[ISSUE 50] **JUNE 07**

TECHNICAL NEWS

50th EDITION

INDUSTRIAL SWITCHGEAR & AUTOMATION SPECIALISTS

NHP

NHP STILL DELIVERING ON ITS PROMISE

Written by Wes Cassidy
B.Eng. (Hons) MBA GradDipArts
National Application Engineering Manager

In the first paragraph of the first edition, we wrote:

We welcome you to this first edition of the NHP Technical News. Three to four publications will be produced annually, providing a wide range of application and design criteria for the motor control and distribution fields.

15 years on, NHP is still delivering on its promise to support the electrical industry. Such is the significance of this 50th edition. In that time, there have been lots of changes and significant events. Remember pulling up to the petrol bowser in 1992 when the price was about 68 cents per litre? During that year Australia's High Court handed down a landmark ruling recognising pre-existing native title to land – known as the Marbo case. Alternative energy was starting to make inroads in Australia. The largest operating wind farm located at 9 Mile Beach, Esperance W.A. was commissioned. Tobacco advertising was banned and our average weekly earnings were about $237. Overseas in France, Michael Milton won Australia's first Gold medal (Skiing) in the Winter Paralympics Games held in Albertville.

15 years ago, NHP's core business was supplying Sprecher + Schuh motor control and Terasaki power distribution products. This has not changed but we've added to our product portfolio an impressive array of products, systems and solutions that enable us to meet the industry requirements in the application categories captured by our icons at the top of this page.

There have been many authors of TNL over the years but the dominant author has been Bill Mairs who is NHP's National Manager – Technical. Bill is a great resource of technical information, know how and advice for NHP and the industry. It is appropriate to acknowledge Bill for his contribution and we congratulate him on his achievements.

Technical News has kept you, our customer, up to date and informed on numerous topics. In this our 50th edition we revisit each of the articles and highlight the salient points that each made.


NHP
TECHNICAL NEWS
WELCOME TO THE INAUGURAL EDITION OF NHP TECHNICAL NEWS!

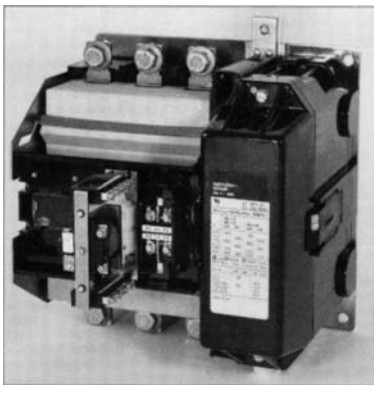
PLEASE CIRCULATE TO:


NHP
TECHNICAL NEWS
CONTACTOR FAILURE
Reasons for contactor failure
(a) failure to close

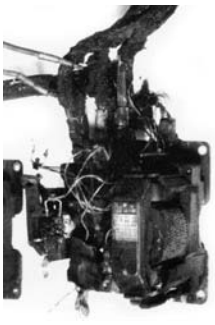

NHP
TECHNICAL NEWS
ELECTRICAL LIFE OF CONTACTORS
Determining electrical life
Electrical life


NHP
TECHNICAL NEWS
The thinking contactor
Conventional contactors

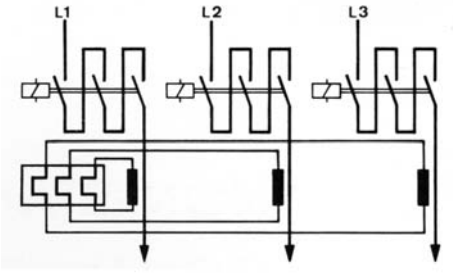
Contactors featured in issues 1, 2, 3, 6, 12, 14 and 19. In issue 1, the use of latched contactors was presented as a method of overcoming voltage dips. This is applicable when short supply failures are possible or the loss of the control phase does not mean that services on the other phases should be disconnected. Issue 2 addressed parallel and series wiring of contactors in AC networks and frequencies other than 50 Hz. Series wiring allows 415 V ratings to be applied to higher voltages e.g. 690 V AC and 1000 V AC while parallel wiring allows a contactor to break up to 2.5 times its rated current. Switching power with frequencies other than 50 Hz has implications on the

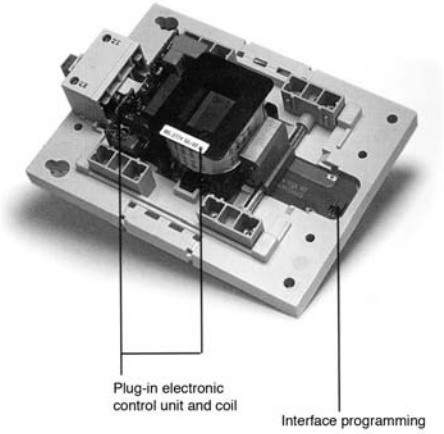


contactor performance in terms of electrical life and arc extinguishing. Hence, special consideration should be taken and the TNL mentions several issues. Why and how contactors fail was discussed in issue 3. Contactors have an electrical life of about one million operations and typically last many years. This issue provides insightful hints for fault finding. Contactor operating speeds was investigated in issue 6. It highlighted the difference in performance between AC coils and DC coils when switching on and switching off. This is important when the switching time is critical such as changeover switching on power failure. Issue 12 discussed the electrical life of contactors. Electrical life depends on many things including the required number of operating cycles, the breaking and making currents, the voltage, power factor, switching frequency and ambient conditions.

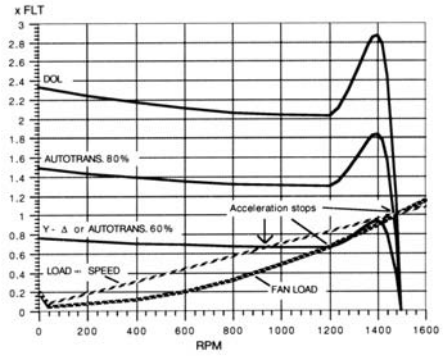


Extinguishing the arc of DC circuits and the impact this has on contactor and relay application was detailed in issue 14. Often in low voltage applications, devices are design for AC circuits. When these devices are used in DC circuits, special considerations or modifications must be made to ensure reliable performance. The last issue on the topic of contactors was issue 19. It presented the "thinking contactor" i.e. contactors with electronic coils. Electronic coils provide numerous benefits over conventional AC and DC coils including direct PLC control, minimised chatter, eliminated coil burnout, and less generated heat.



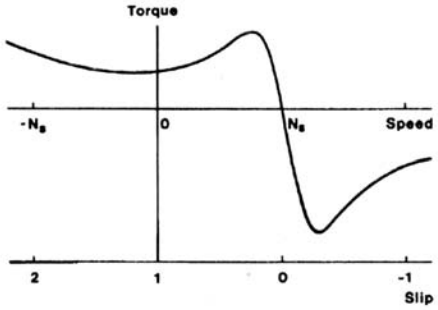


Motor Starting and Protection has been a major part of NHP's product range and this was the subject of issues 4, 10, 11, 13, 15, 23, 35, 39, 47 and 48. There are various methods of starting industry's electric motor work horse – the squirrel cage induction motor. Each has their own advantages and disadvantages and this was addressed in issue 15. Items to consider include motor current, supply limitations, mechanical stress from excessive torque at start up and of course, the price of components making up the starter. The starting torque of the various starting methods was discussed in detail in issue 23. Fundamentally, the starting method must provide enough torque to get the motor up to speed. Issue 4 introduced soft starters as an ideal starting method when the supply is a generator. Soft starters minimise start up current and maximises starting torque with a high degree of flexibility not available with other starting methods as soft starters can be "tuned" to the application to provide optimum results. Issue 35 detailed various star-delta wiring configurations and the impact on overload and short circuit protection.



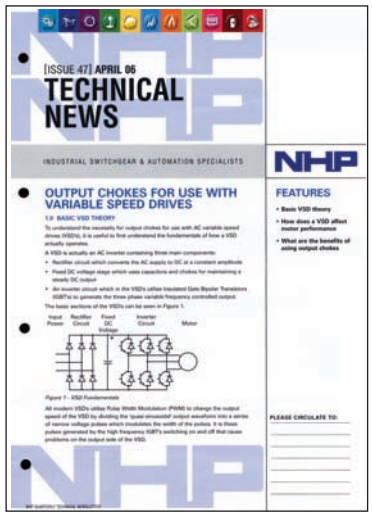
The number of and types of components, specifically overloads and circuit breakers also has an impact on the permissible minimum cable sizes. A less common starting method and its application for slip ring induction motors was presented in issue 13. Liquid resistance starters vary the resistance of the rotor. This allows the speed at which peak torque occurs to be varied and is particularly useful for large loads with high initial torque

requirements. Issues 10, 47 and 48 covered the topic of variable speed drives. VSDs enable the speed of a squirrel cage induction motor to be varied through the use of power electronics. Speed control is one thing, stopping the motor in a controlled manner is another. VSDs with accessories provide this functionality. Issue 10 describes how this is achieved. Issue 47 and 48 cover the impact of VSDs on motors and electrical installations. The ones specifically mentioned in issue 47 and 48 were: voltage and current transients, motor temperature rise, motor whistling, EMI, RFI, and harmonics. The TNLs detailed how output and input chokes, EMC filters, and line reactors easily minimise these impacts. To round out this subject, issues 11 and 39 discussed the protection of motors and their cables. Issue 11 discussed the rise of electronic overloads and motor protection relays and the assumption that these will automatically provide better thermal




NHP
TECHNICAL NEWS
SOFT START FOR GENERATOR LOADS
How motor starting effects ...


NHP
TECHNICAL NEWS
DON'T FORGET THE MOTOR PROTECTION

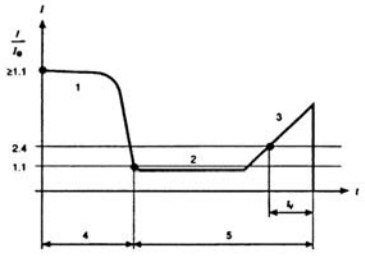

[ISSUE 47] APRIL 06
TECHNICAL NEWS
NHP
OUTPUT CHOKES FOR USE WITH VARIABLE SPEED DRIVES
FEATURES


NHP
TECHNICAL NEWS
SET THE PROTECTION
"Failure to pre-set adjustable trip units can result in unnecessary damage occurring"
Thermal magnetic
Electronic trip units
Magnetic only

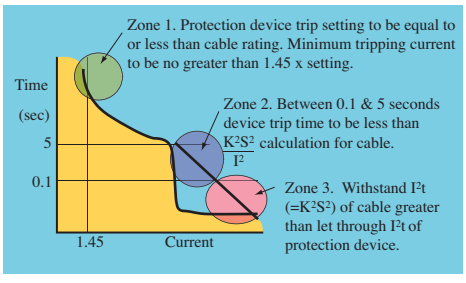

NHP
TECHNICAL NEWS
RCDs are Saving Lives


NHP
TECHNICAL NEWS
KEEP YOUR CABLES COOL
The basic requirements
Normal Load
Cable/Device Rating
New requirements focus on cable protection

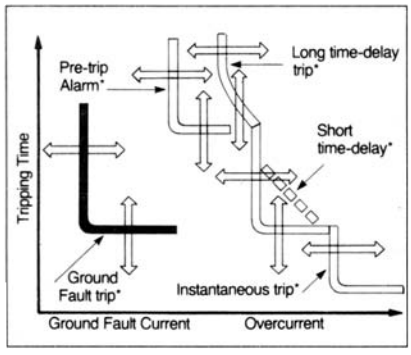
overload protection compared to the basic bi-metal thermal overload. The point was made that high quality motor protection is the primary function and the "bells and whistles" provide useful diagnostic information in the case of (near) failure. Issue 39 highlighted the other purpose of the protection equipment which is to protect the cable. The TNL mentioned the 3 zones of the time current curve and the different requirements each zone has for the protection device in regards to the cable. Also discussed were earth fault loop impedance, protection coordination and location of devices. All impact the cable size and protection requirements.



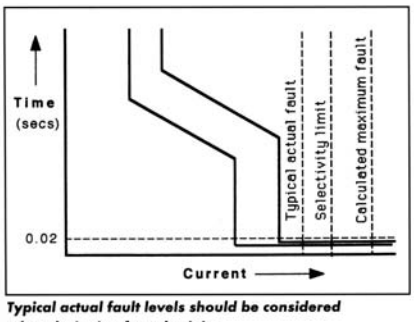
Motor start $I \geq 1.1 I_e$
Nominal operation
High overload or stalling (tripping threshold)
t_s Tripping Delay
4 Stalling protecting not active
5 Stalling protecting active



NHP's great range of **power distribution** products has been one of the keys to its success over the years. Understanding the application of these products was the subject of issues 5, 7, 17, 24, 26, 30, 31, 32, 33, 40, 41 and 46. Moulded Case Circuit Breakers, MCCBs, provide flexibility in tripping characteristics to enable the breaker to match the load requirements. If default settings are used or a circuit breaker is selected incorrectly, then undesirable results are likely under fault conditions. Issue 5 addressed the importance of adjusting the settings of the circuit breakers and highlighting what can go wrong when they are not. The topic of selectivity



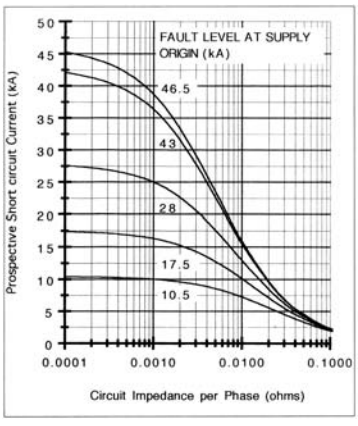
and cascading was explained in issue 41. This topic is all about how series circuit breakers perform under extreme fault conditions. Therefore, understanding what selectivity and cascading are, their differences, pro's and con's is critical to good circuit breaker selection. Issue 7 discussed another circuit breaker selection criterion - fault level. The fault rating of a breaker is the maximum current it is able to safely break. Under sizing breakers on fault capacity can be disastrous, over sizing breakers on fault capacity can be wasting money. Issue 7 discussed how the fault level can be determined to assist in the best choice of circuit breaker. Fault current limiting is a method of reducing the fault current so that devices downstream of the fault do not need to have such high fault



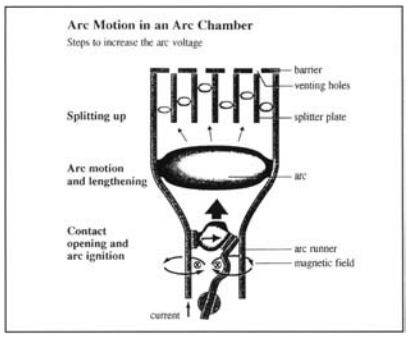
Typical actual fault levels should be considered when designing for selectivity.

current ratings. Some circuit breakers act as current limiters and issue 30 provides great detail on how this is achieved and the benefits that result. The role of the breaker is to protect the downstream cable. Issue 32 discussed the three operating conditions under which this is required. Residual Current Devices are life saving devices and it is therefore important that they are installed correctly. This requires a good understanding of their purpose, what

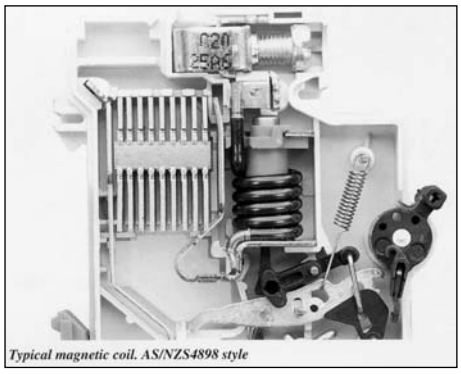
exactly they are designed to do and not to do, the different types, how they work, and what can cause incorrect operation. Issues 26, 31, 33 and 40 cover all these points about RCDs. Issue 46 provides great detail on the topic of earth fault loop impedance and the impact it has on cable sizing, cable runs and the selection of circuit breakers for these cables.



Rounding out the TNLs on Power Distribution topics are issue 17 and 24 which are about power quality. Issue 17 discusses electrical surges – how they are caused, the damage that results and how this damage can be mitigated. There are various types of surge diverters with different applications however they are essential in any electrical system to protect sensitive

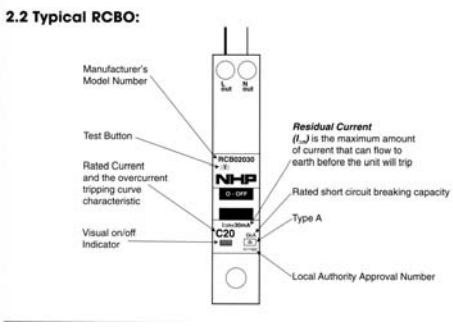


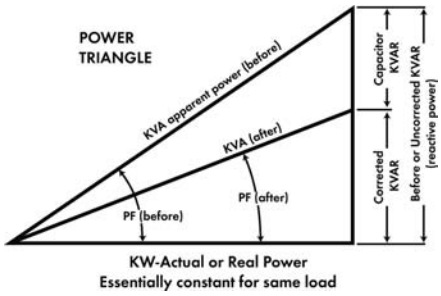
electronic devices and minimise dangerous arcing. Issue 24 introduced power factor correction which is becoming a very important topic. Power factor correction offers many benefits as well as the potential to reduce operating costs. Issue 24 explains why power factor correction is necessary, discusses other factors associated with poor power quality and different installation possibilities.



Typical magnetic coil. AS/NZS4898 style

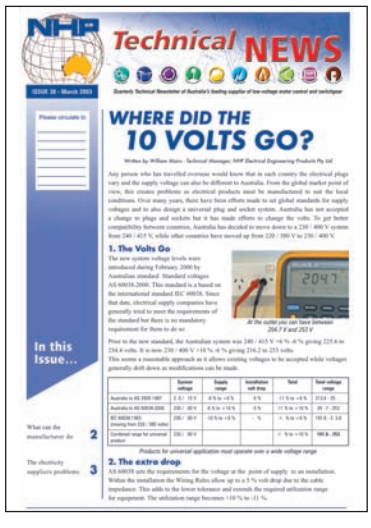
The subject of **automation and safety** was covered in issues 18, 22, 44 and 49. Automation is becoming more and more prevalent and automation systems are almost essential in industrial applications. However, for many in the electrical industry automation remains a mystery full of "smoke and mirrors". Issue 44 attempted to introduce the reader to the building blocks of an automation system to aid in the understanding of what one consists and the function that each part performs. Issue 44 gave a brief overview of PLCs, field devices, HMIs, SCADA, and protocols. Issue 18 focused specifically on the PLC. In 1996 when issue 18 was written, PLCs were well advanced from the 1970s models but the last 10 years has seen significant improvement in their processing and functional capabilities. Issue 49 focused on SCADA systems and detailed their architecture as well as its basic functions including access control,



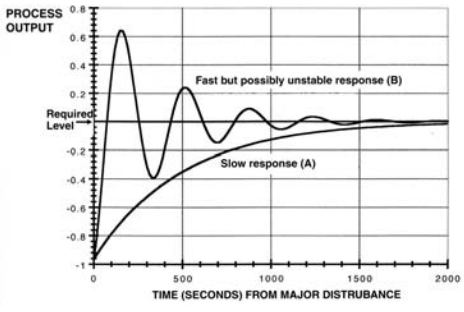



NHP
TECHNICAL NEWS
EMC- What's all the Noise about
By Craig Dunne
NHP Electrical Engineering Products Pty Ltd
Development Engineer
Definition of EMC:
Coupling Modes
IN THIS ISSUE
1 Definition of EMC
2 Cabling
3 Resistive and Capacitive Coupling
4 Inductive Coupling
5 Variable Speed Drives
6 Practical Recommendations

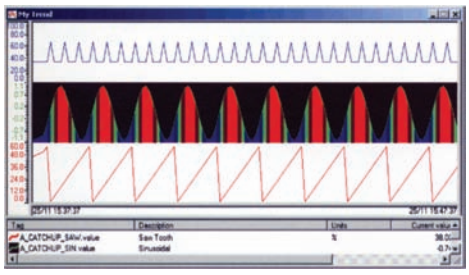

NHP
TECHNICAL NEWS
The quality switchboard
IN THIS ISSUE
1
2
3
4
5
6


NHP
Technical NEWS
WHERE DID THE 10 VOLTS GO?
In this Issue...
1. The Volts Go
2. The extra drop
2
3

trending, alarm handling, logging and report generation. The proliferation of the internet has impacted the implementation SCADA systems and their presentation. Issue 49 concluded with a summary of the benefits of an installed SCADA system. Issue 22 was about safety. Safety is an interesting topic as the safety device is normally non-essential to the basic process and defects are not highlighted until the device is called upon to operate. Further, it is not uncommon to find safety devices tampered with or even removed. These considerations must be part of the design of the safety device as well as the safety system as the consequences of failure can be very high.

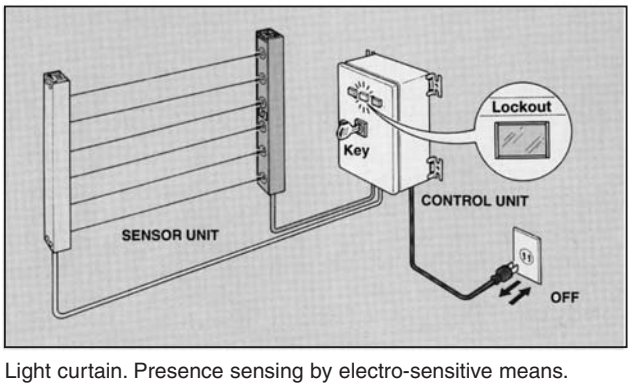


Issues 16, 25, 36, 37 and 42 provided good application information and advice for various products: pilot lamps, terminals, current transformers, flexible busbar and relays. Issues 27 and 43 discussed switchboard design. The introduction of AS/NZS 3439.1.2002 resulted in 17 different types of Forms. Issue 43 discussed them in terms of what the user wants, safe operation, cost and selection. Issue 27 focused on the quality of a switchboard and what


Example of a SCADA trend window

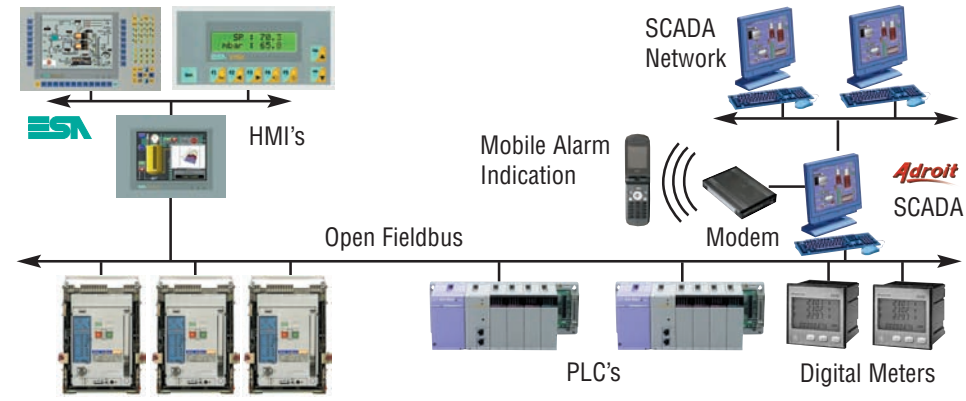
this means in terms of initial cost, maintenance, life time cost, possible failures and risk minimisation.

The remainder of the issues covered application subjects including device ratings, temperature, IP ratings, utilisation categories, electrical interference and standard voltages. Temperature plays an important part in the performance of electrical equipment. Devices will normally have an ambient, operating and maximum temperature rating. When devices are enclosed, the heat generated by the enclosed devices, their relative positions and proximity to each other in the enclosure, ventilation requirements,



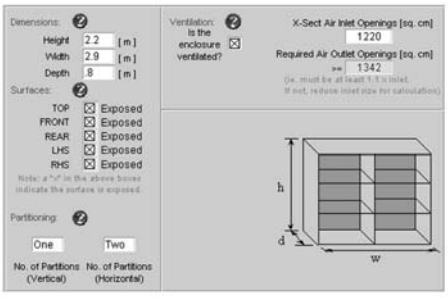
Light curtain. Presence sensing by electro-sensitive means.

Emergency stop pushbutton station.

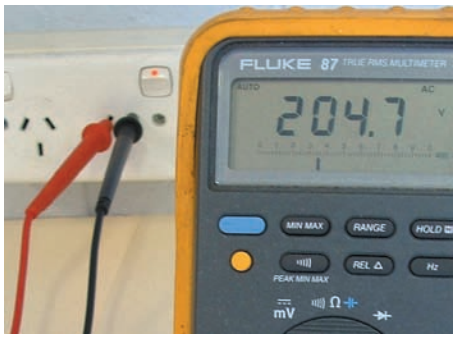


Microprocessor Based Communications

and methods to reduce heat need to be considered. Operating a device outside its temperature rating has a number of results which eventually will lead to failure. Issues 20, 28, 34 and 45 covered this subject. It is important to understand what the ratings of a device mean in practice and issue 28 described some common ratings in detail. Issue 8 provided a summary of the IP ratings. Issue 9 discussed Utilisation Categories. The electrical ratings of devices such as contactors and switches are utilisation category dependent. Therefore it is important to understand what the



categories are so that devices are not misapplied resulting in early failure. Issues 21 and 29 discussed EMI, RFI and EMC. With the increase off communication between devices and the use of electronics in electrical devices, electrical interference has become an important consideration for the reliable and accurate operation of devices. For some this is a black art but issues 21 and 29 provide very sound information for the installation and operation of interference free systems. The last TNL to mention is issue 38



which was titled, "Where did the 10 Volts go?". In this issue, Bill Mairs discussed the change in the Australian Standard of the standard voltage from 240/415 V to 230/400 V and the implication this has on electrical devices.

Thanks for reading our 50th issue – a significant milestone for us and you as it signifies our partnership in the electrical industry. We hope this brief summary of previous issues has been helpful. We look forward to serving you in this way for the next 15 years and beyond. As always, we welcome your feedback and look forward to receiving details of any special or interesting application problems and topics for future issues.

NHP
Electrical Engineering Products Pty Ltd A.B.N. 84 004 304 812

www.nhp.com.au

AUSTRALIA

MELBOURNE
43-67 River Street Richmond VIC 3121
Phone (03) 9429 2999
Fax (03) 9429 1075

SYDNEY
30-34 Day Street North, Silverwater NSW 2128
Phone (02) 9748 3444
Fax (02) 9648 4353

NEWCASTLE
575 Maitland Road Mayfield West NSW 2304
Phone (02) 4960 2220
Fax (02) 4960 2203

BRISBANE
16 Riverview Place Murarrie QLD 4172
Phone (07) 3909 4999
Fax (07) 3399 9822

TOWNSVILLE
62 Leyland Street Garbutt QLD 4814
Phone (07) 4779 0700
Fax (07) 4775 1457

ROCKHAMPTON
14 Robison Street Rockhampton North QLD 4701
Phone (07) 4927 2277
Fax (07) 4922 2947

TOOWOOMBA
Cnr Carroll St & Struan Crt Toowoomba QLD 4350
Phone (07) 4634 4799
Fax (07) 4633 1796

CAIRNS
2/1 Bramp Close Portsmith QLD 4870
Phone (07) 4035 6888
Fax (07) 4035 6999

ADELAIDE
36-38 Croydon Road Keswick SA 5035
Phone (08) 8297 9055
Fax (08) 8371 0962

PERTH
38 Belmont Ave Rivervale WA 6103
Phone (08) 9277 1777
Fax (08) 9277 1700

DARWIN
3 Steele Street Winnellie NT 0820
Phone (08) 8947 2666
Fax (08) 8947 2049

HOBART
2/65 Albert Road Moonah Tasmania 7009
Phone (03) 6228 9575
Fax (03) 6228 9757

NEW ZEALAND

AUCKLAND
www.nhp-nz.com
NHP Electrical Engineering Products (NZ) Limited
7 Lockhart Place Mt Wellington Auckland NZ
Phone 64 9 276 1967
Fax 64 9 276 1992

CHRISTCHURCH
85 Gasson Street Sydenham Christchurch NZ
Phone 64 3 377 4407
Fax 64 3 377 4405

Version 7

If you would like previous copies of Technical News, please complete the following form and **fax to NHP on (03) 9429 1075** to the attention of the **Marketing Department.**

Name: .....

Title: .....

Company: .....

Address: .....

.....

Telephone: ( ) ..... Fax: ( ) .....

Other issues currently available.
Please tick those you would like to receive.

- ❑ 1. First edition (Latched and delayed contactors)
- ❑ 2. Non-standard contactor applications (Parallel and series connections of contacts varying frequencies)
- ❑ 3. Contactor failure (Reasons for the failure)
- ❑ 4. Soft start for generator loads (Advantages of electronic soft starters)
- ❑ 5. Set the protection (MCCB breakers and application)
- ❑ 6. Contactor operating speed (Difference between AC and DC systems)
- ❑ 7. Quick guide to fault levels (Calculating the approximate fault levels)
- ❑ 8. IP ratings what do they mean? (IP Ratings, use and meaning)
- ❑ 9. Utilisation categories (Electrical life of switches)
- ❑ 10. AC variable frequency drives and breaking (Regenerative energy)
- ❑ 11.Don't forget the motor protection (Motor protection devices and application)
- ❑ 12. Electrical life of contactors (How and why contactors are tested)
- ❑ 13. Liquid resistance starter developments (For large slipring motors)
- ❑ 14. Taking the 'hiss' out of DC switching (DC switching principles)
- ❑ 15. Start in the correct gear (Application of different motor starters)
- ❑ 16. Application guide to lamp selection (Industrial pushbutton controls)
- ❑ 17. Electrical surges can be expensive (Electrical surges)
- ❑ 18. Putting the PLC in control (advantages of the PLC)
- ❑ 19. The thinking contactor (The development of the contactor)
- ❑ 20. Some don't like it hot (Temperature rise in electrical switchgear)
- ❑ 21. Pollution of the airwaves (Unwanted signals and their effects on motor protection devices)
- ❑ 22. What's different about safety (Safety devices and their application)
- ❑ 23. Talk about torque (Motors and torque)
- ❑ 24. Power factor what is it? (Power factor and correction equipment)
- ❑ 25. Terminations, good or bad? (Terminals)
- ❑ 26. RCDs are saving lives (Earth leakage protection; RCDs)
- ❑ 27. The quality switchboard (Switchgear and protection devices for Switchboards)
- ❑ 28. How does electrical equipment rate (Understanding ratings of electrical equipment)
- ❑ 29. EMC - what's all the noise about (Understanding EMC)
- ❑ 30. Controlling high short circuit currents with current limiting circuit breakers (Short circuit co-ordination KT 7)
- ❑ 31. Another step in electrical safety (Changes to electrical safety)
- ❑ 32. Keep your cables cool (New requirements on cable protection)
- ❑ 33. A leak to earth can be electric (RCDs)
- ❑ 34. Keep Cool (Derating)
- ❑ 35. Improving star-delta protection. (Overload and short circuit protection)
- ❑ 36. Does your CT measure up? (Selecting the correct current transformer)
- ❑ 37. Is your copper flexible? (Flexible busbars)
- ❑ 38. Where did the 10 volts go? (world uniform voltages)
- ❑ 39. Motor protection and wiring rules (overload protection)
- ❑ 40. Confused about which RCD you should be choosing?
- ❑ 41. Circuit breakers working together
- ❑ 42. Keeping in contact.
- ❑ 43. Is your switchboard in good form?
- ❑ 44. Automation in a technological world
- ❑ 45. Thermal simulation of switchgear
- ❑ 46. Cable Considerations
- ❑ 47. Output chokes for use with variable speed drives
- ❑ 48. VSD Installation Techniques
- ❑ 49. The modern Scada System

Editorial content: - Please address all enquiries to:
The Editor - 'NHP Technical News' PO Box 199, Richmond, Victoria, 3121.

TNL-50 06/07 10M