Hydel Bullet

A Monthly Publication Of the Kerala State Electricity Board Engineers'Association

Issue - 11 Vol - 3 November 2015

The War continues...

The Electricity (Amendment) Bill, 2014 introduced in the Parliament on December 19, 2014 has already attracted the ire of State governments as well as the employees and engineers working in power sector, as it will have adverse impact on the Indian power sector. The main purpose of this bill was further splitting of Electricity Distribution Sector into carriage and content, to enable profit mongers to enter into supply business of urban and revenue potential areas without any investment for development or expansion of the power industry.

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Massive demonstration by NCCOEEE at Kochi on 6-11-2015 at the venue of All India conference of State Power ministers . Er Mohammed Shereef President, KSEB Engineers Association, AIPEF Sec General Er P Rathnakar Rao & other leaders addressed the demonstration.

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Contents

All the major federations of employees and engineers in the country's power sector came together on a common platform of National Co-ordination Committee for Electricity Employees and Engineers (NCCOEEE), for fighting against the anti-people provisions in the Bill.

The splitting of distribution business into content and carriage involves significant costs and may not be easy to reverse. The risk associated with it has to be taken seriously as the interest of private sector is only to earn profits by hook or crook. The multiple licensee system would categorize electricity consumers into priority and non-priority (subsidized) categories leading to "cherry picking". The incumbent public sector licensee will be responsible for supplying electricity to the unprivileged common man (universal supply obligation). This is nothing but nationalizing the losses and privatizing the profits. Also, competition is possible only in a power surplus scenario.

The proponents of the bill claim that this provision will enhance the quality of power supply and enhance the customer satisfaction and minimize the distribution losses. But the real life scenario has proved to be contrary. The experience in Delhi and Mumbai, where private licensees are engaged in distribution business has seen one of the largest tariff hikes seen in recent times. It led to the fall of the government of the day in Delhi with a crushing defeat which is unparallel in the history of democracy in our country. Such has been the public anguish that every government in our country should learn lessons and introspect. The ill effects of the much hyped "Franchisee" model should also be an eye opener before deciding on such new provisions now proposed.

As Electricity is a matter on the concurrent list in the Constitution, the powers of the State Governments, which are already shackled to a large extent by virtue of Electricity Act 2003, are seen likely to be curtailed by the proposed amendments. The priorities and strategies of the states will be different for different states. Every state has its own stake in deciding the structure of the sector, development strategies, tariff design, decisions on subsidies and cross subsidies etc. Hence enforcing policy decisions of central government on such matters as mandatory is against the federal set up of governance and is not proper. Eighteen States have already protested against the implementation of the proposed amendments. So the idea of the Union government to allow private licensees will probably back fire into its vote bank and would affect the majority mandate enjoyed by it.

There are certain other provisions in the Bill which would usher in positive changes in the power sector viz. Renewable energy and Smart grid. The Electricity Act,2003 does not clearly define the renewable sources of energy, which the Amendment Bill defines as hydro, wind, solar, bio-mass, co-generation from these sources, geothermal and other sources which will be subsequently notified by the central government. Also in the lines of the National Electricity Policy brought out by the EA 2003, the bill recommends for National Renewable Energy Policy which seeks to promote generation of renewable energy through tax rebates and generation linked incentives.

The Bill defines a Smart Grid as an electricity network that uses information and communication technology to generate, transmit and distribute electricity efficiently. It seeks to promote provision of electricity through Smart Grid. The Bill also provides for the installation of smart meters for proper accounting and measurement of the consumption and metering of electricity.

The most remarkable positive change proposed is the provision for reigning in the role of State Electricity Commissions in the respective States. Most of these commissions are ruled by members with vested interests, appointed by lobbying the government functionaries and they doesn't have any interest in promoting the public utilities in the power sector. They have encroached on the functions of the public utilities and are vying to be supremo uno in the State's power sector without showing any commitment to the public. The Bill proposes for appointing independent members without any interferences of the ruling government and reduces the term of office for the chairperson or other members of the Regulatory Commissions from five years to three years. The Bill also allows for re-appointment of the Chairperson and members for one more term in the same capacity in which they had earlier held office.

The central government was reluctant to hold discussion with stake holders of the sector, especially with the representatives of employees associations and unions. On November 6, 2015 more than 10,000 employees took out a massive protest march under the banner of NCCOEEE to the venue of the All India conference of State power ministers demanding revocation of the proposed amendment to the Electricity Act 2003. A delegation of NCCOEEE met Sri. Piyush Goyal , Power Minister and he assured the delegation that the concerns of the employees and engineers working in the power sector will be addressed. He informed that the States will be given the power to decide the timing and method of introducing competition in distribution and no cherry picking will be permitted. The necessary changes in the bill cleared by the standing committee will be made after further discussion in the next meeting to be held after three weeks. He assured the delegation that detailed discussion with them will be held in New Delhi after three weeks but before presenting the Electricity (Amendment) bill 2014 in the Parliament.

Our Association had taken up the matter with the Hon. Prime Minister of India and had represented the facts before the Parliamentary Standing Committee on Energy. The report of the Parliamentary Committee on the Amendment Bill has been published in this publication earlier. The protest march and meeting conducted by NCCOEEE at Kochi during the Power Minister's Conference was a great success, considering the decisions which came out of the meeting with the Power Minister. It showed that if all unions and associations remain united and fight for the common cause, then any threat to power sector can be combated effectively. Let this be a way out for the future threats and united shall we stand for the sake of the public good.

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NATIONAL COORDINATION COMMITTEE OF ELECRICITY EMPLOYEES & ENGINEERS

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To

Sri. Piyush Goyal
Hon'ble Minister of state
Ministry of Power, Coal and Renewable Energy
Government of India

Sub : Disastrous provisions in Electricity (Amendment) Bill, 2014

Dear Sir,

We on behalf of the National Co-ordination Committee of Electricity Employees and Engineers (NCCOEEE), the broad based platform of all major Federations of power sector Employees and Engineers of the country put this fervent appeal for your consideration and needful action to ensure affordable and uniterrupted access to Electricity for the entire people of India.

You are aware that the power sector of the country is facing serious crisis with over 30 crore people still not having access to Electricity. The implementation of Electricity Act, 2003 has only worsened the crisis. Accumulation of loss worth ₹ 26,000 crores through five decades from independence was the main reason cited for the restructuring of SEBs. However, after restructuring the accumulated loss of DISCOMS has exceeded ₹ 3 lakh crores within one decade of implementation of the Act. Debt burden has crossed ₹ 4.3 lakh crores. Private DISCOMS / Franchisees enjoy tariff hike but desist from paying dues of state / central PSUs. Worst consequence is volatility in short term market and collapse of bulk power market. Price varied between ₹ 1.00 to ₹ 20.00 through trading and speculation in short term market. In long term bulk power market the private players are vitiating the bid process and is hand twisting the government to succumb to their terms as witnessed in UMPP bids. While 50,000 MW privately owned capacities are on the verge of becoming NPA due to lack of buyers. the country is witnessing severe power restrictions and shortages. World Bank report published in June 2014 admits that no single model can be showcased as a panacea for recovery of the sector. As per their study, even though unbundling was the preferred model, the vertically integrate corporate entities vis KSEB Ltd. & HPSEB Ltd. were the two best performing Electricity Utilities in the country.

Amidst this situation your Government has initiated Electricity (Amendment) Bill, 2014. The most important proposal relates to separation of carriage and content by further

unbundling of the distribution sector into three sectors; one for line business or distribution which will remain in public sector, another for supply business and the third one for dealing with bulk power purchase and redistribution among supply licensees. The proposals aims at promoting private participation in supply business without any need for capital investment by private sector. Earlier the logic for private participation was lack of resources with the government. But now private participation is sought without any capital infusion and at the same time private sector is allowed to utilise the infrastructure built by public sector to reap profit. The most ruinous effects of segregation of Electricity distribution into carriage and content as pointed out through our various representations can be summarised as below;

1. Will lead to cherry picking of profitable sections of consumers as well as profitable urban areas by subsequent supply licensees who are not burdened with the cross - subsidy support in supplying to rural and agriculture consumers.
2. Will bleed the distribution companies and incumbent supply licensees with loss of revenue from profitable sections of consumers as well as profitable urban areas.
3. The distribution network will deteriorate adversely affecting quality of supply to consumers.
4. Consumers has to run among different utilities of various services related to distribution and supply.
5. The energy accounting at lower voltage levels among different supply licensees is going to be an unsurmountable challenge in the Indian context where millions of electric connections are still not metered, despite existence of mandatory legal provisions. It may be noted that the energy accounting even at intra- state transmission level is not effective or proper even today, leave aside that in distribution and supply areas. The efforts under R-APDRP has not yielded any worth while progress in this regard, with worked out AT & C losses being much distant from reality.
6. The scheduling and dispatch of power by different supply companies in the same area of supply is another unsurmountable obstacle given the current state of maturity of Indian power sector.
7. The creation of intermediary company is a back door facilitation to subsequent supply licensees who do not owe the burden of cross subsidy, for cherry picking with the strength of low cost power, originally contracted by public sector distribution companies.
8. The state regulatory commissions are sought to play to the tune of central government discarding the constitutional mandate for federal governance of the sector.
9. The ordinary consumers who are now supported through cross - subsidies and direct cash subsidies will face to the most severe consequence with their energy

bills bound to increase manifold with the disappearance of cross - subsidy support from wealthy sections of society.

10. The fate of over one million electricity employees and over a million contract workers is in dire straits with the impending collapse of existing public sector utilities.

The proposed model has been a huge failure even in a developed economy like that of USA. The states that experimented with the model has tasted defeat, with California experience being widely reported. In view of the failures in early bird states, many states in USA has not implemented the model. The World Bank which looked into the viability of the proposal at the behest of your Ministry has advised you to shelve it. Instead of rolling out the separation, the World Bank has recommended to pilot the same to experiment and learn from the experience in Indian conditions. Thus, at the most, the government need only provide enabling provisions to introduce the model wherever found suitable by the respective State Governments, instead of mandatorily thrusting it upon all the unwilling State Governments of the country.

In short, NCCOEEE along with all its constituents covering membership of Two Million Electricity Workers and Engineers across the country note with grave concern that this Bill, if enacted in its present form and content, will curb the right to electricity for large majority of people, having limited capacity to pay.

We, the working people in the power sector having billions of man hours of technical and managerial experience foresee that the Electricity (Amendment) Bill 2014 will fail to address the real requirement of the people of the country and will rather further aggravate the situation than in the case of Electricity Act 2003. Upon the above circumstances, we request you to drop the idea of enacting the Bill which seek to dismantle existing structures without presenting any workable model.

We modestly like to submit before you that, we are constrained to call for **Nation wide one day token strike / Work boycott as a mark of protest on 8th December 2015.**

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Letters to the Editor

കത്തുകൾ അയക്കേണ്ട വിലാസം

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7th SEMINAR SERIES

Power Augmentation in Kerala –Issues Challenges & Solutions

Electricity is one of the most essential requirements for the human existence and development of a country. Availability of electricity with required quality of supply is not only key to sustainable development, but also have a direct impact and influence on the quality of service in the fields of education, health, food security etc.. Demand of electricity has been increasing tremendously due to the rise in population, changing climate, rapid urbanization, industrialisation and the changing life styles. In order to meet the increasing demand for electricity large additions to the installed generating capacity as well as development of associated transmission and distribution network is required.

Power scenario in Kerala is becoming very complex day by day because of the scarcity of power especially during the peak hours. At present, the total installed capacity of Kerala is 2846.001 MW (11941.9 MU) in which 2194.135 MW (8151.6 MU) is of KSEB owned stations, and the remaining is of Independent Power Producers (IPP)/Captive Power Plants (CPP). Average peak power demand of Kerala is around 3400 MW, with a daily demand of around 60MU. Out of this around 15MU is met from the State Generation and the rest being catered through Central share and long term / short term purchases from power trade exchanges and via IPPs/CPPs. Due to non-availability of transmission corridor, availing the Central share and purchase of power from outside the State have become difficult. Also majority of the losses in the power sector happens in the Distribution sector, where power is brought to the consumers from the substations via Distribution transformers. Studies have shown that the maximum loss happens in the secondary distribution. Thus there are serious issues which affect all the three sectors namely Generation, Transmission and Distribution.

In this context, the KSEB Engineers Association, which is the largest association of Power engineers in the State, would like to present the topic for its 7th seminar series – "***Power Augmentation in Kerala – Issues, Challenges and Solutions***". KSEBEA has been successfully conducting the seminar series for the past six years for the engineering college students across Kerala, in its attempt to bridge the gap between the student community and the engineering professionals. During the last six years, our seminar series have emerged out as the biggest industrial – academic cooperation in the State and thus inspiring the electrical engineering students to dream and inspire on the subject that they study and to contribute to the power sector of the State.

This competition requires the students to brainstorm on the topic given and come out with solutions that are viable for the State – both technologically and financially. The goal is to produce maximum energy at the generation

stations and to bring it to the consumers at the load centers with minimal loss of energy and also achieving self sufficiency in power. Thus the topic deals with power augmentation in all the three sectors of power sector – Generation, Transmission and Distribution. The topic has been divided into three broad areas namely.

➢ **Issues**

- Students have to identify the issues pertaining to the power sector in the State which shall involve all the three major sectors- Generation, Transmission and Distribution.

➢ **Challenges**

- The gravity of these issues
- What impact it cause to the future development of the power sector of the State.

➢ **Solutions**

- How these challenges can be encountered
- Whether technically and financially viable,
- Whether any new technologies are available
- The teams shall come up with suitable proposals.

We would like to invite all the electrical engineering students across the State to participate in the seminar competition and make it a grand success. We expect that this seminar series will help the students to complement their academics with suitable industrial exposure.

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OBITUARY

ആധ്യാത്മിക പ്രഭാഷകനും റിട്ട. ഡെപ്യൂട്ടി ചീഫ് എൻജിനീയറുമായ കണ്ണൂർ, ചാലാട്, ഭാനു റോഡിൽ, രോഹിണിയിൽ **Er. ടി.വി. സുധാകരൻ** (75) നവംബർ 21-ാം തീയതി അന്തരിച്ചു. ഭാര്യ സുഷമ. മക്കൾ: ജയ്മിനി, ഷിബി (മസ്ക്കറ്റ്), സരമ രാഗേഷ്, രജി (ഇറ്റലി) മരുമക്കൾ : ഷൈറ, സുഷമ, പി.കെ. രാഗേഷ് (കണ്ണൂർ കോർപ്പറേഷൻ കൗൺസിലർ), നീതി.

നമ്മുടെ അസോസിയേഷന്റെ സജീവ പ്രവർത്തകനുമായിരുന്ന ഇദ്ദേഹത്തിന്റെ നിര്യാണത്തിൽ അസോസിയേഷൻ അനുശോചനം രേഖപ്പെടുത്തുന്നു.

Unit Activities - November 2015

Kollam

Unit meeting held on 19th Nov, 2015 at Engineers' house, Kollam. Er.Varun.V.R presented an interactive session on ' Laying of 110kV UG cable - Standards and practices'.

Kottayam

The unit meeting held on 12th November 2015 at 5:30 pm at Bestotel, Kottayam with technical session on "Concrete Technologies" by Er Shyju Nair, Zonal Head, Ambuja Cements. The business session of the meeting commenced with the Chairman Er C.P. George in the chair. In the general discussion, various activities occurring in the field was discussed. Also other matters related to Pay revision, NCCOEE march and protest, Celebrating Energy conservation day and arranging a progamme related to energy conservation were discussed. Meeting came to a close at 8:30 pm.

Kasargode

Kasaragode unit conducted technical tour to CIAL & Poringal koothu Hyde station on 07/11/2015. Team consisting 15 members visited the 12 mwhp solar plant owned by Cochin International Airport limited in the morning and poringal koothu hydal power plant , PLBE etc in the afternoon.

Thrissur

Unit meeting was held at PORINGAL on 18/11/2015 Er. T R Suresh chairman presided the meeting and Er. M.V.Jose and Er. N T Job were present. Er. Shine Sebastian presented welcome speech. Er. T R Suresh mentioned this meeting as a high tension -

high altitude meeting and appreciated all the members of the meeting. He explained about latest developments in EA &KSEBL since last unit meeting. Minutes of last unit meeting read out by unit secretary.Er. M V Jose talked on safety and accidents at KSEBL and ask AAAC and COPPER configurations should be replaced and all of us should use PPE. Er.Jagathy mentioned about the success of Nov 6 th protest march to Cochin and appreciated all the 35 members participated in the event. He also informed the unit about Dec 8th national wide strike. He also talked about increasing accidents in KSEBL. Er. Abdu, Er.H.Suresh,Er.Aravindakshan & Er.Jiji Francis talked on safety issues. Er. N T Job talked on safety concern, issues with model section, issues concerning power utilities and new policies of central govt to revamp the state utilities and make them profitable viz UDAY. He also congratulated Er. Martin,Er.krishnaraj,Er.Hareesh & Er.Paulose and other members of engineers association on their contribution towards renovation of PORINGAL power house. Er. Abdu talked on units technical visit and mentioned that the visit was a full package with the nature and technologies viz. Screw turbine, solar plant, renovated stations,tea plant and dam visits etc. A committee for discussing safety **issues constituted. Er. H Suresh presented vote of thanks and meeting concluded.**

Muvattupuzha

Unit meeting held on 18.11.2015 at Tee Cee Tourist Home, Thodupuzha. Detailed discussion was conducted about AGB at Thodupuzha with Idukki and Chithirapuram unit office bearers. Next meeting for the same with all the three unit representatives will be in the 1st week of December. Pay revision proposal was prepared and presented at CEC Alappuzha. Er. Santhosh P Abraham, AEE, Electrical sub Division, Velloorkunnam conducted a short but very useful presentation about "Interpersonal Relationship" including tips from eminent personalities. It is planned to conduct a technical tour to 2000MW, 500kV Kolar converter station tentatively in the 1st week of January 2016.

Kannur

Unit meeting held on 17-11-2015. Er. James M. David, Chief Engineer (Transmission North) & Er. Geogre V. James, Deputy Chief Engineer were honoured during the unit meeting.

Alappuzha

ALAPPUZHA unit honoured Er.James M David, CE for his remarkable achievements as Chief Engineer in the short span of his tenure. Er.James M David, is in forefront of utilising Technological advancement for the growth of our organisation. Senior Engineer Er. Geevarghese T ,offered the traditional 'Ponnada' on behalf of the Unit. Unit expressed whole hearted support for his future endovers 20 members from ALAPPUZHA Unit participated in the demonstration organised by NCCOEEE on 6 Nov at Kochi. The team was led by Er. Anil M, unit chairman, Er. Rajesh K R, Benovalent Secretary, Er.KJ Abdul Vahid, program coordinator

The Governing Body meeting for the month of November is hosted by ALAPPUZHA Unit on 21_11-2015. The GB meeting was noted for the active participation of over 50 members.

PRIVATISATION OF POWER SECTOR: FACTS AND MYTHS

C. P. George

Dear Engineers,

There is a great propaganda in the State on the ills of privatisation in Power Sector and making hysteria on the issue by creating fear psychosis….! Actually it helps only to divert the attention from real issues being faced by us in the Sector and do no good for the power sector in the state. It is better to have some facts and figures to have a better perspective of the issue.

As such the power sector in India is structurally and functionally divided into Generation, Transmission and Distribution. The Electricity Act also classified its sections according to this functional division and hence we also need to conceive and evaluate the performance of the Sector in the State accordingly.

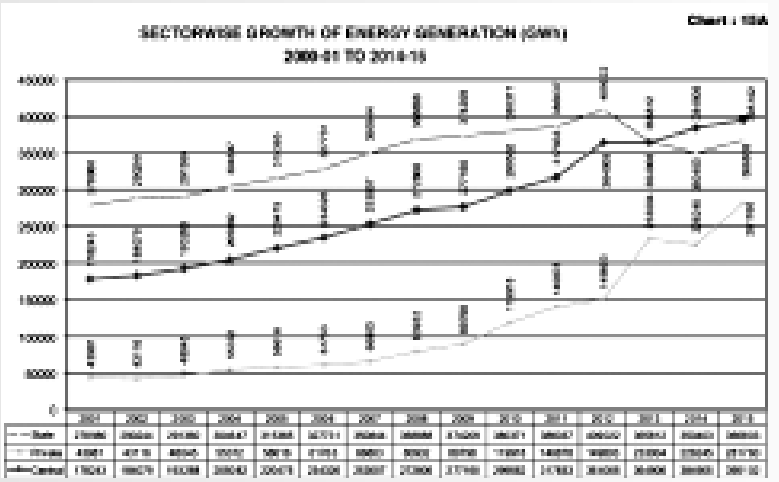
GENERATION

According to provision of the Electricity Act 2003, the Generation in the country is delicensed and anyone can start a generating station in the country and sell the electricity to any of the licensee or the bulk consumers in the country through open access. And let us see the growth of various Sector in India during the period after 2001 in the graph below

Chart : 15 A

SECTORWISE GROETH OF ENERGY GENERATION (Gwh)

2000-01 to 2014 - 15



The Sector wise Installed Capacity data by 9/2015 and generation as on 2015 is given below..

	IC in MW	IC in %	Energy in GWh	% increase in generation (2001 to 2015)	Remarks
Private	108107.67	38.8	281760	84.0%	LowPLFdominantly RES & imported Coal
State	96454.80	34.6	366803	23.9%	Low PLF
Central	74171.15	26.6	395102	54.9%	Dominated by NTPC
Total	**278733.62**	100.0	1043665	52.0%	

As such it is very evident and clear that even though there is no substantial contribution by private generators in Kerala, the country is sustaining on private sector power and the trends are for increased relevance and dependency on private Sector generation in future. In spite of all our resistance to privatisation, Kerala is depending on them now for about 25% of its energy needs..! In case of Kerala we even failed to make substantial progress in generation during past 15 years even in public sector and resisted the private sector with success as we do not have any resources to do a profitable business in generation….! Again no point in our protest against privatisation when other states wants private participation for efficient utilisation of their resources for profitable electricity generation …..!!! We need to know that the only sensible option for cheaper electricity in the country is to create an environment and network for efficient harnessing of the available energy resources in the country and ensure better PLF for these generating plants.

TRANSMISSION

According to Section 38 & 39 of Electricity Act, the Central Transmission Utility and State Transmission Utility shall be Government Companies only. And their responsibility is to ensure development of an efficient, co-ordinated and economical system of inter-state and intra-State transmission lines for smooth flow of electricity from a generating station to the load centres. As such we do not have any threat of privatisation in transmission sector and it is good to evaluate what investment we have made so far in the state for efficient and economical intra-state transmission system in tune with the National Electric Policy, the Indian Electricity Grid Code (IEGC) and Grid Standard in force…! It is a fact that our intra – state transmission system is obsolete and do not comply with many of the provisions in the Grid Standard and IEGC. It is pity that we have made no substantial investment in the transmission sector during the past 15 years and not even have an approved plan for its modernisation

and to ensure compliance of relevant statutes, standards and policies. With lack of transmission corridor and lack of enough reliable transmission elements in the transmission network, we ensured that no private initiative for generation is feasible with intra-state open access…! With lack of resources and no possibility of increase in internal generation, we should have concentrated on better intra-state transmission corridors to ensure flaw less transmission of appropriate quantum of power inside the state with quality and reliability along with an eye on better import and power handling capabilities. As such our immediate concern should be the lack of investment and modernisation in transmission sector as private transmission utilities are not envisaged in transmission and it is going to be a natural monopoly under government. Again better transmission system is the only possibility to ensure efficient and economical generation of electricity by ensuring better PLF for the generating stations and effective harnessing of renewable energy resources in the country.

By raising hysteria about privatisation, we are diverting the focus from these technical and financial issues which need to be sorted out immediately by the "State Transmission Utility", KSERC and the State Government.

DISTRIBUTION

This is the functional area of licensees and both private and public entity is envisaged in the Electricity Act 2003 and relevant statues. When we evaluate the provision in the EA 2003,policies and regulation; it is very clear that the distribution function is a "State Subject" and GoI have little scope for interfering with the affairs of the utility, if it is technically sound and financially viable. In the end, we need to know that the attitude of the consumers in the state and policies of the state government is the major deciding factor on the structure (Public or Private) in the distribution function. Even the state policy will be decided based on the attitude of the consumers and hence depends on the performance of the incumbent distribution company.

Before creating anti privatisation hysteria, it is good to evaluate the historical performance of those Electricity Boards functioned in those area and the plight of the ordinary consumers in the area. Again we need to know that 49% of the shares of those private companies are still owned by the concerned state governments and the state governments have great say in management of these companies….! Again it is good to know that all companies, whether public or private, function from the fund raised from the public….!! The only difference is that, for a Government Company, not less than 51% of the investment is from the tax collected from by the government from the public…! And their accountability to the taxpayers are only during the election time……?! For Private Companies, the invested amount is raised through public shares or loans that again form the public fund through Indian financial institutions…!!

As such, it is observed that, the only difference is on the appointment of the team of the management in the affairs in a company and the type of accountability. In case of PSU its performance shall be based on the competency and integrity of the individual in the PSU management and the attitude and policy of the government. In case of private company, it again depends on the competency and integrity of the management team, but are focussed on profit motive as they are accountable to ensure minimum return to the investors. Again they are directly accountable to many statutory bodies including SERC. Regarding the profit and loss,it is clearly governed by appropriate statutes. It is for the SERC and other enforcement agencies of the government to ensure that their accounts are clean and transparent. If a government do not have the integrity to ensure these minimum statutory responsibility to its citizen, then how can we trust that government to run a PSU in power sector…?!!

As such, we need to know that privatisation is a consequence of the failure of the PSU and if we want to avoid privatisation, we need to address the issues that prevent us from performing to the expectation of the consumers. And we need to know that the major threat is not privatisation, but the technical and competency issues with respect to modernisation and financial issues with respect to the capital investment and revenue expenditure. In the end it is better to ask ourselves, as a consumer, whether we are happy with the performance of our "Home Section" and as an employee whether we are satisfied with KSEBL as an Employer…?!!

CONCLUSION

Generation: Generation is de-licensed and anyone can start a generating station in the country. Private Sector has shown substantial progress during the past 15 years where there are enough resources and environment to do generation business profitably. No point in protest against private generation as the country is sustaining on private generation and even Kerala depends on 25% of its total energy from private generators. Again it is for the respective states to decide how to utilise their resources efficiently for electricity generation.

Transmission: Only Government Company is envisaged as transmission utility and no point in creating hysteria against privatisation in transmission..!

Distribution: The distribution function is a "State Subject" and GoI have little scope for interfering with the affairs of the utility if it is technically sound and financially viable. Privatisation is a consequence of the failure of the PSU and if we want to avoid privatisation, we need to address the issues that prevent us from performing according to the expectation of the consumers. It is good to keep in mind that we cannot find political solution for technical and financial issues that prevents the utility from performing to the desirable level.

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FOURIER SERIES AND HARMONICS IN MUSIC AND ELECTRICITY

Continution from last article.....

P.V. Pramod
Assistant Executive Engineer
220KV Substation, Orkatteri

20. ELIMINATION OF HARMONICS IN ALTERNATORS.

A. Using distributed winding

Harmonics can be much reduced by using distributed winding instead of concentrated winding in stator(armature). If the winding is distributed in such a way that several slots per pole and phase exists, the voltage induced in individual conductors in each phase have slight phase difference. These voltage act in series so that their resultant (terminal)voltage contains less harmonics

If the slot pitch is ψ electrical degrees, the phase difference of the components of fundamental frequency for two consecutive coils will be ψ , for the third harmonics it will be 3ψ, for the fifth harmonics 5ψ and so on. The vector diagrams for group coils considering different harmonics separately are shown in fig 26. Here the alternator is 3 phase having 4 slots per pole and the phase spread of 60^0 so that ψ is 15^0. It is seen that in the case of harmonics , the vector sum of voltages are much reduced.

Fig 27 shows the individual voltage induced in each loop and the total voltage induced in a multi turn distributed coil of 6 loops. Here we see that the individual voltages are non-sinusoidal, but resultant is sinusoidal.

B. Using short-chord winding

A short chord winding is one in which the coil width is less than the pole pitch. There is thus a phase difference between the voltages in the two coil sides. By the use of such coils it is possible to eliminate one particular harmonic. Thus if the distance x (Fig 28) is 1/n of the pole pitch , the n^{th} harmonic will be eliminated, because the n^{th} harmonicin the voltages in two coil sides will be in phase opposition.

APOLOGY

Due to printing error, we missed art sections 20.c to section 22. We seek apology from the readers of this article, as well as the author and is republishing it for the sake of continuity of the article.

Editorial Board

C. By Shaping slots to Suppress Tooth Ripples

As a pole move past the stator teeth, the configuration of the air gap is altered, its reluctance passing through a series of maximum and minimum values. These variations in reluctance set up a stationary wave of magnetism, one cycle of which corresponds to one slot pitch.

Let '**a**' be the number of slots per pole then '2**a**' is the number of slots per pole pair. So one pair of poles corresponds to **2a** cycles of this stationary wave and only 1 cycle of the fundamental voltage. The frequency of the stationary wave is therefore **2af**.

This stationary wave is split into two travelling components rotating in opposite directions; having angular velocities$(2a+1)\,\omega$ and $(2a-1)\,\omega$ relative to the field; ω being the synchronous angular frequency. Hence they set up harmonics of frequencies $(2a+1)f$ and $(2a-1)\,f$. For example if there are 3 slots per pole and phase, a=9 and the harmonics due to tooth ripples are ((2×9)+1) and ((2×9)-1), i.e. 19^{th} and 17^{th}.

In order to suppress tooth ripples it is necessary to reduce the variations of reluctance of the air gap to minimum. This can be done by-

1. By making pole span a whole number of slot pitches.
2. By employing semi-enclosed or totally enclosed stator slots as shown in fig 29. The placing of the windings in these slots is difficult and so the totally enclosed slots are rarely used except for low voltage bar windings.

21. HARMONICS IN POWER TRANSFORMERS

In a transformer harmonics are generated due to non-linear magnetising characteristics of the steel; as shown in fig 30. When a sinusoidal voltage is applied to the primary, a flux is set up in the core. The magnetising force H is proportional to the current and so if the B-H curve of iron were a straight line through the origin and if there were no hysteresis, the current wave would be sinusoidal and in phase with the flux density wave. The current wave will thus be in quadrature (lagging) with the applied voltage and the power would be zero in the core. However in real case, the B-H curve is nonlinear having a definite area corresponding to the hysteresis loss. Hence the current lags by an angle less than 90^0 w.r.t the voltage since a component of it supplies the hysteresis loss. Also since B-H curve is

not a straight line; but having a non-linear shape, the current is distorted from the pure sinusoidal form. (See Fig 31.

Thus the magnetising current wave has a 'peaking' shape showing that it contains a pronounced third harmonic,whose amplitude relative to the fundamental increases as the saturation of the iron core is increased.

Power transformers are designed to normally operate just below the 'knee' point of the magnetising saturation characteristic. The operating flux density of a transformer is selected based on optimisation of steel cost, no load losses, noise, and many other factors. If no load losses and noise are specified to be very less by an electrical utility, the transformer manufacture use more steel in the core resulting higher saturation curve that yields lower harmonic currents.

Although transformer exciting current is rich in harmonics, at normal operating voltage, it is typically less than one percent of rated full load current. However their effect is significant in utility distribution system containing a number of transformers, during low load conditions. A significant increase in triplen harmonic current occurs during early morning hours when the load is low and the voltage rises. Transformer exciting current is more significant then because there is insufficient load to obscure it and the increased voltage causes more current to be produced. Harmonic voltage distribution from transformer overexcitation is apparent under these light load conditions.

22. HARMONIC SOURCES FROM CONSUMER LOADS

Electronic power converters constitute the most important class of nonlinear loads, which includes electronic ballast, switched mode power supplies, motor drives, fluorescent lighting etc. Commercial facilities such as office complex, hospitals, internet data centres are dominated with fluorescent lighting with electronic ballast, lift elevator drives, air conditioners, electronic equipment supplied with SMPS etc. Commercial loads are characterised by a large number of small harmonic producing load types. These small harmonic currents may add in phase or cancel each other. The voltage distortion level depends on circuit impedance and overall harmonic current distortion. Since P.F correction capacitors are not used in commercial facilities, the circuit impedance is dominated by the distribution transformers and conductor impedances.

Industrial facilities involve nonlinear loads such as 3 phase power converters, arcing devices, saturable devices with steel core etc. These loads inject harmonic currents into the power system, causing voltage distortion. Since these loads are of low PF the industries use capacitor banks, which magnify harmonic currents from the loads, giving rise to resonant conditions within the facility. The highest voltage distortion occurs at the low voltage bus of the facility where capacitors are applied. Resonant conditions cause motor and transformer overheating and misoperation of sensitive electronic equipment.

Let us see the most important type of nonlinear loads in detail.

22.1 Switched Mode Power Supplies

Power supplies for single phase electronic equipments produce harmonic currents. There are two types of single phase power supplies. Older type employ ac side voltage control methods such as transformers to reduce voltage to the level required for dc bus. The inductance of the transformer provides a beneficial side effect by smoothing the input current waveform, reducing harmonic content.

In modern switched mode power supplies (Fig.32), the input diode bridge is directly connected to the a.c line eliminating the transformer. This results in a coarsely regulated dc voltage on the capacitor. This d.c is converted back to a.c at a very high frequency by the switcher and subsequently rectified again. The non-requirement of input transformer makes the SMPS lightweight, compact, efficient, and tolerant to large variation in input voltage. But the lack of a.c side inductance causes the input current to become very short pulses as the capacitor C1 regains its charge on each half cycle. Thus increasing harmonic content in the current. Thus very high third harmonic currents are present in SMPS, which get added in the neutral of 3 phase system, overloading the neutral conductors of building wiring and overheating the transformers.

Fig.33 shows the current waveform of SMPS and its spectrum.

22.2 Fluorescent Lighting

Fluorescent lightning constitutes the majority portion of lightning load due to its high energy savings. Florescent lights are discharge lamps. So they require a ballast to give a high initial voltage to initiate the discharge for the current flow between two electrodes in the fluorescent tube. Once the discharge is established, the voltage decreases and current increases. Now the ballast quickly reduces the current to a suitable level for specified lumen output.

There are two types of ballasts-magnetic and electronic. A magnetic ballast is made up of an iron core and insulated winding. It operates at the line fundamental frequency 50 Hz. The heat loss in iron core make this ballast less efficient. However the harmonics in such ballasts are comparatively less. Fig.34 shows the ballast current wave and its harmonic spectrum.

Electronic ballast uses a switch mode type power supply to convert the incoming fundamental frequency voltage to a higher frequency 25-40 KHz. This high frequency has two advantages- 1) a small inductor is sufficient to limit the arc current. 2.) it eliminates the 100Hz flicker associated with a magnetic ballast. However the harmonic output is typically double or triple of that of magnetic ballast. Fig.35 shows the ballast current wave and harmonic spectrum of electronic ballast. Good quality electronic ballast are equipped with the passive filters to reduce input current harmonics.

22.3 Three phase power converters

Three phase power converters differ from single phase converters as they do not generate third harmonic currents .Most important use of 3 phase converters are in Adjustable Speed Drives (ASD). An ASD consists of an electronic power converter that converts ac voltage and frequency into variable voltage and frequency. The variable voltage allows the ASD to control motor speed to match the application requirement.

In an a.c ASD the rectifier output is inverted to produce a variable frequency a.c voltage for the motor. Inverters are classified as voltage source inverters (VSI) or current source inverters (CSI). A VSI requires a constant dc (low ripple)voltage input to the inverter stage. This is achieved with a capacitor or LC filter in the DC link. The CSI requires a constant current input, hence a series inductor is placed in the dc link. AC drives generally use squirrel cage induction motors.

Popular a.c drives use VSI employing PWM technique to synthesise an a.c waveform as a train of variable width d.c pulses (Fig 36). The rectifier feeds directly from a.c bus to a large capacitor on the d.c bus with little inductance, the capacitor is charged in very short pulses creating the distinctive rabbit ear shaped ac side current waveform with very high distortion as indicated by the spectrum in Fig (37). The merit of PWM drives is that, to control motor speed, it is not necessary to vary the rectifier output voltage. So rectifier thyristers can be replaced with diodes,thus eliminating the control circuitry. They also have best energy efficiency over wide range of speed.

CSI drives (Fig 38) have good acceleration /deceleration characteristics but require motor with leading p.f. The harmonic in a.c side current waveform is comparatively lesser than that of PWM type VSI drives (Fig 39).

22.4 Arc furnace and welding

The VI charecteristics of electric arcs are non-linear. After arc ignition, the voltage decreases as the arc current increases, limited only by the impedance of the system. This gives the arc a negative resistance characteristics over a portion of its operating cycle. In electric arc furnace, the limiting impedance is the furnace cable and leads with some contributions from the furnace transformer. The electric arc itself is a source of voltage harmonics. If a probe is placed across the arc, a trapezoidal waveform will be observed, the magnitude of which depends on length of the arc. However the impedance of the ballast or furnace leads acts as a buffer and the supply voltage is only moderately distorted. The arcing load thus appears as stable harmonic current source.

The harmonic content of the arc furnace load and the other arcing devices is similar to that of magnetic ballast. These phase arcing devices can be arranged to cancel the triplen harmonics through the transformer connection. However this cancellation may not work in three phase arc furnaces because of the frequent unbalanced operation during the melting phase. During the refining stage; when the arc is more constant, the cancellation is better.

23. HARMONIC ANALYSER

The process of splitting up a complex wave into fundamental and harmonics is called harmonic analysis. It involves the determination of amplitude and frequency of fundamental and harmonics. A harmonic analyser is an instrument used to measure the harmonic current in a complex wave. Harmonic analysis at power frequency can be made simply with a circuit set up shown in Fig40. D is a dynamometer wattmeter with centre zero. Its voltage is supplied with an analysing current from a variable frequency oscillator. The current being analysed is passed through the current coil. The voltage coil current is read by means of a thermal milli-ammeter A.

The oscillator is first tuned to the fundamental frequency of current being analysed. The wattmeter pointer deflects maximum when current waves in fixed and moving coils are at same frequency and in phase with one another. The maximum deflection now gives the r.m.s value of the fundamental.

Higher harmonics are measured similarly by tuning the oscillator to the appropriate harmonic frequency and measuring maximum swing. The analyzing current magnitude in the voltage coil is usually kept constant when doing analysis, because then the ratios of the maximum indications for the harmonics to that of the fundamental give the harmonic analysis directly.

25. HARMONIC INDICES

The most commonly used indices for measuring the harmonic content of a wave form are the Total Harmonic Distortion (THD) and the Total Demand Distortion(TDD). Both are measures of the effective value of a waveform and may be applied to either voltage or current.

A. Total Harmonic Distortion

It is a measure of the effective value of the harmonic components of a distorted waveform. It corresponds to the potential heating value of the harmonic relative to the fundamental

$$\mathrm{THD} = \frac{\sqrt{\sum_{n>1}^{h} \mathrm{Mn}^2}}{\mathrm{M1}}$$

Where M_n is the r.m.s value of n^{th} harmonic component of the quantity M., h is the maximum value of n and M_1 is the r.m.s value of fundamental.

THD index give a good idea of how much extra heat is realized when a distorted voltage waveform is across a resistive load. Thus it gives an indication of the additional losses caused by the current through a conductor. However it is not a good indicator of the voltage stress within a capacitor because that is related to the peak value of the voltage waveform, not the heating value.

THD index can be calculated for either voltage or current. But it is commonly used to describe voltage distortion. Harmonic voltages are referenced to the fundamental of the waveform at the time of the sample.Since the fundamental voltage varies only a few percent, the voltage THD is a meaningful number.

Variations in the THD over a period of time follows a pattern representing non-linear load activities in the system. Fig41 shows the voltage THD variation at 11kv distribution substation (transformer) supplying residential load over a one week period. High THD occurs at night and early morning as non linear loads are being used more during these hours.

B. Total Demand Distortion

When current distortion levels are characterised by THD index, it may give misleading observation. A small current may have a high THD but not a significant threat to the system. For example an ASD may have high THD for the input current when operating at very light loads. This is not a significant concern as the magnitude of harmonic current is low, even though its relative current distortion is high.

This difficulty can be avoided by referring THD to the fundamental of the peak demand load current rather than fundamental of the present sample. This is called Total Demand Distortion (TDD).

$$TDD = \frac{\sqrt{\sum_{n=2}^{h} In^2}}{I}$$

I_L is the peak demand load current at the fundamental frequency component measured at the point of common coupling. I_L can be calculated as the average of the maximum demand current for preceding 12 months. For a new facility, I_L is estimated based on the predicted load profile.

26.EFFECTS OF HARMONIC DISTORTION IN POWER SYSTEM

Harmonic current produced by nonlinear loads are injected back into the supply system. These currents interacts adversely with power system equipments such as capacitors, transformers, motors etc. causing additional losses,overheating and over loading. They also produce interference with telecommunication lines and errors in power metering. Let us see this in details.

A. Impact on capacitor bank

A shunt capacitor may form LC series circuit with inductance of distribution transformer or line. Resonance may occur in the LC combination. The impedance of the combination is very small and is approximately equal to resistance .The harmonic current corresponds to resonant frequency will flow freely in this circuit. The voltage at the capacitor is magnified and highly distorted. Thus a capacitor bank experiences high voltage distortion during resonance. The current through the capacitor bank is very high thus the RMS current is higher than the capacitor rms current rating.

B. Impact on transformers

Harmonic currents cause additional heating due to conductor losses. The eddy current losses in various conducting parts of a transformer such as core , windings, body etc. increase to very high value with harmonic induced currents since the eddy current loss is proportional to the square of frequency.So derating of the transformer capacity results.Otherwise transformer is required to be designed to handle higher frequencies using continuously transposed cable instead of a solid conductor and increasing number of cooling ducts.

C. Impact on motors

Harmonic voltages at the motor terminal is translated into harmonic fluxes within the motor. Harmonic fluxes do not contribute to motor torque but rotates at a frequency higher than the rotor synchronous frequency. These fluxes induce high frequency currents in the rotor causing additional losses. It results in decreased efficiency along with heating, vibration, noise etc.

D. Impact on telephone lines

Harmonic currents in power distribution line will creates interference in nearly telephone lines. Voltage induced in parallel conductors by harmonic currents may fall within the band width of voice communication. Tripler harmonics are severe in 4 wire 3 phase systems as they are in phase in all conductors of a 3 phase circuit and add directly in the neutral circuit which has greater exposure with the telephone circuits.

E. Impact on energy/demand meters

Harmonic currents from non-linear loads affect the accuracy of energy and demand meters adversely. Conventional energy meters involving magnetic disc have a negative error at harmonic frequencies. They register less power at harmonic frequencies; the meters already been calibrated for fundamental frequencies. However in most practical cases the voltage distortion is within the limits so that the error is small. Also modern electronic energy meters are more accurate which can be set to measure harmonic power also. However normally they are set to measure the fundamental power.

In demand metering the possibility of error is great. The metering error is the result of ignoring the portion of the apparent power that is due to harmonics . Thus the measured KVA demand will be less than actual .

Thus in general the errors in metering due to harmonic distortion cause benefit to the consumer.

27. CONTROLLING HARMONICS

In power system harmonic distortion normally exists. However controlling of harmonics is required when they becomes a problem to the system. The basic options for controlling harmonics are

1. Reduce the harmonic currents produced by the load.
2. Use filters to remove harmonics currents from the system or to block the harmonic currents from entering the system.
3. Modify the frequency response of the system by filters, inductor or capacitors

A . Reducing harmonic currents in loads

If a load equipment is working at its designed characteristics, significant reduction in harmonics could not be achieved by adjustments within the load. However if an equipment is misoperated or operated with deviations from design parameters; harmonics can be reduced by bringing the equipment to specified operating characteristics. An overexcited transformer can be made to operate normally by lowering the applied voltage to correct range.

Transformer connections can be used to reduce harmonic currents in 3 phase systems. Delta connected transformers can block the zero sequence harmonic currents from the line. Zigzag and grounding transformers can shunt the triplen harmonics of the line. In a 12-pulse converter using the two numbers of six pulse bridges, if the input to one of

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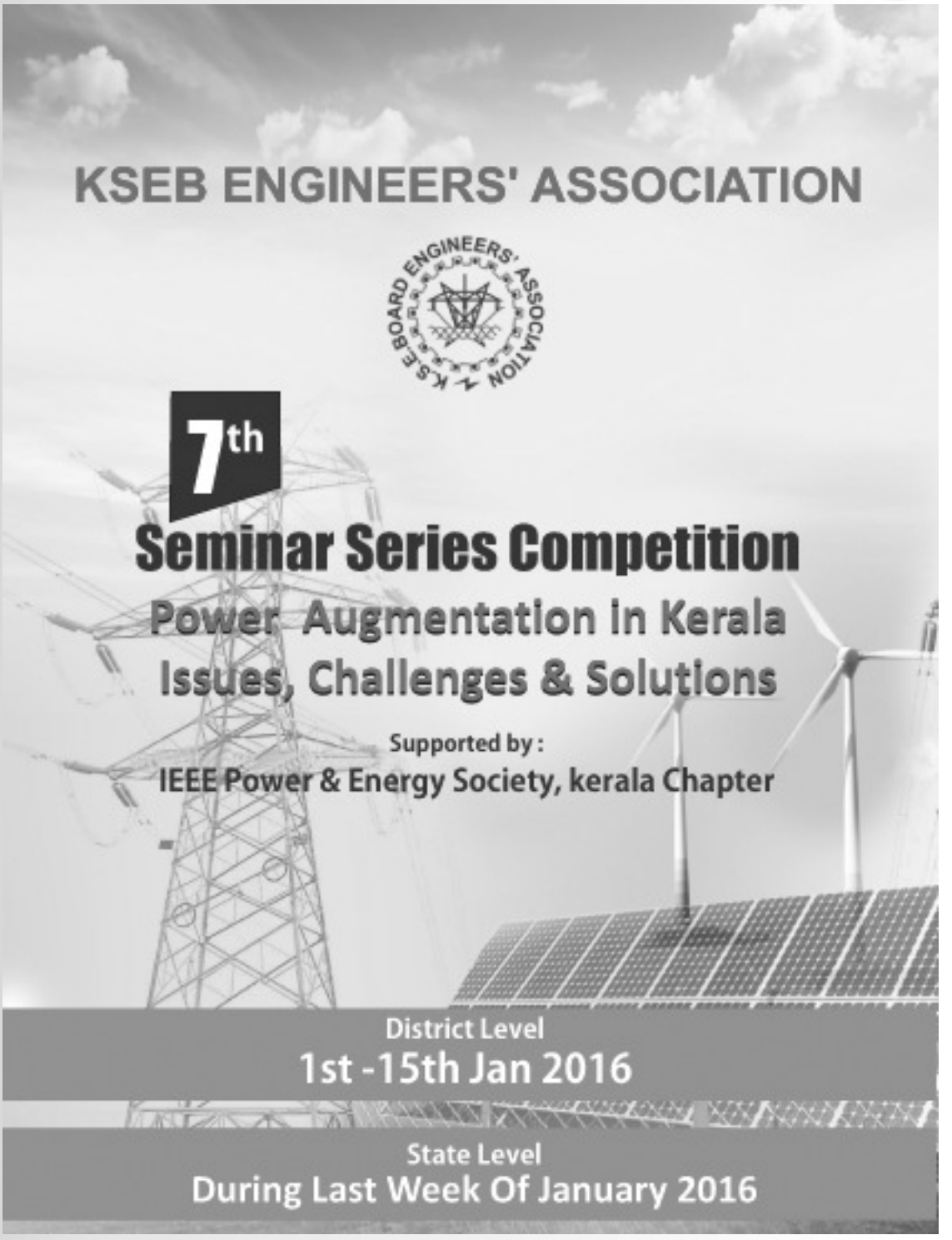
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District Level Presentation

The District Level Programme is scheduled during January 1st -15th, 2016.
Duration of the presentation shall be 20 minutes.
Two teams will be selected for the State level Presentation from each District.
Certificate of CEEBA will be distributed to all participants.

State Level Presentation

State Level Presentation will be conducted at Thiruvananthapuram in the last week of January 2016

1. Cash Award and Mementos to the Winners at State Level.
2. Sri. M.V. Jacob Memorial cash award for the best innovative and Implementable idea presented in the State level.

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(Director, CEEBA)

Er. E. Mohammed Shereef
(President)

Er. George Mathew
(General Secretary)

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bridge is phase shifted by 30° (by using star transformer for one bridge and delta transformer for the second), it will result in reduction of 5^{th} and 7^{th} harmonics

B . Filtering

Filters can be broadly classified as passive filters and active filters. Passive filters involve inductance, capacitance and resistive elements configured and tuned to control harmonics. Active filters work by electronically supplying the harmonic component of the current into a nonlinear load. Passive filters are economical and are commonly used, but their demerit is that they interact adversely with the system causing resonance. Passive filters may be configured as shunt filters , series filters or low pass broadband filters .

1. Passive filters

The shunt type is normally used.The most common type is single- tuned notch filter. This filter is series-tuned to have a low impedance to a particular harmonic content and is connected in shunt with the system. The harmonic currents are diverted from line through the filter .They also serve for power factor correction. Fig 42 (a) shows the single-tuned filter.

A series passive filter is connected in series with the load. The inductance and capacitance are connected in parallel and are tuned to provide a high impedance at a selected harmonic frequency so that flow of harmonic current at the tuned frequency only is blocked. The filter provides low impedance to the fundamental frequency. Fig 42(b) shows series filter. Series filters are useful in single phase circuits where it is not possible to take the advantages of zero sequence characteristics. They are also used in the neutral of a grounded star capacitor to block the triplen harmonic currents.

A shunt or series filter is tuned for a single frequency. So to block a range of harmonic frequencies multiple stage shunt or series filters are required; which are difficult and expensive. Hence low pass broadband filters are used to block widespread harmonic frequencies. It passes frequency components below the filter cut-off frequency f_c and blocks those above f_c. Fig 42(C) shows the diagram low-pass band filter.

2. Active filters

They are based on sophisticated power electronics and are much more expensive than passive filters. They have a distinct advantage that they do not resonate with the system. They work independently of the system impedance characteristics. They are used where passive filters are unsuccessful due to resonance problems. They can also handle more than one harmonic at a time and combat other power quality problems such the flicker. They are useful for large distorting loads fed from weak points on the power system. They are also useful for power factor correction.

Active filters work by supplying harmonic component of current into a non-linear load. The idea is to replace the portion of the sine wave that is missing in the nonlinear load. Fig 43 shows this idea. An electronic control monitors the line voltage/current, switching the power electronic circuit very precisely to track the load current or voltage and force it to sinusoidal form. For this an inductor is used to store the current to be injected into the system. Though the load current is distorted corresponding to nonlinear load, the current seen by the system is sinusoidal.

28. STANDARDS GOVERNING HARMONICS

There exist various international standards regarding harmonics. The objective of the standards is to provide a common platform for all the involved parties-manufacturers .utilities, consumers etc.-to work together to ensure compatibility between end-use equipment and the system equipment. The important standards governing harmonic limits are IEEE 519-1992, IEC 61000-2-2, IEC 61000-3-2, IEC 61000-3-4 and IEC 61000-3-6.

A. IEEE STANDARD 519-1992

Harmonic distortion is evaluated usually at a point between the costumer and the utility system where another customer can be served. This point is called the point of common coupling (PCC). The IEEE standard 519-1992 establishes harmonic current distortion limits at the PCC based on the size of the load with respect to the size of the power system, which is defined by its short circuit capacity. The short circuit ratio is the ratio of maximum short circuit current (I_{sc}) at the PCC to the maximum demand load current (fundamental) at the PCC. The philosophy behind this standard involve two facts-

1. It seeks to limit the harmonic injections from individual consumers so that they do not create unacceptable voltage distortion.
2. It seeks to limit overall harmonic distortion in the voltage supplied by the utility.

Thus the standard divides the responsibility for limiting harmonics between customers and the utility. Customers are responsible for limiting the harmonic current injections, while the utility is responsible for limiting the voltage distortion in supply system.

B. IEC 61000-2-2

IEC has defined a category electromagnetic compatibility (EMC), standards that deal with power quality issues. The term EMC includes concerns for both radiated and conducted interference with end-use equipment.

IEC 61000-2-2 defines compatibility levels for low frequency conducted disturbances and signalling in public low voltage power supply circuits such as 50 Hz single phase 240V and three phase 415 V systems.

C. IEC 61000-3-2

This standard define limits for harmonic current emission for equipments drawing input current up to 16A per phase. This standard is aimed at limiting harmonic emissions from equipments connected to the LV public network. So that compliance with the limits ensures that the voltage in the public network satisfies the compatibility limits defined in IEC 61000-2-2. This standard classifies equipment's into four categories.

Class A – Balanced 3 phase equipment

Class B – Portable Tools

Class C –Lighting equipment including dimming devices

Class D– Equipment with input current with a special wave shape and an active input power < 600 W.

D. IEC 61000-3-4

This standard define limits for harmonic current emission from equipment drawing input current larger than 16A and up to 75A per phase. The aim of this standard is same as that of IEC 61000-3-2.

E. IEC 61000-3-6

It defines limits of harmonic current emissions for equipment connected to MV(1 to 35KV) supply systems. A voltage higher than 230 KV is considered as EHV; while a voltage less than 1 KV is considered as LV. This standard specifies that emission limits for individual equipment connected to the MV and HV systems should be evaluated on voltage distortion basis. This is to ensure that harmonic current injections from harmonic producing equipment do not result in excess voltage distortion levels.

29. CONCLUSSION

Fourier was a pioneer in mathematical physics who made profound study of natural phenomena in mathematical terms. He developed the concept of splitting complex periodic functions into a series of sinusoidal terms with fundamental frequency and higher frequencies termed harmonics. This concept was known as Fourier's theorem and the mathematical series so obtained was referred to as Fourier series.Fourier coefficients in the series can be evauted by Eulers Formulas. If a periodic phenomena is represented as a graph or table the Fourier coefficients can be obtained as mean values. Fourier series can be effectively represented graphically as amplitude and phase spectrums. The observation of amplitude spectrum easily gives idea of harmonics content in a complex wave.

Fourier theorem is used largely in study of music and musical instruments. In fact the term harmonics comes from music. The tones produced by all natural instruments correspond to complex periodic waves; which can be split into sinusoidal components called partial tones as per Fourier theorem.It is also possible to combine different simple tones of various frequencies and amplitudes to create sound of various musical instruments, which is the concept of modern electronic synthesizers. Writing set of harmonics in musical notation results in a sequence of notes known as harmonic series which plays a crucial role in musical theory. It is from the harmonic series the fundamental musical intervals are derived.

Electrical engineering is the area where Fourier theorem finds it profound use, such as analysis of electrical circuits and power systems. The parameters of a complex electrical signal such as voltage , power, power factor etc. can be easily calculated by applying Fourier theorem. Harmonics in power circuits are caused by non-linear devices in power systems. Voltage harmonics and current harmonics are to be separately considered. Symmetrical components can be used to analyse system response to harmonic currents. In electrical systems odd harmonics are most common, Harmonic voltages are developed in alternators due to non-uniform distribution of flux in air gap; which can be reduced by various winding configurations and suitable shaping of slots. Harmonics in transformers are due to nonlinear magnetising characteristic of steel core. In fact it is from the consumer loads the harmonics are originated. The modern power electronic devices such as electronic lamp ballasts, switched mode power supplies, motor drives etc. are the major ones. The most common indices to measure harmonics are Total harmonic distortion (THD) and total demand distortion (TDD). Harmonics in power system adversely affects capacitor banks, transformers, motors, energy meters, telecom lines etc. Harmonics can be controlled using suitable transformer connections and by using passive/active filters. Various standards governing harmonics have been developed by IEEE and IEC in connection with the controlling of harmonics.

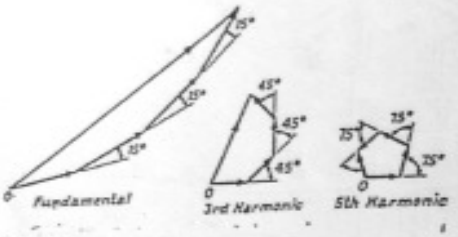


Fig. 26 Vector sum of voltages for fundamental and harmonics for distributed winding.

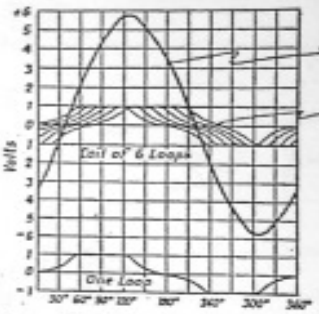


Fig. 27. Voltage induced in each loop and total voltage of multiturn distributed coil.

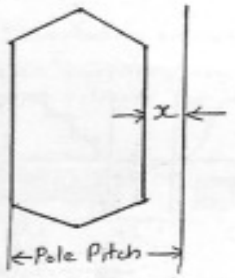


Fig. 28. A Short Chord winding

Fig. 29. Different Types of Stator Slots

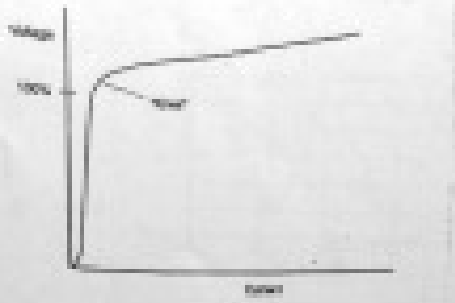


Fig 30 Transformer magnetizing characteristic

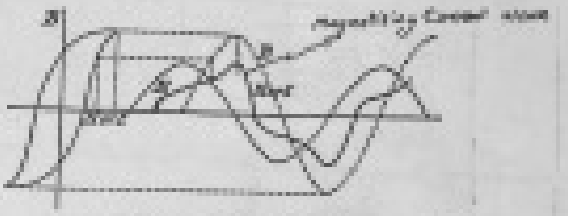


Fig 31 Magnetizing waveforms of Transformers

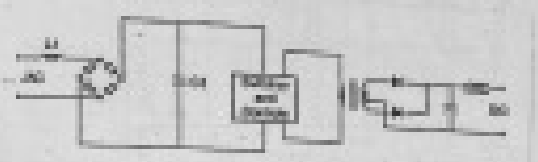


Fig 32

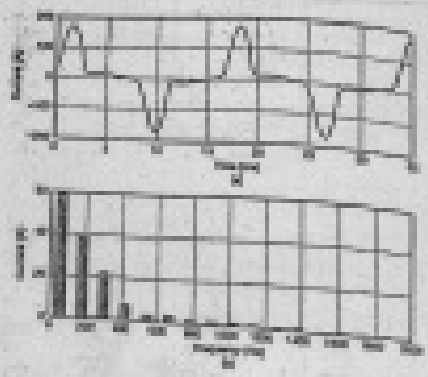


Fig 33 Simple circuit and harmonic spectrum

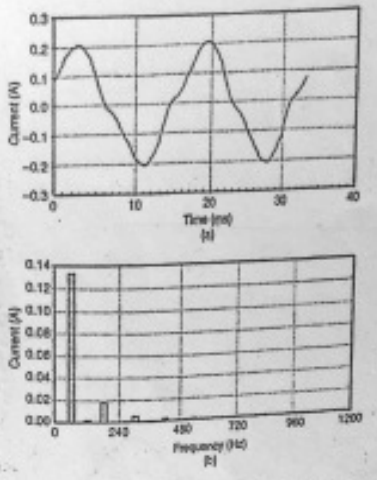


Fig 34 Flourescent lamp magnetic ballast current and harmonic spectrum

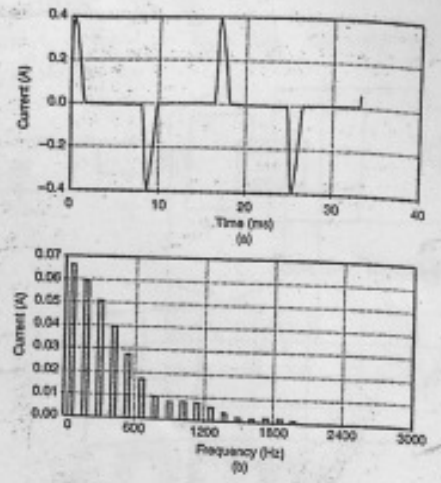


Fig 35 Flourescent lamp electronic ballast current and harmonic spectrum

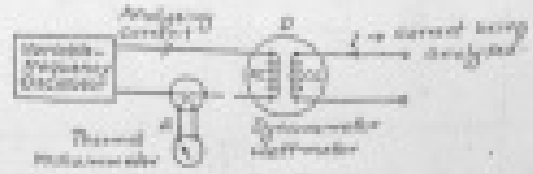


Fig. 4a. Basic Harmonic Analyser

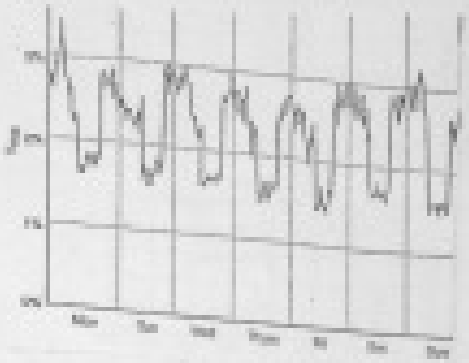
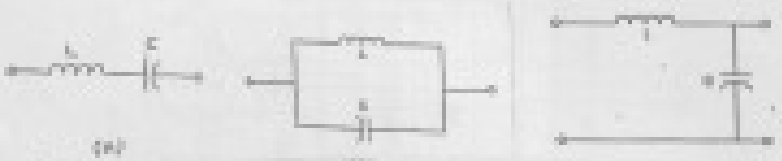


Fig 4b. Voltage THD at 11kv Distribution Transformer for 1 week -



(a) Single Tuned (b) Second order (c) Low pass broadband

Fig 4c. Various passive filter configurations

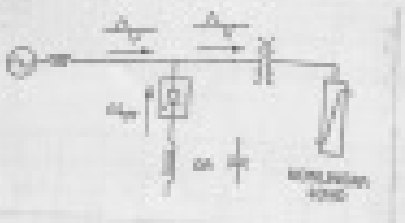


Fig 4d Active filter connected at a load -

നേപ്പാൾ സമസ്യ

Er. രാജൻ വി.

നമ്മുടെ വടക്കൻ ഹിമാലയൻ അയൽ രാജ്യമായ നേപ്പാൾ കുറെ നാളായി പല പ്രതിസന്ധികളിൽകൂടിക്കടന്നു പോകുകയാണ്. ആദ്യമായി, കൊട്ടാരവിപ്ലവത്തിൽ രാജകുടുംബം ഏതാണ്ട് മുഴുവനായി കൊല്ലപ്പെട്ടു. അങ്ങനെ ഭരണം രണ്ടാംതലമുറ രാജാവിന്റെ കൈകളിലായി. അദ്ദേഹത്തിനും കുടുംബത്തിനും ജനപിന്തുണ വളരെ കുറവായിരുന്നു. അങ്ങനെ നേരത്തെ തന്നെ ജനങ്ങളിൽ മോശമല്ലാത്ത സ്വാധീനമുണ്ടായിരുന്ന മാവോയിസ്റ്റുകൾ രാജാവിനെതിരെ സായുധ സമരം തുടങ്ങി. പിന്നാലെ നേപ്പാളി കോൺഗ്രസ്സ് മറ്റ് പാർട്ടികളും കൂടി ഇതിൽ പങ്കുചേരുകയും ചെയ്തു. ഇതിനെതിരെ പിടിച്ചുനില്ക്കാൻ സാധിക്കാതെ രാജാവ് പൊതു തിരഞ്ഞെടുപ്പിന് വഴങ്ങി. പിന്നാലെ നടന്ന തിരഞ്ഞെടുപ്പിൽ, ചിട്ടയായ പ്രവർത്തനത്തിലൂടെ ഏതാണ്ട് കേഡർ പാർട്ടിയായ മാവോയിസ്റ്റുകൾ ഏറ്റവും വലിയ കക്ഷിയായി. അങ്ങനെ അതിന്റെ നേതാവായ പ്രചണ്ഡ (പുഷ്പകുമാർ ദഹൽ) പ്രധാനമന്ത്രിയായി അധികാരമേറ്റു. മാവോ പ്രബോധനങ്ങൾക്ക് അനുസരിച്ചായിരുന്നു ഭരണം. രാജഭരണത്തിൽ കഴിഞ്ഞിരുന്ന ജനങ്ങൾക്ക് ഈ ഭരണരീതിയോട് അത്ര താല്പര്യമില്ലാതായി. അതിന്റെ ബലത്തിൽ പ്രതിപക്ഷം, പ്രധാനകക്ഷിയായ നേപ്പാളി കോൺഗ്രസ്സിന്റെ നേതൃത്വത്തിൽ ഗവൺമെന്റിനെതിരെ സമരം തുടങ്ങി. ഇതിനിടക്ക് അവിടത്തെ കാര്യത്തിൽ ചൈനയും ഇന്ത്യയും അനാവശ്യമായി ഇടപെട്ട് പ്രശ്നങ്ങൾ ഉണ്ടാക്കുന്നെന്നുള്ള പരാതി ജനത്തിനുണ്ടായിരുന്നു. മാവോയിസ്റ്റ് പാർട്ടിയുടെ റെഡ് വാളന്റിയേഴ്സിനെ പട്ടാളത്തിലെടുക്കുന്ന പ്രശ്നത്തിൽ ഉടക്കി ഗവൺമെന്റ് വെളിയിലായി. പിന്നാലെ പ്രതിപക്ഷം മന്ത്രിസഭ ഉണ്ടാക്കി. അപ്പോഴും റെഡ് വാളന്റിയേഴ്സ് പ്രശ്നം രൂക്ഷമായി നിലനിന്നു. ഇവിടെ ഒരുകാര്യം പ്രത്യേകം ശ്രദ്ധിക്കണം, നേപ്പാളിലെ ഉയർന്ന സ്ഥാനങ്ങളിൽ ഇരിക്കുന്ന പല ഉദ്യോഗസ്ഥരും ഇന്ത്യയിൽ പഠനം നടത്തിയവരായിരുന്നു. അത് കാരണം മാവോയിസ്റ്റുകൾക്കും ചൈനക്കും, നേപ്പാളിലെ രാഷ്ട്രീയത്തിലുള്ള ഇന്ത്യയുടെ താല്പര്യത്തിൽ പല സംശയങ്ങളും ഉണ്ടായിരുന്നു. അന്നത്തെ റോയൽ നേപ്പാൾ ആർമിയുടെ തലവൻ ഇന്ത്യയിൽ ജനിച്ച ഒരാളായിരുന്നു. അദ്ദേഹത്തിന്റെ കടുംപിടിത്തമാണ് വാളന്റിയേഴ്സിനെ പട്ടാളത്തിൽ എടുക്കുന്നതിന് വലിയ തടസമായിരുന്നതും. ഇതിനിടക്ക് പല മന്ത്രിസഭകൾ വന്നു; അവസാനം ഒരു ഭരണ ഘടന എഴുതി ഉണ്ടാക്കാനായി ഒരു കമ്മിറ്റി, എല്ലാ പാർട്ടികളും യോജിച്ച് രൂപീകരിച്ചു. അതിനൊരു നിശ്ചിത സമയവും തീരുമാനിച്ചു. അത് പല പ്രാവശ്യം മാറ്റി. ഹിന്ദു രാജ്യമായി നിലനില്ക്കണോ (ജനങ്ങളിൽ അധികം ഹിന്ദുമതവിശ്വാസികളാണ്), അതൊ ജനാധിപത്യ മതേതര രാജ്യമാകണോ എന്നതായിരുന്നു പ്രധാന തർക്കം. ഇതിനിടയ്ക്ക് ഇവിടെ കേന്ദ്രത്തിൽ ഭരണമാറ്റം ഉണ്ടായല്ലൊ. അതും അവിടത്തെ പ്രശ്നങ്ങൾ വഷളാകാൻ കാരണമായി. അവസാനം നേപ്പാൾ ജനാധിപത്യ മതേതര രാജ്യമായി പ്രഖ്യാപിക്കാൻ ഭരണ ഘടന നിർമ്മാണ കമ്മിറ്റി തീരുമാനിച്ചു. ആ തീരുമാനത്തോട് അനുബന്ധിച്ച് എടുത്ത ചില തീരുമാനങ്ങളിൽ രാജ്യത്തെ ജാതിശ്രേണിയിൽ താഴെ തട്ടിലുള്ള വിഭാഗങ്ങൾ അസംതൃപ്തരായിരുന്നു.

ഈ സമയത്താണ് അവിടെ 8.5 ശേഷിയുള്ള ഒരു ഭൂകമ്പം ഉണ്ടായത്. ഇത്രയും ശേഷിയുള്ള ഒരു പ്രകൃതി ദുരന്തത്തിൽ നാശനഷ്ടങ്ങളുടെ കണക്ക് തിട്ടപ്പെടുത്താൻ എളുപ്പമല്ലല്ലൊ. അയൽ രാജ്യമെന്നുള്ള നിലയിൽ ഇന്ത്യ എല്ലാ സഹായവും നല്കി. കൂട്ടത്തിൽ സർവ്വവ്യാപിയായ നമ്മുടെ മാധ്യമങ്ങളും, വിശേഷിച്ചും ചാനലുകളും ഇതിന്റെ കൂടെക്കൂടി. പട്ടാളക്കാരെ പേടിച്ചിട്ട് അവരുടെ കൂടെയും മാധ്യമങ്ങൾപ്പോയിരുന്നു. (ഇതിൽ അവസാനം അങ്ങോട്ടും ഇങ്ങോട്ടും മുതലെടുക്കാനുള്ള

ശ്രമങ്ങളായിരുന്നു നടന്നത്). നമ്മുടെ മാധ്യമങ്ങൾ, സാധാരണപോലെ, കഴുകൻ കണ്ണുകളുമായി തന്നെയാണ് ജനത്തിന്റെ യാതനകൾ റിപ്പോർട്ട് ചെയ്തത്. അതുകൊണ്ട് തന്നെ ഒരാഴ്ച കഴിഞ്ഞപ്പോഴേക്കും മാധ്യമങ്ങളെയും പട്ടാളത്തേയും അവിടെ നിന്നും വെളിയിലാക്കി. ഇത്രയും നാണംകെട്ട സമീപനം നമുക്ക് ഒരിക്കലും ഉണ്ടായിട്ടില്ല. പക്ഷെ നമ്മുടെ മാധ്യമങ്ങൾക്ക് ഇതൊന്നും ഒരു പ്രശ്നമെയല്ല. നേപ്പാൾ ലോക സഹായം കൊണ്ട് ഈ പ്രതിസന്ധിയിൽ നിന്നും പതിയെ കരകയറുന്നുണ്ട്.

അപ്പോഴാണ് വീണ്ടും അംഗീകരിച്ച ഭരണ ഘടനക്ക് എതിരെ എതിർപ്പ് വരുന്നത്. അവിടെ ബ്രാഹ്മണരും ക്ഷത്രിയരും മറ്റ് ഉയർന്ന ജാതികളും കൂടി ഏതാണ്ട് 30% വരും. ഇവരാണ് പ്രധാന രാഷ്ട്രീയ പാർട്ടികളിലെ നേതാക്കളും ഭരണം കയ്യാളുന്നവരും. അവിടത്തെ തനി പൂർവ്വികരെന്നു പറയുന്ന ഏതാണ്ട് 50% വരുന്ന ജനജാതികൾ (പട്ടിക വർഗ്ഗം), ദളിതർ, മാദേശികൾ എന്നിവർ പണ്ട് കാലം മുതലെ അടിച്ചമർത്തപ്പെട്ട വിഭാഗങ്ങളാണ്. ഇവർ പൊതുവെ നമ്മുടെ വടക്കെ അതിർത്തിയുമായി ചേർന്നു കിടക്കുന്ന ഭാഗങ്ങളിലാണ് കേന്ദ്രീകരിച്ചിരിക്കുന്നത്. എന്ന് വച്ചാൽ ബീഹാറിന്റെയും യു.പി.യുടെയും അയൽ വാസികളാണിവർ. ഇതിൽ മാദേശികൾ ഇന്ത്യക്കാരുമായി ധാരാളം വിവാഹബന്ധവും സ്ഥാപിച്ചിട്ടുണ്ട്. കൂടാതെ ഈ പ്രദേശത്ത് കൂടിയാണ് ഇന്ത്യയിൽ നിന്നും നേപ്പാളിലേക്കുള്ള സാധനങ്ങളും ഉല്പന്നങ്ങളും കൊണ്ട് പോകുന്നത്. അതിൽ പ്രധാനം പെട്രോളിയം ഉല്പന്നങ്ങളാണ്.

ഈ പ്രദേശത്തുകാരായ,നേരത്തെ പറഞ്ഞ താഴ്ന്ന ജാതികൾക്ക് പുതിയ ഭരണ ഘടനപ്രകാരം പ്രത്യേകിച്ചൊരു അധികാരവും അവകാശവുമില്ല എന്നതിന് പുറമെ അവരെ പല പ്രാദേശിക വിഭാഗങ്ങളായി വേർതിരിക്കുകയും ചെയ്തു. ഇതവരുടെ ഐഡന്റിറ്റിതന്നെ ഇല്ലാതാക്കാനുള്ള ശ്രമമായിട്ടാണ് അവർ വിശ്വസിക്കുന്നത്. ഇവരെ ഒരു എതിർപ്പിന്റെ വക്കിൽ എത്തിക്കരുതെന്ന് ഇന്ത്യ അധികാരികളെ ഉപദേശിച്ചിരുന്നു. അത് ഗൗരവമായി കണ്ടില്ല.

ഈ സാഹചര്യത്തിലാണ് നേരത്തെ പറഞ്ഞ താഴ്ന്ന ജാതിക്കാർ റോഡ് ഗതാഗതം തടഞ്ഞ് സമരം തുടങ്ങിയത്. ഇത് എല്ലാ രാജ്യത്തുമുള്ള പ്രശ്നമാണല്ലൊ. അത്കൊണ്ടും നേരത്തെ പറഞ്ഞ കാര്യങ്ങൾ കൊണ്ടും നമുക്ക് അവിടെ കാര്യമായ രീതിയിൽ ഇടപെടാൻ സാധിച്ചില്ല, സാധിക്കുന്നില്ല. അതിനാൽ നേപ്പാളിൽ എല്ലാ സാധനങ്ങൾക്കും ക്ഷാമമാണ്, പ്രത്യേകിച്ചും ഇന്ധന എണ്ണകൾ. സമരം ശക്തമായി തുടരുകയാണ്. സാധനങ്ങൾ അയക്കാൻ ഇന്ത്യൻ വ്യാപാരികൾ തയ്യാറാണ്. പക്ഷെ ഉപരോധവും ശക്തമാണ്. അത് കാരണം നേപ്പാൾ ചൈനയിൽ നിന്നും ഇന്ധനം ലഭ്യമാക്കുന്നുണ്ട്. നമ്മോടു നേപ്പാളികൾക്കിടയിൽ നേരത്തെ ഉണ്ടായിരുന്ന ഈർഷ്യ ഈ സംഭവത്തോടെ വളരെ വർദ്ധിച്ചു. നമുക്ക് ഈ പ്രത്യേക സാഹചര്യത്തിൽ കാര്യമായ ഇടപെടൽ നടത്താനും സാധിക്കുന്നില്ല. സാധനങ്ങൾ നിറച്ച ലോറികൾ നമ്മുടെ ഭാഗത്ത് യാത്രക്ക് തയ്യാറായി നില്ക്കുന്നുണ്ട്. പക്ഷെ സമരം ശക്തമായി തുടരുന്നതിനാൽ ഒന്നും ചെയ്യാൻ സാധിക്കുന്നില്ല. ഇന്ത്യ വെറുതെ പഴികേൾക്കുകയാണ്. നമ്മുടെ പ്രതിപക്ഷം ഇക്കാര്യത്തിൽ ഉത്തരവാദിത്വത്തോടെയുള്ള സമീപനമാണ് ഇതുവരെ എടുത്തിട്ടുള്ളത്. അത് തന്നെ തുടരുന്നതാണ് തല്ക്കാലം രാജ്യത്തിന് നല്ലത്. മാധ്യമങ്ങൾ, നേരത്തെ പറഞ്ഞ കാര്യം കാരണം, ഏതാണ്ട് ഈ വിഷയത്തിൽ മൗനം ദീക്ഷിക്കുകയാണ്. വിവരങ്ങൾ ജനത്തെ സത്യസന്ധമായി അറിയിക്കുകയെന്നുള്ളതാണ് പത്ര മാധ്യമ ധർമ്മം. അത് ചെയ്യാതിരിക്കുന്നതിന് ഒരു ന്യായീകരണവും പറയാൻ സാധിക്കില്ല.

ഇന്നിപ്പോഴറിയുന്നത് (24-ാം തീയതി) നേപ്പാൾ സർക്കാർ ഈ വിഭാഗത്തിന്റെ ആവശ്യങ്ങൾ ഏതാണ്ട് അംഗീകരിക്കാൻ തയ്യാറായെന്നാണ്. അടുത്ത ദിവസങ്ങളിൽ കൂടുതൽ വിവരങ്ങളറിയാം.

❖

വിധിയുടെ ക്രൂരത

എച്ച്. പാൽരാജ്

ഉച്ചയൂണിന് വേണ്ടി ക്യാന്റീൻ ഹാളിൽ കാത്തിരിക്കുകയായിരുന്നു സുകുമാരൻ. തന്റെ മീൽസ് ക്യാരിയർ ഇതുവരെ എത്തിയിട്ടില്ലായിരുന്നു. സുഹൃത്ത് ശേഖരൻ അപ്പോൾ അവന്റെ അടുത്ത് വന്നിരുന്നു.

ശേഖരൻ : "എന്താ സുകുമാരാ ? എന്തോ വല്യ ആലോചനയിലാണെന്നു തോന്നുന്നു ?

സുകുമാരൻ : ഒന്നുമില്ല, ജോലിക്കാരി ഇതുവരെ ആഹാരം കൊണ്ടുവന്നില്ല. അതിനു വേണ്ടി കാത്തിരിക്കുകയാണ്. റോഡിൽ ബ്ലോക്കായിരിക്കും എന്നു തോന്നുന്നു. അതാ വൈകുന്നത് ?

ശേഖരൻ : "അതിനെന്താ ? എന്റെ കയ്യിൽ ലഞ്ച് കൂപ്പൺ ഉണ്ട്. ക്യാന്റീനിൽ നിന്നു കഴിച്ചോ".

"അതുവേണ്ട ശേഖരാ. ഞാൻ പുറത്ത് നിന്നും ഒന്നും കഴിക്കില്ല എന്ന് നിനക്കറിയാമല്ലോ ?"

''ശരി ഞാൻ കഴിക്കുന്നതിനു വിരോധം ഒന്നുമില്ലല്ലോ".

" ഒരു വിരോധവുമില്ല. ജോലിക്കാരി ഇപ്പോ വരും. നീ കഴിച്ചോ" എന്നു പറഞ്ഞതും ജോലിക്കാരി ഉച്ചയൂണുമായി വന്നതും ഒന്നിച്ചായിരുന്നു. ജോലിക്കാരി വൈകിയതിന്റെ കാരണം അന്വേഷിക്കുകയായിരുന്നു സുകുമാരൻ.

''സാറെ എന്റെ അച്ഛന്റെ പതിവ് നെഞ്ചുവേദന പിന്നേയും വന്നു. ഹോസ്പിറ്റലിൽ കാണിക്കാൻ പോയതുകൊണ്ട് വരാൻ വൈകി. രണ്ടുദിവസം അഡ്മിറ്റ് ചെയ്യണമെന്നാണ് ഡോക്ടർ പറയുന്നത് ".

എയ്ഡ്സ് രോഗ നിർമ്മാർജ്ജനത്തിന്റെയും ബോധവൽക്കരണത്തിന്റെയും ഫീൽഡ് വർക്കാണ് സുകുമാരന്റെ ജോലി. രാവിലെ വീട്ടിൽ നിന്നും തിരിച്ചാൽ രാത്രി വൈകിയേ വീട്ടിൽ തിരിച്ചെത്താറുള്ളു. ആത്മാർത്ഥതയുള്ള ജോലിക്കാരനാണ് സുകുമാരൻ. ജോലിയെ ദൈവമായി കരുതുന്നവൻ.

ഫീൽഡ് വർക്ക് ഇല്ലാത്ത ദിവസം ഉച്ചയൂണ് ഓഫീസ് ക്യാന്റീനിൽ വരും. ജോലിക്കാര്യത്തിൽ തന്റെ മേലുദ്യോഗസ്ഥരും കീഴുദ്യോഗസ്ഥരും ഒരുപോലെ മതിപ്പായിരുന്നു. എല്ലാവരോടും സ്വന്തം കുടുംബാംഗത്തെ പോലെയാണ് സുകുമാരൻ പെരുമാറുന്നത്.

"എന്താ സുകുമാര താൻ ഓഫീസ് ജോലികൾ സ്വന്തം തറവാട്ടുകാര്യം പോലെയാണല്ലോ നോക്കുന്നത്. അതിന്റെ ആവശ്യം വല്ലതുമുണ്ടോ എന്ന് എന്നെങ്കിലും ചിന്തിച്ചിട്ടുണ്ടോ ? അതോ നിനക്ക് പ്രത്യേക ലാഭം വല്ലതും കിട്ടുന്നുണ്ടോ ?".

"അല്ല, ലാഭനഷ്ടം നോക്കാൻ ഇത് കച്ചവടമാണോ ? കിട്ടുന്ന ശമ്പളത്തിന് ആത്മാർത്ഥമായി ജോലി ചെയ്യുന്നു, അത്രതന്നെ. മാത്രമല്ല ആരോഗ്യവകുപ്പ് കൈകാര്യം ചെയ്യുന്ന നാം കർത്തവ്യം മറക്കരുത്. പലരുടെയും ജീവിതം കൊണ്ടാണോ നാം കളിക്കുന്നത് ?

''പ്രസംഗിക്കാൻ വരട്ടെ. നമ്മുടെ ഡിപ്പാർട്ട്മെന്റിൽ ജോലി ചെയ്താലും ഇല്ലേലും ശമ്പളം കിട്ടും. ഒഴുക്കിനൊത്ത് നീന്തുന്നതാ ബുദ്ധി. വെറുതേ ഒഴുക്കിനെതിരെ നീന്തി സമയം കളയാതെ സുകുമാരാ. അല്ല, ഞാൻ ഒരു കാര്യം ചോദിക്കട്ടെ, ഇങ്ങനെ രാപകൽ ജോലി ചെയ്ത് നിനക്ക് വല്ലതും സംഭവിച്ചാൽ ഒരു റീത്ത് വച്ച് ഡിപ്പാർട്ട്മെന്റ് തൃപ്തിപ്പെടും. അതിനുശേഷം ആരും നിന്റെ കുടുംബത്തെ തിരിഞ്ഞുനോക്കുകപോലും ഇല്ല. ഇതുപോലെ എത്ര പേരെ കണ്ടതാ ഞാൻ. അതിനുമുമ്പ് വല്ല 'തരികിടയും ചെയ്ത് രക്ഷപ്പെടാൻ നോക്ക്. നീ, കേറി പോകുന്നത് വേശ്യകളുടെ താവളത്തിലേക്കാണ്, പലരും എയ്ഡസ് ബാധിതർ. അത് നീ മറക്കരുത്'.

"ജീവിതത്തിൽ ഒരു ലക്ഷ്യം വേണം. അതിൽ എത്തിച്ചേരാൻ കഠിനമായി അദ്ധ്വാനിക്കുകയും വേണം. അതിനുവേണ്ടി ജീവൻ ഹോമിക്കേണ്ടി വന്നാൽ അതും ധന്യമായി തന്നെ ഞാൻ കരുതും. നിങ്ങൾക്ക് ഞാൻ ഗുണം പിടിക്കാത്തവനാണെന്നു തോന്നാം. പക്ഷേ എന്റെ ജീവിത കഥ കേട്ടാൽ ചിലപ്പോൾ നിങ്ങളുടെ സംശയം മാറും.

ഞാൻ ഒരു മിഡിൽക്ലാസ് ഫാമിലിയിലാണ് ജനിച്ചത്. ഞാൻ താലോലിച്ച് വളർത്തിയ എന്റെ ഇളയ സഹോദരി അവളുടെ പതിനേഴാം വയസ്സിൽ എയ്ഡ്സ് രോഗത്തിനു കീഴടങ്ങി മരിച്ചു. അവൾക്ക് ഈ എയ്ഡ്സ് രോഗം എങ്ങനെ ഉണ്ടായി ? എല്ലാം വിധി എന്നു കരുതി സമാധാനിക്കാനാകുമോ?.

എന്റെ അച്ഛൻ ദുബായിൽ ജോലി ചെയ്യുകയായിരുന്നു. ഒരു ദുശ്ശീലവും ഇല്ലാത്തയാൾ. ഞങ്ങളെ അമ്മ വളരെ ഓമനിച്ചാണ് വളർത്തിയിരുന്നത്. നാട്ടുകാരെ മുഴുവൻ ഞെട്ടിക്കുന്ന രീതിയിൽ എന്റെ സോഹദരിയുടെ കല്യാണം നടത്താനായിരുന്നു ഞങ്ങളുടെ ആഗ്രഹം. പക്ഷേ ദൈവത്തിന്റെ തീരുമാനം മറ്റൊന്നായിരുന്നു. വർഷങ്ങൾക്ക് ശേഷമാണ് അച്ഛനിലൂടെയായിരുന്നു സഹോദരിക്ക് അസുഖം വന്നതെന്ന് മനസ്സിലായത്.

സഹോദരി ജനിക്കുന്നതിന് മുമ്പ് അച്ഛൻ ഗൾഫിൽ നിന്നും ലീവ് കിട്ടി നാട്ടിലേക്ക് വരുകയായിരുന്നു. ബോംബെയിൽ നിന്നും അടുത്ത വിമാനത്തിലാണ് ഇവിടെ വരേണ്ടത്. അതും പിറ്റേ ദിവസം. അങ്ങനെ ബോംബെയിൽ ഒരു സലൂണിൽ ഷേവ് ചെയ്യാൻ പോയിരുന്നു. കടയിൽ തിരക്കായിരുന്നതിനാൽ അടുത്ത് ഒരു കസേരയിട്ട് ഒരാൾ ഷേവ് ചെയ്തു. അപ്പോൾ അച്ഛനു ചെറുതായി ഒന്നു മുറിഞ്ഞു. അത് കാര്യമാക്കാതെ അച്ഛൻ അവിടെ നിന്നു തിരിച്ച് നാട്ടിലെത്തി.

ലീവ് കഴിഞ്ഞ് അച്ഛൻ മടങ്ങുമ്പോൾ അമ്മ ഗർഭിണിയായിരുന്നു. താമസിക്കാതെ അനുജത്തി ജനിച്ചു. കുംഭമാസം മകം നക്ഷത്രം. ഞങ്ങളുടെ കുടുംബ ദൈവം മായാദേവിയെ പോലെ സുന്ദരിയും അതീവ ബുദ്ധിമതിയുമായിരുന്നു അവൾ. ഞങ്ങൾ അവൾക്ക് മായ എന്ന പേരു നൽകി. അങ്ങനെയിരിക്കെ ഒരു ദിവസം അവൾ മയങ്ങി വീണു. ഉടനെ ആശുപത്രയിൽ എത്തിച്ചു. രക്തം പരിശോധിച്ചപ്പോൾ എയ്ഡ്സ് രോഗമുള്ളതായി അറിയാൻ കഴിഞ്ഞു. അധികം താമസിയാതെ അവൾ ഞങ്ങളെ വിട്ടുപിരിഞ്ഞു. പിന്നാലെ അച്ഛനും അമ്മയും.

അന്ന് എനിക്ക് മുപ്പത്തിരണ്ട് വയസ്സ്. എന്റെ കഥ അറിയാവുന്ന ആരും എനിക്ക് വിവാഹാലോചനയുമായി വന്നില്ല. അപ്പോൾ എന്റെ ഒരു സുഹൃത്ത് അവന്റെ സഹോദരി വത്സലയെ എനിക്ക് വിവാഹം ചെയ്തു തരാൻ തയ്യാറായി. ഞങ്ങൾക്ക് ഒരു ആൺകുഞ്ഞും ജനിച്ചു. അതിനുശേഷം എയ്ഡ്സ് രോഗികളെ ശുശ്രൂഷിക്കാൻ എന്റെ ജീവിതം ഞാൻ ഉഴിഞ്ഞു വച്ചു.

തെറ്റായ മാർഗ്ഗത്തിൽ ജീവിക്കുന്നവർ മാത്രമല്ല, അശ്രദ്ധകൊണ്ടും എയ്ഡ്സ് രോഗാണുക്കൾ നമ്മളെ ബാധിക്കാൻ സാധ്യതയുണ്ട് എന്ന് പൊതുജനങ്ങളിൽ ബോധവൽക്കരണം ഉണ്ടാക്കേണ്ട ചുമതല നമുക്കുണ്ട്.എന്റെ ഭാര്യയും അതിനു പ്രോൽസാഹിപ്പിക്കുന്നുണ്ട്.

എന്റെ അച്ഛൻ, അമ്മ, സഹോദരിയുടെ മരണ കാരണം അന്വേഷിക്കാൻ തുടങ്ങിയതാണ് ഈ ദൗത്യത്തിലേക്ക് എന്നെ കൊണ്ടെത്തിച്ചത്. അച്ഛൻ അശ്രദ്ധയോടെ ബോംബെയിൽ ഷേവ് ചെയ്തതിലൂടെയാണ് ഞങ്ങളുടെ കുടുംബത്തിന് എയ്ഡസ് രോഗം വന്നതെന്ന് വളരെ വൈകിയാണ് എനിക്ക് മനസ്സിലായത്.

നിശ്ശബ്ദനായി കഥ കേട്ടുകൊണ്ടിരുന്ന ശേഖരൻ സുകുമാരനെ ഒരു അസാധാരണ മനുഷ്യനായി മാത്രമേ കണ്ടിരുന്നു. ഇതുപോലെ അസാധാരണ വ്യക്തികൾ തന്റെ കർമ്മം ദൈവത്തിന് ചെയ്യുന്ന സേവനമായി കരുതുന്നവർ നാടിന് ആവശ്യമാണ്. ഈ സത്യം നമ്മിൽ എത്രപേർ തിരിച്ചറിയുന്നു. !...

❖.

ഞാൻ നല്ല 'നടി'യായതെങ്ങിനെ?

കെ.പി. ഗോപാലകൃഷ്ണൻ
(ഡെപ്യൂട്ടി ചീഫ് എൻജിനിയർ (റിട്ട.)

1963 എഞ്ചിനീയറിംഗ് കോളേജ് മെൻസ് ഹോസ്റ്റൽ ഡേ. ഗാനമേള, നാടകം പ്രധാന പരിപാടികൾ. നാടകത്തിൽ സ്ത്രീവേഷം കെട്ടാൻ ആരും തയ്യാറല്ല. ഓമനിച്ചുവളർത്തുന്ന മീശ എടുത്തുകളയണം. പരശുവാണ് കൂട്ടത്തിൽ ഏറ്റവും സുന്ദരൻ. സ്ത്രീവേഷം കെട്ടിയാൽ ലേഡീസ് ഹോസ്റ്റലിലെ സുന്ദരികൾ അസൂയപ്പെട്ടുപോകും. പക്ഷെ പരശു വഴങ്ങുന്നില്ല. ഒടുവിൽ നറുക്കുവീണത് എനിക്കും മീശ വയ്ക്കാത്ത പണിക്കർക്കും. കൂട്ടുകാരുടെ നിർബ്ബന്ധത്തിന് വഴങ്ങാതെ വയ്യ; ഞാനാണ് മുഖ്യസംഘാടകൻ. മേയ്ക്കപ്പ്മാൻ തിരുവല്ലാ രാജൻ. മേയ്ക്കപ്പ് കഴിഞ്ഞ് കണ്ണാടിയിൽ നോക്കിയപ്പോൾ അതിശയിച്ചുപോയി. ഇത് ഞാൻ തന്നെയോ? ഈ വേഷത്തിൽ ലേഡീസ് ഹോസ്റ്റലിൽ ചെന്നുകയറിയാൽ ആരും സംശയിക്കില്ല. പക്ഷെ നെഞ്ചോടുചേർത്ത് വരിഞ്ഞുകെട്ടിയിരിക്കുന്ന 'സാധനം' ശ്വാസം മുട്ടിക്കുന്നു. അല്പം അയച്ചുകെട്ടാൻ രാജനോട് പറഞ്ഞു.

"അയ്യോ ചതിക്കല്ലേ; സ്റ്റേജിൽ വച്ചെങ്ങാനും അഴിഞ്ഞുവീണാൽ ആകെ അലമ്പാകും, നാണക്കേടാകും, കാണികൾ കൂവും. കുറച്ചുനേരത്തേക്കല്ലേയുള്ളൂ; സഹിക്കുക, മാത്രമല്ല പരന്നനെഞ്ചുമായി സ്റ്റേജിൽ ചെന്നാൽ ഈ സൗന്ദര്യം മുഴുവൻ പോകും."

"നാടകം കഴിഞ്ഞിട്ട് മേയ്ക്കപ്പ് അഴിച്ചുവച്ചിട്ടേ പുറത്തിറങ്ങി നടക്കാവൂ; പീഡനങ്ങളുടെ കാലമാണ്"

തമ്പിയുടെ മുന്നറിയിപ്പ്.

"ഉഗ്രൻ... ആയിരിക്കുന്നു", റിച്ചാർഡ്സ് സാറിന്റെ കമന്റും. നാടകം തകർത്താടി. ഭർത്താവ് ഉപേക്ഷിച്ചുപോകാൻ തുടങ്ങുമ്പോൾ കാലിൽ വീണ് കരഞ്ഞപേക്ഷിക്കണം. കണ്ണുനീർ കുടുകുടാ പൊഴിക്കണം. രംഗം കഴിഞ്ഞ് അണിയറയിലേക്ക്. ശിവകുമാർ അടുത്തെത്തി.

"കൺഗ്രാജുലേഷൻസ്. കലക്കി; അഭിനന്ദനങ്ങൾ"

"എന്താ ഞങ്ങളുടെ കൂടെ പോരുന്നോ; ഹോസ്റ്റലിലേക്ക്, ആരും സംശയിക്കില്ല. എന്റെ ഗസ്റ്റായിരുന്ന സൂസന്റെ ക്ഷണം."

"വേണ്ട, വേണ്ട, അങ്ങനിപ്പം സുഖിക്കേണ്ടാ."

അവസാനം ഫലപ്രഖ്യാപനം, ഏറ്റവും നല്ല നടി 'കെ.പി. ഗോപാലകൃഷ്ണൻ!' കണ്ണിൽപുരട്ടിയ ഗ്ലിസറിന്റെ നീറ്റൽ പോകാൻ രണ്ടുദിവസം വേണ്ടിവന്നു.

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രണ്ടാമൂഴം, പൊരിങ്ങൽക്കൂത്ത് റിക്രിയേഷൻ ക്ലബ്ബിൽവച്ച്. ക്ലബ്ബ് വാർഷികത്തോടനുബന്ധിച്ച് സ്റ്റാഫിന്റെ ഒരു നാടകം കളിക്കുകപതിവാണ്. പ്രധാന ഇനം കാളിദാസ കലാകേന്ദ്രത്തിന്റെ 'യമുന' എന്ന നാടകമാണ്. ഞങ്ങളുടെ നാടകം ആരംഭിച്ചു. എനിക്ക് വീണ്ടും സ്ത്രീവേഷം. കമ്മത്ത് സാർ കുടുംബനാഥൻ. ഞാൻ ഭാര്യ. ഞങ്ങളുടെ സംഭാഷണത്തിനിടയിൽ യു.പി. വർഗ്ഗീസ് വന്നു കയറണം. ഞങ്ങൾക്ക് പറയാനുള്ളതെല്ലാം പറഞ്ഞുകഴിഞ്ഞിട്ടും വർഗ്ഗീസിനെ കാണുന്നില്ല. ഒന്നും പറയാതെ സ്റ്റേജ് നിശ്ചലമായി നിന്നാൽ കാണികൾ ബോറടിക്കും; കൂവി കലക്കും. സന്ദർഭത്തിനൊത്ത് ഉയർന്നേ കഴിയൂ. കുറെയൊക്കെ മനോധർമ്മം പ്രയോഗിച്ചുനോക്കി. കമ്മത്തും നല്ല മനോധർമ്മമുള്ള ആളാണ്.രണ്ടുപേരുടെയും സ്റ്റോക്ക് തീർന്നു. പെട്ടെന്നൊരു ഉൾവിളി.

"അയ്യോ, പാൽ അടുപ്പത്ത് വച്ചിട്ടാണ് പോന്നത്; തിളച്ചു തൂവിക്കാണും; നോക്കീട്ടു

വരാം." ഞാൻ സ്റ്റേജിന് പുറകിലേക്ക്. കമ്മത്ത് അസ്വസ്ഥനായമട്ടിൽ സ്റ്റേജിൽ അങ്ങോട്ടുമിങ്ങോട്ടും നടന്നു.

സ്റ്റേജിന് പുറകിലെത്തിയപ്പോൾ വർഗ്ഗീസ് മേയ്ക്കപ്പ് ചെയ്തുകൊണ്ടിരിക്കുന്നതേയുള്ളൂ. കാളിദാസ കലാകേന്ദ്രത്തിലെ കലായ്ക്കൽ കുമാരനും അണിയറയിൽ മേയ്ക്കപ്പ് ചെയ്തുകൊണ്ടിരിക്കയാണ്. വിവരം അദ്ദേഹത്തോടു പറഞ്ഞു.

"അനിയൻ സ്റ്റേജിലേക്ക് പൊയ്ക്കോളൂ. രണ്ടു മൂന്നു മിനിറ്റുനേരം എന്തെങ്കിലുമൊക്കെ പറഞ്ഞ് സമയം കളയണം. വർഗ്ഗീസിനെ അപ്പോഴേക്കുമങ്ങു പറഞ്ഞുവിടാം."

നേരേ സ്റ്റേജിലെത്തി.

"ഞാൻ ചെന്നിരുന്നില്ലെങ്കിൽ പാലാകെതിളച്ചുതൂവിപോകുമായിരുന്നു."

കമ്മത്തും സന്ദർഭത്തിനൊത്തുയർന്നു.

"ആ കുരങ്ങനെ ഇതുവരെ കണ്ടില്ലല്ലോ; എവിടെ പോയി കിടക്കുന്നോ; എട്ടുമണിക്ക് എത്താമെന്ന് പറഞ്ഞതാണ്. എട്ട് പതിനഞ്ചായിരിക്കുന്നു. കൃത്യനിഷ്ഠയില്ലാത്ത ശവം!" അപ്പോഴേക്കും വർഗ്ഗീസുമെത്തി.

"എവിടെ കിടക്കുവാരുന്നെടാ കെഴങ്ങാ?"

"ഇതുകേട്ടാൽ എന്റെ കുഴപ്പമാണെന്നു തോന്നുമല്ലോ. പോരുന്ന വഴിയിൽ ഒരു കൂട്ടം കഴുതകൾ വഴിമുടക്കിനിൽക്കുന്നു. അതിനെ ഉപദ്രവിച്ചാൽ തൊഴികിട്ടിയതുതന്നെ. എന്തുപാടുപെട്ടാണ് ഇപ്പോഴെങ്കിലുമെത്തിയത്."

"നിനക്കും അക്കൂട്ടത്തിൽ കൂടാമായിരുന്നു."

ഏകദേശം 15 മിനിറ്റുനേരം സ്ക്രിപ്റ്റിലില്ലാത്ത സംഭാഷണങ്ങൾ. കാളിദാസ കലാകേന്ദ്രത്തിന്റെ എല്ലാമായ ഒ. മാധവൻ, വിജയകുമാരി, വർഗ്ഗീസ് തിട്ടേൻ എന്നിവർ കാണികളായിരിപ്പുണ്ട്. അവരാണ് വിധികർത്താക്കൾ. നാടകം തീർന്നു. നീണ്ടുനിന്ന കയ്യടി. സദസ്യർ മുഷിഞ്ഞതേയില്ല. അവസാനം ഫലപ്രഖ്യാപനം.

ഏറ്റവും നല്ല നടി കെ.പി. ഗോപാലകൃഷ്ണൻ

ഏറ്റവും നല്ല നടൻ മധുരനാഥ കമ്മത്ത്

ഏറ്റവും നല്ല ഹാസ്യനടൻ യു. പി. വർഗ്ഗീസ്

വല്ലാത്ത അഭിമാനവും സന്തോഷവും തോന്നിയ നിമിഷങ്ങൾ. നന്ദി പറയാനായി ഒ. മാധവന്റെ അടുക്കലെത്തി.

"മൂന്നുപേരും നന്നായി അഭിനയിച്ചു. സ്ക്രിപ്റ്റിൽ ഇല്ലാത്ത സംഭാഷണങ്ങളാണ് നിങ്ങൾ നടത്തുന്നതെന്ന് കാണികൾക്ക് മനസ്സിലായതേയില്ല. പക്ഷെ ഞങ്ങൾക്കത് അപ്പോൾ തന്നെ മനസ്സിലായി.

'യമുന' നാടകം കഴിഞ്ഞു. രാത്രി ഐ. ബി.യിൽ ക്യാമ്പ്. രാവിലെ യാത്രയാക്കാൻ ഞങ്ങൾ ഐ.ബി.യിൽ എത്തി.

"മൂന്നുപേരുമുണ്ടല്ലോ. എന്താ കാളിദാസ കലാകേന്ദ്രത്തിലേക്കു പോരുന്നോ?" ഒരു മഹാനടനിൽ നിന്നു കിട്ടിയ അഭിനന്ദനവാക്കുകൾ.

വർഷങ്ങൾക്കുശേഷം കൊല്ലം മീറ്റർ കമ്പനിയിൽ എം.ഡി. ആയി എത്തുമ്പോൾ താമസിച്ചത് ഒ. മാധവന്റെ അയൽവാസിയായി. മൂകേഷും സന്ധ്യയുമൊക്കെ സ്കൂളിൽ പഠിക്കുന്നതേയുള്ളൂ. പഴയ 'പൊരിങ്ങൻപുരാണം' പറഞ്ഞപ്പോൾ, കൂടുതൽ സൗഹാർദ്ദപുരസ്സരം എന്നെ വീട്ടിലേക്കു ക്ഷണിച്ചു. കൊല്ലത്തുനിന്നു പോരുന്നതുവരെ ആ സൗഹൃദം തുടർന്നു.

അദ്ദേഹത്തിന്റെ വേർപാട് മലയാളനാടകരംഗത്തിന് നികത്താനാവാത്ത ഒരു നഷ്ടമായി ഇന്നും അവശേഷിക്കുന്നു.

❖

Er.James M.David, Chief Engineer,Transmission (North)
being honoured at the GB Meeting held on 21-11-2015

Technical session on "Laying of 110 kV UG Cable-Standards & Practices"
by Er.Varun V.R during Kollam unit meeting.

Kollam unit conducted a session on Energy conservation at Younus College
of Engineering, Kollam on 29.10.2015. Er.Syed Ali handled the session.

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