

CEEAMA E-NEWS

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Issue # 1

Electrical Consultants' Newsletter

October 2017

From the President's Desk

Dear All,

Greetings from CEEAMA Governing Council (GC).

We are pleased to release first edition of CEEAMA E-News.

Our intention of CEEAMA E-NEWS is to provide the platform to share our experiences with each others, as well to assist our members in updating happenings in Electrical Industry.

Getting involved and sharing experiences with colleagues is a priceless benefit and CEEAMA E-News is one of the opportunities to share your experience. You may also reach out to any Governing Council (GC) member or me personally to find out how you can play a part in CEEAMA.

Please drop in your suggestions or review of CEEAMA E-News at admin@ceeama.org.

In new role of President, I have a challenge to give CEEAMA a new face, maintaining the aims and objectives laid down by our founder members.

Recently we had initiated few changes in our operating philosophy, which you might have noticed till now and I am sure that it will help us to grow.

After successful and exciting CEEAMATECH-2017 exhibition at Pune, we are also glad to announce CEEAMTECH-2018 - one day conference cum exhibition at NSE-Goregaon, Mumbai.

CEEAMATECH is the one event, where you can fulfill your requirements and network with your peers, vendors and service providers in a single event.

In closing, my request to each of you is to take the initiative to grow personally and professionally with CEEAMA in your tool kit.

Together we can continue to make efforts in increasing CEEAMA presence in Industry and at statutory bodies.

Wish all of you and your family a very Happy Diwali. May this Diwali brighten your life with Happiness, Good Health and Wealth.

Thanks & Regards,

Anil Bhandari

Hon. President

What is New?

New generation of high-efficiency solar thermal absorbers developed.

Researchers from the Universities of Bristol and Exeter are one step closer to developing a new generation of low-cost, high-efficiency solar cells. The structure is one of the world's first examples of a tri-layer meta surface absorber using a carbon interlayer.

The system, developed by Chenglong Wang a PhD student in Professor Martin Cryan's research group, uses amorphous carbon as an inter-layer between thin gold films. The TRILAYER gold-carbon-gold meta surface strongly absorbs light across the solar spectrum but minimizes emission of thermal radiation from the structure. The use of gold in the research is a first step towards a high temperature meta surface where gold can be replaced by other refractory metals such as tungsten or chrome.

The cell will be used for solar thermal energy applications and has the potential to reach much higher temperatures than simple black surfaces because it can minimize the emission of thermal radiation.

The meta surface has been developed as part of a joint project, led by Dr Neil Fox, between Bristol's Department of Electrical and Electronic Engineering and Schools of Physics and Chemistry. The aim of this project is to develop diamond-based solar thermionic devices, which use sunlight to get surfaces sufficiently hot that they emit electrons directly into a vacuum. If these electrons are collected at a cooled anode, electrical energy can be produced with maximum efficiencies predicted to be much higher than is achievable using conventional silicon solar cells.

Source: LFM Mangesh Shirgaonkar

Information Source: Science Daily <http://www.alphagalileo.org/ViewItem.aspx?ItemId=165200&CultureCode=en>

In This Issue...

- Article on Asset Management – Medium Voltage Switchgear
- Technical Notes on Damages due to Neutral failure in 3 phase connections feeding mostly single phase loads.
- CEEAMA recent activities



Technical Notes

Subject: Damages due to Neutral failure in 3 phase connections feeding mostly single phase loads.

During the course of power quality audits to locate cause of frequent equipment failures, especially in case of **small or medium hospitals and banks**, it is observed that in most of the cases the cause is NEUTRAL DISCONNECTION.

Small hospitals / Nursing homes / Small Branches of various banks etc have sanctioned electrical loads which are less than 50KW and become LT consumers of utility company. Such connections work on a 4 wire R-Y-B-N connection available from MSEDCL. Usually these applications being critical, they are supported with back up DG sets which also are 4 wire systems. Most of the loads here are single phase costly or critical equipments like computers with important data, medical equipment etc.

Such establishments usually depend on "Contracted Electrician" who does repairs and attends to breakdowns. Such a person is usually capable of undertaking front line liaison with concerned utility company although in most of the cases he is not qualified to do the job. **Usually management of such establishments is "Electrically illiterate" and depends fully on such person. The management tends to avoid involvement of electrical consultant in view of cost cutting.**

Our Observations:

- 1) As per present norms, MSEDCL insists on an arrangement – auto or manual – which will keep only one neutral connected to the circuit, the one provided by utility or other provided by DG sets. These changeover circuits are not maintained properly and result into neutral disconnection due to loose contact or a faulty contactor in AMF switch etc.
- 2) LT 3 phase connection is usually given by tapping all four wires from the nearby pole without taking proper precaution while preparing the joint. Most of such joints carry huge harmonic currents as most of the LT loads are non linear.
- 3) Such single phase circuits are usually tapped internally when a new load is added, without considering capacities of incoming conductor.

All these negligence and so called cost saving causes tremendous problems on a particular day and results into huge loss. We have seen hospitals postponing open heart surgeries due to this and banks not able to offer services to clients or 2 / 3 days till the fire fighting on the front of repairs is over. Neutral failure for single phase loads results into unbalanced high voltages and can result into fire due to insulation failure in electrical equipment.

With all this fact remains that such clients still avail our services after major disaster and not as preventive or predictive major; Whereas we are offering our services to multinational banks twice a year on contract basis.

Our recommendation to clients:

As dependency on utility company workmanship cannot be guaranteed, we recommend our clients to install isolation transformers at the input with DELTA primary and STAR secondary configuration and create own neutral by grounding star point of this transformer. This transformer should be simple

double wound power transformer with voltage ratio as 1:1. The rating should be decided based on load profile and current harmonic contents. There is no need of Ultra isolation etc which would increase cost.

If voltage profile on 24 hours is fairly acceptable, then there is no need of servo stabilizer after this.

All AMF / Auto change over arrangements should be serviced properly. The isolation transformer as above should be installed after the change over arrangement so that the load is always protected.

Utility companies should provide proper joints for tap offs.



I am enclosing a photograph of distribution around overhead conductors from USA. This was shot during my recent visit. It appears that a sincere hard work definitely follows behind the "Electric Supply Reliability" which they boast off.

In view of reducing distribution loss at 110V level (as currents are higher), they use pole mounted transformers for all LT or single phase loads. One can see method of connections and neatness followed in workmanship. All tap offs use connectors.

Can our clients expect this any time in future? Will our clients act in proactive way ?

Prepared by

Narendra Duvedi

CEEAMA Activities.

6th Annual General Meeting of the Members of Consulting Electrical Engineers Association of Maharashtra was held on Saturday, 23rd September, 2017, at Chembur Gymkhana, Chembur, Mumbai at 4 pm.

Key Feature :

- 40 members attended AGM.
- Discussions on the new way of CEEAMA working.
- Announcement of CEEAMATECH-2018 – one day conference cum Exhibition and CEEAMATECH-2019 – Three day Exhibition.
- It was discussed in depth and decided that, we shall approach hon. Energy Minister to give separate Accreditation to electric consultant as The Chartered Electric Safety Engineers And Electric Safety Auditor.



Article

ASSET MANAGEMENT – MEDIUM VOLTAGE SWITCHGEAR INTRODUCTION

In today's competitive environment; almost every individual end user such as private industries; SEB's or Utilities have more focus on Asset Management. This is achieved mainly through cost reduction projects; increase in safety; reliability and optimum utilisation of existing equipment. In short more emphasis is to have a perfect balance between investing in new equipment with respect to maintenance cost; safety & down time.

In this paper I have tried to cover various aspects of Asset Management with respect to Medium Voltage Switchgear (henceforth referred as MV Switchgear). Conventional method is to replace the existing MV Switchgear when it has served its full life cycle which is approximately 30 to 35 years. Unfortunately this involves a high investment cost in new equipment. Also one has to consider other factors with respect to new switchgear; such as

- a) Life of the plant & other equipments with respect to new switchgear.
- b) Downtime.
- c) High Investment Cost.

Therefore today's MV Switchgear manufacturers tend to offer various alternatives to customers based on safety & life cycle management of the switchgear.

Alternative choices for customer under Asset Management of MV Switchgear includes:-

- a) Repair
- b) Replace
- c) Refurbishment
- d) Retrofit

Periodic Maintenance: Vacuum circuit breakers are characterized by their simple and robust construction. They have long life expectancy. Their operating mechanism has a low maintenance requirement, and the interrupters are maintenance free during their working life. There is no adverse effect on the vacuum, even from frequent switching of operating and short circuit currents.

The servicing intervals and scope are determined by environmental influences, the switching sequences and number of short circuit breaking operations. With carefully performed inspections and servicing work, and under normal operating conditions, the circuit breaker service life of up to 20,000 operating cycles and more.

The periodic maintenance schedule may vary as per manufacturer; but broadly it can be as under

- 1) Panel & Circuit Breaker Inspection- Once in 2 year.
- 2) Measurement of Breaker Power Circuit Resistance-Once in 2 year.
- 3) Lubrication- Once in 2 year.
- 4) Tightness of Fasteners of Power Circuit of Breaker & Panel-Once in 2 year.
- 5) Overhaul Operating Mechanism- Once in 5 years or after every 5000 operating cycles.
- 6) Insulating Parts- Once in 3 Years.
- 7) Control Circuit Connection Tightness & Component Functioning - Once in 3 Years.

Major Spares Parts to be maintained for periodic maintenance :

Close Coil & Trip Coil; Operating Counter; Drive Insulator; Limit Switch; Auxillary Switch; Spring Charging Motor; Vacuum Interrupter.

Since most of us are aware of the first two options Repair & Replace; we shall mainly discuss the other two options i.e. Refurbish & Retrofit.

FAQ's

What is Asset Management?

It is the management of both tangible as well as intangible assets. It is a systematic process of operating, maintaining, upgrading, and disposing of assets cost-effectively.

Asset Management – Medium Voltage Switchgear

It is the practice of managing the entire life cycle of MV Switchgear; this includes design & construction; installation & commissioning; operation & maintenance; repairing; modifying; replacing and decommissioning or disposal.

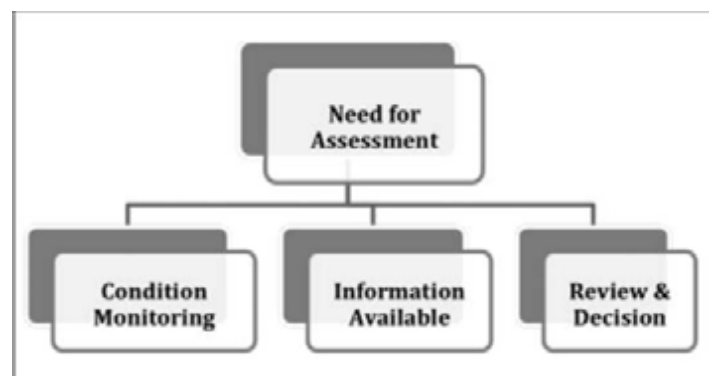
Why Asset Management for MV Switchgear?

Asset Management for MV Switchgear provides any of the following solutions to age old existing switchgear in service.

- a) Up gradation to more reliable & newer technology.
- b) Costly or unavailable spares.
- c) Improved Safety – For both; Life & Property.
- d) Minimise frequent outage due to switchgear failure.
- e) Minimises time span for regular & periodic maintenance.
- f) Improved support for maintenance.
- g) Improved documentation; such as SLD; BOQ; wiring diagram etc..
- h) Improved efficiency from existing infrastructure.
- i) Best use of limited CAPEX; O&M budget.
- j) Above all it's Cost Effective Solution.

Assessment of Aged Switchgear

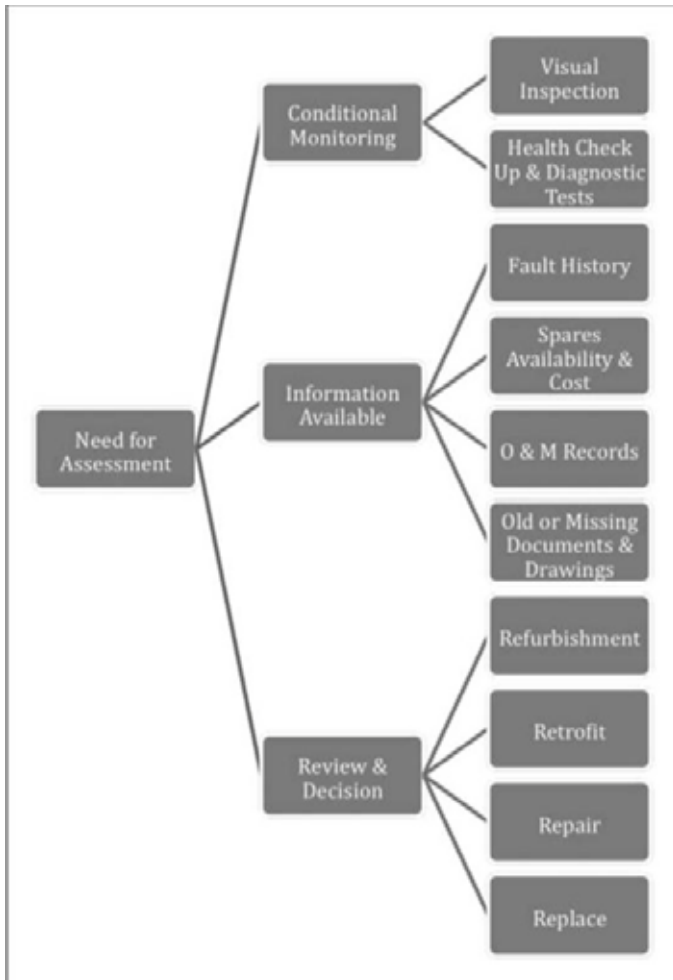
Assessment of aged switchgear enables the uses for taking the correct decision to be made on; whether to refurbish; retrofit; repair or completely replace the existing old switchgear and utilise the available CAPEX in best possible way. Following flow chart explains the various steps involved in assessment of aged switchgear.



When is it necessary?

Result of assessment provides user the analysis of historical fault & failure information for similar types of MV Switchgear. This helps to assess the remaining life of switchgear. Following factors affect the life of existing switchgear.

- 1) Mechanical problems.
- 2) Malfunctioning.
- 3) Insulation failure.
- 4) Failure due to improper cable termination.



- 5) Failure on VT & CT.

Whom to refer?

Sufficient technical expertise may not be available in house to carry out a risk assessment and decide on appropriate precaution. In such cases MV Switchgear owners / users should take advice from suitably competent organisation such as:

- a) MV Switchgear Manufacturers.
- b) Consulting Organisations specialised in MV Switchgear.
- c) Maintenance contractors with experience in MV Switchgear.
- d) Distribution Companies.

REFURBISHMENT

Refurbishment is the act or an instance of making neat, clean, or complete, as by renovating, re-equipping, or restoring old switchgear.

Servicing or renovation of older or damaged MV Switchgear brings it to a workable or better looking condition. Also it can be defined as Servicing, readjusting, and recalibrating Switchgear or instruments to bring them to near-new or original operational level.

In short refurbishment offers customer a life cycle extension of their switchgear cost effectively.

Refurbishment of Switchgear can be considered by those

customers who expect an acceptable performance over short to medium life of Switchgear.

Refurbishment involves major overhauling of the Switchgear with replacement of parts which are time expired eg. Operating mechanism; insulation components etc..

Thus a normal Repair / Replace would solve a specific problem related to a HT VCB; while Refurbishment (good maintenance) combines repair with maintenance and or renewal activity.

Broadly Refurbishment of MV Switchgear can done with respect to

- a) Dynamic Components
- b) Static Components

Refurbishment of Dynamic Components:

Major Dynamic components such as main contacts in case of SF6 breakers; vacuum interrupter (VI) in case of VCB ; drive mechanism; potential free contacts; common drive rod; rack in rack out mechanism; motor for breaker charging etc are checked for their health & decision needs to be taken to overhauled or replaced individual component. Other moving components such as bearing; cotter pins; hinges etc needs to be replaced fully.

Refurbishment of Static Components:

This type of refurbishment can be applied where the MV Switchgear is used & shifted frequently due to nature of its application for example on construction sites etc. In this all the major static components are removed completely for example sheet metal components etc. and are cleaned or repainted completely as required. This activity can be done at customer site also. Insulation levels also needs to be checked for its values & should be replaced if required. All the switching components can be reused depending on its condition.

RETROFIT

Retrofitting of MV Switchgear is becoming more popular now days.

Retrofitting is an instance of modernizing or expanding with new or modified parts, devices, systems, or equipment.

Advantages

- 1) Improved technology.
- 2) Reduced Footprints; increased floor space.
- 3) Reduced moving parts means less maintenance.
- 4) Reduced inventory.
- 5) Up gradation of relays.
- 6) Up gradation of meters.
- 7) Insulation up gradation means improved safety.
- 8) Additional interlocks can be incorporated.
- 9) Panel addition deletion can be done.

Similar to refurbishment; retrofitting can be broadly classified as -

- a) Retrofitting of Dynamic Components.
- b) Retrofitting of Static Components.
 - i. Mechanical Components.
 - ii. Electrical Components.

Retrofitting of Dynamic Components:

This involves up gradation of major components such as circuit breakers. Most of the old circuit breakers still in service use old technology of arc quenching such as OIL & SF6. Since Vacuum

Circuit Breakers have advantage over OIL & SF6; people tend to prefer VCB. With retrofitting option available the same can be up graded to Vacuum with an economical option.

Retrofitting of Static Components:

a) Mechanical Components - Mechanical components mainly includes fabricated panel.

Retrofitting provides the end user more compact with new technology thus increased safety & better footprints. Improved protection against faults like internal arc due to improved designs. Condition of bus bar can be checked & can be replaced if required. Also inter phase insulations if any can be completely replaced or removed. New & improved interlocks can be integrated if desired.

b) Electrical Components – On one side technology with respect to electrical & electronics components has developed rapidly which includes metering & protection instruments like relays & meter; current transformers & potential transformers; panel & inter- panel wiring.

And on other side plant have modernised and uses more of process control which requires high level of accurate and system integration.

Depending upon the application & requirement the end user can decide upon upgrading the relays from electromechanical to compact numerical communicable; meters from analogue to compact digital communicable; replacing the old oil filled CTs & PTs with new dry resin cast CTs & PTs or LTCTs.

Also if desired a new protection scheme can replace the old one for better results.

PRECATUTION

The performance of retrofit panel depends mainly on the quality of work carried out during retrofitting by service team. Also any deviation without the knowledge of design group during the work; may lead to failure later on & it will be too late and costly to identify the cause of the failure by the designer later on. Some of the major points that need to be taken care are:

1) Proper engagement between fixed contact & isolating

contacts is desired.

2) Interlock between breaker & panel is service position must be secured so that there is no play between them in service position; so as to prevent any arcing.

3) Depending upon customer requirement; retrofitted breakers needs to be type tested for STC & Short circuit test duties.

CONCLUSION

All new technological developments in the field of Asset Management of MV Switchgear such as refurbishment & retrofitting have provided the end user a range of options for economically improving safety & extending the life of their existing MV Switchgear. An in depth comparison of these options helps the user to identify the most suitable way of improving the performance of the electrical asset there by maintaining a competitive advantage in the market place.



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Mark your Diary

17th November : Visit to Siemens factory, Kalwa.

Proposed Agenda shall be :

Introduction and briefing on Standards applicable to LV Switchgear, Network planning and Innovative products, Introduction to Medium Voltage product portfolio AIS, GIS, Compact Substation.

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