The future of illumination

Light Emitting Diodes

- **In the beginning, God created the earth.**

He divided time into day & night.

He made the sun to light up the day

For the night, there was the moon,

but only for half the nights

…and left the rest for the humans to light

up- ---------- using their brains!

- So, man took up the challenge.
- He found a blessing in fire and tamed it .
- He lighted up his dark nights by burning wood and animal fat.
- This went on for centuries till two brilliant inventions came about –
  - electricity and light bulb.
- Light bulb gave light by resisting the flow of electricity in a conductor in an inert atmosphere, thereby heating the conductor to incandescence.

- He made the

  Fluorescent tube,

  which generated radiations in the invisible region within the tube using mercury & argon and converting it to visible light by fluorescence.
- Starting high voltage was supplied by choke &starter.

- Fluorescent tube was not the perfect answer.
  - It started hesitantly,
  - Had stroboscopic effect,
  - Used harmful mercury
  - Suffered from low power factor &
  - Gave 60 lumens of light /watt of electricity used.
- To overcome these shortcomings, came what many thought as panacea ---------

Compact Fluorescent lamp or CFL

- They started instantly, were small & cute looking and had improved efficiency – about 80 lumens per watt

- Due to growing energy consumption and depleting energy resources, soon this efficiency was considered low.
- Due to harmful effects of mercury, CFLs are environment unfriendly.
- They too suffer from low power factor.

In the meantime, other light sources using similar technologies were developed :-

Sodium Vapor lamps

and

Mercury vapor lamps.

- These too suffer from problems:
  - –in color rendition
  - –hazardous material contents
  - –Low power factor and efficiencies of 80 lumens/watt
  - –Maintenance prone

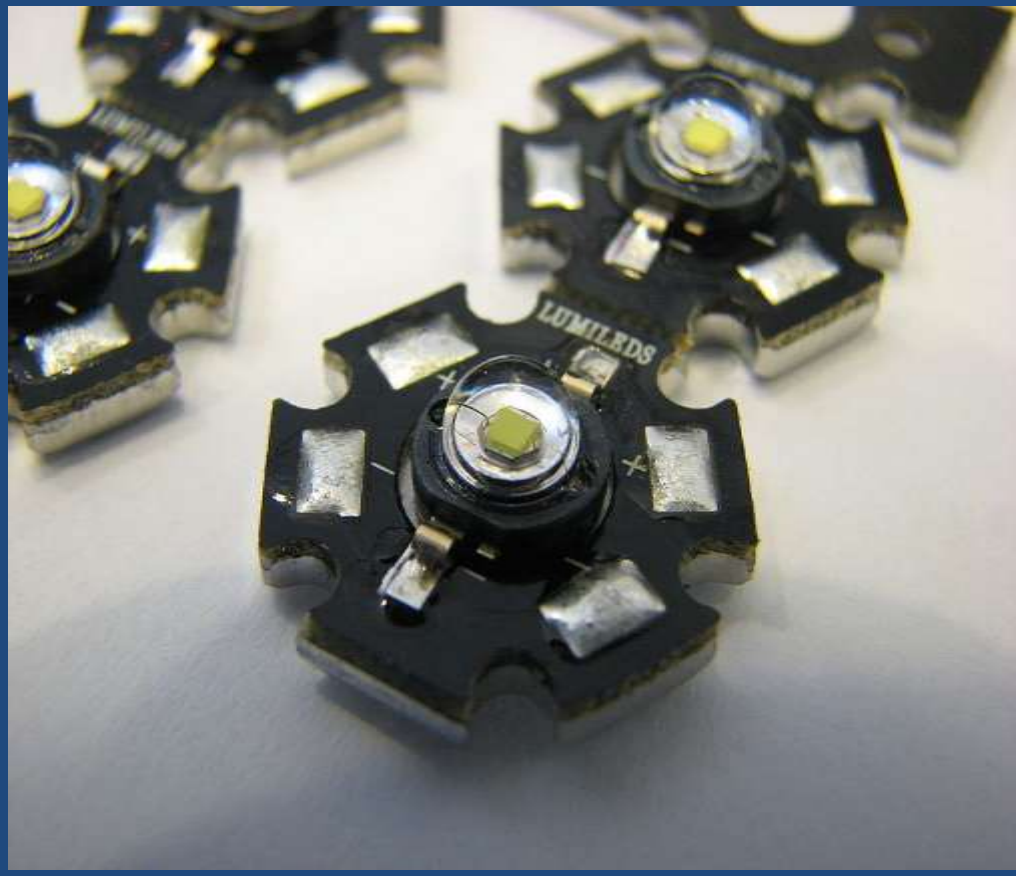
  And then--- came a solution from a new technology –

Semiconductor electronics.

- Diodes are devices which allow current to flow in one direction easily, but resist the flow when current direction is reversed.
- They are made of semiconductor in two halves- both doped with different impurities such that one has extra electrons and other is deficient.
- When voltage in the right direction is applied, excess electrons flow to the junction and “fill up the deficiencies on the other side, causing current flow.
- With certain semiconductors, this also gives out “PHOTONS” – or light in a certain wavelength, which can be focused.
- This is the working principle of:--

Light Emitting Diodes

- They work at relatively high efficiencies – 90-120 lumens / watt,
- Work is on to get 300 lumens/watt in near future



- They however require low d.c. voltage (≈3.8 V) and constant current source.
- They need to operate at junction temperature of less than 75 degrees Centigrade,
- Their life in these conditions is ≈ 50,000 hours.
- This long life and low power consumption more than compensates for the high initial cost.
- This a new area of technology, and cheaper materials are being tried out to make L.E.D.s cheaper and more efficient.
- By changing the materials, it is possible to get light in different pure or combination colors.

- The components of L.E.D. luminaires are :-
  - Light emitting diodes, arranged in series and parallel, depending on the driver used
  - A power driver to convert A.C. into D.C. voltage in multiples of the voltage required by LEDs
  - A heat sink to dissipate the heat generated by the LEDs, thus enhancing its life
  - Luminiare to give the desired spread of light to suit the requirement on the working surface or floor.
  - Protection from dust, moisture, insects etc. when needed.

- Ansh Resources is a very young company, probably the only one of the very few in Eastern India and certainly the first in Chhattisgarh to have come out with lighting solutions using this technology.
- We have won the prestigious order from CREDA for supply of LED bulbs for a project sponsored by Bureau of Energy Efficiency.
- We also make other indoor, outdoor and industrial lights, suitable for a vast range of applications.
- We also provide customized lighting solutions.
- We shall now present our products and their comparison with other lights.

Calculation of Return on Investment due to replacement of 70 w lamp by 12 w LED luminiare for application in conveyor belt gallery illumination

Particulars	70 w Sodium Vapor lamp	12 w LED luminiare
Energy used/yr @12 hr/ day	80x12x365= 350KW h/year	12 x12x365=53 KW h/ year
Cost of Energy @ Rs.4/-	350 x 4 = Rs.1400 / year	53x4= Rs.210/- per year
Lamp life @ 12 hrs./day	6000 hrs life =1.5 yrs	50,000 hrs = 11.5 yrs
Replacement of SV lamp during 1 LED's lifetime	= 7.7 replacements in 11.5 yrs	No replacement in 11.5 years
Initial cost per unit	Rs. 1,500/- (net)	Rs.5,500 /- (net)
Life Time Replacement Cost	1,500x7.7 = Rs.11,550.00	0
Total life Time Cost= initial cost +replacement cost+ energy cost during 11.5 yrs	11550+1400x11.5=27,650/-	5,500 + 2,415 = 7,915/-
Lifetime saving on 1 LED		27,650-7,915 = Rs.19,735/-
Saving per year on 1 LED		Rs.1,716 /- per year
Return on investment		31 %

Note: ROI will increase with increase in power tariff & increase of SV lamp cost.