

INSIDE

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- Cabling our Customers!
- Fundamentals of Cable Designing.... contd.



**Taking New strides...
Within and beyond
boundaries!**

FROM THE ED'S DESK

My dear friends,

The financial year 2010-11 has brought mixed fortunes-while the economy continues to grow @8%+, inflation & commodity prices have spoiled the party!

Our business too has grown to revenues of over Rs.500 crs, for the first time in our history! Of course, this was aided, partly, due to the commodity price increases. We are especially proud of our growth in the Telecom Cables business where revenues have grown threefold and we have a footprint in 15 countries.

We continue to take rapid steps in our capacity enhancement with the completion of the ground breaking at our Greenfield facility in Vadodara for a State-of-the art 220 kV power cables plant.

Our team in RPG Cables is fully committed to serving the exacting requirements of our valued customers by delivering quality products on time. Do send us a line to share your experience with our products.

Best Wishes for FY 2011-12 !!!

Sincerely,

Nikhil Gupta

"At RPG Cables, we believe in the artful combination of technology with operational excellence, to deliver you, our customers, confidence on performance, reliability and value."



CABLES DESIGN FUNDAMENTALS...contd

In the previous issues of C2C (December 2010), we had covered this subject in some detail. If you have missed this issue, do write to us for your copy.

INSULATION RESISTANCE

Insulation resistance is the resistance to the passage of direct current through the dielectric between two electrodes. In the case of an electric cable it is the value of the resistance between the conductor and the earthed core screen, metallic sheath, armour or adjacent conductors.

CAPACITANCE

The cable may be single-core cable with an earthed metallic layer around the core, or 3-core cable with an earthed metallic screen around each core. In both cases, the electrostatic field is contained within the earthed screen and is substantially radial. The capacitance depends upon relative permittivity which is a characteristic of the insulation material and is dependent on temperature and frequency. Generally, the capacitance is referred as either the nominal capacitance per core or the nominal star capacitance.

DIELECTRIC POWER FACTOR (DIELECTRIC LOSS ANGLE)

The power factor of the dielectric of cable goes down as the voltage grade of cable goes up. It is the ratio of loss in dielectric (watt) to the product of voltage & current. When a voltage is applied to a cable with a 'perfect' dielectric, a charging current flows which is in leading quadrature with the voltage. In such a 'perfect' dielectric there would be no component of charging current in phase voltages. However, in actual condition perfection in dielectrics can not be achieved and there is a small current which is in phase voltage. This current causes losses in the dielectric which generate heat. The losses in the dielectric are proportional to the cosine of the angle between the resultant current and applied voltage. The dielectric power factor of a cable is frequently referred as $\tan \delta$ where δ is known as the dielectric loss angle (DLA). Hence it is the cable manufacturing expertise that the dielectric loss angle must be kept to an absolute minimum to achieve low dielectric losses. This can be confirmed by testing the power factor of the cable in discrete voltage steps within the voltage range of $0.5U_0$ - $2U_0$, where U_0 is

voltage between conductor and earth. Such a test gives information on the ionisation which takes place in the insulation as it increases with increase in applied voltage.

ELECTRICAL STRESS DISTRIBUTION

The flux distribution in cable insulation is complex. The stress is a maximum at the conductor surface and varies throughout the insulation and decreases with the distance away from the conductor surface. It can not happen in clearly defined manner because of the differing permittivities of the components and the distribution of the flux at various times during the voltage phase rotation.

In case of unscreened cores, the stranded conductors gives a slight unevenness of stress distribution around the periphery because of the small radius of the individual wires. To overcome the disturbed stress problem, the screen is used to have a clearly defined stress pattern where a screened core consists of a cylindrical capacitor with the conductor as the inner electrode and the insulation screen as the outer electrode. As the permittivity of the dielectric is substantially constant throughout the operating temperature range of the cable, the stress distribution remains constant at all operating conditions.

FIELD CONTROL IN CABLES

For most normal applications, therefore, cables always have circular cores with the combination of conductor screen, insulation and insulation screen which are produced in one production process to ensure a composite extrusion without voids at the insulation surfaces. The main functional element of the insulated core in both semiconducting layers are in intimate contact with the insulation which results in less partial discharge, which further avoids premature cable failure.

As a result, the electric field in these cables is kept within a homogeneous dielectric and has a radial pattern. In order to provide a continuous earth reference for the



semiconducting insulation screen and to carry the charging currents through out the cable length, a layer of copper tape is applied over the insulation screen.

SOURCES OF ELECTRICAL LOSSES

A cable consists of three basic components, namely the conductor, the dielectric and the outer metallic layer. When the cable is energised and carrying load, heat is generated by each of these components, which must get dissipated to the surrounding medium.

During power transmission, the distribution of current is not evenly disposed throughout the cross-section of the conductor. This is due to the skin effect and the proximity effect of conductor construction and leads to conductor losses which are Ohmic losses.

The dielectric losses are proportional to the capacitance, the frequency, the phase voltage and the power factor. The loss component of the power factor is due to -

- (a) leakage current flowing through the dielectric which is independent of frequency
- (b) dielectric hysteresis,
- (c) ionisation, i.e. partial discharge in the dielectric.

The power factor of the cable insulation is dependent on frequency, temperature and applied voltage and is very low up to 33 kV operating voltage. Therefore, the dielectric losses are also less in comparison with conductor losses. However, for cables above 33 kV, the dielectric losses goes up rapidly with voltage and affects the current carrying capacity of the cable. Therefore specialized expertise is required to design cables above 33 kV.

When cables carry current, the magnetic field is generated which induces e.m.f.s in the sheath of the cable and also in the sheaths of surrounding cables. Such induced emfs result into two types of sheath losses i.e. sheath eddy current loss and sheath circuit loss. Eddy currents are induced by the current or currents in the conductors of the cables in close proximity to the sheath. The integral of such currents over the sheath cross-section is zero. These eddy currents are independent of the type of sheath bonding and decrease with the

distance between the cables. For lead sheathed cables these losses are normally small compared with conductor losses, but are considerably higher with aluminium sheathed cables when they are in close proximity. When the sheath of cable is bonded to earth or to other sheaths at more than one point, a current flows in the sheath due to the e.m.f. induced by the conductor current like 'transformer' action. This is because the sheath and return path, to which each end of the sheath is bonded, form a closed loop which is cut by the flux associated with the current in the conductor. The magnitude of the flux which cuts the sheath is dependent on the size of the loop which, in turn, is dependent on the spacing between the cables or between the sheath and the mean return path of the current through the earth or other medium. The heat generated by losses in the conductor, the dielectric, the sheath and armour has to pass to the surrounding medium, which may be the ground, air, duct, trench or some other material. As the current carrying capacity of an electric cable is normally dictated by the maximum temperature of the conductor, the components of the cable, in addition to meeting the electrical requirements, must also have as low a thermal resistivity as possible to ensure that the heat can be dissipated efficiently.

Ref : BICC Handbook

For further details or discussion on the subject, please do write to us at sanyalb@kecrpg.com
Tel.No. 022 2173 1704.



TELECOM...GOING GLOBAL!

RPG Cable's Telecom business at its Mysore plant has recently developed and exported Optic fiber cables and copper telecom cables of various types and construction to several international customers.

CABLES FOR USE IN FTTH (FIBER TO THE HOME) NETWORK:

Apart from the regular design of underground cables meant for direct burial and laying in ducts, the Company has designed, manufactured and exported Optic fiber cable for FTTH network. The design (ref drawing 6719) is compact facilitating easy installation even in cramped places and conduits. The design has been well accepted by the customer in Europe and repeat orders have been received and executed in the recent past. Further compact designs are being explored and we are looking forward to actively participate in the FTTH cable market in the coming days.

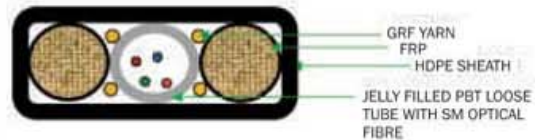
Figure 8 Cable constructions for both Optic fiber and Copper aerial cable has now become a regular product for export. The Company has recently received an order or \$5.5 Million for export of Copper Telecom Cables from Sri Lanka, largely Fig 8 Aerial type. The Optic fiber cable with Fig 8 Design has been developed for both Unitube and Multitube construction and is also being exported to various countries. (dwg. 6661 and 6669)

ADSS (All dielectric Self Supporting) Optic fiber cables orders were received from various countries and the same have been produced to suit aerial deployment, with varying span lengths and exported successfully. Designs are available for cable suitable for span length varying from 40 mtrs to 400 mtrs.

Composite cables (combination of SM G 655 + SM G 652 D) with 12 Loose tubes design have been developed with LSZH sheath and exported for use in African Markets. Dwg Reference 6672.

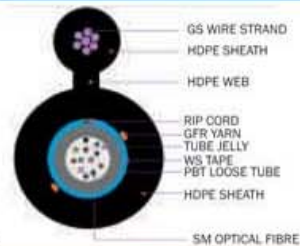
The Company is constantly striving to develop new designs, tailor made packing lengths and also catering to smaller requirements of regular customers in India and abroad.

4F SM FTTH CENTRAL TUBE - OPTICAL FIBRE CABLE



drawing 6719

12F SM UNITUBE - FIG 8 - OPTICAL FIBRE CABLE



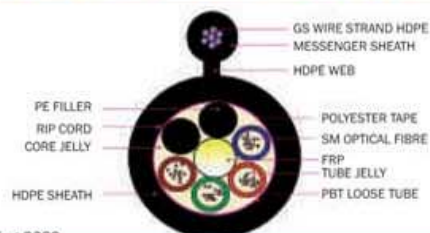
drawing 6661

88F+8F SM COMPOSITE UNARMOURD DRY CORE LSZH SHEATH OPTICAL FIBRE CABLE



drawing 6672

48F SM FIG-8 AERIAL OPTICAL FIBRE CABLE



drawing 6669



CABLING OUR CUSTOMERS!

At RPG Cables "Customer is the King". This mantra is very much compelling whether it's the external, or the internal customer employees!

We all had a memorable night on the 2nd of April 2011 at Wankhede Stadium. The Indian Cricket team won the World Cup after long 28 years! And guess what, we had the fortune to actively participate and support the historical event too! We provided the stadium with LT Cables through L&T LTD. ECC DIV.

Below is the excerpt from the appreciation mail that RPG Cables received from the L&T, Wankhede Site Manager, Mr. Dinesh V. Kakatkar.

Well, that's for our external customers!

We also had our round of appreciation from our internal Customers as well! The Employee Engagement Survey results for the last financial results are out! And what's even more rewarding is that not just for FY 2010-11, but for the past 3 years, we have been continuously achieving the highest score in the RPG Group!

The employee engagement survey which is conducted annually by an independent professional firm, and is based on having primarily 3 key employee behaviours-Strive, Say and Stay. As per this model Employee Engagement is defined as the extent to which an employee feels committed to an organisation and achieving its stated or unstated objectives. Along with these 3 behaviour indicators, the survey also collates feedback on the 11 other drivers. Our belief is that engaged employees go that extra mile to support our valued Customer!

Subject: Thanks to All
Dear All,

Heartily congratulations to you all for winning the world cup by our team india.

This message is to, say thanks to all our wankhede site team members and also to those who had given their valuable contribution and co-operation throughout the project, our vendors and to all sub-contractors and also to those who supported us morally for making this site Historical and memorable. We all know, We have created a history and all the memories are already engraved in everybody's heart. One thing to tell you all without you people, it would have never been possible to bring this great day in our life. We have shown to our criticsers

"KISIKA NAAM KHARAB KARNE SE KISKA KAAM KHARAB NAHI HOTA....."

THANKS TO EVERYONE FOR ALL YOUR SUPPORT AND CO-OPERATION.

CHEERS TO L & T !!!

- Proud to be L & T 'ite DINESH V. KAKATKAR

Electrical-Section

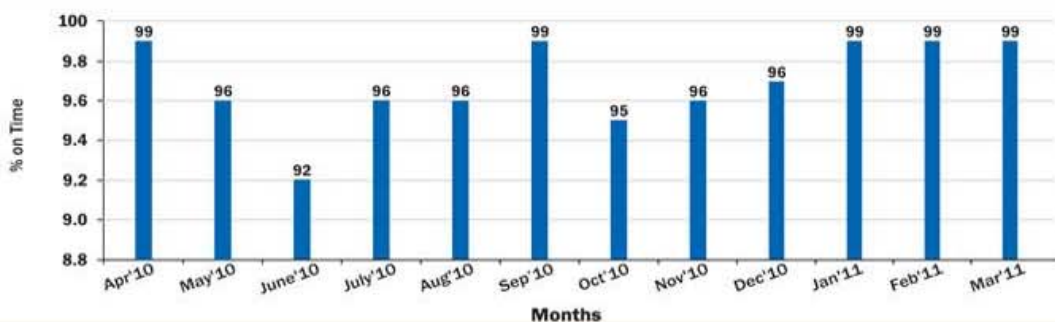
L & T LTD.

ECC DIV.

Wankhede-Site

Churchgate-mumbai

Delivery Rating Index (DRI)





FROM THE NEWS DESK

BHOOMI PUJAN OF THE NEW MANUFACTURING FACILITY @ VADODARA

The path to growth for any company is through expansion of business and investment in new technologies. We are proud to announce that the Bhoomi Pujan of our Vadodara plant took place on 6th April 2011. This is a state-of-the-art greenfield manufacturing project which is located near Vadodara, Gujarat and is capable of manufacturing a range of power cables up to 220 kV with equipment, technology and layouts sourced from world leaders. (Refer the above pictures). In addition to this, the project will also be implementing the concept of Self Managed Teams.



ORG ANNOUNCEMENTS

With our business expansion, our sales team is also expanding.

Mr. Aravind Kumar, has joined our Hyderabad team, he can be reached at chilukamarriak@kecprg.com & 09397622007

Mr. Kishore K Bhatt, has joined in our Chennai team, he can be reached at bhatkk@kecprg.com & 09962647955

Mr. Deepak Talware has joined our Mumbai Team, he can be reached at talwaredp@kecprg.com & 09920062856



For additional information/details/queries and to subscribe to C2C please write to:

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