our current and future generations. SIRF Roundtables has provided me with a vehicle to genuinely help in many ways. We bring international experts to Aus/NZ to deliver genuine training value to the business community. Problem Solving | 5Y | 5Y/A3 | Fishbone | Cause Trees | RCA2Go | VSM | 5S | SMED | TPM | Kanban | Operations Management | Continuous Improvement | Lean Manufacturing. We remain fiercely independent and I will NEVER allow SIRF Roundtables to become a Trojan Horse company for any consultancy.I love developing people with structured training methodologies such as our 5Y/A3 & RCA processes. I want nothing more than for your people to be able to apply what they have learnt from our training again and again. Not only that, I want them to see the big picture in solution options. I'm just as passionate advocating for mobility developments to support the worlds disabled. My wife and I have a disabled child and know intimately the difficulties many in our community face trying to achieve genuine social inclusion.

Continued over page >

Conference'24

Conference Speakers

Continued....

Harley Kramer

Starting out in the precision world of aviation as an aircraft maintenance engineer and progressing through to quality leadership roles with an unwavering passion for quality and getting the job done right, first time, every time.
Whether in heavy industry, manufacturing or maintenance, he has a strong belief in understanding the requirements of the job and working towards achieving, and often surpassing, compliance standards.
With a history of success across multiple industries including mining, manufacturing, energy and infrastructure, he relishes the challenge of not only assisting owners to successfully understand and mitigate the risk involved with purchasing equipment, particularly in emerging markets, but also working with suppliers and manufacturers to understand and meet customer requirements. His approach to Quality is mirrored in both Maintenance and Reliability from having been immersed in reliability focused and precision maintenance industries for over 15 years.
In that time he has been able to assist organisations achieve effective and sustainable improvements to both their asset reliability and operational performance, culminating in positive returns to their business.

Qing Ou

I have been involved in product development for machine condition monitoring since 2009. Products I have worked on including portable vibration analyzers, permanent online monitors and wireless sensors. Currently I am developing intrinsically safe (Ex rated) wireless sensors for machine condition monitoring applications.

Terry Blackman

I am a Mechanical Engineer with nearly 40 years' experience in the delivery of services and training that support improvements and effectiveness of plant maintenance and reliability. My work experience covers broad range of roles from technical work as an Application Engineer to managerial roles as State Manager, General Manager and Company Director. Originally from Brisbane, I spent some years in Perth and Adelaide, before settling in Melbourne where I am now. I am currently teaching the Mobius Asset Reliability Practitioner [ARP] courses and supervising the Certification Exams - mostly in Australia although I have taught the courses in New Zealand, Malaysia, Vietnam, and South Africa.

Iain Epps

Managing Director, Mobolo Technology Ltd, NZ
After completed a PhD in Vibration Monitoring of Rolling Element Bearings Iain embarked on a successful career leading software and new technology development in transport, finance, business services, agritech and hydropower.
In 2015 Iain returned to the area of his PhD research and formed Mobolo Technology to developed and commercialize an exciting new approach to severity measurement in rolling element bearings.

Other speakers at Conference'24 include...

Ben Heywood	*Topic:* Electrical Current Signature Analysis tech
Bruce Shepherd	*Topic:* Vibration
Cameron Blackbourn	*Topic:* 10 Essential Habits For Successful Reliability Programs
	Topic: Waveforms
Craig Carlyle	*Topic:* PM & H&S
Chris Unsworth	*Topic:* Lubrication Dispensing
Chris O'Leary	*Topic:* Alignment
Dr James Neale	*Topic:* Ultrasonics
	Topic: Infrared
John Clynes	*Topic:* Underwear vs Overwear The Naked Truth
Jonathan Smith	*Topic:* Lithium Battery Fires
Larry Wiechern	*Topic:* Awareness of Counterfeit Products
Matt Gough	*Topic:* 'Advanced Maintenance Engineering' product
Mike Wharry	*Topic:* Oil Analysis
Simon Hurricks	*Topic:* State based monitoring and alarms
	Topic: Balancing
Simon Mulholland	*Topic:* Oil Whirl Case History

Exhibitor Floorplan

We would like to extend a huge thank all of our exhibitors for the 2024 VANZ Conference, held at the Plymouth Internation Hotel in New Plymouth. Below is a list of all our exhibitors and where they will be located in our exhibitor hall and social networking room. Please ensure you take the time to visit our sponsors and find out what they might be able to you offer you and your business. With 19 trade stalls for Conference '24, we're sure there will be something here for everyone.

** Note. Floorplan subject to change without notice.*

Conference'24

PRESIDENTS' REPORT

By Tim Murdoch | VANZ President

As we approach the conference, I am thrilled to share some exciting updates and insights. With just six weeks remaining until the event, its remarkable how quickly this past year has flown by.

New Plymouth, VANZ is heading your way in May! Back to the location of the first VANZ workshop conference in 1989. I strongly encourage each of you to secure your spot at the conference by registering at **www.vanz.org.nz** Don't miss out on this exceptional opportunity to engage, learn and collaborate.

Conference timetable

The conference timetable is full, we even have three streams running on Wednesday 22 May. I invite you to take some time to read through it on pages 8-9 and take note of the presentations that interest you – there's something for everyone.

Prepare to be captivated by a diverse lineup of speakers—both local and international. We are honoured to have Allan Rienstra from SDT Ultrasound Solutions as our keynote speaker. His insights will be enlightening and inspiring. Our speakers span various aspects of condition monitoring, asset management and reliability, ensuring a rich and informative experience for all attendees.

Mike's motor course

Mike Davis is back this year running his motors masterclass designed for electrical and mechanical disciplines. If you'd like to have a practical knowledge about motors, get a better understanding why that motor has that vibration coming from it etc. then make sure to register on the VANZ website to lock in your place. Limited numbers available.

Exhibitors

Our exhibitors are set to showcase their technologies and latest innovations. They are:

- GVS Reliability Products
  (Platinum sponsor of the VANZ conference this year)
- Lubrication Engineers
- Energy Systems Management Ltd
- CSE-W. Arthur Fisher
- Emerson
- Schaeffler
- Applied Industrial Technologies
- IFM Effector
- NVMS
- Allied Petroleum
- ABD Group
- John Morris Group
- Delta AR
- AVO
- MESNZ
- Agen Ltd
- Evident Scientific
- Reliability Institute of Australia

Thank you for your commitment to the VANZ community and to our organisation.

Networking Opportunities

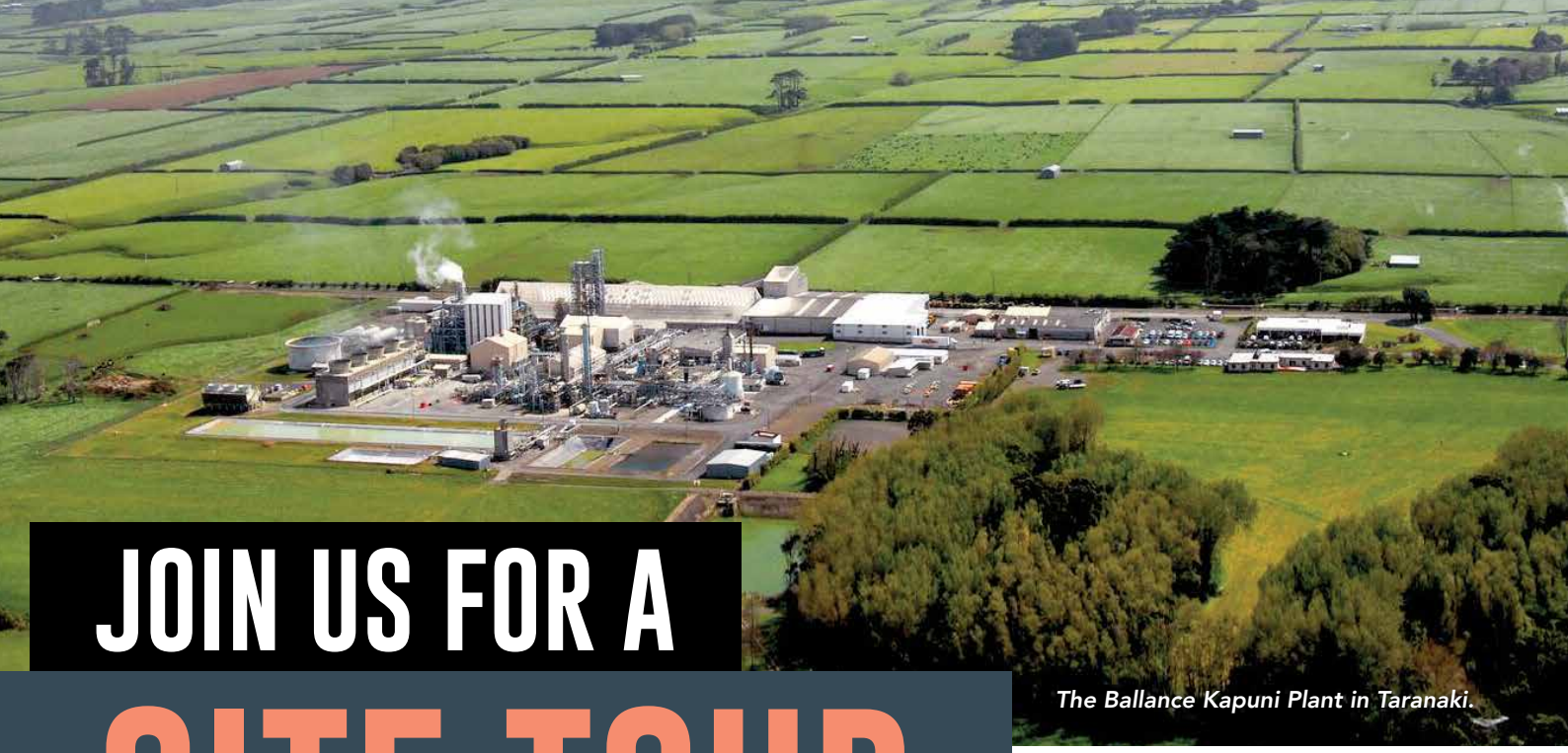
Our conference provides a unique platform for networking with like-minded people in the fields of condition monitoring, asset management and reliability. Whether you are seeking to connect with industry experts, explore new technologies or learn from real world case studies, this is the place to be. Remember, you might discover solutions that resonate with your own workplace challenges.

Below: The Ballance Kapuni Plant in Taranaki.

Site Visit

We are delighted to offer an exciting opportunity for a site visit to Ballance Kapuni on Friday 24 May following the conference. This exclusive visit allows you to explore the facility and gain valuable insights. For a nominal fee of $30, you can be part of this enriching experience. To secure your spot, please email Angie at secretary@vanz.org.nz - limited spaces available.

Please make the most of this opportunity to learn, connect and shape the future of our field. I'm looking forward to seeing you all there! ■



JOIN US FOR A SITE TOUR

The Ballance Kapuni Plant in Taranaki.

Ballance agri-nutrients

Join us* in visiting the only Ammonia Urea plant in New Zealand sporting a diverse range of both rotating and static equipment.

* Available only to attendees of Conference'24

$30 per person | Friday 24th May | 08:30- 13:30

Return transport provided leaving Plymouth International Hotel | Light lunch provided

STRICTLY LIMITED SPACES

To participate in the site tour you must:

- Be a minimum of 16 years of age.
- Wear protective footwear. (Limited steel cap boots available on site for those traveling from overseas)
- Wear ankle to wrist clothing.
- No cell phones, cameras or ignition sources are to be carried within the secure area.

The following will be provided during the tour

- Hard hats, safety glasses, high visibility vests, NH3 escape masks.

VANZ VIBRATIONS ASSOCIATION of NEW ZEALAND

Register your place on the tour now at
secretary@vanz.org.nz

Crimping of Compacted Cables

The crimping of compacted cables can catch you out.

What is a compacted cable ?

Compacted cable is a cable which has had it's strands compressed together during manufacture. This produces a slightly thinner cable than a standard strand cable. The Cross Sectional Area (CSA) in mm^2 remains unchanged. Compacted Cables are common in the size range of A 25 mm^2 standard to 95 mm^2 CSA.

What is the trap with such a cable ?

Because the conductors are compacted together the lug that is recommended to use feels a bit loose. There is the temptation to select a smaller lug and then crimp the smaller lug onto the cable. The problem is that the crimp will not be a good one and the smaller lug will not carry the rated current of the larger cable. A HOT JOINT will occur. Use the same CSA (mm^2) lug as the cable CSA (mm^2). Crimp as per standard crimp procedure.

Continued over page >

Photo 1. A 35 mm^2 standard strand cable on left and a 35 mm^2 compacted cable on the right.

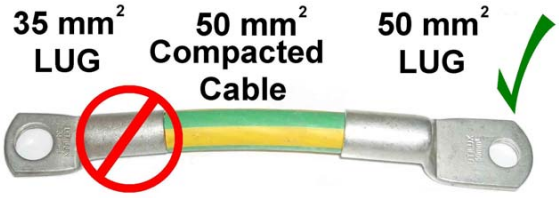


Photo 2. A 35 mm^2 crimp lug fits onto a 50 mm^2 compacted cable. (Are we right to crimp it ?. Answer = NO). A 50 mm^2 crimp lug feels a bit loose on a 50 mm^2 compacted cable. (Are we right to crimp it ?. Answer = YES)

Photo 3. A 50 mm^2 flexible cable.

Article prepared by Rod Bennett.

EDITORS' CORNER

By Angie Delfino | Spectrum Editor

Greetings readers!

Conference time is rolling around again and VANZ is a hive of activity planning this years' symposium so all who attend can benefit and take away new information and techniques not to mention the latest gadgets to roll out in to the field.

Our conference committee have got a lot in store for us this year as always and our main sponsor this year is GVS! You can register online at www.vanz.org,nz/conference-2024 so check out the website for updates as conference gets closer.

Many thanks go to all those who are helping to sponsor the event this year with a variety of different support, from trade-stands to networking nights. Also to our continued advertisers who are much appreciated and are all an important part of keeping VANZ going.

In this issue you can read thru an article by Mike Davis from EMKE, titled Problems and Solutions with Magnetic Stator Wedges, he'll be conducting a special 1 Day only training event at the conference – the Electrical Masterclass. Also there's an article by Wayne Ruddock with An Introduction to Thermography. Browse through the update from the President's Report by Tim Murdoch, he gives us an idea of what to expect from this years' conference. If you want to puzzle your grey matter then flip through to Carl's Quiz and see how well you score on the latest questions.

Enjoy the read and see you at the conference!

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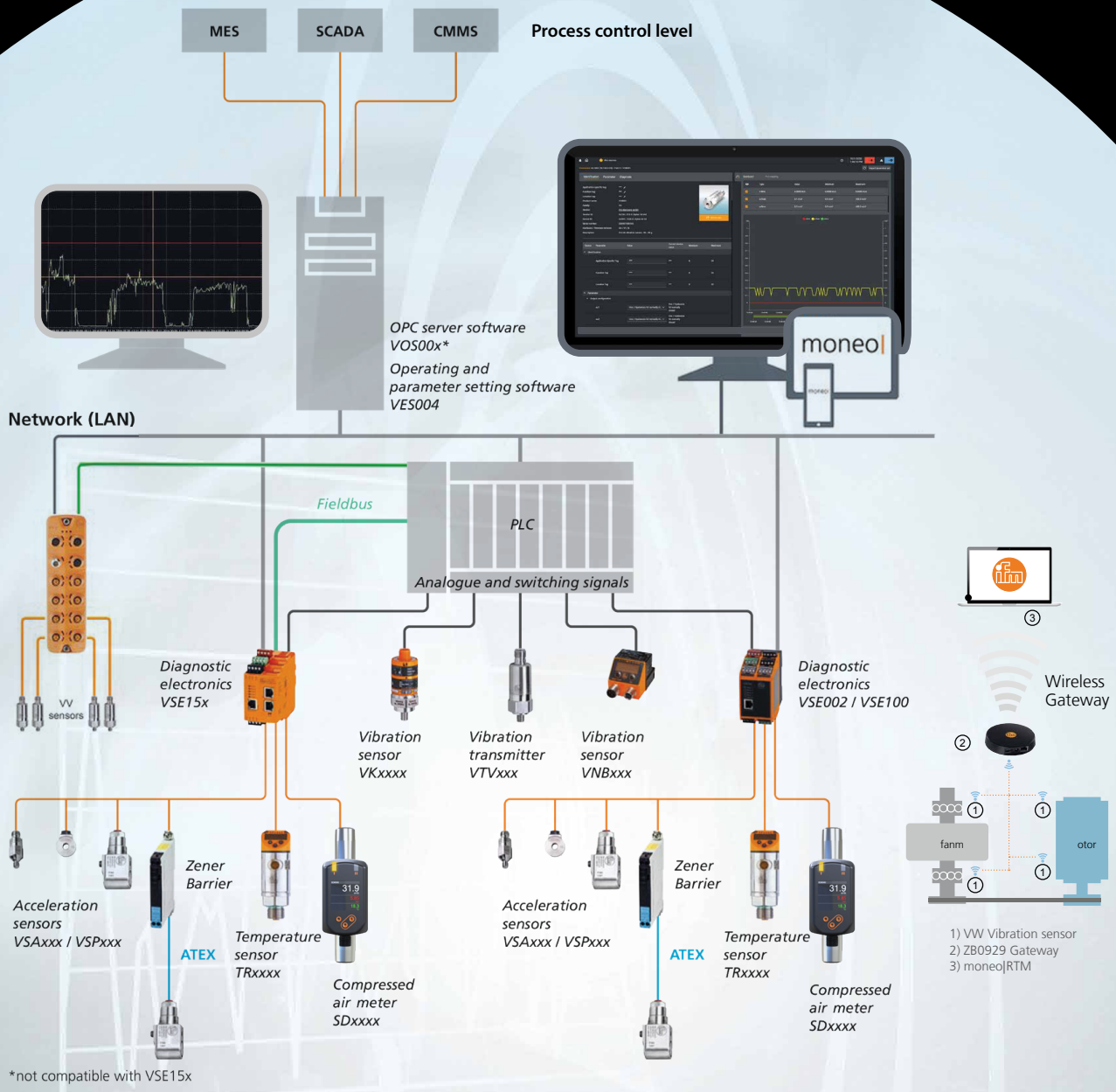


Crimping of Flexible Cables
The crimping of flexible cables requires special consideration.

What is a flexible cable ?
A flexible cable is a cable comprising of many fine strands. Typical applications are for Electric Arc Welding leads and power cables for mobile/moving equipment or where cable movement frequently occurs.

Due to so many strands, there are a lot of air gaps between the individual strands. This produces a problem when crimping because of the larger physical size of the overall conductor for the given Cross Sectional Area (CSA). The standard size lug for the given CSA of flexible conductor will usually be too small to accommodate all of the conducting strands.

The suggested solution is to select the next higher CSA lug size and use a "Half Hex" crimping method.
The Half Hex method has to be used because the standard Hexagonal dies for the lug selected will not produce the desired compression to create a sound crimp.

Flexible Conductor Size			*Crimp Lug CSA (mm^2)*	*Utilux Crimp Lug Part Number*	*Utilux Half Hex Die Set consists of:*
Nominal	*Range*				
(mm^2)	*Min*	*Max*			
16	*15*	*19.3*	*25*	*H1416 (M10) H1416B (M12)*	*Half 38-98CU plus 38-FLAT17*
25	*23.5*	*30.5*	*35*	*H1368 (M10) H1369 (M12)*	*Half 38-98CU plus 38-FLAT17*
35	*27.5*	*35*	*50*	*H1420 (M8) H1421 (M10)*	*Half 38-130CU plus 38-FLAT17*
50	*47.5*	*58*	*70*	*H1422 (M10) H1423 (M12)*	*Half 38-153CU plus 38-FLAT17*
70	*66.5*	*82*	*95*	*H1424 (M10) H1425 (M12)*	*Half 38-183CU plus 38-FLAT14*
95	*89.5*	*112.5*	*120*	*H1381 (M10) H1382 (M12)*	*Half 38-220CU plus 38-FLAT14*
120	*113.5*	*141.5*	*150*	*H1384A (M10) H1384 (M12)*	*Half 38-245CU plus 38-FLAT14*
150	*131*	*162.5*	*185*	*H1387A (M10) H1387 (M12)*	*Half 40-260CU plus 40-FLAT25*
185	*174.5*	*219.5*	*240*	*H1390D (M10) H1390A (M12)*	*Half 40-310CU plus 40-FLAT25*

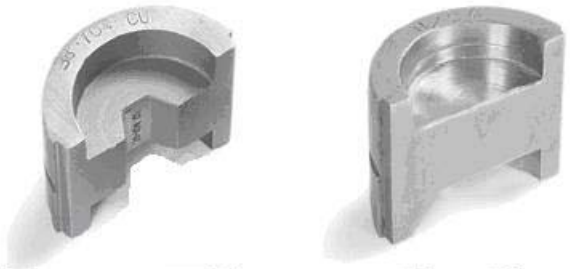
Table 1. Common Flexible cable sizes with recommended crimp and die selection Refer to Utilux® Power Products Reference Manual (page 120-121 for full range).

Use 1 size higher CSA (mm^2) lug than the cable CSA (mm^2). Use half hex die set and crimp as per standard crimp procedure.

Crimping Tool Selection
The correct Crimping Tool and Crimping Die must be selected to suit the lug selected. Refer to Utilux® crimp selection guide. Note: There are different Dies for Aluminium and Copper Lugs.

A Die Identification mark will automatically be stamped onto the Lug Barrel during crimping.

For flexible cables use the half hex combination



Above left: Hexagon Die. Above right: Flat Die.
Below: UTILUX 38A – 12 Ton Crimping Tool.

Use the right tool for the job!

Crimping Steps

1. Align crimp lug in jaws of Crimping Die with cable inserted. Ensure jaws do not overhang lug barrel as this will produce a sharp edge that will damage the cable strands.

2. Keep applying crimp pressure until the jaws meet and the tool "clicks". If the jaws don't meet, then there is a problem with the tool set-up. This must be corrected. If you find that the crimp isn't quite right, don't try to fix the situation by re-crimping the same lug. CUT THE LUG OFF AND START AGAIN.

3. The finished crimp
Note: Crimping die Identification stamped into finished crimp (38-165 CU). ■

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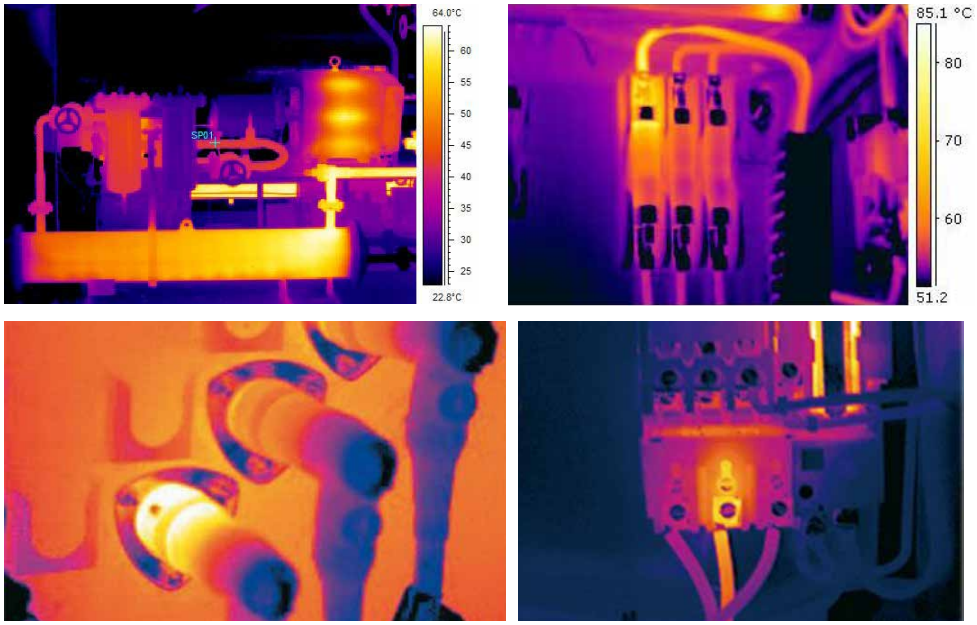
FEATURE

An introduction to

Infrared Thermography

Infrared thermography is one of the most diverse technologies available in the industrial world. Many people believe that infrared devices measure temperature. They do not. Rather than be a shortcoming of the technology, this fact is really an asset. Infrared can be used for much more than simple temperature measurement tasks. Not only is it a valuable tool in a predictive maintenance program it is also a mainstay in the military for its "see in the dark" abilities. It is also used as a research and development tool and in many instances is employed as a process control device where temperature is not the principle factor. First we will briefly introduce the main principles behind infrared thermography and then we will look at a few of its many applications.



Infrared Basics

Infrared devices from the simplest $50 spot radiometers to the complex $250,000 computerized R&D systems do not measure temperature. In some infrared devices, temperatures are calculated based on specific operator inputs. All infrared devices are simple receivers, which capture infrared radiation in the 2 – 14 micron wavelength of the electromagnetic spectrum. There are no harmful or detrimental emissions of energy such as those found in x-ray devices. The radiation an infrared device sees comes from approximately the first .0254 mm of the surface of most solids and liquids. As this radiation comes from only the surface of objects, infrared devices do not see through or into any common objects that we find in the world around us.

In general this surface radiation can come from 3 distinct sources. It can be reflected from the surface of the object, from a background source. This is similar to the reflection in a mirror. Some of the radiation the camera sees can be emitted from the object due to the temperature of the surface of the object viewed. In rare cases some of the energy can be transmitted through the object, from behind the object of intersest. This only happens with a handful of the materials such as Germanium, Silicon, Zinc Selenide, Sapphire, Arsenic Trisulphide Glass, as well as some polyethylene's and a few other man made compounds. There is no transmission through common materials such as metals, woods, paints, plastics, glass, cloth, skin etc.

The energy emitted from the surface of an object then travels through the atmosphere and strikes the lens of the infrared device. In some cases the atmosphere can absorb some of this energy and emit its own energy. This loss of energy is accounted for in most infrared devices where temperatures are calculated by an onboard microprocessor.

While infrared devices do not measure temperature, there is a relationship between emitted energy, which is a product of the kinetic vibration of the molecules at the surface of a material and temperature. This relationship is defined by the Stephan-Boltzman formula. This formula states that the amount of energy emitted from an objects surface is proportional to an objects temperature in Kelvins raised to the fourth power. This means that a small change in temperature is a very large change in the amount of radiated energy. Many infrared devices are capable of seeing changes in emitted energy caused by a temperature difference as low as .03 degrees Celsius. Temperature calculations are only accurate if the necessary variables are correctly input into the microprocessor.

> **Thermography is a compound of two words, thermo and graphic. This helps explain what infrared thermography is all about.**

Infrared Thermography

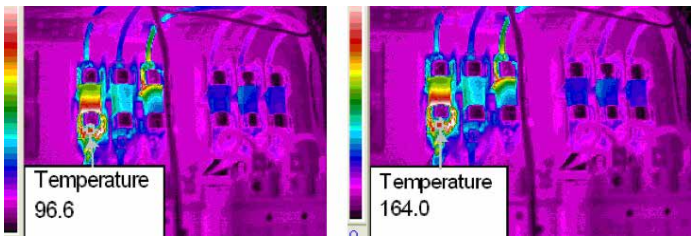
The word thermography is really a compound of two words, thermo and graphic. This helps to explain what infrared thermography is all about. While there are numerous infrared devices, such as remote controls, heaters, and spot radiometers, infrared thermography is the related only to the area of infrared where a thermogram (thermal picture) or infrared image is produced.

Continued over page >

This is accomplished with the use of an infrared imaging system. In the past most camera systems were priced out of the reach of many industries. When the author of this paper first entered this field in the 1970's a typical industrial infrared camera was approximately $70,000. Today an infrared camera system capable of temperature calculations and digital image storage can be purchased for as low as $1,595 US.

All infrared camera systems have 4 main components. On the front of the camera there is a lens/optic system, which focuses the infrared energy. Lenses come in all shapes and sizes. They vary in price from less than one thousand dollars to hundreds of thousands of dollars. There are microscope lenses to see fine detail up close as well as telephoto lens which are capable of seeing a person in the dark conditions kilometers away. The lens must match the application the camera will be used for.

The second component in all IR cameras, is the detector system. This measures the incoming infrared energy and converts it to a usable electrical signal. Some cameras have a single element and the image is produced by a combination of scanning prisms and or mirrors. Most of today's cameras are equipped with Focal Plane Arrays (FPAs). These detector systems can have as many as 1 million individual detector elements mounted on a flat focal plane. Common industrial cameras have 320 X 240 element FPAs yielding an image with 76,800 individual pixels of radiated energy in the image.



A display device allows the technician to view the energy patterns radiated off of the scene viewed. The display can be an LCD screen or an eyepiece. Some camera systems today have both types of displays. The image can be displayed in a gray tone, or in any number of color pallets, as chosen by the operator.

An electronic package inside each camera allows the operator to control how the image is manipulated and displayed. In most industrial cameras the electronic functions also allow the operator to store a number of infrared images either on a removable memory card or in the cameras internal memory. These images can then be transferred to a computer for post analysis and report generation. In cameras which are classified as Quantitative cameras, the electronics include a specialized microprocessor. This allows the operator to calculate and display temperature values for the items of interest in the scene being viewed. To achieve accurate temperature calculations the operator must be trained to at least Level 1 achievement status in a course which complies to written standards from organizations such as AINDT, ASNT or ISO. Without this knowledge all temperatures are usually inaccurate and unrepeatable. Which temperature is right? Only a trained, experienced technician can produce accurate temperatures with an infrared camera.

Applications

Applications for infrared thermography can be placed in two distinct categories. They are qualitative and quantitative. In qualitative applications the infrared cameras do not have the capability of calculating temperature. They display only a thermal image with no temperatures. Many applications do not require temperature. An image of the radiated energy pattern of an object is often sufficient to determine its condition. On the other hand most predictive maintenance applications do require temperatures to determine the severity of problems as well as the repair priority and schedule. Below is a basic application chart for the two categories of thermography.

General Application Chart

Qualitative	*Quantitative*
NDT	*NDT*
Security and Surveillance - Civil	*Predictive Maintenance*
Homeland Security - Military	*Research and Development*
Search and Rescue	*Industrial Heat Loss*
Fire fighting	*Process Monitoring*
Building Inspections	*Continuous Monitoring*
Process Monitoring	*Quality Assurance*
Continuous Monitoring	*Medical*
Quality Assurance	
Research and Development	

Continued over page >

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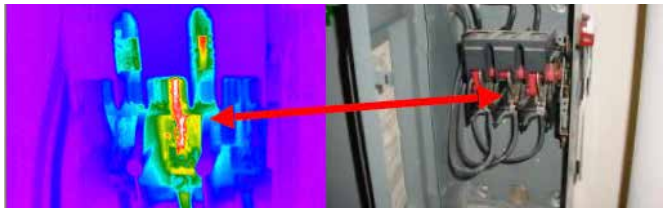
Infrared Thermography and Predictive Maintenance
There is no other technology in the predictive maintenance field that can come close to infrared for its diversity and value. It is not the best tool for all applications but it is the only tool that can be used for a multitude of applications. Unlike many other tools, which are narrow in their scope, infrared can be used throughout a facility for a wide variety of inspections. It can be used for electrical inspections, mechanical inspections looking at motors pumps drives etc, process inspections, vessel inspections, steam inspections including traps and insulation, relief valve inspections, furnace and boiler inspections. It can also be used in plant for quality assurance and process control as well as the above predictive maintenance applications.

> **Thermography is the ideal tool to aid in identifying failing equipment before it can cause a loss of production and revenues.**

Electrical Inspections: Infrared thermography is the only practical tool for electrical predictive maintenance. It also offers the highest return on investment. One major electrical fault can shut an entire plant down for an extended length of time if the electrical failure is catastrophic and causes fire losses. Even if there is not fire involved, electrical outages can cause the loss of an entire days production or worse depending on the severity of the problem.



The example above is a high resistance problem on the main incoming electrical transformer, that if left unattended, would eventually result in catastrophic failure. This problem would disable the entire facility and require a specialty crew to be called in to facilitate the repair. Compare this cost to an investment of approximately $35,000 for the initiation of a complete in-house electrical inspection program, which includes camera, software and training.

Infrared thermography can identify potential electrical problems years before catastrophic failure. The National Fire Prevention Association recommends that every facility should have an electrical inspection on all electrical equipment once a year and an inspection on high value/high risk equipment a minimum of twice a year.

Mechanical Inspections: Most mechanical equipment is composed of some form of moving parts. In a perfect system all of the energy supplied to the machinery should result in profitable work done by the equipment. In reality a certain amount of energy is transformed by friction or stress into thermal energy, which increases the temperature of the components. As mechanical equipment begins to fail or operate in an undesirable fashion, there will usually be a change in the normal thermal pattern of the equipment as compared to the thermal pattern of a properly operating system. Infrared Thermography is the ideal tool to aid in identifying failing mechanical equipment before it can cause a loss of production and revenues.

In most mechanical infrared programs a baseline for each individual piece of equipment in the program is established as the program is initiated. The equipment to be chosen for

the program is selected using various criteria. Criticality to operation, cost, replacement availability, and suitability for the program are a few of the issues considered.

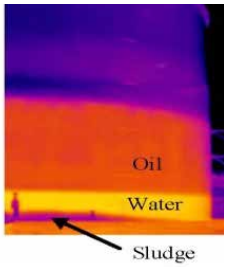
Equipment suitable for inspection with infrared thermography includes:

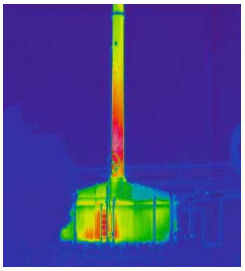
Motors	*Pumps*	*Fans*
Gearboxes	*Bearings*	*Shafts*
Drives	*Pulleys*	*Compressors*
Conveyer systems	*Robotic Equipment*	*Generators*

Any rotating equipment such as paper machines and kilns may also be included in this inspection list.

Process and Vessel Inspections: Predictive maintenance issues can be seen with infrared in many pieces of equipment due to differences such as conductivity and specific heat. Different materials have different specific heat values and this can cause thermal differences in various liquids in large vessels. Not only can levels be identified but different types of liquids as well as sludge buildups can be visualized. A trained thermographer, with a good knowledge of principles such as solar gain and specific heat, can produce accurate results in many situations.

Damaged insulation and refractory thinning causes a change in conductivity. Any insulated process or furnace which suffers from either of these problems will exhibit "hot spots" in these areas of higher conductivity. Infrared thermography can map out these areas. Over time, records of the temperature verses refractory thickness can be gathered. This will give the technician the ability to gauge refractory thickness by calculating the surface temperatures and comparing the new values to historical data.





Steam Traps and Relief Valves: In both cases infrared thermography is a good mass screening tool to look at hard to get to steam traps and relief valves. If the valves are venting to the atmosphere there is both a loss of product and energy and in the case of some relief valves, an environmental danger which can result in large noncompliance fines. Under normal operation, as can be seen in the example *(below left column)*, the steam side of the trap will be hot while the condensate side will be cooler. In the case of a trap which is stuck open both sides of the trap will be hot. This condition will be the same for relief valves as well. The example on the right is a valve which is stuck open and venting to the atmosphere. Two are working correctly while the center one is in a failure mode. This example was a chargeable offense due to the makeup of the gas released.

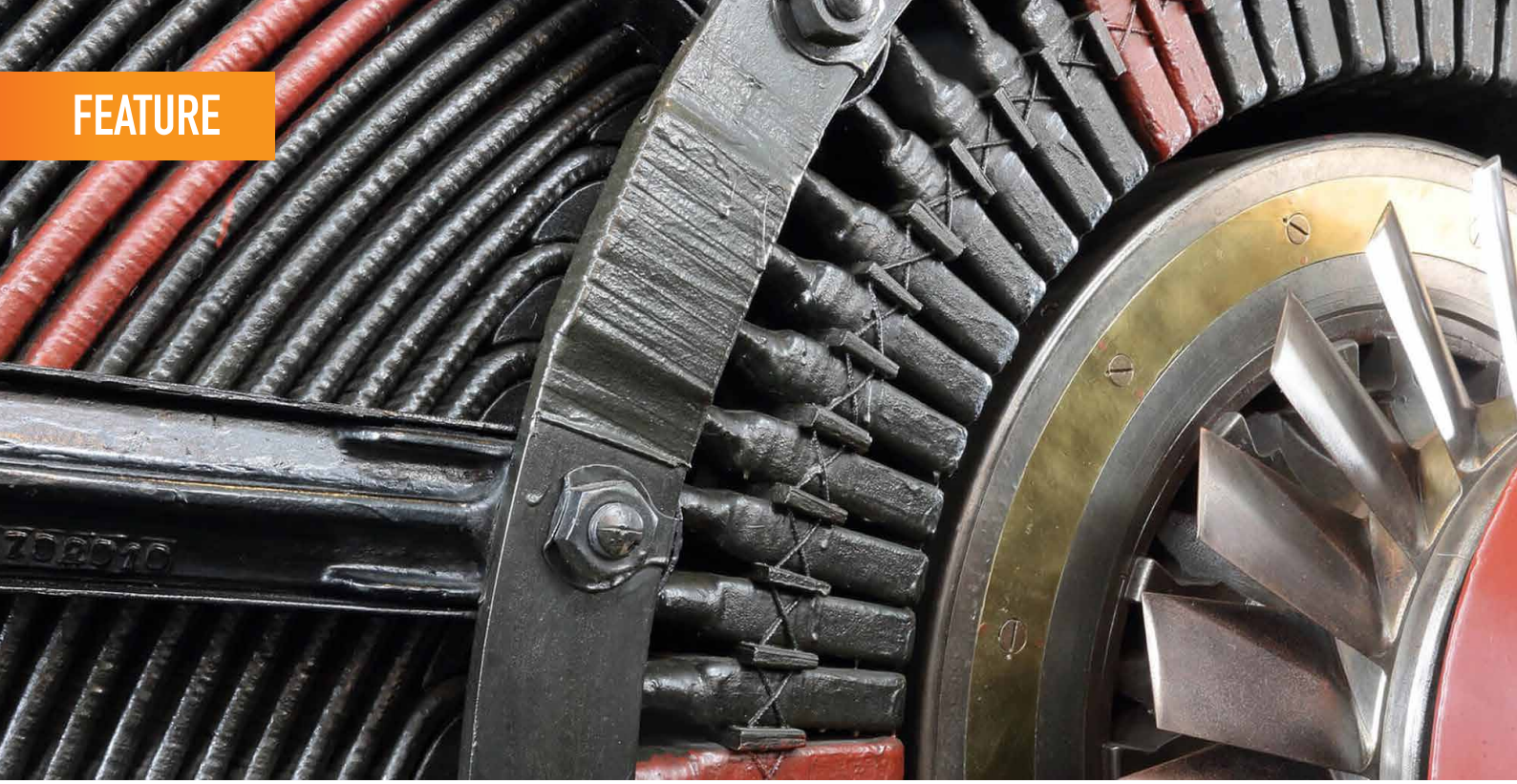
Benefits of Infrared Thermography

- Temperature calculations are non-contact
- The process does not have to be shut down - must be running
- Will not deface or destroy the product
- Transient phenomena or moving objects can be studied
- Fast response, milliseconds
- Temperature calculations of irregular shaped objects
- Pattern observation and evaluation
- Collection of large amounts of thermal data
- Measurement through hazardous atmospheres
- Measurement through special IR windows (electrical cabinets)
- Data easily stored and analyzed for trending
- Simple efficient reporting software.

Summary

Infrared thermography is a versatile, nondestructive testing tool that will benefit many different application projects including predictive maintenance programs. Cameras are now affordable and program setup is readily available. The return on investment is short term. Trained technicians can record accurate, repeatable temperatures allowing trending over time. A properly setup infrared predictive maintenance program can become a proactive maintenance program once sufficient data has been collected over time. ■

■ *Article by Wayne Ruddock | www.infraredthermography.com | Advanced Infrared Resources*



FEATURE

Problems and Solutions with Magnetic Stator Wedges

Abstract

The use of magnetic materials for wedging induction motor stator windings has become more prevalent over the last decade. The move to the use of these materials has led to new reliability and maintenance challenges. This paper briefly discusses the function of stator wedging, the historical development of magnetic wedge material, the advantages of using magnetic wedges. Maintenance considerations for magnetic wedge integrity is also discussed.

Function of Stator Wedging

In large electrical machines the stator slots are opened to the width of the slot to allow the fitting of coils. The stator core laminations are punched in a manner to allow the fitting of wedges in rebated landings at the top of the slot. After coils are fitted and packed in the slots wedges are fitted in the slot landing.

The purpose of the wedging is to restrain the coils in the slot against steady state bar forces (100Hz or 120Hz vibration) and transient bar forces (Starting forces are proportional to in-rush current squared).

Historically the material used for wedging has been non-magnetic - typically an epoxy glass laminated board machined to match the stator slot landing. Increasingly the epoxy laminate is being replaced with magnetic laminate.

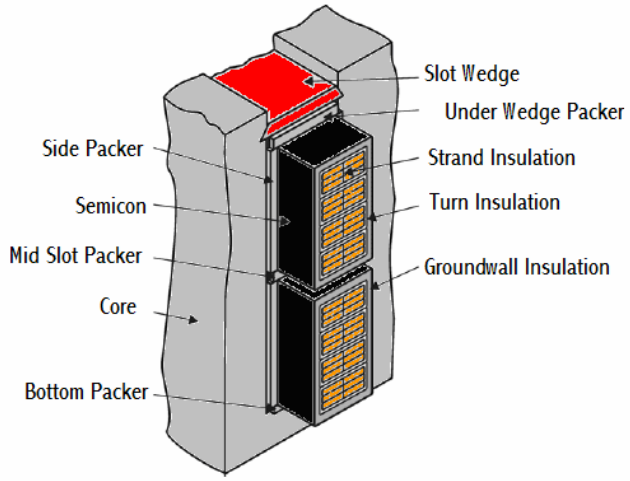


Fig. 1. Typical arrangement of wound stator slot

Magnetic Wedging

The typical material composition of magnetic wedging is detailed in table below:

Typical Material Composition of Magnetic Wedges	
Iron	*70%*
Glass Fabric	*10.8%*
Binder	*19.2%*

The use of this type of material changes the wedge from a magnetically passive characteristic to being magnetically

Continued over page >

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Schaeffler's OPTIME Ecosystem is a revolutionary condition monitoring system, designed to transform the landscape of industrial maintenance. Pri-marily targeting rotating machinery, it is adept at functioning across a diverse range of speeds, from 120 to 5000 rpm, and is also suitable for hazardous environments. The system's foundation lies in its wireless, battery-operated sensors that are remarkably easy to install. After the installation, the data collected by wireless OPTIME sensors is transmitted to a digital service via a gateway. This setup enables continuous monitoring and early detection of potential machine issues, thereby preventing costly unplanned downtimes.

A distinguishing feature of the OPTIME Ecosystem is its usercentric design, making it accessible to a wide range of users, from beginners to experts in the field of maintenance. Its affordability further enhances its appeal, breaking traditional cost barriers associated with advanced monitoring systems. The system's design excellence has not gone unnoticed, garnering it prestigious awards such as the Red Dot Design Award 2021 and the Industry 4.0 Innovation Award 2020.

The 24/7 monitoring capability of OPTIME offers real-time data and analysis and allows maintenance technicians to tackle emerging issues promptly. This is a key factor in saving time and resources.

An integral component of the system is the OPTIME ExpertViewer digital service. This service is compatible with OPTIME and "OPTIME-ready" data, including data from Schaeffler SmartCheck and Schaeffler ProLink. ProLink, like SmartCheck, is part of Schaeffler's range of innovative monitoring tools, designed to work seamlessly with OPTIME. This compatibility ensures a comprehensive approach to condition monitoring, allowing users to leverage the strengths of different Schaeffler products in a unified manner. Additionally, the OPTIME C1 wireless automatic lubricator and the integrated digital lubrication management ensure optimal machine performance by continuously monitoring lubricator devices, alerting maintenance teams to critical lubricant levels and enabling remote adjustments, further enhancing operational efficiency.

Furthermore, OPTIME forms a key part of Schaeffler's broader Lifetime Solutions suite, offering an extensive approach to machine lifecycle management. This suite combines monitoring, analysis, and maintenance support into a cohesive package, addressing various industrial maintenance needs.

Schaeffler's OPTIME is a groundbreaking development in condition-based monitoring. Its amalgamation of cutting-edge technology, ease of use, cost-effectiveness, and integration with a broader suite of tools, including ProLink, positions it as an indispensable asset in modern industrial maintenance. By implementing OPTIME, industries are poised to significantly improve their maintenance processes, resulting in enhanced efficiency, minimised downtime, and substantial cost savings. The OPTIME Ecosystem exemplifies Schaeffler's commitment to driving innovation and excellence in industrial maintenance solutions.

SCHAEFFLER

active. As a result of this the normal wedging function of retaining the coils in the slot is changed to one of retaining coils and providing a low reluctance magnetic path across the opening on the top of the stator slot.

As a result of providing a magnetic closure on the top of the slot the following improvements are achievable;

- Reduced core losses.
- Lower magnetizing current.
- Reduction in zig zag torque.
- Improved Efficiency.

The level to which these improvements are realised has wide variation and is dependant on case by case design parameters of the machine. In modern machines it could be said that the addition of magnetic wedges is one way manufacturers can reduce the active material content of machines; the others being better insulation and smarter ventilation design.

Studies have shown the net result of this trend of reducing active material content for given outputs has led to a 14 times reduction in mass of machines at given outputs in the period of 1920s to 1990s. [1]
The machine performance benefits in life cycle power cost associated with using magnetic wedges can easily be lost in additional reliability costs associated with magnetic wedge failure particularly after rewedging of machines. [2]

Given magnetic wedges are subjected to un-remitting magnetic forces throughout operational life the challenge for designers is to apply wedges with considerations for material reluctance, flux densities and physical assembly to prevent looseness developing in service. Meeting this challenge has occupied designers since the 1920s. The figure below shows a magnetic wedging technique patented in 1945 by Fisher. Many such designs exist all aimed at ensuring the magnetic and restraining function of magnetic wedges are preserved throughout the operational life of the machine.

The modern magnetic wedge material design and application approach relies heavily on “gluing” the wedge in position with epoxy resin. The life limiter for wedge systems using this approach is the epoxy resin. In circumstances where localised temperature rise (hotspots) in stator cores occurs through high flux concentration the thermal aging of the wedge bonding epoxy is accelerated.

Epoxy based materials shrink with thermal aging. Once the bonding is compromised the wedges are free to move independently in response to the machine magnetic field. In circumstances such as this wedges vibrate and are progressively reduced to iron powder and debris due to the abrasive nature of the stator slot landings.

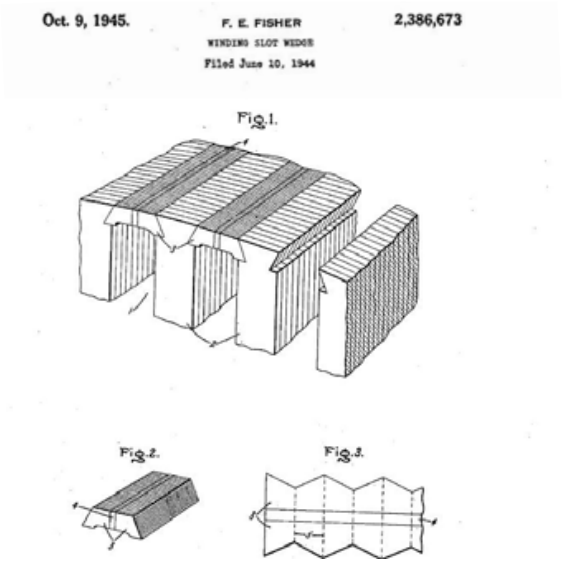

Fig. 2. Early magnetic wedge patent (US Patent No. 2 386 673).

One fix for this problem is to replace the magnetic wedge material with traditional non-magnetic material. The impact on machine performance in removing magnetic wedges and replacing them with non magnetic wedges range from no change [3] up to a 50% reduction in magnetizing current. [4]

Detecting Failed Magnetic Wedges

Machines with failed magnetic wedges may display one or more of the following operational characteristics;

- Higher no-load current when compared to “type test” value.
- Increased temperature rise.
- Increase in Endwinding Discharge due to the presence of wedge material contamination on the stator endwinding (HV Machines).
- Increase in electrically excited vibration.

Due to the inconclusive nature of the above characteristics as an indicator of magnetic wedge failure it turns out that the most effective detection technique is a visual inspection. The visual evidence for failed magnetic wedges is;

- Ferrous contamination on the stator endwindings.
- Ferrous and glass matting debris in the base of the machine.
- Glass matting debris in the machine primary air circuit ducting.
- Missing wedge sections from the stator slots (predominantly in the middle of the stator slots).

Having detected failed magnetic wedging a maintenance choice needs to be made which can include only re-wedging slots where wedges have failed (Partial re-wedge), completely re-wedging the stator and replacing

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the wedge material with nonmagnetic material. In either case significant reliability risk can result from what appears to be simple maintenance.

Maintenance Considerations

There are important considerations before attempting re-wedging maintenance where magnetic wedges are employed. These include;

Wedge removal – the removal of wedges is high risk maintenance particularly on windings which have been Vacuum Pressure Impregnated.

The risk of causing impact damage to stator coil groundwall insulation needs to be evaluated. A low risk approach is to run a saw down the centre of the slot to a depth slightly less than the wedge thickness and collapse the wedge in toward the cut.

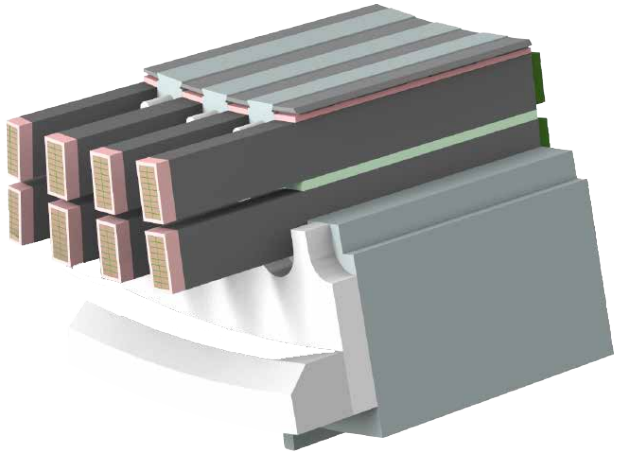
Wedge size – It is important when surveying the wedge dimensions that accurate measurements are made. The wedge dimensions should match the profile of the slot landing and maintain the original design thickness. The finished wedge size should allow for a neat fit in the landing whilst applying downward pressure on the coils in the slot.

Vented core – when wedging machines with vented cores attention should be paid to ensuring the wedges are notched at a location corresponding to core vent to ensure no ventilation restrictions occur.

Lamination shuffle – When laminated stator cores are assembled all laminations never align in precisely the same location due to manufacturing tolerances. This results in what is termed lamination shuffle. When fitting wedges lamination shuffle can impact on the fit of the wedge in the slot. The uneven edge of the slot landing serves to take material off the wedge as it is dredged into the slot. The results of this problem can be observed in machines with failed wedges as most wedge portions fail in the centre of the slot – the location of wedges which have been dredged the greatest distance along the slot landing.

Slot length – When fitting magnetic wedges the less force required to fit the wedge the better. Force required to fit wedges can be reduced by reducing the length of the wedges. Careful consideration should be given to ensuring that wedges are fitted in short lengths. In vented cores the butted joints of wedge portions should always be positioned within the core packs.

Bonding material – The fit of magnetic wedges and downward force on the stator coils on their own are not



enough to restrain magnetic wedges in the stator slots. To achieve bonding of the wedge to the slot landings epoxy resins need to be applied during the fitting of the wedges. The epoxy used in this application should be of appropriate thermal rating.

Conclusion

The utilization of magnetic wedging systems in induction motors is becoming more prevalent. The following conclusions are drawn from experience with magnetic wedge systems:

- Magnetic wedges compensate for deficits in active material content.
- The impact of magnetic wedges on machine performance varies on a case-by-case basis.
- Detection techniques for magnetic wedge failure are limited with visual inspection being the most useful.

Careful consideration needs to be applied prior to re-wedging machines after magnetic wedge failure to ensure successful maintenance. Design efficiency gains through employing magnetic wedges can be a fraction of the reliability cost of failed wedges. ■

References

[1] Glew. C.N "The Next Generation" –A Review of the Factors influencing the Output of an Electrical Machine in the New Millennium. INSUCON/ ISOTE`C '98 p 231-242

[2] Scollay & Stewart "The Real Cost of Magnetic Wedges in Improved Performance of Induction Motors" CWIEME 2007 - Berlin, Germany

[3] Hanna, Hiscock & Klinowski "Failure Analysis of Three Slow Speed Induction Motors For Reciprocating Loads" IEEE Paper No. PCIC-2005-XX

[4] Magnatuff MDS "Case Studies" http://www.camawi.com

■ *Article by Mike Davis.*

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TEST YOUR KNOWLEDGE - PART 75 OF A SERIES

1. Due to the risk of entanglement, parts of a machine that were previously accessible for vibration analysis are now fenced off. Accelerometers are to be installed. The temperatures of some of the surfaces that the cabling may come in contact with reach as high as 160 degrees Celsius. Which of the following jacket materials might be best suited to this application?

A. Polyurethane
B. Teflon
C. PVC
D. Any of the above will be suitable for these temperatures.

2. A 22218 rolling element bearing was removed from service on the recommendation of a vibration analyst. The bearing was inspected, and a single spall was found right in the load zone (assuming 0 degrees contact angle) of one of the outer race rows. Additionally, the other outer race row had a single spall, but this was located off to one side of the load zone, in an area that might be at a 20-degree contact angle. What might the analyst have seen in the spectrum collected from this bearing prior to its removal?

A. A peak at BPFO
B. A peak at 2 x BPFO
C. A peak at 0.5 x BPFO
D. Two peaks very closely spaced at around BPFO.

3. The teeth on a blade used in a Resaw of a sawmill are not pitched evenly. Why might this be so?

A. To achieve lower vibration and achieve a better surface finish
B. This is the result of a manufacturing error
C. To allow the blade to be reversed to achieve twice the life of the blade
D. None of the above.

4. Your analyser is capable of performing different types of averaging, and one of them is Negative Averaging. For what application might you choose this?

A. When carrying out dynamic balancing
B. When analysing for the cause of electrically sourced vibration
C. When carrying out a bump test on a stationary machine
D. When carrying out a bump test on a machine that is running.

5. Two machines vibrate at the same frequency in a purely sinusoidal fashion. Machine "A" vibrates at 10 mm/s rms, and machine "B" vibrates at 13 mm/s pk. Which machine has the highest vibration? (This is a correction to question 4 in Knowledge Test 74)

A. Machine "A"
B. Machine "B"
C. The frequency of the vibration needs to be known to answer this question
D. Both have equal levels of vibration.

6. If a rigid rotor is dynamically unbalanced, what is the minimum number of planes in which corrections are needed to bring it into balance?

A. 1
B. 2
C. 3
D. 4.

7. In theory, how might you determine if a bearing is cocked on a shaft?

A. There might be an approximately 180 degrees difference in the top to bottom or left to right axial phase on the bearing housing
B. There might be high vibration at 5 x running speed
C. There might be high vibration at 10 x running speed
D. All of the above.

8. A spare pump with rolling element bearings is reconditioned, and then left sitting close to the running pump which subjects the spare pump to vibration, causing its bearings to become damaged. This type of damage is called ….

A. Brinelling
B. False Brinnelling
C. Fretting
D. Spalling.

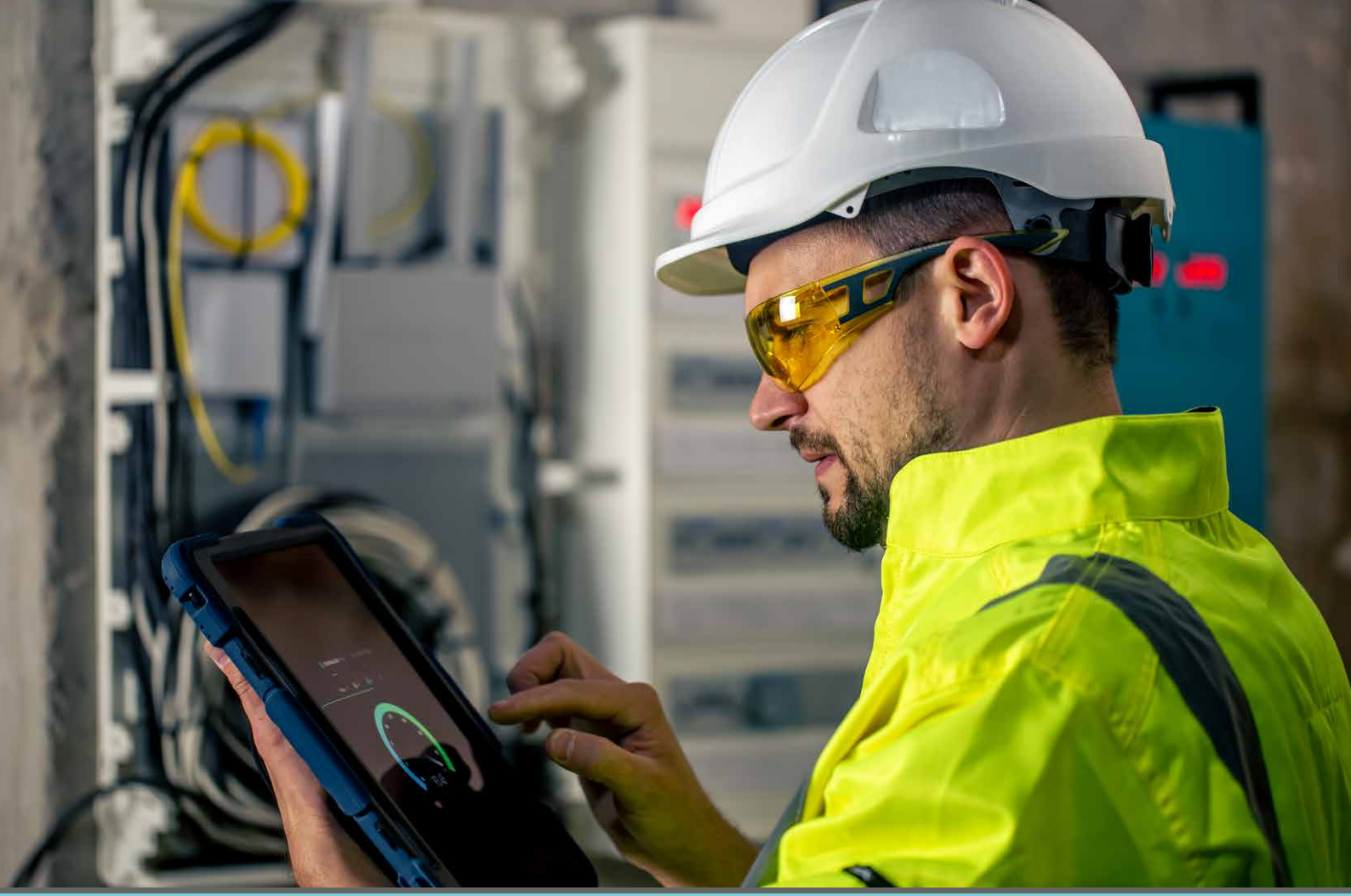
9. Where might you most-likely encounter the term heterodyning?

A. In a discussion on Ultrasonics
B. In a discussion on balancing techniques
C. When carrying out performance tests on automotive engines
D. None of the above.

10. A bias voltage test was done to check the integrity of an installed ICP accelerometer and its cabling. A reading of zero volts was obtained. What might this indicate?

A. The transducer and cabling are in good working order
B. There is an open-circuit in the system
C. There is a closed-circuit in the system
D. Either b or c could be correct depending on the cable length.

Check your answers on page 38 >



TEST YOUR KNOWLEDGE

Further enquiries can be directed to: Carl Townsend at Carlton Technology Ltd.
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Technology, materials and manufacturing processes are continually developing. And so too has the engineer skills and knowledge developed. Today the engineering role has evolved to where the analyst, by diligent use of multiple Condition Monitoring tools and principles, can empower Predictive Asset Management. But it is a challenging role! So much is at stake with the high cost of downtime, equipment replacement costs, and the potential safety risks. The future of the business can hinge on the Predictive Asset Management achieved by this special group of people. Yet detecting, diagnosing, and preventing these faults takes training, knowledge, skill and experience. That is why VANZ exists, and why VANZ constantly evolves!

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VANZ is a volunteer-run, not-for-profit, membership group of like-minded people from New Zealand and Australia. VANZ as an organisation evolved from a Workshop Conference held in New Plymouth in 1989. From this Workshop Conference the Vibrations Association of New Zealand was registered as an Incorporated Society and the first annual technical conference held in Rotorua 1990.

From this beginning VANZ has continually developed to provide a platform for people to discuss their challenges with their fellow analysts and learn from their peers and industry experts.

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The core function of VANZ is the annual conference held every year in May. Like a family reunion, over 100 people gather in a friendly environment to participate in technical presentations, round-table discussions, and at times debate. Keynote speakers from Australia, Europe, America, and Turkey have, and continue to present technical papers at conference. And importantly New Zealand presenters add a New Zealand context.

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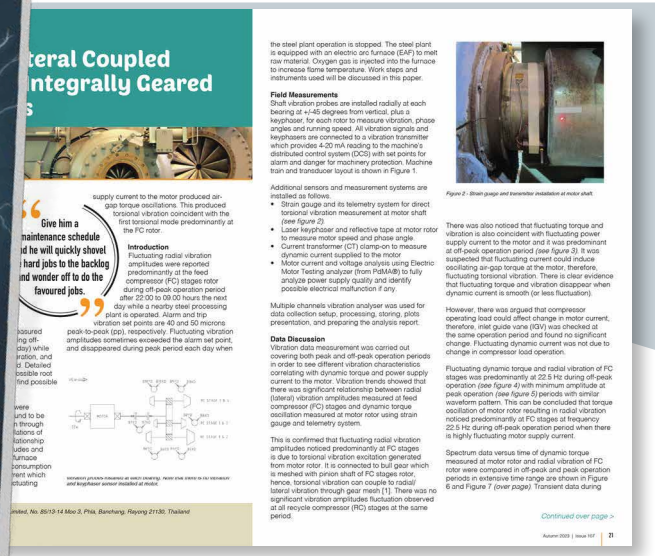

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PUZZLE CORNER

Solutions on page 38

WORD BUILDER

How many words of **three or more** letters can you make using the six letters below? You can only use each letter once. Plurals are allowed, but no foreign words or words beginning with a capital.

Word scores expected...

15 - Good | 20 - Very Good | 25+ - Excellent

T	I	L	H	G	S

There is two 6 letter words in this puzzle.

WORD LADDER

A Word Ladder has two words in the ladder, one at the top and one at the bottom. You must form a sequence of words going down. On every step of the ladder (1-6), you must unscramble and create a new word that only differs by one letter from the word above it until you reach the destination word on line 6.

Nice to Arms...

1 NICE

2

3

4

5

6 ARMS

SUDOKU

To solve, each number from 1 to 9 must appear once in:

- **Each of the nine vertical columns**
- **Each of the nine horizontal rows**
- **Each of the nine 3 x 3 boxes**

No number can be repeated twice in a box, row or column. **We've started it off for you...**

Puzzle difficulty: **Hard**

48.8% of puzzlers can solve this. Can you?

4		9	6					
			7	4	3			
							4	
		7		2			5	
9	1							
2						6	3	
	4	5	9				1	
		6			5	3		
					7	2		

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How Duolec Additive Works in Gear Oils

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- Achieved 9 years – 27,500 hours oil service life, eliminating 11 oil changes of the OEM recommended oil
- The OEM commercial branded oil additive package failed after 2,500 hours causing gearbox wear.

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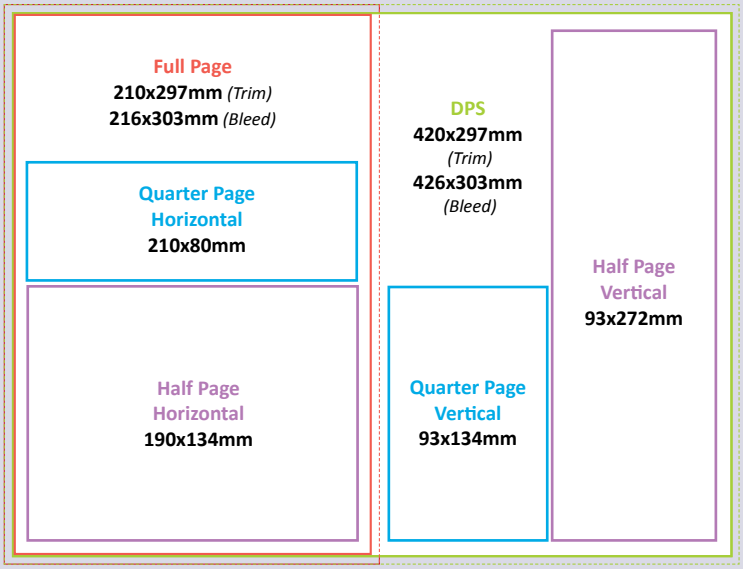

Carlton Technology Quiz 75: 1B, 2D, 3A, 4D, 5A, 6B, 7A, 8B, 9A, 10C
Word Builder: slight, lights
Word Ladder: 1. nice 2. dice 3. dime 4. dims 5. aims 6. arms

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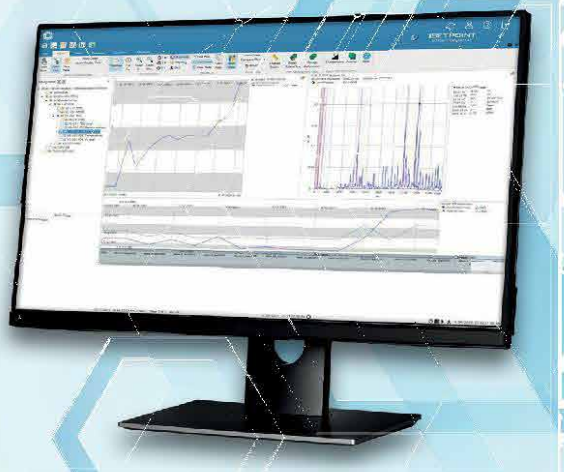

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