Technical note: 004  Dated: 1st July 15

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?

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