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Case Study on Safety– What can go wrong while noting Breaker nameplate details?

We wish you will give your valuable 10 minutes to read this case study about Human Safety

Background :

Safety (Humans & Equipment's) has been one of the major concerns in all the industries. Safe practices in Industries keep the people working in it safe. And various industries in India and across the world are taking various steps to improvise Human & Equipment safety in their plants. One common step which everyone knows is Safety helmet. However, there are many industries in India, Having good safety budget. As soon as any person enters into plant, they are provided with the PPE's from gate itself whether it is Visitor or Vendor or Employees.

Normally PPEs consist of Safety Helmet, Safety Shoes, Highlighter Jacket, Safety Googles and Earplug. While for doing different kinds of job different PPE is recommended, which I will not elaborate, else 2 pages will be filled with that only.

Today, we are going to tell you about one such incident, which happened in one Process plant 4-5 years back with an engineer having 2-3 years of experience in plant, having very good technical skills and very much interested in learning more technical stuff related to his field of engineering.

Incident Details:

During shutdown, various kind of activities are held, and the engineer, which we are taking about was also given some activities inside substation, to look after complete 6.6 kV HT panel activities through their own inhouse team. HT panel maintenance activities were completed as per planning. We are not going to talk about What PPEs they used during the plant maintenance. After completion of maintenance, Engineer was taking details from HT Panel might be Breaker name plate, operation and some other details. The panel had 30 verticals.

Normally it is a tendency of every engineers / technician whenever they enter the substation, they remove the safety helmet as a sigh of relief, as if some burden from head is removed. This is the very common practice you will see in plants (Now this practice is also improving). This tendency of removing helmet becomes common in substation also, because in many plants we have seen the sitting place / office of field Engineers & technicians are inside that substation room only. So as soon as engineers enter to his office, he / she removes the helmet.

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So, that engineer also did the same, he came to his substation for noting down something from HT panels and after entering he removed the helmet and kept on his table, took notebook and pen to note-down details.

Pictorial representation of HT Panels

After noting down details of around 15-16 panels, he went to next panel. He opened relay control panel (upper half of Panel), noted down something, closed and sit on his knees to note down details from breakers. While closing the control panel (upper side), he didn't properly hook the closing knob and sat down. Now, due to unproper closing of panel door, that control panel door got opened. And at that time only he, got up and his head banged in the panel door.

Pictorial representation of HT Panels with control door open

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Pictorial representation of HT Panels with control door open and Engineer without helmet

His head was severely injured, with lots of bloods, and he slowly felt unconscious. He was rushed to the hospitals in Township by the colleagues and after 3-4 hours he was rushed immediately to a Big hospital in ambulance of plant, which was around 200 kms from plant in a big city. Plant people and doctors over there all bit which they can do. He had lost lots of blood, was unconscious for around 14-15 days. He was the only son of his parents. You can imagine the trauma that parent had got in those 14-15 days.

After he got conscious, he was again examined and there was a severe blood clot in the brain which was needed to be operated. Doctors asked him and parents that he should forget about going to job at least before 1 year. Parents kept him there for 2 more weeks after the condition was stable, they took them to their home. Before operation there was medication of around 7-8 months. After successful operation, it took time of around 1-1.5 years for him to recover fully. Good news is that, he is fine and in good health today. He decided to leave that job and start afresh. He is now working in a reputed Bank, leaving his technical skills aside, which he loved doing.

He was lucky to start fresh, but you know many are not. Every day, somewhere, we keep on hearing unwanted incident / accidents keep on happening in plant, which we all feel must be reduced.

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Conclusion that can be drawn from this Incident:

If he had wear Safety helmet at that time of work as simple as noting down details from panels, even in Substation, his life could have been different.

The common notion about SAFETY HELMET is that it will protect your head if anything is falling on your head from above. But what if your head is falling into something. Also, the common argument of people is that “is terrace going to fall on us inside substation? ” In this case it has.

It’s not necessary that we should learn from our mistakes only, we must also learn from other mistakes and we can improvise and that is the reason we are Human being, because we can improvise. After all human life is of prime importance, its above all the things.

Precautions to be taken :

So, whenever you are doing any work even if it is in the safest environment wear the required protective PPEs. In this case if he had worn that safety helmet while noting Just details, those years of his were not wasted and the trauma and pain he himself, his complete family and his friends went through could have been avoided.

We wish next time you go near panel even for noting details, you will wear your protective equipment’s.

Any other suggestions, if you have, are welcomed.

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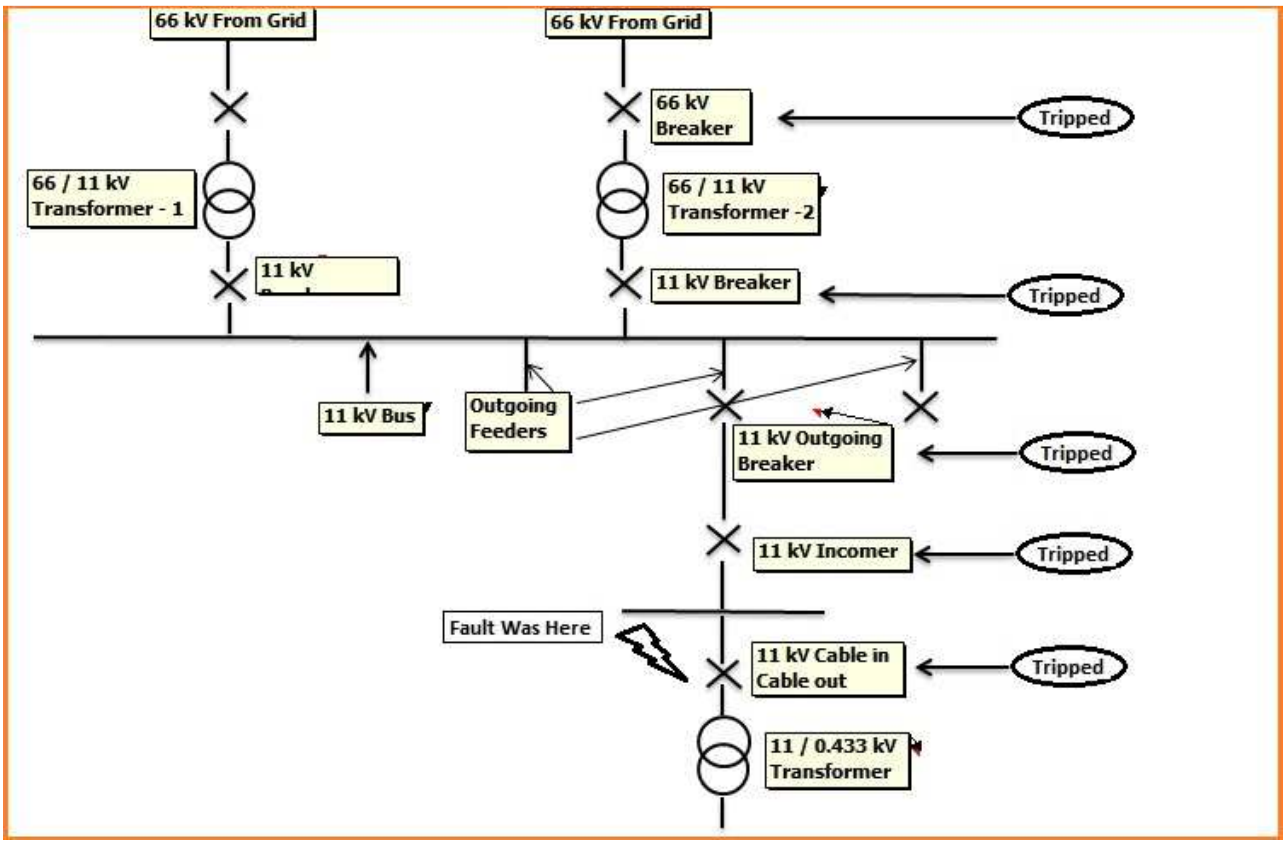
Case Study on Importance of Setting Date & Time in Numerical Relays

Many of you have Numerical Relays in your plant for protecting different Electrical equipments like **Generator, Transformers, Transmission lines and Motors.**

But many times we don't give importance to very simple stuff like running time inside the relay, which can be manually set, But nobody worries to see it that whether the clock in Relay is according to current time or not. Whether relay current time is correct or not, it will not return in any malfunction, so what will it do?

Let understand it from a case study :

- Below is the SLD of a typical industrial system.



One fine **Sunday morning,** there was a breakdown of one section due to fault in 11 kV transformer feeder (Remote) **{on lighter Note, Most of the Maintenance team will accept that Problem or Breakdown always come on Sunday or Holidays}**, which caused cascaded tripping till 66 kV Incomer from grid tripped. Obviously problem was of Relay Co-ordination, everyone understand it. But some different things happened during analysis.

- We were called for trouble-shooting the above. The first thing we did was to take Fault Records of all 5 Relays along with existing settings.

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- At the time of checking, both the Relays were showing proper date and time but had no fault records matching the other 3 Relays, instead they were showing some dates 6 months to 6 years prior to the incident!

- On enquiring in detail, we came to know that in both the Relays, Date & Time settings were modified by a Plant Technician post the occurrence of fault!

- After lengthy discussions with many personnel involved and sifting Fault Records minutely, eventually we could zero-in on which Records to interpret and how to consult based on that, a seemingly 10 minutes exercise lengthened to about 8 hours!

Retrieved data of The Fault record shown was as follows:

Fault 1 **:** 19th February 2016 and some time (Over Current)
Fault 2 **:** 12th September 2013 and some time (Earth - Fault)
Fault 3 **:** 16th July 2015 and some time (Over Current)

How come in the world can 12th September 2013 come after 16th July 2015?

So, which fault was correct one, everyone will say that **Fault 1 is the latest**, but in the time between the breakdown and when our team reaches the site for data collection for Fault analysis (7 Days Later), there was one more tripping due to over current. So, after checking Fault in other 11 kV relays which were tripped that day, we found that **Fault 2** was actual for which we have to do analysis for Breakdown occurred on 14th February 2016.

Generally, relay looses synchronism when relays auxiliary supply is lost for very much long time, which usually happens during routine shutdown for Particular unit for 3 – 4 days or more than that. There is no remedy for that except it is made habit to synchronize Relay clock with Indian standard time whenever you switch on the Auxiliary supply.

Problems due to non/improper setting of Date & Time

- Erroneous Records of all Faults and Events
- Erroneous Analysis may lead to re-occurrence of same events
- Wastage of productive time

Solution to above

- Synchronisation of Relay Clock with DCS / GPS / SCADA – this helps especially in case Auxiliary Supply is out of service for longer duration
- Checking of Relay Parameters at regular intervals

Where we can be of help

- All Protective Relays on a single Computer with user-defined HMI
- Suggesting suitable / optimal Relay Type according to Plant Requirement
- Providing complete Retrofit Solution with thorough Commissioning and Start-up assistance along with Equipment Commissioning

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Case Study - Effects of Voltage Variation on Industrial lighting

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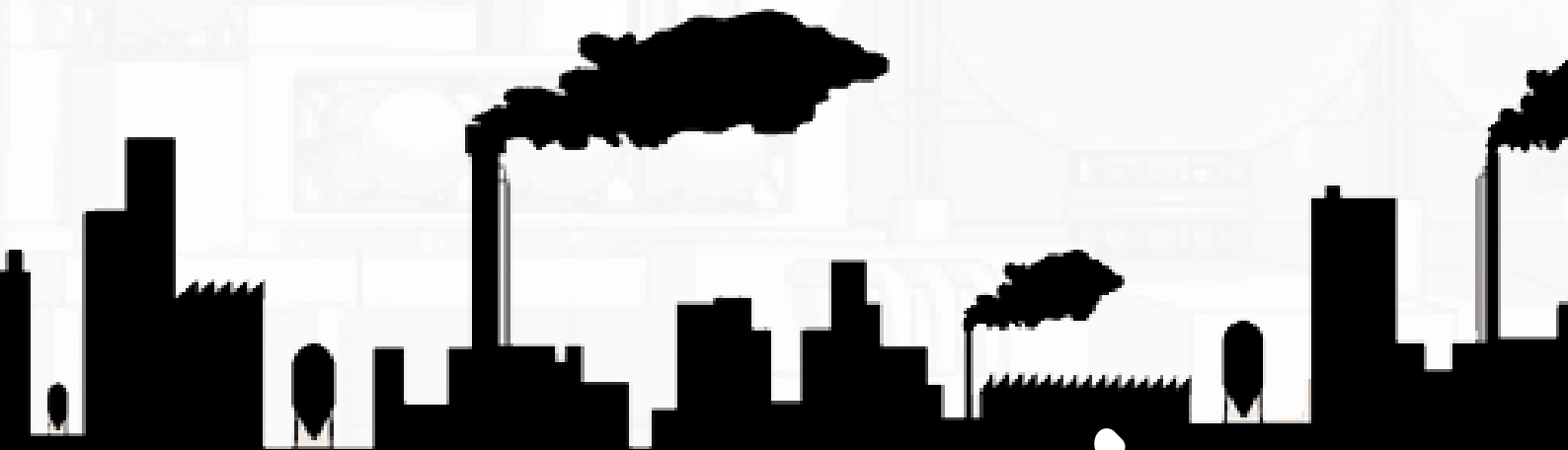
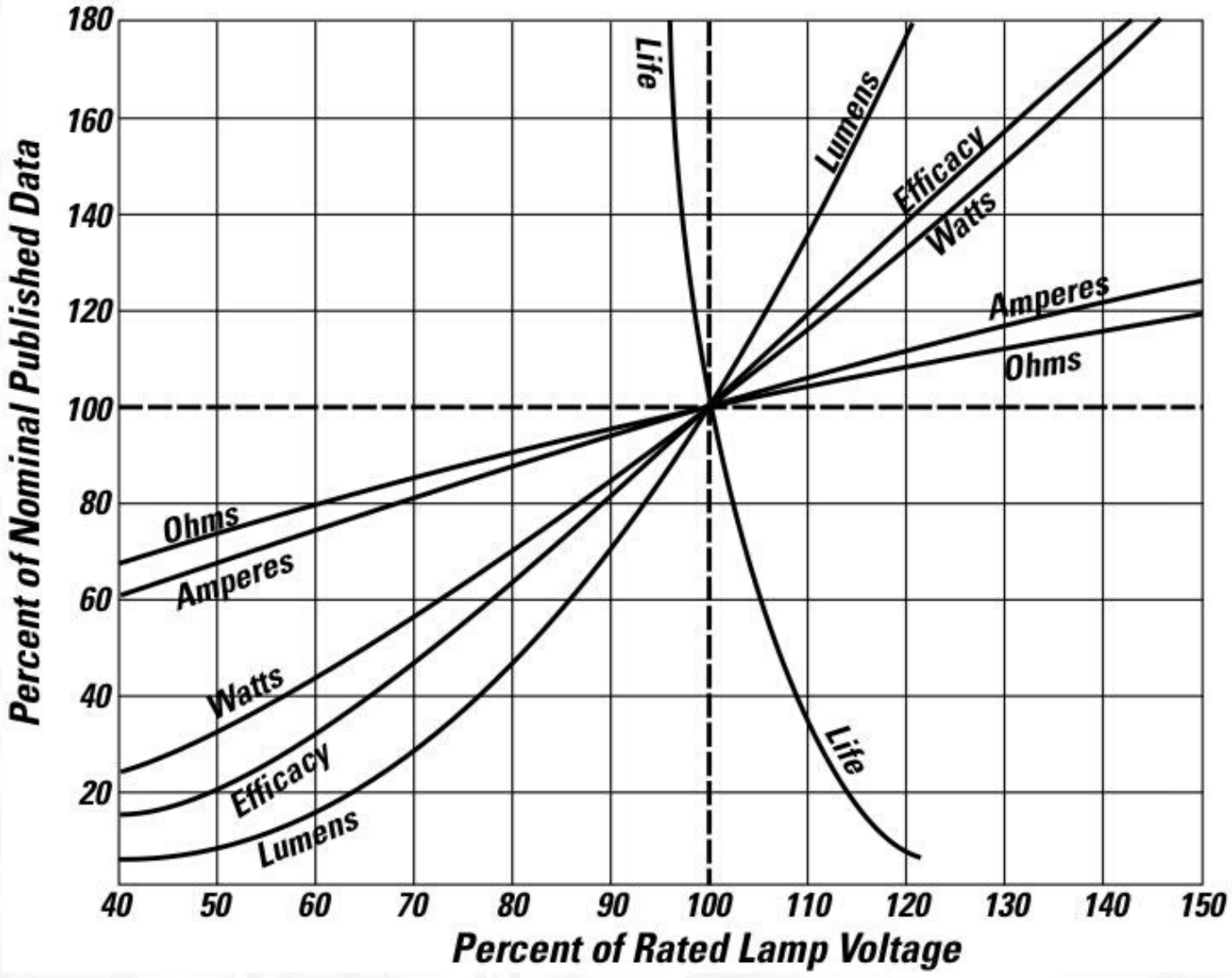
Dear Friends / Sirs,

Below Figures shows the effect of variation of voltage on light output and power consumption and life.

Similar variations are observed on other gas discharge lamps like mercury vapour lamps, metal halide lamps and sodium vapour lamps.



Source: BEE (Bureau of Energy Efficiency)



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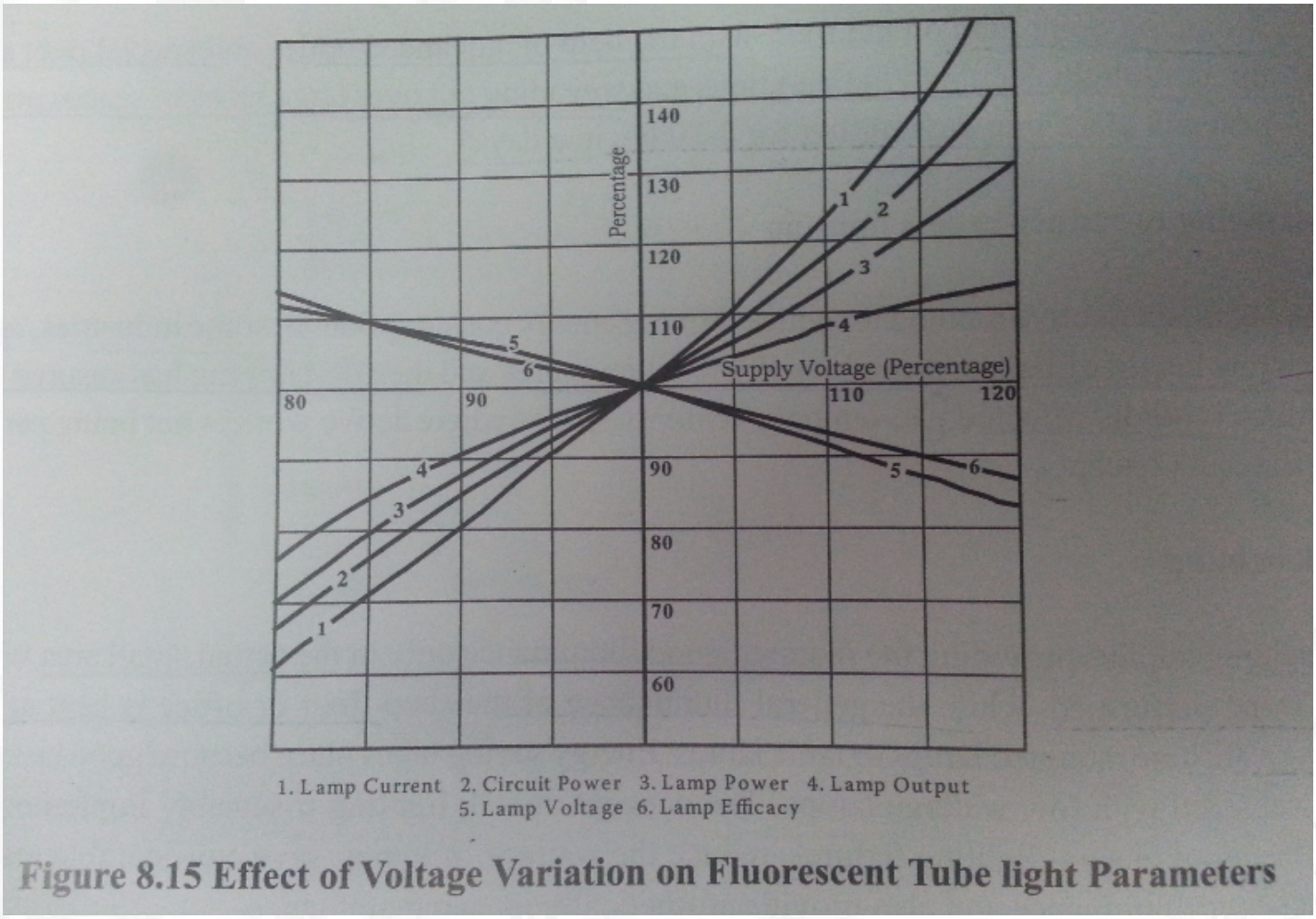

Figure 8.15 Effect of Voltage Variation on Fluorescent Tube light Parameters

Variation in Light output and Power Consumption		
Particulars	**10% Lower Voltage**	**10% Higher Voltage**
Fluorescent Lamps		
Light Output	**Decreases by 9%**	**Increases by 8%**
Power Input	**Decreases by 15%**	**Increases by 18%**
HPMV Lamps		
Light Output	**Decreases by 20%**	**Increases by 20%**
Power Input	**Decreases by 16%**	**Increases by 17%**
Mercury Blended Lamps		
Light Output	**Decreases by 24%**	**Increases by 30%**
Power Input	**Decreases by 20%**	**Increases by 20%**

Reduction in lighting feeder voltage can save energy, provided the drop in light output is acceptable.

If rated voltage for light used is 240 Volts than keep voltage at 96-97% i.e. **230-233 Volts (Ph-N)** Approx i.e. **400 -405 Volts (Ph-Ph).**

In Many areas, night time **Grid voltages are higher than normal**; hence reduction in voltage can save lot of energy and also provide the rated output (As Majority of lights are on during night only).

Hope this may be helpful in your plants.

And yes your suggestions are welcome

Regards

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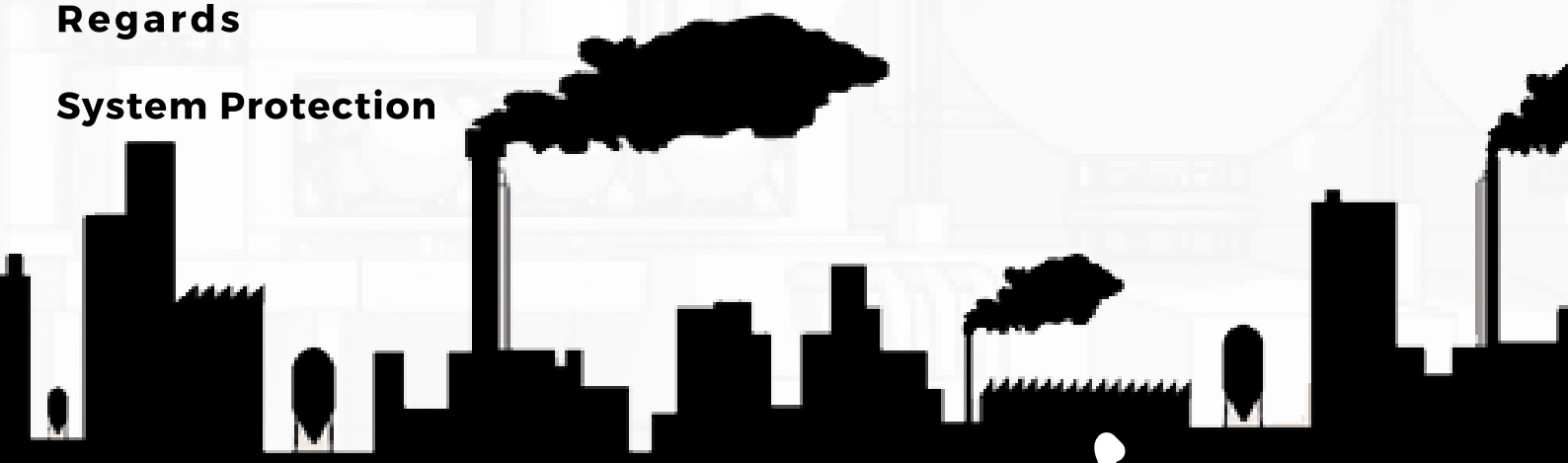

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Case Study – Importance of Relay Selection in Grid Connected Industries

Even Infinite source do the finite mistakes?

Hello Friends,

Just like all other cases, we bring you one more actual incident happened recently in one of the Process Industry, connected with GRID (State Utility). In our 18 years of service to industries, we have come across many abnormalities, incident and have resolved them. Even we learn while solving the issues or Tripping incidents but summation of these many years of experience has strengthen us to resolve this type of incidents in time. However, this is the first time we came across this kind of issue.

On a lighter note, to our knowledge, most of the abnormalities, Tripping or operational problems in Industries happens on Sunday or Holidays only. Keeping legacy alive, this also occurred on Sunday evening 4 PM.

Here under is the summary:

- It was planned shutdown from Grid side for adding new 33 kV distribution line to their substation. Same was informed to all the consumers 2 weeks in advance for this shutdown which was scheduled for 2-3 hours in continuation.
- All goes well as per schedule, Power resumed within 2.5 hours but……. Connected Industries failed to start. Reason….? Unhealthy Voltage. And relay blocked Circuit breakers to close pertaining to Unhealthy Voltage.

Then started troubleshooting:

- They checked PT supply, found healthy.
- If during shutdown, any modification/s OR Change/s made in the wiring? No, everything was as it was.
- They took all possible measures, but waste. Relay keep issuing tripping command.

Worried about the incident, we got distressed call from user:

- We enquired with them and asked whether all necessary measures have been taken.
- We asked them to check in relay configuration, but not necessarily plant people knows it.
- We even advised to reboot the relay, if in case it may have hanged.
- Then we asked Rare check. To change the phase sequence of Incoming Voltage supply in relay for all the combinations as RYB, RBY, YRB, YBR, BYR, BRY.
- To our surprise!!!!! With combination RBY, relay contact got reset and plant was started.
- We also asked them to check with other plant connected to GRID with same feeders and found:
  - Their Motors were running in Reverse direction and same has leads to certain issues related to process. Adding additional down time.
  - Same was issue with other plants as well.

The problem was identified as change in Phase sequence mistakenly by GRID side during shutdown. We advised plant people to keep the original wiring so that if this happens again in future than same can be identify and rectify.

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Well, we got their appreciation as System Protection has been involved in Selection and Retrofitting of relays. If the plant has been started with reverse direction more revenue loss would have registered.

Proper Relay Selection for Equipment's play a key role in Protecting your plant equipment in the best way.

The relay sensed the Phase Reversal as unhealthy voltage and therefore, was giving tripping commands. Under pressure, maintenance engineer Bypassed Undervoltage protection and charged the panel as he was concerned about production lost. But when Relay is at fault you can't even change or disable setting, and this is blessing in disguise.

Our team during annual Relay testing in shutdown (July 2018), suggested and enabled this setting.
We feel sorry for the other industries who suffered due to improper relay selection. Damage has already occurred. To avoid this we strongly recommend, while selecting protective relays either in Projects or retrofitting, all the points must be considered pertaining to protection and process perspective.

We at System Protection would be happy if we can be helpful to you for any of your requirement.