

State Associations News

Following are the reports of activities submitted by the various State Association Members of TEEAM.



Penang Electrical Merchants' Association

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Tel: 604 - 229 0195 Fax: 604 - 228 4233
E-mail: pema@streamyx.com
Website: www.pema.org.my

60th AGM

The Penang Electrical Merchants' Association (PEMA) held its 60th Annual General Meeting (AGM) & election of office bearers for the term 2008 – 2009 on 15th March 2008. Outgoing President, Mr Hong Yeam Wah expressed his gratitude and thanked all members for their support and commitment extended to him during his tenure as President. The meeting later adopted the minutes of the previous AGM held on 31st March 2007, annual report for 2007 and audited accounts for the year ended 31st December 2007. At the AGM, the election of new office bearers for the term 2008-2009 also took place with some members seeking re-election and a few new faces joining the line-up.



Mr Teoh Yew Yean – PEMA newly elected President and representative in the TEEAM Council.

Office Bearers of PEMA for the year 2008-2009

President	Teoh Yew Yean
Deputy President	Lee Kuan Meng
Immediate Past President	Hong Yeam Wah
Honorary Secretary	Ir Chong Yew Lam
Asst Hon Secretary	Cheah See Yeong
Honorary Treasurer	Kee Eng Kim
Council Members	Ooi Kok Kee, Lee Boon Hoe, Choo Kwang Wah, Lim Kim San, Khaw Tatt Siew, Chee Soon Chin, Tan Peng Aun, Tang Keem Hoong, Yeoh Chin Kueng, Tang Lye Hock, Joe Tan Joo Giap
Technical Advisor	Ir Beh Hong Pin, Ir Thean Kah Kong, Ir Tan Tea Hwa, Ir Tan Yeow Joo
Legal Advisor	Lena Leong Oy Lin
Association Advisors	Lai Chang Hun, Lee Thean Chor, Foo Sing Tatt, Ir Chen Chin Peng, Chiem Boon Kooi
Honorary Auditor	Lau Kok Kon
Trustees	Kee Eng Leong, Koh Ah Tee, Ir Chen Chin Peng, Ong Choong Siang



New line-up – PEMA Office Bearers for the year 2008-2009 (seated from left) Hong Yeam Wah, Kee Eng Kim, Ir Chong Yew Lam, Teoh Yew Yean, Lee Kuan Meng, Ooi Kok Kee and Choo Kwang Wah. (standing from left) Cheah See Yeong, Joe Tan Joo Giap, Tang Keem Hoong, Chee Soon Chin, Khaw Tatt Siew, Yeoh Chin Kueng, Tang Lye Hock, Tan Peng Aun and Lim Kim San.

60th Anniversary Dinner Celebration

PEMA 60th Anniversary Celebration dinner was held at the Berjaya Ballroom, Berjaya Georgetown Hotel Penang on 26th April 2008. More than 600 members and guests attended this auspicious occasion.

The Guest of Honour was YAB Tn Lim Guan Eng, the Chief Minister of Penang State. He highlighted the importance of an association like PEMA which was established in 1948 and has been recognised as the leading electrical organisation in Penang. He said that this 60th celebration mark the re-birth of another milestone for PEMA. He hopes that the association will continue to interact with the government through the policies of competency, accountability and transparency to assist the government to bring development and prosperity to the people of Penang.

Earlier PEMA President, Mr Teoh Yew Yean highlighted that members must embrace the tool of modern science and the latest technology to remain competitive in the borderless world of globalisation. PEMA will continue to work closely with the various government departments, statutory bodies and the private sector. To bring about these developments, he said that there is a need to promote education. In conjunction with the 60th Anniversary Celebration, PEMA organised an Education Fund Raising Campaign. With the overwhelming generosity of members, the campaign generated more than RM 420,000 for the Education Fund. Highlights of the celebration were entertainment show, lucky draw and cake cutting.



Token of appreciation – (right) Mr Teoh Yew Yean (PEMA President) presenting a plaque to guest of honour, YAB Tn Lim Guan Eng (Chief Minister of Penang State).



Happy occasion – Cake cutting ceremony by PEMA officials to mark their 60th Anniversary.

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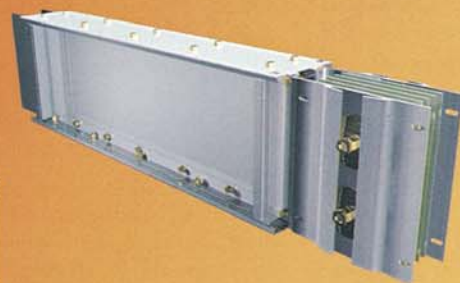
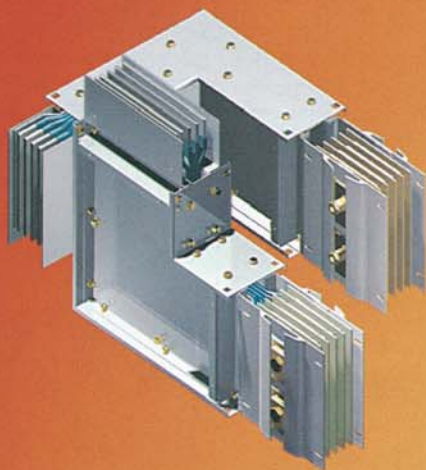
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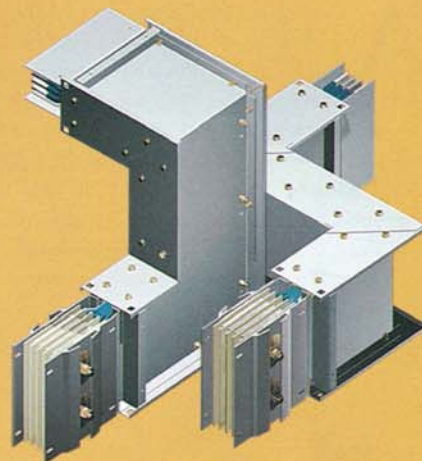


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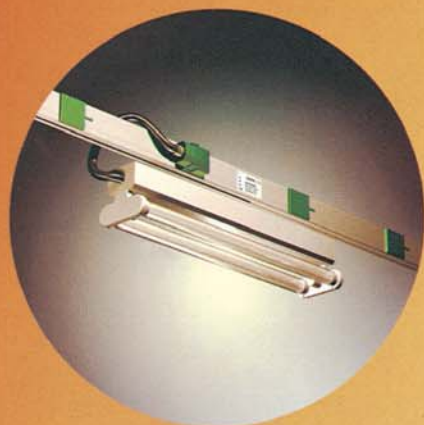
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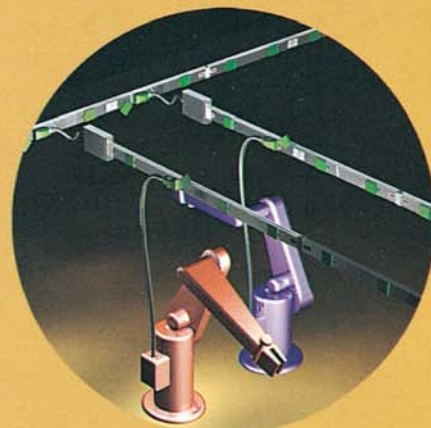
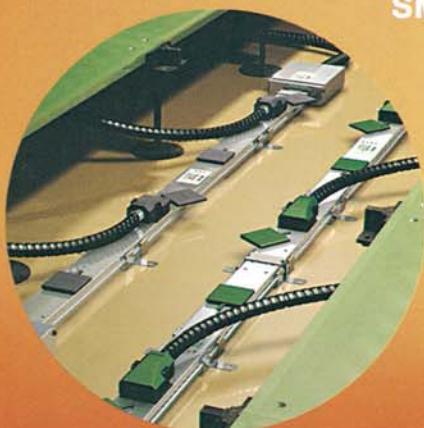


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Dialogue with TNB Pulau Pinang

PEMA held a dialogue with TNB Pulau Pinang on 14th January 2008. TNB Pulau Pinang was represented by its new General Manager for Penang State, En Ismail Hj Abdul Rahman while the PEMA delegation was led by its then President, Mr Hong Yeam Wah. Mr Hong congratulated En Ismail on his new appointment and thanked him for the dialogue.

PEMA presented a memorandum of issues to TNB Pulau Pinang for discussion such as the persistently long duration to approve or reject project, shortage of materials, problem arises from application of electricity to name a few. At the dialogue, PEMA was briefed on the second edition of the TNB Electricity Supply Application Handbook. It can be downloaded from TNB website. The dialogue was very interactive with many questions raised to TNB for clarifications. Some of the issues were solved during the dialogue and En Ismail will revert to PEMA on those issues that are related to policy requirement. After the dialogue, PEMA hosted a lunch for TNB officials at the Sheraton Hotel.



PEMA meeting TNB Pulau Pinang – Pressing issues were raised at the dialogue.



Johor Bahru Electrical & Electronics Association

No.7-01, Jalan Bentara Luar, Taman Iskandar,
80050 Johor Bahru, Johor Darul Takzim.
Tel: 607 - 333 8174 Fax: 607 - 224 1923
E-mail: jatco@pd.jaring.my /
i-bon@streamyx.com

AGM & Election

The Johor Bahru Electrical & Electronics Association (JBEEA) held its Annual General Meeting and election of office bearers for the year 2008 – 2010 on 23rd March 2008. Mr Leong Kam Meng is the newly elected Chairman of JBEEA.



Mr Leong Kam Meng – JBEEA newly elected Chairman.

Office Bearers of JBEEA for the year 2008-2010

Chairman	Leong Kam Meng
Vice Chairman	Lee Chee Boon
Honorary Secretary	Leong Heng Peng
Assistant Honorary Secretary	Lee Hai Soon
Honorary Treasurer	Jab Kok Keong
Assistant Honorary Treasurer	Chua Hock Leong
Committee Members	Lim Suan Haw, Ngoo Wee Min, Tiow Yok Seng
Auditors	Tan Eao Teck, Ng Hong Chon



The Perak Electrical Association

No. 12-A, Jalan Datuk Mahmud,
31650 Ipoh, Perak Darul Ridzuan.
Tel: 605 - 254 1502 Fax: 605 - 250 9145
E-mail: multi99@streamyx.com

AGM & Election

The Perak Electrical Association (PEA) held its Annual General Meeting and election of new office bearers recently. Mr Wan Kam Weng was elected the President of PEA. Representative from PEA in the TEEAM Council is Mr Chan Kaim Sam.



Mr Chan Kaim Sam – PEA newly elected Deputy President and representative in the TEEAM Council.

Office Bearers of PEA for the year 2008-2009

President	Wan Kam Weng
Deputy President	Chan Kaim Sam
Vice Presidents	Hong Chin Bee, Chang Yok Fan, Lim Ah Bah PMP, AMP Yong Hieng Charn
Honorary Secretaries	Teoh Kim Fong, Ngeow Khaw Seng
Treasurers	Wong Kee Keong, Foo Yoke Toong
Social Secretaries	Wong Lean Fatt, Cheah Koon Yeong
Welfare Officers	Leong Kok Wai PJK, Tham Kim Wan
Correspondences	Yew Heng Wah PPT, Wan Kam Yew, Ng Wai Cheong PJK
Investigators	Choy Chak Ho, Wong Kon Yuen, Wong Tet Woon AMP
Auditors	Loo Swee Kee, Lai Koon Loy
Ordinary Committee Members	Lee See Seng, Law Kok Loong, Wong Ngen Wah, Leong Kok Wah, Chan Ling Fee, Foo Kooi Chong, Leong Wai Meng, Wong Kok Mun, Ong Kean Seng



Sabah Electrical Association

Lot No. 3-3-R, Beverly Hills Plaza, Jalan Bundusan,
88300 Kota Kinabalu, Sabah.
Tel: 6088 - 712 358 Fax: 6088 - 717 358
E-mail: pes233@tm.net.my

AGM

The Sabah Electrical Association (PES) held its 6th Annual General Meeting and election of office bearers for the year 2008-2009 recently. The newly elected President is Mr Chung Kee Hung.



Mr Chung Kee Hung – PES newly elected President.

Office Bearers of PES for the year 2008-2009

President	Chung Kee Hung
1st Vice President	Woo Soo Poo
2nd Vice President	Chin Fui Ming
Secretary	Lee Vui Ken
Treasurer	Fo Ying Foh
Committee Members	Philip C P Ng, Leslie Jong, Foong June Choy, Wong Chee Sen, Chin Chung Kee, Lau Tong Liong, Chong Son Min, Arthur Y T Lim, Lai Tet Vui, David S V Chan
Immediate Past President	Ir Shim Siong Lit



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Sarawak Electrical Association

Lot 412, (2nd Floor), Lorong 11D,
Off Jalan Ang Cheng Ho, 93700 Kuching, Sarawak.
P. O. Box 1494, 93730 Kuching, Sarawak.
Tel: 6082 - 423 145 Fax: 6082 - 429 011
E-mail: btanhakkoon@yahoo.com

AFEEC-FAPECA Conference & Meeting in Taiwan

The Sarawak Electrical Association (SEA) Chairman, Mr Bernard Tan Hak Koon led an 11-member delegation to join TEEAM at the Asean Federation of Electrical Engineering Contractors (AFEEC) and Federation of Asian and Pacific Electrical Contractors Association (FAPECA) Conference & Meeting in Taiwan held from 14th to 16th November 2007 at the Grand Hotel, Taipei, Taiwan. It was a good networking event for SEA members.



Support from Sarawak - SEA members at the farewell dinner.

Other State Association Members' contacts:



Malacca Electrical Contractors and Traders Association

No. 389-G1, Taman Pringgit Jaya,
Jalan Mata Kuching, 75400 Melaka.
Tel: 606 - 283 8688 Fax: 606 - 781 1466



Negeri Sembilan Electrical Engineering Association

c/o No. 194, Jalan Pantai, 71000 Port Dickson.
Tel: 606-647 1105 Fax: 606-647 4728

Sandakan Electrical Engineering Association, Sabah

Block A, Lot No. 1, 2nd Floor, Bandar Tong Huat,
Batu 3, Jalan Utara, 90000 Sandakan, Sabah.
Tel: 6089 - 213 978 Fax: 6089 - 213 978
E-mail: chin336@tm.net.my



Electrical Association of 3rd, 6th & 7th Divisions, Sibul

No. 6, Lane 4, Kandis Road, Off Maling Road,
96000 Sibul, Sarawak.
Tel: 6084 - 331 460 Fax: 6084 - 346 114
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Tested by TNB Engineering for functionality and currently been used
For monitoring TNB low voltage substation.



Fuse-switch Disconnecter 160A - Brand : Fusetec

The Fusetec FH range fuse-switch disconnectors are fully insulated on-load switches which have been designed and manufactured in Malaysia for reliable use in low voltage overhead systems using either aerial bundled or bare overhead conductors. These switches are suitable for mounting directly onto transformers, poles or building facades.

Certified by SIRIM and CPRI India plus obtained Sijil Guna Pakai from TNB.



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Be Energy Efficient

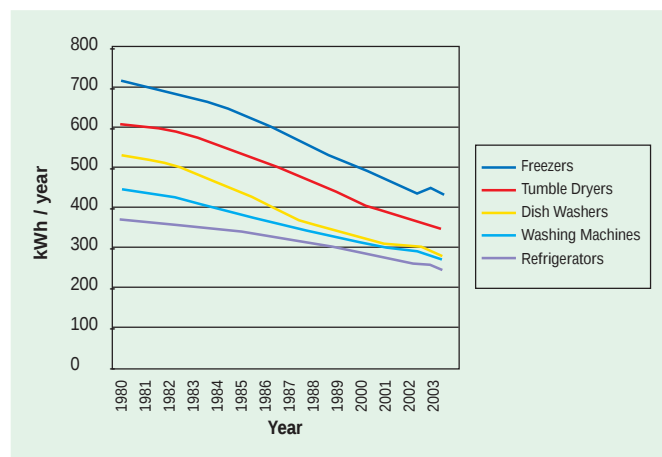
Introduction

The Energy Commission (Suruhanjaya Tenaga – ST) has published a “Be Energy Efficient Guidebook” for distributors, retailers and consumers like you to understand the advantages of energy efficient refrigerators and the benefits of supporting energy efficiency. This is important, as you can help prevent unnecessary spending on fuel needed to generate electricity.

Now’s your chance to play an active role in this national campaign to save energy – and be handsomely rewarded for it, at the same time.

The world is going for Energy Efficiency

More and more people from around the world are choosing energy efficient appliances. Since the successful launch of various energy efficiency standards and labelling programmes, substantial energy savings have been achieved by countries around the world.

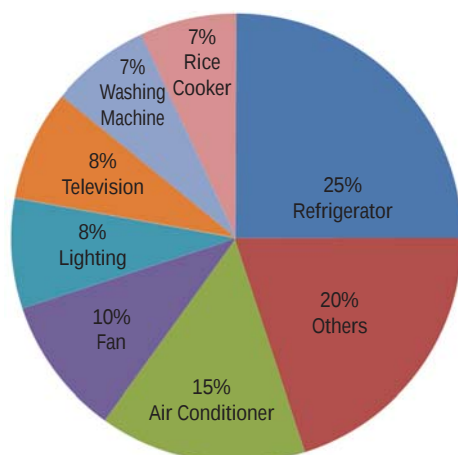


Specific electricity consumption of household appliances in Denmark

The leading countries implementing these programmes are members of the European Union, Australia, USA, Canada, Korea, Japan, Philippines, Thailand and Singapore.

Long run savings of Energy Efficiency

The refrigerator is one of the largest energy users in most households, and it is in continuous use. Choosing an energy efficient refrigerator will give significant savings on your electricity bill in the long run. 5-Star refrigerators are the most energy efficient in the market and will save you more than 25% electricity compared to average 3-Star refrigerators.



Energy consumption of household appliances in Malaysia

Star(s)	Energy Consumption
1	> 25% more than average 3-Star refrigerators
2	10% - 25% more than average 3-Star refrigerators
3	Average consumption corresponding to most common refrigerator models in the market
4	10% - 25% less than average 3-Star refrigerators
5	> 25% less than average 3-Star refrigerators

How you will profit from Energy Efficiency

Energy efficiency is not a fad. It’s here to stay. The appeal of paying less for getting the same amount of convenience will be irresistible. What more if you can reduce global warming and health risks caused by air pollutants, at one go.

Without doubt, demand for energy efficient refrigerators will rise. The production of new and improved energy saving models will increase. Progressive and informed retail outlet owners will ensure stocking ‘5-Star’ rated refrigerators. Strategic advertisement campaigns and on-ground promotions will continuously hit the market place. It’s easy to be Energy Efficient: 5-Star refrigerators carry a special label with Suruhanjaya Tenaga endorsement.



5-Star Energy Efficient Label

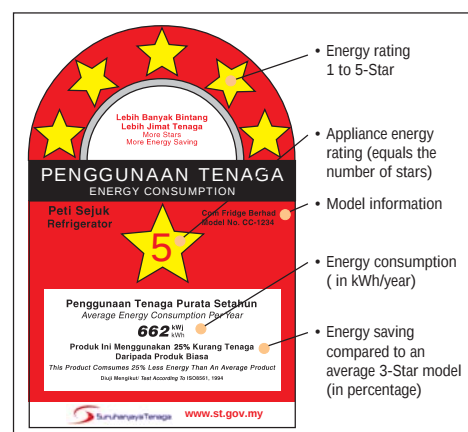
Understanding Energy Rating Labelling

Energy labelling is a widely accepted concept around the world. ST has established an energy labelling scheme for household appliances to assist Malaysian consumers. With the Energy Rating Label, you will see the appliance energy performance at a glance, to help you to compare products and make the smarter choice in purchasing energy efficient refrigerators. Energy efficiency performance of refrigerators is verified according to internationally recognised test procedures and endorsed by ST.

Reading the Energy Rating Label

The Energy Rating Label indicates a product’s energy performance. The more stars there are on the upper part of the label the more energy efficient the product is. 5-Star indicates that it is the most energy efficient model. The white box on the label contains information on the refrigerator’s energy usage as tested.

Here’s what to look for on the label:



The Energy Rating Label

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..... Continue Be Energy Efficient

It's easy to promote Energy Efficiency

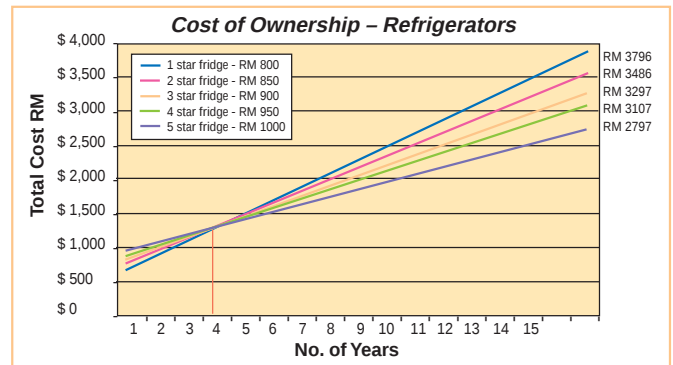
There's nothing to it. Once you get on this campaign that changes the way consumers buy refrigerators, you will discover that almost everything you need is provided for:

- Energy Rating Labels are printed and ready-fixed on new refrigerators by manufacturers and importers.
- Communications Workshops are carried out free-of-charge at selected venues around Malaysia.
- Roadshows for the public are organised at popular shopping areas across the country.
- A comprehensive list of advertising and promotional support material has been prepared by ST to assist you in the marketing of energy efficient refrigerators to consumers nationwide.

The comparison of Energy Efficient refrigerators

Generally, energy efficient refrigerators cost a bit more than less energy efficient conventional refrigerators of similar capacity and make. The higher price can easily be recovered from the electricity savings over the life of the refrigerators.

The chart beside shows a comparison between refrigerators, each having the same capacity and features, but with different purchase prices and energy costs.



This example shows that the extra purchase price is recovered in a few years.

One day all products will be Energy Efficient

Inevitably, energy will cost more in the near future. This will further trigger an escalating demand for refrigerators with energy conserving features that add to overall energy savings. Refrigerator suppliers have already committed themselves to promote energy efficient models in Malaysia.

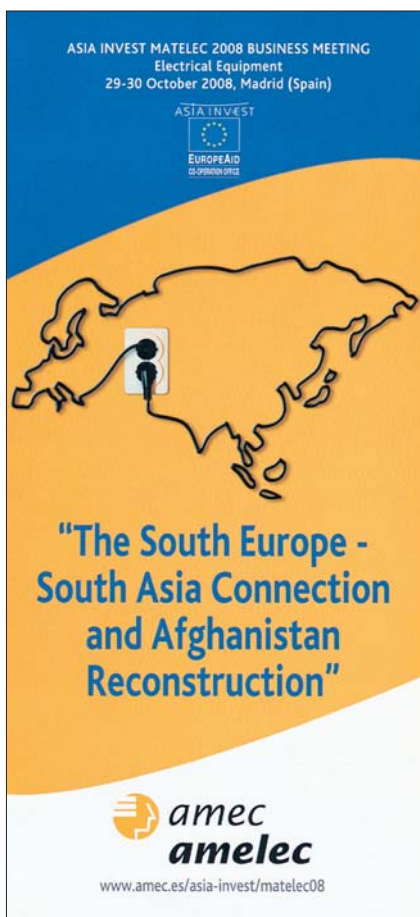
Soon, ST will expand its promotional efforts to encompass other energy efficient household appliances through energy rating labelling. This refrigerator campaign is just the beginning. For more information on energy efficiency in Malaysia, visit www.eefridge.com.my.

Source: "Be Energy Efficient Guidebook" published by Energy Commission, Malaysia.



ASIA INVEST MATELEC 2008 BUSINESS MEETING

29th-30th October 2008, Madrid, Spain



An Invitation to Spain

TEEAM in collaboration with the Spanish Association of Electrical Equipment Manufacturers (AMEC-AMELEC) presents a business matching event during MATELEC 2008 in Madrid, Spain. Malaysian companies are invited to participate in pre-arranged meetings with prospective European companies. This event is co-funded by the European Commission under the Asia Invest Programme. It aims to promote and support business cooperation between European Union and Asia. Project partners of AMEC-AMELEC are TEEAM, IEEMA, TEMCA, AICC and Consorzio Italiasia.

40 Asian companies from Malaysia, India, Thailand and Afghanistan will have individual business matching meetings with 25 European companies. The business matching meetings will be held on 29th & 30th October 2008 in Madrid, Spain during MATELEC 2008, an international exhibition of electrical and electronic equipment.

Sectors at the Meeting

- Generation, transformation and storage of electric power
- Power distribution and conduction
- Electrical lighting techniques
- Automation, measurement and regulation techniques
- Intercommunication Systems

Company Profile

- Manufacturers of electrical equipment
- Distributors of electrical equipment
- Representatives of electrical equipment
- Prescribers of electrical equipment (architects, engineers, building contractors)

Cooperation Agreements

- Commercial agreements for distribution and representation
- Joint manufacturing agreements
- Know how and technology transfer
- Creation of joint ventures
- Joint participation in international tenders
- Other strategic agreements

Partners



TEEAM (Malaysia)
The Electrical and Electronics Association of Malaysia



IEEMA (India)
Indian Electrical and Electronics Manufacturers' Association



TEMCA (Thailand)
Thai Electrical and Mechanical Contractors Association



AICC (Afghanistan)
Afghanistan International Chamber of Commerce



Consorzio Italiasia (Italy)

For enquiries and registration for business matching meeting, please contact TEEAM at:
Tel: +603-9221 4417, 9221 2091 Fax: +603-9221 8212
E-mail: teeam@po.jaring.my / teeam@streamyx.com
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Website: <http://www.pentapower.com.my>

Danger of Fire in Electrical Installations

By Mr Menso Groenewegen, Managing Director of Hensel International GmbH

Introduction

The use of thermoplastic materials in modern electro-technical installations especially for distribution boards and junctions is increasing nowadays. This is mainly due to the very good features of the material such as insulation, weight, strength, ease of handling, corrosion resistance and colour.

Due to the power loss of internal components like circuit breakers, terminals and cabling, the temperature inside the cable junction boxes and distribution boards are higher than the normal surrounding temperature.

For modern thermoplastic materials, these temperature levels are no problem as they are designed to be used in such conditions. However the technicians should ensure that they study the technical data from the suppliers which indicate the maximum power loss which is allowed inside the boxes and boards. This will ensure an optimal design.

Failures Inside Electrical Installations

In case of failure inside an electrical installation, this might result in temperature which is higher than the maximum limit that the material can withstand. For instance if a wire is not correctly fixed inside a terminal, due to the high resistance and possible sparks, the temperature might reach very high levels. If this is left unattended, the result could be that the material starts to burn. This burning material drips to the ground causing ignition of other materials which then leads to a fire.

To avoid problems and fire in case of failures, some materials have been enriched with special additives which make the material self-extinguishing and flame retardant. Unfortunately many of these additives have some other negative effects in case of a fire in the building. Many of the standard additives take away the oxygen of the flame in case of fire but create toxic gases like halogen at the same time. These toxic gases have a very negative effect on human beings and we can often read in the newspapers that people were more affected by the toxic gases than by the fire itself.

Halogen Free

For this reason many regulations and technical rules require products that are free of these toxic gases. The suppliers changed or removed the

additives that caused the toxic gases which in some cases reduced the self-extinguishing behaviour of the material again. These products often are indicated with "Halogen free" but this indication does not say anything about the self-extinguishing behaviour of the material!

An insurance company in Sweden noticed that the amount of fire in agricultural buildings caused by electrical installation was increasing as clients had installed only halogen free products as per local regulations. In a test conducted, they noticed that many of the well-known products did not meet the self-extinguishing requirements. In fact, only a few passed the test. The products that passed the test were made of more expensive material and additives that prevent toxic gases in case of fire and improve the burning behaviour as well. Of course these products are better and safer but they are also more expensive because of the material used.

How to Know the Difference

For an electrician it is very difficult to see from the outside the difference of material which is being used and how the behaviour is in case of electrical fault. For this reason, special tests that classify the behaviour of the material in case of electrical fault have been implemented into the standard technical rules of IEC. The so called glow-wire-test according to IEC 60 695-2-11 simulates a glowing wire that hits the surface on the inside of the box. In this test different temperature levels for different applications have been defined such as 650°C, 750°C and 960°C. All electro-technical equipment must pass this test with a minimum test temperature of 650°C.

As an indication for the electrician we can say that the higher the temperature of the test that has been passed, the better the quality of the material and the self-extinguishing behaviour. For example if a product has passed the test with 960°C, it has better quality than a product which was tested at 650°C.

Fire on the Outside of the Installation

There are other tests that use an open flame which is held against the material from the outside. This UL test is for instance important to simulate a short circuit inside a distribution board and gives an indication how flame retardant the material is.

In cases where a fire is already burning and reaches the electrical installation on the

outside, the self-extinguishing and burning behaviour effect of the material is not so important anymore, as the fire has unfortunately already been caused. In this case the halogen free material is important to avoid and reduce the amount of toxic gases.

For some vital functions it is sometimes necessary that the electrical installation remains in function for a certain period of time, even when the fire is burning on the outside of the installation. For this application there are technical solutions known as "functional integrity". This kind of installation requires special cables, cable junction boxes and terminals made out of special material and clear mounting instructions that have been tested in an oven with 1000°C as a complete system for a "functional integrity" solution. These systems guarantee the functionality for either 30 minutes (E30) or 90 minutes (E90), depending on the type of cable at a temperature of 1000°C.

After the fire at Düsseldorf airport, this solution was originally developed for public buildings. The fire caused the death of many people because the electrical installation of vital functions, like fire flaps, ventilators, etc. were out of order. Today not only public buildings but also car tunnels, subway, train stations, sport-arena, banks and other applications use this "functional integrity" as a secure solution in case of fire.

Summary

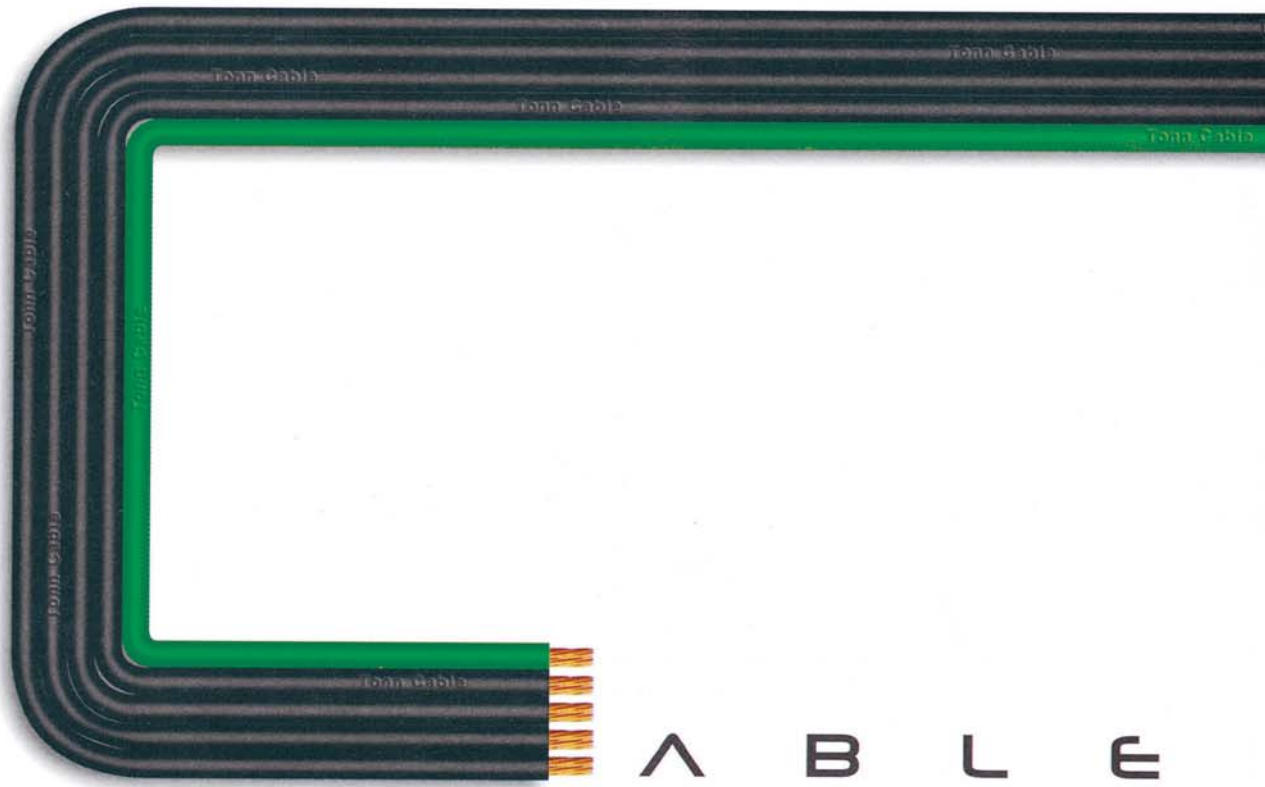
There are very good products and materials in the market that combine the advantages of the thermal plastics with the demands to avoid fire caused by electrical faults. There is a big difference in the materials that are being used for the installation products that are offered in the market which very often is also reflected in the price of the product. It is better to choose products from manufacturers having a few decades of experience in manufacture of such products as this is a question of security, reliability and lifespan of your installation.

Mr Menso Groenewegen is the Managing Director of Hensel International GmbH - a 77 year old German manufacturer of high quality industrial electrical power distribution systems made of thermoplastics.

He has a wide experience of more than 30 years in the field of electrical installation with insulated material and is passionate about educating consumers on the right selection of plastic materials for electrical use.

He can be reached at:

E-mail: menso.groenewegen@hensel-electric.de

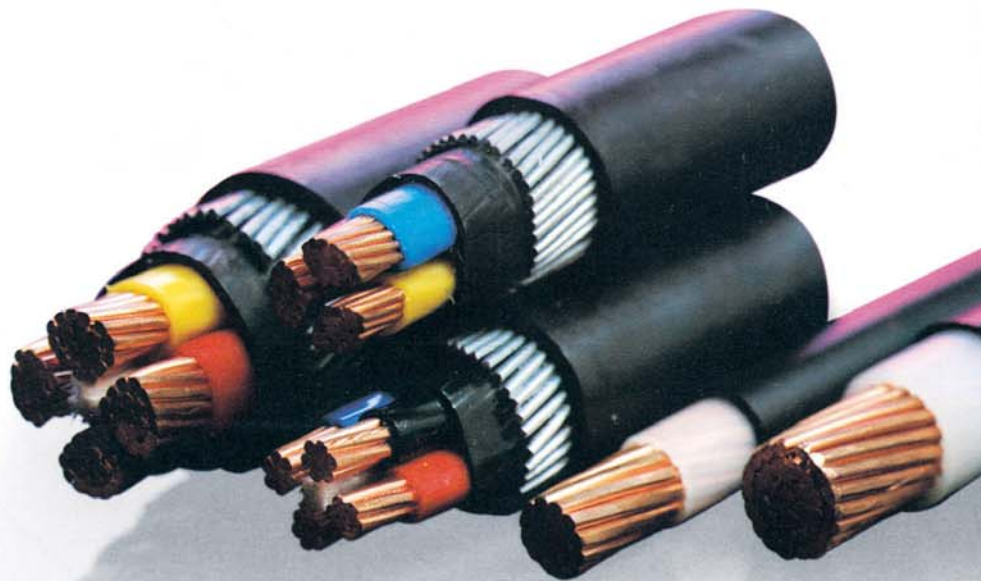


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Challenges and Opportunities in Electrical Industry - Part 8

This paper was prepared by Ir Chew Shee Fuee, TEEAM Immediate Past President.

TNB e- Application

TNB in its efforts to improve the supply system has initiated the e-Application. All electrical contractors are requested to register with TNB if they wish to offer their service to the public. The public will engage the contractor for the service by contacting them direct. The e-Application will become compulsory by 1st June 2008 if a project involves units exceeding 150. The developer is responsible for this and I envisage the electrical contractor will bear most of the tedious paper work for the project.

The new system will eventually keep the efficiency of new electricity application to the best that it can be expected. House owners and contractors can keep track of progress of application online.

We hope all contractors will assist to make the new system work so that it may benefit everyone. All you need to do is to register with TNB and specify the areas that you will like to provide your service.

Ultimately the information gathering system will help everyone in the electrical supply business.

Another fatal electrical electrocution caused by negligence

ULU TIRAM: All he wanted to do was to take shelter from the rain. However, M. Hari, 14, was electrocuted when he leaned against the grille gate of the staircase of a shophouse in Jalan Intan, Taman Ros, and held it during a storm at 4.30 pm on Thursday 26th April 2008. The shophouse was under renovation and it is believed that the grille was in contact with exposed electrical wiring.

The actual cause of the incident is being investigated by the Energy Commission.

The application of Residual Current Devices (RCDs) can be a very important one in this aspect. The usage of RCDs even in areas where wiring is not permanent is even more crucial. In the event of any leakage of current the RCDs will be sensitive enough to remove the faulted circuits.

Until we can confirm the people responsible for the incident above we can only assume that unlicensed people are doing the wiring work in renovation.

The other group are those who carried out installation of air-conditioners. Generally these works are carried out by unlicensed companies because they need not have any approval from any party.

TEEAM has highlighted the need to have electrical contractors to be engaged for all electrical installations including renovation. Owners and management of properties should always insist that this is being practised. One easy way is to demand for completed G & H forms just as in the case of a new installation. A renovation is a modification to an existing installation and therefore can be more dangerous if all necessary requirements are not carried out accordingly.

New BS 7671-2008

As many of us are familiar with the IEE Wiring Regulations the latest version is the BS 7671-2008 which is published on 1st January 2008. The new regulations will be implemented by 1st July 2008.

Our Malaysia standard of MS IEC 60364 generally is very similar to the BS 7671. Therefore I believe the changes in BS 7671 will also be incorporated in MS IEC 60364 in the future.

Some of the changes in BS 7671 are listed here.

Chapter 41 Protection Against Electric Shock

This chapter now refers to basic protection under normal conditions (previously referred to as protection against direct contact), and fault protection which is protection under fault conditions (previously referred to as protection against indirect contact).

Chapter 41 now requires that for the protective measure of automatic disconnection of supply for an AC system, additional protection by means of an RCD with a rated residual operating current not exceeding 30mA and an operating time not exceeding 40ms at a residual current of 5 times be provided for socket-outlets with a rated current not exceeding 20A that are for use by ordinary persons and are intended for general use, and for mobile equipment with a current rating not exceeding 32A for use outdoors. This additional protection is now to be provided in the event of failure of the provision for basic protection and/or the provision for fault protection or carelessness by users of the installation. Note that certain exceptions are permitted.

Part 6 Inspection and Testing

The insulation resistance value is revised from 0.5 M Ohm to 1 M Ohm.

Ir Chew Shee Fuee B.Sc. (Hons) (Strathclyde), PEng, CEng, FIEM, MIEE Member, IEEE Member, 1st Grade Electrical Engineer (Competent up to above 500 kV).

Ir Chew is the President of The Electrical and Electronics Association of Malaysia (TEEAM) for 2001 - 2003 and 2003 - 2005. He is the Past President of the Asean Federation of Electrical Engineering Contractors (AFEEC).

Ir Chew is the Managing Director of G. H. Liew Engineering (1990) Sdn Bhd and QATM Engineering Services Sdn Bhd. He graduated from the University of Strathclyde, Glasgow with a B. Sc (Hons) in Electrical & Electronics Engineering. He is a Professional Engineer and is also licensed by Energy Commission as a competent engineer (without voltage limits) and a service engineer to carry out electrical testing up to a voltage of 500 kV.

Ir Chew has 26 years experience in electrical control and relay protection. He is also specialised in electrical site tests on power equipment, electrical fault investigation, service and maintenance of electrical switchgear and relays. His work also includes electrical supervision of substations and electrical audit. He presents lectures on electrical apparatus and the protection system. He can be reached at E-mail: sfchew@ghliew1990.com

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Energy Efficiency and Conservation Guidelines for Motors

Introduction

In Malaysia, electric motors typically account for 70% of the electricity usage among industries. The motors in the industrial sector in Malaysia consume as much as RM6 billion worth of electrical energy annually. It, therefore, makes sense that higher efficiency in motors will result in substantial savings in energy and electricity costs.

Guideline on Equipment Energy Efficiency

Motor Selection

High Efficiency Motor

Motors convert electrical energy into mechanical energy to drive machinery. During this conversion, some energy is lost. Current motors feature improved designs and incorporate the latest developments in materials technology. The most efficient of these motors are termed High Efficiency Motors (HEMs) – classified as Eff1 under the European Committee of Manufacturers of Electrical Machines and Power Electronics (CEMEP), or their equivalent.

The CEMEP classification standard has been adopted by Malaysia to classify motor efficiencies. Below HEMs or Eff1 are Eff2 and Eff3 motors, which have descending order of efficiencies. Key design features of HEMs include:

- Improved fan design - Reduces windage losses and improves air flow
- Better slot design - Improves both efficiency and power factor
- Improved core design - Lowers flux density and increases cooling capacity, reducing magnetic and load losses
- Optimised air gap - Reduces current requirements and stray load losses

These features result in order advantages besides energy savings, as HEMs:

- Have higher power factor,
- Have longer lifespan and fewer breakdowns,
- Run cooler and less susceptible to voltage and load fluctuations, and
- Produce less waste, heat and noise.

Motor efficiency classification labels are labelled as EFF1 (the highest), EFF2 and EFF3 (the lowest) on rating plates and technical data tables in manufacturers' catalogues.

Efficiency classification

Motors are classified according to CEMEP in three efficiency classes:

- EFF1 (high-efficiency motors)
- EFF2 (improved-efficiency motors)
- EFF3 (standard motors)

The efficiency ranges for the classifications are as shown in Tables 1 and 2.

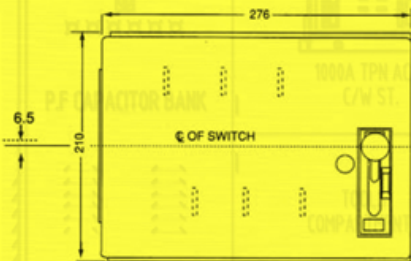
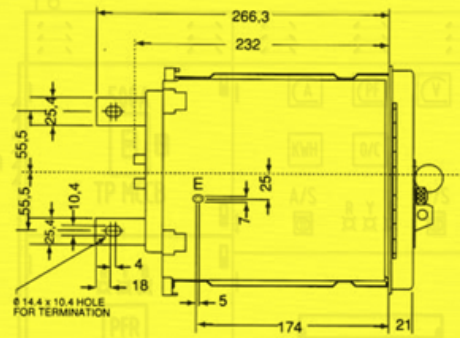
Table 1: The CEMEP classification for Motor Efficiency Levels (2-pole)

2-pole			
	Efficiency		
kW	EFF1 equal to or above	EFF2 equal to or above	EFF3 below
1.1	82.8	76.2	76.2
1.5	84.1	78.5	78.5
2.2	85.6	81.0	81.0
3	86.7	82.6	82.6
4	87.6	84.2	84.2
5.5	88.6	85.7	85.7
7.5	89.5	87.0	87.0
11	90.5	88.4	88.4
15	91.3	89.4	89.4
18.5	91.8	90.0	90.0
22	92.2	90.5	90.5
30	92.9	91.4	91.4
37	93.3	92.0	92.0
45	93.7	92.5	92.5
55	94.0	93.0	93.0
75	94.6	93.6	93.6
90	95.0	93.9	93.9

Table 2: The CEMEP classification for Motor Efficiency Levels (4-pole)

4-pole			
	Efficiency		
kW	EFF1 equal to or above	EFF2 equal to or above	EFF3 below
1.1	83.8	76.2	76.2
1.5	85.0	78.5	78.5
2.2	86.4	81.0	81.0
3	87.4	82.6	82.6
4	88.3	84.2	84.2
5.5	89.2	85.7	85.7
7.5	90.1	87.0	87.0
11	91.0	88.4	88.4
15	91.8	89.4	89.4
18.5	92.2	90.0	90.0
22	92.6	90.5	90.5
30	93.2	91.4	91.4
37	93.6	92.0	92.0
45	93.9	92.5	92.5
55	94.2	93.0	93.0
75	94.7	93.6	93.6
90	95.0	93.9	93.9

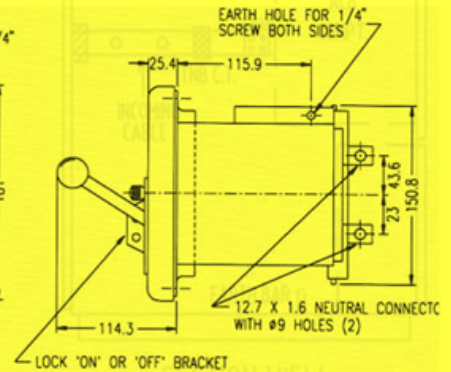
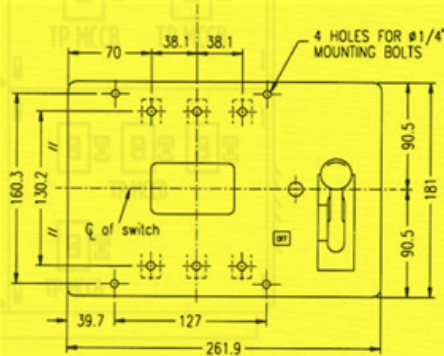
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Efficiency Testing Requirements

Motor energy efficiencies are to be tested according to MS IEC 60034-2:2005 or its latest edition. The qualifying motors for Energy Efficiency Classification under CEMEP are as follows:

- Totally Enclosed Fan Cooled (TEFC), IP 54 or IP 55.
- 3-phase, squirrel cage induction motors, of 2- & 4-pole construction with outputs 1.1 to 90kW.
- Rated for 400 volts, 50 Hz, S1 Duty (Continuous Duty). For motors rated at 380 – 420 volts, the declared efficiency values are tests at 400V.
- Standard design (Design N), given in IEC 60034-12 and Harmonisation Document (HD) 231.

Quick guide!

Application parameters for selection of motor energy efficiency level:

- ✓ EFF1 Motor for operating hours exceeding 2,000 hrs per year.
- ✓ EFF2 Motor for operating hours below 2,000 hrs per year.
- ✓ EFF3 Motors are not recommended to be used.

Energy and Cost – Saving Potential

Cost premium for High Efficiency Motors

The cost premium for HEM is about 50 to 150 per cent above the cost of an average motor. An HEM comes with higher capital cost but there will be a significant amount of energy savings during its lifespan. The Malaysian Government has made it even more attractive to buy HEMs by offering:

- Exemption on import duty and sales tax, and
- Investment tax allowance for energy efficient equipment

To know more about the incentives, log on to: www.hem2profit.com.my

On average, the initial purchase cost of a motor only makes up 2% of the total cost of ownership. The total electricity consumed to operate the motor over its lifetime of 15 years makes up 97% of its total cost.

Savings in Running Cost

The energy costs of a motor can be quite high over its lifetime. The longer the operating hours, the higher the energy costs. Therefore, the lifetime cost calculations should be performed to determine whether repair or replacement of an existing standard motor with a high efficient motor is more economical.

Table 3: Method to calculate savings from using a high efficiency motor

The annual saving achieved by installing a high efficiency motor in place of an existing standard efficiency machine is calculated using the formula:

$$\text{Annual saving} = \text{hrs} \times \text{kW} \times \% \text{ FL} \times \text{RM/kWh} \times \left[\frac{1}{\eta_{\text{std}}} - \frac{1}{\eta_{\text{hem}}} \right]$$

Where;

- Hrs = annual operating hours
- kW = motor rating in kW (ie shaft or output power)
- %FL = fraction of full load at which motor runs
- RM/kWh = electricity cost
- η_{std} = efficiency of standard motor
- η_{hem} = efficiency of high efficiency motor

Quick guide!

Typical energy savings in high efficiency motors compared with standard motors

Motor size	Savings
Up to 10 kW	5 – 10%
10 – 20 kW	2 – 5%
Above 20 kW	1 – 2%

Motor Sizing

What to Consider When Selecting a Motor

When changing to a smaller or high efficiency motor, it is important to consider the following:

- Running temperature – High efficiency motors operate within the same Class B temperature limits as standard motors but will not dissipate as much heat.
- Maximum power capability – Before changing to a smaller, lower-rated motor, it is important to check that no load will arise which will exceed this new rating.
- Starting torque – The starting torque developed in the new, lower rated motor is likely to be less than that of the existing motor. Thus, the starting duty in the application will have to be checked. In cases where the existing drive is a star/delta starter, a change to direct-on-line start can be considered except where starting torque or current must be limited. Soft starters may be considered.
- Special loads – Many drives provide starting and acceleration torque to the load as their main function, eg centrifuges or flywheels on presses. The running current of these machines, i.e. when full speed is achieved, is quite low and may give the impression that downsizing is possible. Such cases are unsuitable for application of this energy saving opportunity, but this could be easily established by measuring the starting current.

How to Estimate the Efficiency of Existing Motors

When considering replacing a functioning motor with a high efficiency motor, it is important to know the efficiency of the existing motor in order to calculate the potential savings. Unfortunately, it is difficult to get this information precisely for the present crop of installed motors. Therefore, one or more of these methods could be tried:

- Check the motor nameplate – Older motors typically do not have efficiency information on their nameplates. Any efficiency ratings on motors that date prior to the present system of efficiency ratings may not be in accordance with the CEMEP classification.
- Contact the manufacturer – Start with the manufacturer's engineering department. Provide all the nameplate information.
- Check the original installation file – The information submitted with the motor when it was installed may contain efficiency information. Beware of efficiency figures in promotional literature, especially if the test method is not stated. The fact that a motor efficiency may have been specified in the designer's specifications does not guarantee that the motor actually installed has this efficiency.
- Make a guess based on other characteristics – Even if the motor efficiency is not stated explicitly, try to consider:
 - Age of the motor: Maximum efficiency of motors increased substantially during the 1980's. Therefore, replacing a motor that was installed before then is likely to yield a substantial efficiency improvement.

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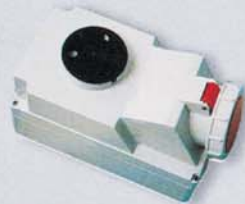
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..... Continue Energy Efficiency and Conservation Guidelines for Motors

- **Full-load RPM:** Full-load RPM as shown on the nameplate relates to efficiency. In general, a higher full-load RPM means higher efficiency. However, a comparison is valid only within a particular torque classification. High-torque motors are designed for lower full-load RPM. Especially in order motors, the full-load RPM may be nominal.
- **Service factor:** Service factor relates indirectly to motor efficiency. A service factor of 1.0 suggests mediocre efficiency, but this is not always true.

Quick guide! Estimated efficiency data for 4-pole motors:		
Rated		Typical efficiency of an approx 20 year-old motor
3.0kW	FL	81%
	$\frac{3}{4}$ x FL	81%
	$\frac{1}{2}$ x FL	79%
7.5kW	FL	85%
	$\frac{3}{4}$ x FL	85%
	$\frac{1}{2}$ x FL	82%
15 kW	FL	88%
	$\frac{3}{4}$ x FL	88%
	$\frac{1}{2}$ x FL	86%
30 kW	FL	90%
	$\frac{3}{4}$ x FL	90%
	$\frac{1}{2}$ x FL	88%
75kW	FL	93%
	$\frac{3}{4}$ x FL	93%

Guidelines for Best Practice

General guidelines for operation and maintenance are given below. Each premise is recommended to develop its respective guideline for best practice in operation and maintenance in accordance with its requirements.

Operations and Maintenance

Proper operations and maintenance of motors can result in significant energy savings, in the region of 10 to 15% of motor energy consumption costs, depending on existing maintenance practices. This will be covered under the following aspects:

- Proper commissioning
- Maintenance records
- Motor set-up and alignment
- Motor cleaning
- Motor lubrication and bearing maintenance
- Motor condition assessment
- Electrical performance assessment
- Switching off when not needed
- Reducing motor loads
- Checking supply voltage characteristics
- Slowing down loads for pumps and fans

Proper Commissioning

This is an important first step in the operation of a motor. Commissioning is done not only when a new motor or equipment is installed, but also when the existing equipment has undergone a major repair or there has been a major variation in the operating needs of the equipment. Improper commissioning can lead to inefficient operation and early equipment failure. The checklist for proper commissioning should include:

- Is the motor suitable for the application?
- Are the foundations rigid, stiff and to the machine supplier's specification?
- Is the drive baseplate stable and are all mounting surfaces in the same flat plane?

- Are all motor feet individually and appropriately shimmed?
- Are all foundations and anchor hold-down bolts in place and tightened to torque specifications?
- Does the foundation avoid resonance (for example, no excessive vibration during start-up, shut-down or at the operating speeds)?
- Where applicable, does the coupling connecting the motor to the equipment meet the equipment specification and is it carefully selected and set up to avoid locking the driving and driven shafts together?
- Has alignment been completed within specification by an accepted alignment method?
- Where applicable, are the pulleys the correct type and size for the V-belts and are they properly aligned?
- Where applicable, are the V-belts correct and tensioned to specification?
- Has it been ensured that there are no restrictions to motor ventilation?
- Is the motor grounded with adequate surge protection?
- Are all electrical connections clean, tight and properly sized?
- Is the terminal cover suitably gasketed and adequately tightened?
- Is the motor circuit resistance and impedance balanced?
- Are motor current and voltage balanced?
- Is the motor temperature rise in accordance with type test certificate?
- Are machine vibrations within manufacturer specified limits?
- Are all lubrication points accessible and adequately lubricated, and are all the lubrication drain plugs removed?
- Is all documentation complete and permits to operate motor signed off?
- Does the machine deliver what is required?
- Has the control strategy been evaluated in terms of its energy efficiency?

Maintenance Records

Maintenance records are important as they can provide vital information on the type and specifications for each motor, where they are located, specifications for components attached to them such as belts and pulleys and an historical record of maintenance and repairs. When kept in an orderly fashion, they can provide indications of when tests, inspections or servicing are due. They also allow staff to quickly identify spare parts or replacements when needed. If performance tests are also done, they can provide information on the energy efficiency aspects of the motors.

Motor Set-Up and Alignment

Correct shaft alignment is important to ensure smooth, efficient transmission of power from the motor to the load. There are 2 types of misalignments – radial misalignment and angular misalignment (Figures 1 and 2). The alignment should be checked at regular intervals. Incorrect alignment will result in strain on bearings and shafts, shortening their lives and reducing system efficiency.

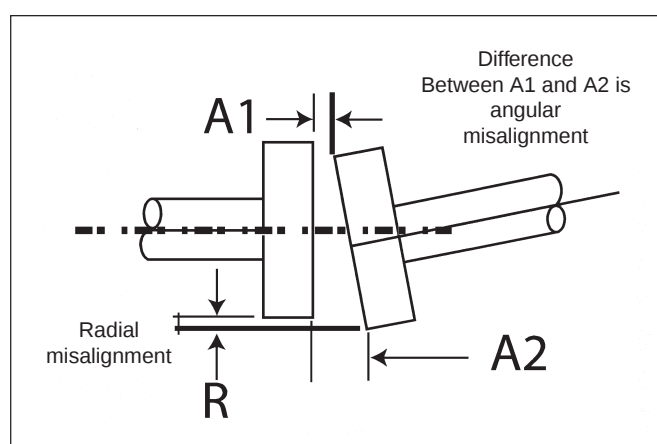


Figure 1: Misalignment of Motor Coupling



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Similarly, belts and pulleys must be properly aligned and tensioned when they are installed, and regularly inspected to ensure alignment and tension stay within tolerances. The tension in the pulleys is also important as incorrect tension will result in strains in the bearings and shafts, shortening their lives and resulting in inefficient operation.

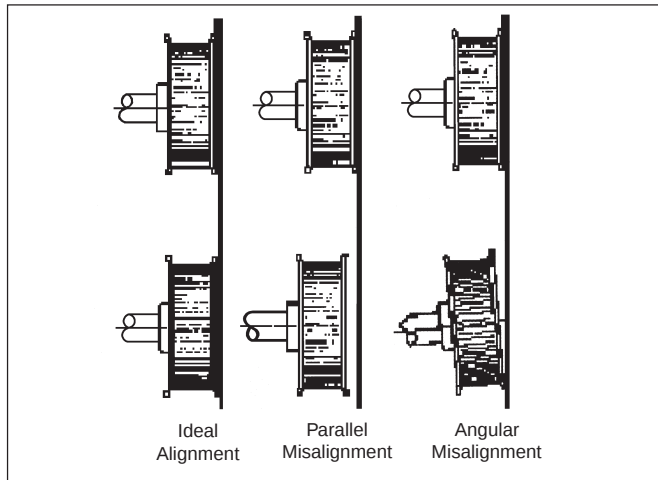


Figure 2: Misalignment of Sheaves

Motor Cleaning

Cleaning of dirt on motors is important as dirt can be abrasive to moving parts, contaminate bearings, coat windings and can combine with water to result in a corrosive mixture. This will result in an increase in energy consumption by the motor. Cleaning will also ensure adequate ventilation of the motors.

Motor Lubrication and Bearing Maintenance

Bearings used in electric motors can fail due to incorrect bearing selection, improper bearing fits, poor handling during installation, improper installation techniques, excessive thrust loads, loss of lubricant, contamination and over-greasing. Bearing maintenance consists primarily of keeping bearings clean, lubricated and loaded within tolerances. Simple lubrication and cleaning can improve efficiency and add years to the life of a motor. While lubrication is necessary, over-lubrication can be harmful if lubricant gets inside the motor where it can trap dust and dirt, chemically attack internal parts or cause short circuits. A proper lubrication schedule should be drawn up for this purpose.

Motor Condition Assessment

Regular assessment of the motor condition is vital to efficient and reliable performance. Regular visual and operational checks on the motors should be scheduled. Maintenance staff should use all of their senses – sight, smell, hearing and touch – as well as basic monitoring equipment such as a hand-held vibration meter or thermometer to monitor the condition of the motors. Infrared condition monitoring can help identify loose connections.

Electrical Performance Assessment

Power supply quality will have a significant impact on motor efficiency and reliability. For this, the following will have to be ensured:

- Nominal voltage marked on the motor nameplate is within 5 per cent of supply voltage.
- Voltage imbalance, that is the maximum difference of the voltages in relation to the average voltage, is under one per cent. Common causes for voltage imbalance are non-symmetrical distribution of single-phase loads on the three-phase network, an open circuit in one of the phases or unequal cable lengths and sizes causing voltage drop in one of the phases. Voltage imbalance leads to high current imbalance, which leads to high losses.

- Harmonic distortion producing devices (such as variable speed drives, other power electronic devices and arc furnaces) are isolated from other equipment by separate feeders, transformers or harmonic filters. In motors, harmonics can increase losses, reduce torque, cause torque pulsation and overheating.

Switching Off When Not Needed

Motors running on no-load consume energy to overcome internal losses. This can be in the region of 14% of rated power. Therefore, switching them off during such periods can save energy. Switching off can be done through several methods:

- Manual: This is the least cost method but it may not be reliable due to human factors such as forgetting to do so, no one person being made responsible to do it or the person responsible finding it inconvenient to do it.
- Having sensors: These sensors will sense that the motors are on no-load and will switch them off.
- Interlocking control: This is to ensure that the motor is switched on only when the equipment it is driving is operating.
- Time switch: Motors switch on at predetermined times as needed.
- Full-load operation control: Here, there is a system that ensures that the motor does not run continuously at partial loads, but is run at full loads part of the time. However, this depends on operational requirements and the control may be complex.
- Having multiple motors: This is to ensure that some of the motors are switched off to ensure that the others operate on full rather than at partial loads.

Frequent switching however, can result in increased wear in the bearings and can shorten life of the motor insulation due to high starting currents. The limits on start-ups per period of time will have to consider this and will depend on the loading of the motor and the motor rated output power.

Reducing Motor Loads

To ensure efficient operation, the possibility of reducing the motor loads, such as pumps, fans and compressed air systems, refrigeration systems and conveyers should ideally be done first. This could include minimising sharp bends in the piping or ducting systems, having proper impeller sizing, proper system pressures and temperatures and ensuring no leaks.

Slowing Down Loads for Pumps and Fans

The use of dampers, throttles, recirculation systems and pressure relief valves to reduce equipment output is very energy inefficient. At the same time, operating the motors at partial loads to achieve this is also inefficient as motors operate at their optimum efficiencies near their rated output levels. Reducing the speed of the load, for example, for pumps and fans, is a much more efficient way of having the same effect.

Since induction motors essentially operate at fixed speeds when operated at fixed supply frequencies and voltages, this speed change will have to be done by other means. This can be done by changing the gearbox ratio or changing pulley ratios. Here, the speed of the motor is not altered, but the speed of the load will change. The speed of the motors can also be changed by having multiple speed motors (multiple winding motors, pole changing motors or pole amplitude modulated [PAM] motors) or using variable speed drives (VSDs).

The savings will depend on the load characteristics:

- For variable torque loads such as centrifugal fans and pumps, the savings can be quite substantial because the power input to the fan or pump is proportional to the cube of its speed.



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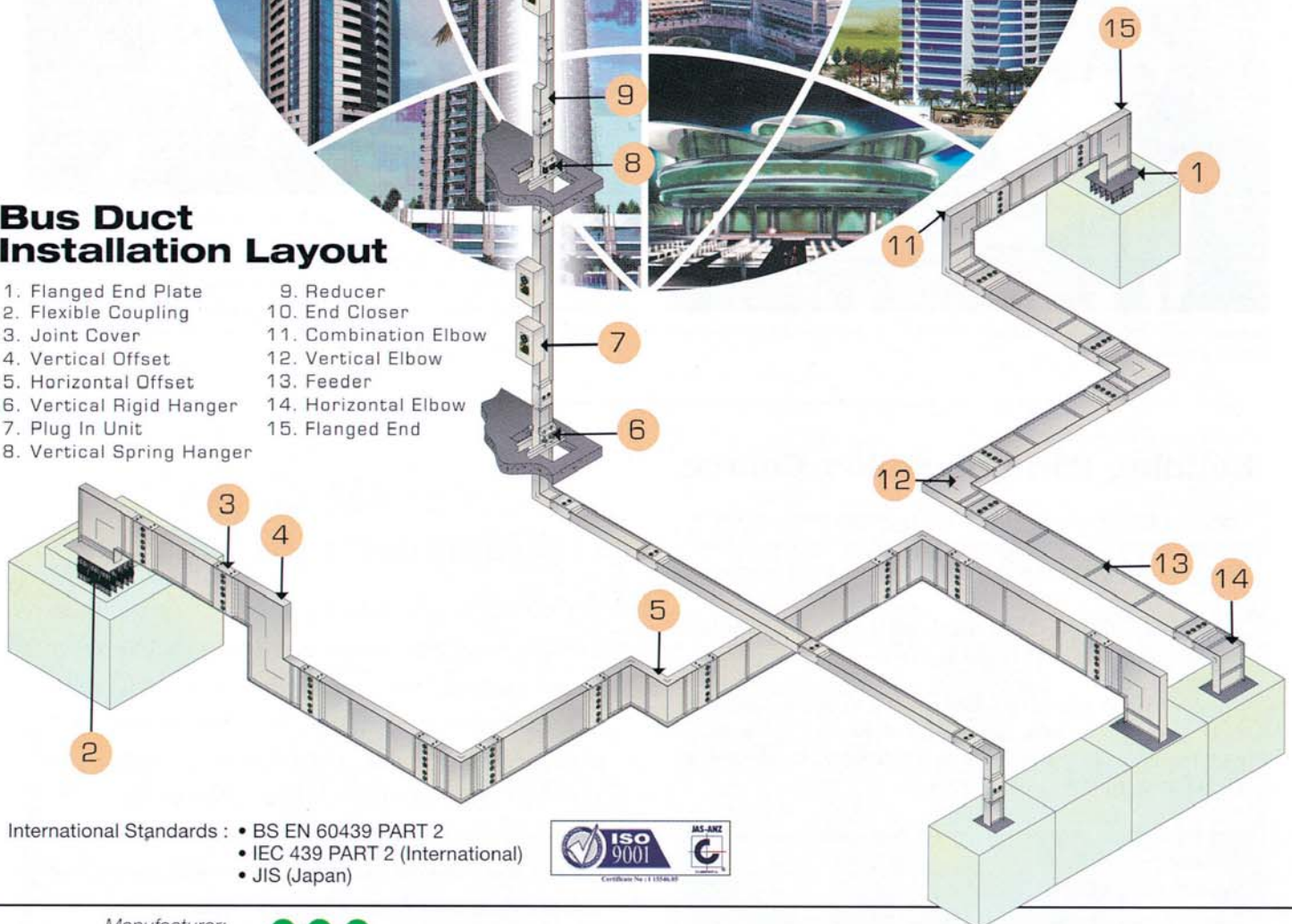
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|---------------------------|-----------------------|
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| 4. Vertical Offset | 12. Vertical Elbow |
| 5. Horizontal Offset | 13. Feeder |
| 6. Vertical Rigid Hanger | 14. Horizontal Elbow |
| 7. Plug In Unit | 15. Flanged End |
| 8. Vertical Spring Hanger | |



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..... Continue Energy Efficiency and Conservation Guidelines for Motors

- For positive displacement air compressors, agitators, crushers, conveyors, etc., the torque does not vary with speed and the power is directly proportional to the speed. Here, if the speed is reduced to half its value, the energy consumption is also halved.
- For loads such as machine tools and centre winders, the torque is inversely proportional to speed. Here, the power is constant and speed reduction will not result in power reduction.

The above variations in the load and savings can be elaborated as follows:

a) Variable Torque

Fundamental laws governing the operation of centrifugal pumps and fans state (the affinity laws):

- (flow) proportional (speed)
- (pressure or torque) proportional (speed)²
- (power) proportional (speed)³

The above relationship is also referred to as the “power cubed law” or “squared torque law”. A small change in speed results in a large fall in power.

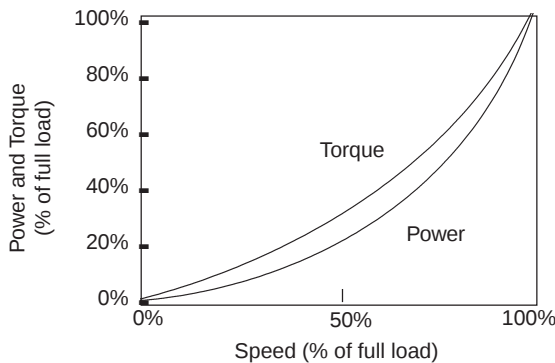


Figure 3: Variable Torque Load

b) Constant Torque

In applications such as positive displacement air compressors, conveyors, agitators, crushers and surface winders, the torque does not vary with the speed and the power is directly proportional to the speed. As the energy used is directly proportional to the speed, the energy savings is not as large as in square torque law applications. Halving the speed of a constant torque application will half the energy consumed.

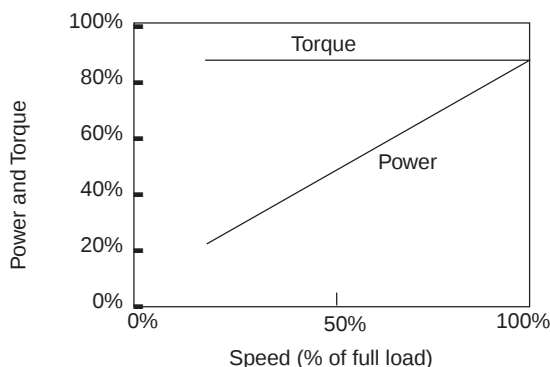


Figure 4: Constant Torque Load

c) Constant Power

In applications where the power does not vary with speed and the torque is inversely proportional to speed, energy savings from speed reduction is minimal. Applications with constant power include machine tools and centre winders.

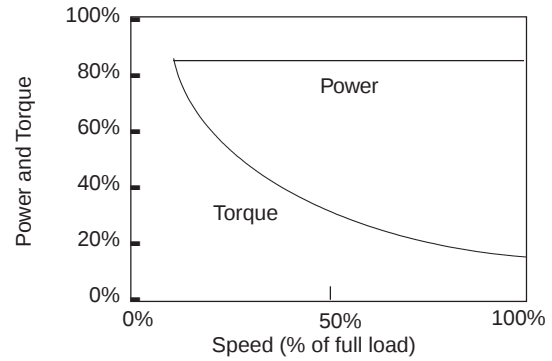


Figure 5: Constant Power Load

d) Constant Base Load

These are systems where the drive is subjected to a constant and high load. Common examples are water pumping schemes operating at high pressure. In such case, a major portion of energy is utilised entirely on maintaining this static head. As the power cubed law assumes that load characteristic is due to resistance from frictional losses, the potential for energy savings will be severely restricted.

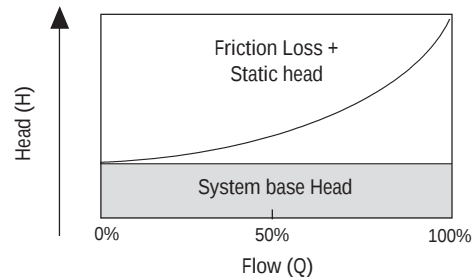


Figure 6: Constant Base Load

Comparison of Various Methods of Varying Motor Speeds

A brief comparison of the various methods of varying motor speed is tabulated in Table 4 below.

Table 4: Methods of Varying Motor Speeds and their applications

	Application	Cost
a) Mechanical		
i) Belts and pulleys	Constant load with 2 to 3-step speed; eg 3 to 4-speed airflow in blowers; discrete speed machine tools.	Low cost, simple maintenance and installation.
ii) Traction drives	Heavy duty, large torque with highly variable load; mainly in vehicles, heavy machineries.	High cost and constant maintenance required.
b) Hydraulic drives	Heavy duty, large torque with highly variable load; eg trains, riding lawnmower.	High cost and sensitive to environment.
c) Electric drives		
i) DC Drives	Precision speed and/or positioning. Variable speed for a wide range of application. Starting torques are very high for DC drives. Examples include servo motors; vehicles, trains, etc.	Cost can be high or low depending on application. Generally, higher capital and maintenance cost of DC motors is off-set by lower cost of speed controller.
ii) Eddy current drives	Low cost and rugged for most industrial and commercial applications. However, low efficiencies, particularly at low rated speed, relegates EC drives to its current obscurity.	Low cost drive.
iii) Multiple speed motor	Simple step-wise load, eg fan coils for air conditioning (pole-changing motors are common).	Low cost.
vi) VSD	Variable speed and torque for a wide range of application.	Generally medium cost.



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Motor Repair

Most motors – particularly large and special types – are repaired several times during their working life. Proper care and attention must be given to the repair process. If they are not, there can be a significant reduction in efficiency. It is important to pay attention to:

- The gauge and number of turns of the replacement wire;
- The temperature at which the stator is heated for winding removal;
- Use of correct spares; and
- General mechanical handling.

Tests have shown that rewinding a motor can permanently reduce its efficiency by over 1% but if the rewind is done properly, the reduction can be kept to 0.5% or less.

In practice, it is rarely economical to repair standard induction motors with a rating of less than 7.5kW even though some motor users choose a much higher cut-off point. However, badly damaged motors of whatever size should be scrapped rather than repaired.

Decision to Replace or Repair the Failed Motor

Replace

When it is essential to keep a drive or process operational, the cost of down time and the quickest way of reinstating the drive will dominate this decision. If the motor is of a common rating and speed, it may be available from stock. If a choice exists, replacement with a higher efficiency motor should ideally be chosen.

However, if there is less urgency to replace or rewind, for example, when a spare motor is available or it is being used in less critical applications, life cycle cost (LCC) calculations should be performed to determine whether to go for repair or replacement with a HEM.

Opting for replacement provides an opportunity to purchase a HEM, thus obtaining an improvement of 2% to as high as 8% or 10% depending on the size, age and efficiency of the failed motor. However, the benefit will actually be greater because even if proper care is taken during repair, the efficiency of the repaired motor will fall by, say 0.5%. The net difference in efficiency between a new HEM and a repaired motor could be higher. Although the cost of repairing a motor is usually less than the cost of buying a new one, the energy savings from buying a new HEM can, therefore, make this a more attractive option.

Repair

When it is essential to keep a drive or process operational with minimum down time for cases where the motor is used with a special machine, repair may be quicker and cheaper.

Modern HEMs are likely to suffer much lower losses in efficiency after being rewound, as the steel laminations within many of them are better able to cope with the high oven temperature required for the removal of old windings.

Other Factors Affecting Choice between Replace and Repair

It is important to emphasise that the decision to replace or repair on the basis of LCC depends on many site-specific data, eg running hours, load, cost of electricity, costs of new or repaired motors, etc. Setting up a computer spreadsheet to automate these calculations will allow one to develop a table specific to one's company. A final step could be to draw a graph that shows the economic decision for each motor replace/repair decision. Such a graph should greatly assist subsequent repair/replace decisions. The flow chart below shows a suggested decision-making process in determining replacement or rewinding of a motor when motor failure occurs.

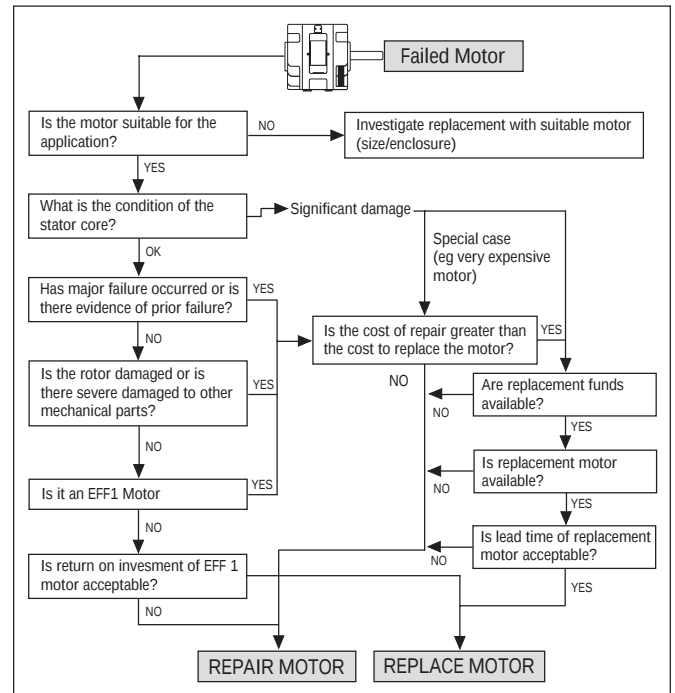


Figure 7: Suggested Decision-making Process when a Motor Fails

Variable Speed Drives (VSD)

Introduction

Variable Speed Drives (VSD) or adjustable speed drives are devices to control the speed of motors. Traditionally, load demand on constant speed motors is regulated by the following methods:

- air flow by adjustable dampers, and
- fluid pumping by throttling valves.

It is estimated that about 60% to 70% of motors in industry are related to centrifugal or flow applications such as fans, blowers, compressors and pumps. Controlling the speed of motors in response to the load demand is therefore a means of energy optimisation.

Types of VSD

Several types of variable speed drives are available. They differ in the way they transform the electrical power supply to the motors. The three basic transformation techniques used are:

- Pulse Width Modulated (PWM) VSDs use computer software to control the frequency and voltage delivered to the motor. This type of VSD is the most commonly used today and is available for all sizes of motors. Their advantage is that they have a high power factor, fast response characteristics and have the ability to control several motors from a single drive. However, among the disadvantages are that they cause increased motor heating, lack regenerative braking capability and are complex to service.
- Voltage Source Inverter (VSI) VSDs are used for low to medium power applications, generally up to a few hundred horsepower. Their advantages include having a simple electronic circuit and operating efficiently over a very wide range of 10 to 200 per cent of motor speed. They can also have a simple circuit configuration and have the ability to control several motors from a single drive. Their disadvantages include the lack of regenerative braking capability and poor performance at speeds below 10 per cent.
- Current Source Inverter (CSI) VSDs are best suited for medium and large motors. Their advantages include having regenerative braking capability, inherent short-circuit protection and a quiet operation. Their disadvantages include poor performance below 50 per cent speed, inability to test the drive while not connected to motor and difficulty in controlling more than one motor with a single drive.



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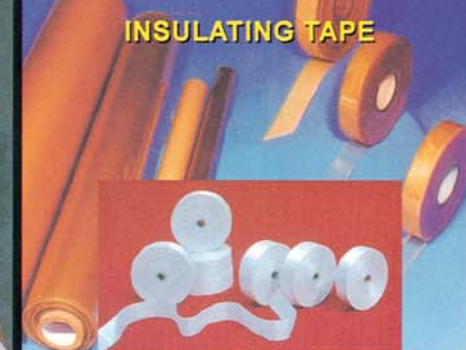


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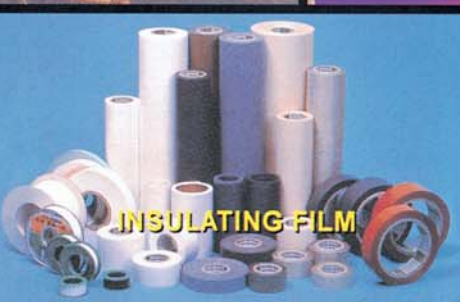


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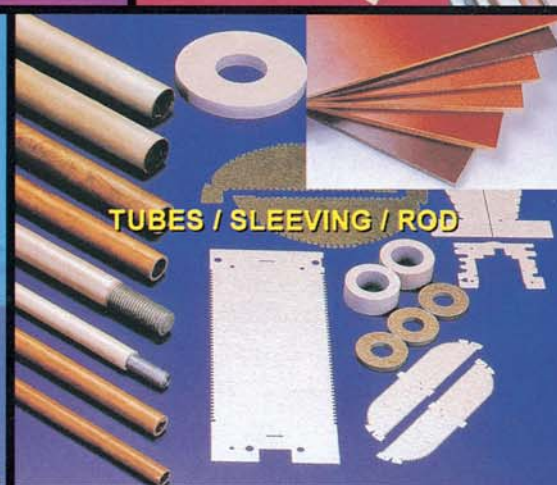
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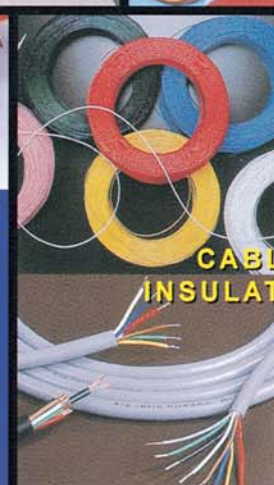
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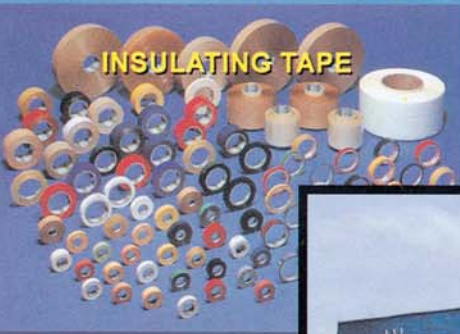
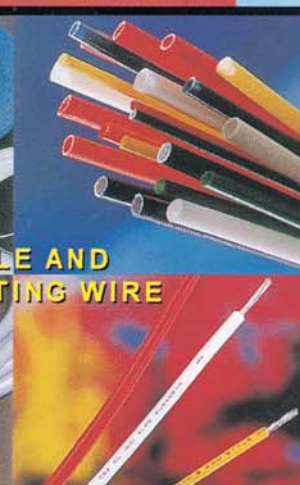
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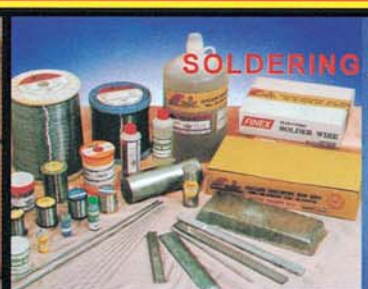
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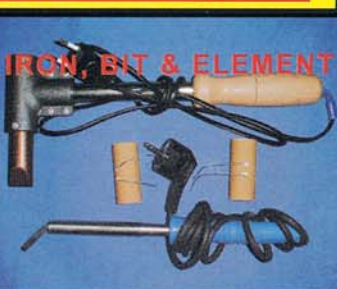
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Best Practice

Assessing VSDs for energy savings based on load profile

In assessing the potential for energy savings from VSDs, whether for new motor drive or retrofit of existing motor drive, an assessment of the load profile and cost effectiveness on the motor should be made:

- a) Motors with constant loads are poor candidates for implementation of VSDs. Examples of constant load applications include:
 - i) Pumps with constant flow and head,
 - ii) Pumps with high static head,
 - iii) Air conditioning units with constant load demand,
 - iv) Blower fan supplying fixed volume of air, and
 - v) Chillers supplying machines with constant production rate requiring fixed cooling load.
- b) Motors with simple step-loads may be candidates for implementation using belt and pulley drives, geared drives or multiple speed motors as a more cost effective measure than using VSDs. Examples of step-load applications include:
 - i) Fan coil units with 3-speed controls using multi-speed motors (usually pole changing motor).
 - ii) Implementing air conditioning units with step-wise loading (standby load).
 - iii) Blower fan (AHU, extract or supply air fans, etc.) with simple step-load control using belts and pulleys.
 - iv) Chillers supplying machines which may be adjustable for differing production rate requiring step-wise heat load demand.
- c) Motors with irregular load patterns are prime candidates for implementation of VSDs. Examples of irregular load applications:
 - i) Air conditioning supplying space with highly irregular heat load (eg office with highly varying occupancy demands during regular hours, supermarkets with seasonal and differing hourly load patterns, etc).
 - ii) Pumping scheme with highly varying flow rate in response to demand (normally in mains pumping station).

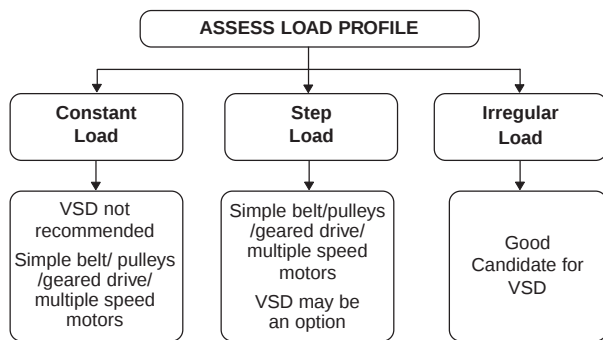


Figure 8: Assessing Load Profiles for Energy Savings Potential

Assessing quantum of energy savings based on load characteristics

After assessing the prospect for implementing VSDs, an assessment on the quantum of savings may be made based on the load characteristics. It should be noted that variable torque loads which deals with volumetric flows obeying the affinity laws represent about 60% of motor loads in commercial and industrial applications.

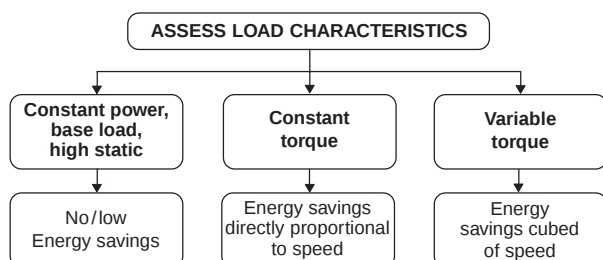


Figure 9: Assessing Load Characteristics

Best Practice Guide

Measures/Conditions	Recommendations
Basic assessment for: a) VSD	- Measures to assess potential for energy savings. - In pumps with high static head, calculating energy savings based on the affinity laws is erroneous and can only be an approximation.
b) Retrofitting of existing motors with VSD	If existing motors are assessed to have good energy savings potential from implementing VSD and unless good economic returns can be estimated from installing new VSD, use of simpler belts and pulley may be a more cost-effective option.
c) New applications	VSD should be considered for all new applications after assessment.
d) Discrete step-loads or distinct load patterns	- Where step-loads are simple multiples (eg fan coils) multiple speeds, pole changing motor may be cost effective. - For air conditioning system, where distinct load patterns can be discerned during design stage, it may be simpler and cheaper to install discrete units to cater for the load patterns on individual switching or 'load-shedding' mode rather than installing complex and expensive variable frequency drives for variable flow control. <i>Note : This observation may be reassessed in future when the cost of variable flow control for air conditioning units falls.</i>
e) Matching of motor and VSD	- For variable torque load, where motors may operate below rated speed, motor heating will not be a problem and additional cooling fan may not be required. - In case of constant torque load (positive displacement pumps), the motor may not be adequately cooled at low speed requiring the addition of a separately-driven cooling fan. - Where motor speeds are operated to higher rated speed, bearings and lubrication system will have to be ascertained for suitability.
f) Matching of pumps and VSD	- In variable torque pumps ('rotodynamic'), reducing speed will positively affect the pump (reduced cavitation, bearing life is the seventh power of speed and reduced noise level). Conversely, increased speed will negatively affect the pump. - For constant torque pumps ('positive displacement'), it may be necessary to operate the pump over a wider speed range (typically 10:1). This wider speed range will require special examination of motor cooling, lubrication and pump characteristics. - Pumps operating away from the 'best efficiency point' (bep) may encounter excessive shaft deflection. Shaft deflection is a function of the shaft slenderness ratio ($\text{length}^3/\text{diameter}^4$). Thus, reducing shaft length (or increasing shaft diameter) will avoid shaft deflection.
g) Vibrations and resonance	Pumps/fan motors, pipings and support structure can vibrate excessively at a certain natural frequency (resonance condition). In fixed speed motors, the excitation harmonics will generally not coincide with this natural resonance frequency. However, in VSD, where the speed may vary continuously, there exists possibilities that resonant condition may occur. Vibrations typically occur at bearings housing and support structure. Pressure pulsation is common excitatory mechanism and such pulsation may be amplified by the acoustic within the pumps. Mitigating factors include: - Analysis to predict hydraulic resonance, structural resonance and passing frequency. - Where the above is not possible, an on-site test running through the speed range of the VSD may be conducted to check for resonance.
h) Hazardous area	Electronic VSD should be located in non-hazardous area unless certified to the relevant 'Ex' standard applicable.



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Measures/Conditions	Recommendations
i) Electromagnetic Compatibility (EMC)	- EMC considerations include emission and withstand limits of VSD installed. - EMC withstand applies where the electronic circuits of VSD may be susceptible to harmful electromagnetic surge originating from outside the circuit. In this case, surge protection device (SPD) will be necessary to protect the VSD circuits. - EMC emission refers to the harmonics and surges emanating from the VSD and entering the general electrical network. In this case, VSD will have to be certified to comply with EMC emission limits under IEC61800-3. - System assessment of harmonics and EMC due to 'non-linear loads' (of which VSD may comprise a major component) in an electrical network may be required to ensure compliance with IEC61000-3-2, 61000-3-4 and 61000-3-6 (limits on harmonics current). - Mitigation measures to alleviate harmonics include installation of filters or isolating circuits. <i>Note: A rule of thumb assessment generally may be made as follows:</i> → Where short circuit level is reasonably good, harmonics will not be a problem if a non-linear load is less than 50% of total loads. → Where short circuit level is low, harmonics may be an issue if non-linear loads are at 40%. → Generally, a power system expert should be engaged to make such an assessment. - In PWM drive (the most common VSD), propagation of the PWM pulse along the cable connecting the inverter and motor mimics a transmission line (due to the short rise-time of the pulse). The resultant distortion of the pulse train before reaching the motor can cause stress on the insulation of the motor. Mitigation measures to alleviate this problem include: → Where supply voltage is over 500V, enhanced motor insulation should be used. → Where supply voltage is less than 500V, normal class F insulated motors may be sufficient; subject to confirmation with VSD manufacturer. → The connecting wires between motor and VSD should be as recommended by the VSD manufacturer.

Advantages and Disadvantages of Using Variable Speed Drives

In many commercial and industrial applications, apart from reducing energy costs, VSDs also reduce maintenance costs. However, there will be instances where they may not be worth the additional cost or may be inappropriate to install. The benefits and disadvantages of VSDs should be considered for a particular motor application before selecting them.

Benefits

- The energy savings can be very significant in many situations. This will depend on the existing system design, installed equipment and motor load requirements.

- The resulting speed reduction may extend the life of a machine and motor due to reduced stresses and fewer revolutions.
- Since VSDs start motors gradually and normally include soft-starting features, they reduce the stress on drive components such as belts. This will reduce maintenance on these components and the effect of fluctuating voltage due to the sudden start of a large motor.
- The process control can be improved and this will result in enhanced product quality.
- Several motors can be controlled by a single VSD where all the motors connected to the drive will operate at the same speed.
- Some VSDs can operate motors at speeds greater than their original design speeds.
- Power factors can be improved. This only applies to PWM VSDs.
- Some VSDs provide power regeneration when the motor slows down. This will give additional energy savings.
- Speed control can be accomplished by different methods based on load requirements, which include revolutions per minute (rpm) of the motor, pressure, flow and power.

Disadvantages

- If the motor is operating at or near full speed most of the time, adding a VSD will increase overall energy consumption due to inherent energy losses in the drive.
- VSDs may increase motor heating, especially at slower speed. Many motors rely on internal cooling fans attached to the motor shaft to remove internal heat. When VSDs are used, motors may run at slower speeds and the heat generated internally may not decrease in proportion to the fan's cooling capacity. Thus, additional cooling may be required.
- Some VSDs may produce electrical interference that harms other electronic equipment at the facility. In this case, electrical isolation equipment or installing a reactor may be required.
- The additional electronics associated with a VSD will add to the maintenance and repairing complexity of the drive system.
- A VSD may be less efficient than a two-speed motor in situations where intermediate speeds between the high and low magnitudes are not required.
- Each VSD application needs to be carefully considered and engineered for proper installation and compatibility. This may require special expertise.

Source: The Energy Efficiency and Conservation Guidelines for Malaysian Industries Part 1: Electrical Energy-use Equipment published by Pusat Tenaga Malaysia.



Badminton Tournament 2008

Date : 12th & 19th October 2008 (Sundays)
Time : 9:00 am – 6:00 pm
9:00 am – 1:00 pm
Venue : Michael's Badminton Academy Bandar Puteri,
Selangor Darul Ehsan.

Registration: Contact TEEAM Secretariat
Tel : 603-9221 4417, 9221 2091
Fax : 603-9221 8212
E-mail : teeam@po.jaring.my / teeam@streamyx.com
Website : www.teeam.com