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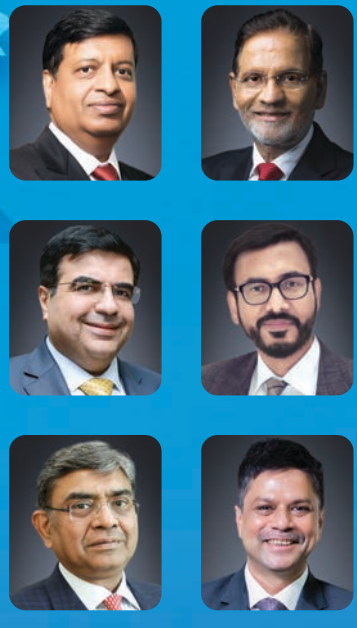
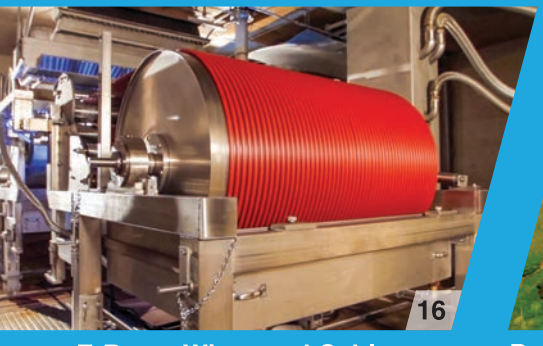
UNION BUDGET 2021: Wire and Cable Industry Views....44



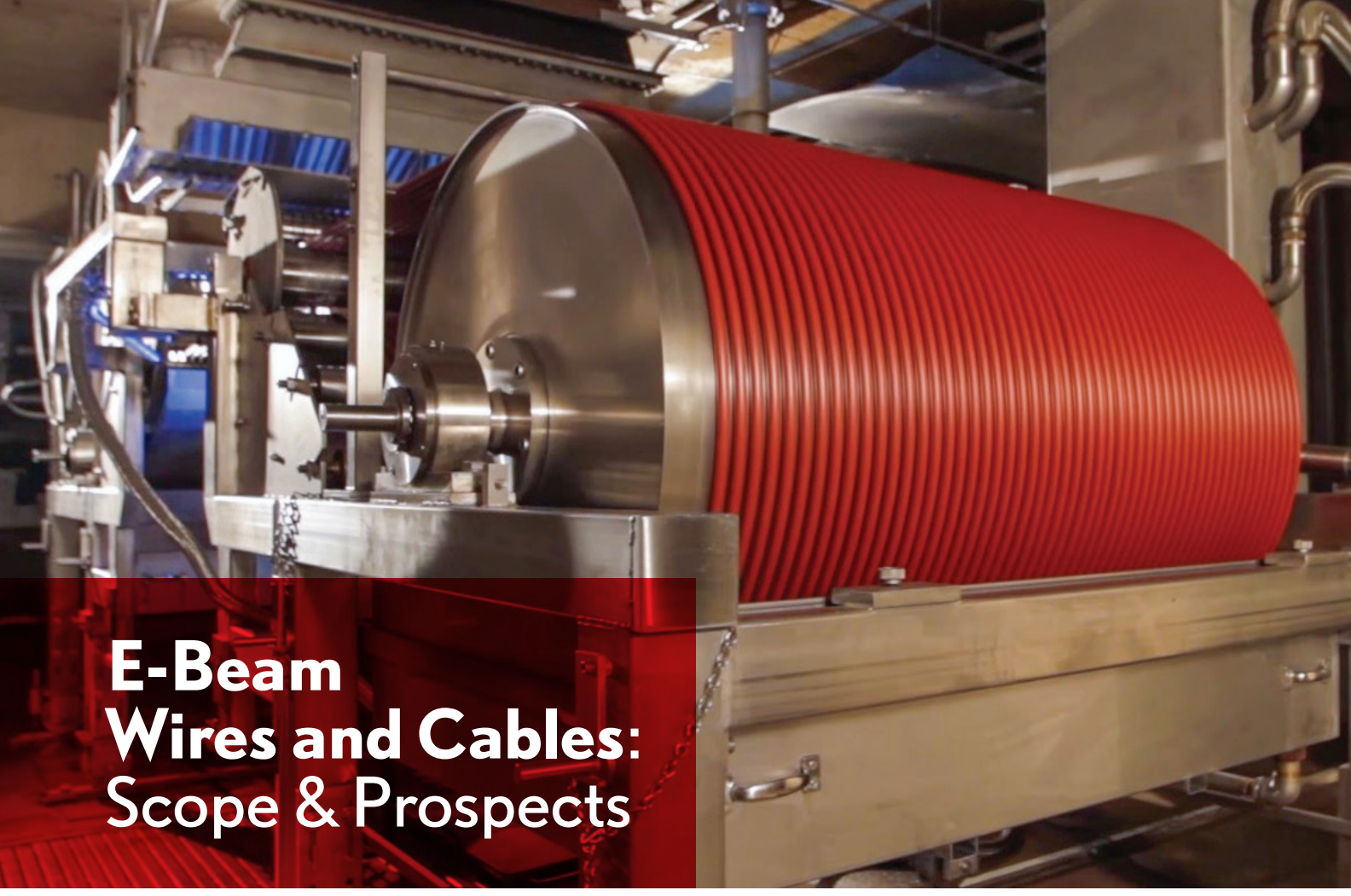


16

E-Beam Wires and Cables:
Scope & Prospects

12

Polycab's DNA:
Expansion Turnover Growth



E-Beam Wires and Cables: Scope & Prospects

In the past few years, there's been a gradual build up in the demand for electron beam processing in wires and cables. In view of the rising prevalence of the processing technique, team Wire & Cable India has initiated an editorial feature to present an insightful article on the know-how of the technique, the outlook of the prominent players in the wire and cable sector – Polycab, Thermo Cables, Anand International, Apar Industries, and Vindhya Telelinks on this advancement, and the various advantages that E-beam offers as compared to the conventional curing processes.

Electron beam (E-beam) processing is a technology that has a diverse range of commercial, medical and industrial applications. It provides an effective and efficient means to give rise to favorable changes in the properties and the performance of polymers and a range of other materials. The technology is also widely used for the sterilization of medical devices, pharmaceuticals and cosmetics.

In the wire and cable industry, E-beam irradiation provides enhanced cross-linking and polymer modification for wire, cable, and tubing products. The processing technique, more often than not, doesn't require any additives, nor does it generate any hazardous chemical by-products. In addition, the E-beam cross-linking does not require the hours of cure time needed for other conventional chemical cross-linking methods. This is an energy-efficient process, and the minimal amount of exposure time helps ensure high throughputs.

History of E-Beam

The history of electron beam technology can be traced back to the year 1869 with the experiments by physicists Hittorf and Crookes who first tried to generate cathode rays in gases. These cathode rays were an interesting physical phenomenon and this led to the discovery of a particular type of ray by Roentgen (1895), Thompson (1897) and Millikan (1905), which were described as "fast moving electrons". However, at that time, the heat generated by the impact of the electrons was considered rather to have a damaging effect in those experiments and attempts were made to prevent this by means of cooling. In the following time, more and more scientists experimented with electron beam technology, which led to the development of oscillographs, microscopes and the drilling of metals.

In 1948, a new era in material processing began with the physicist Dr. h.c. Karl-Heinz Steigerwald who was working on the further development of electron beam sources with higher powers for the construction of electron microscopes. The year 1952 is regarded as 'the dawn of electron beam technology' when he built the first electron beam processing machine.

In recent years, the electron beam processing is now getting widely used for medical and industrial applications. Also, with a series of advancements made in this technology, electron beam accelerators are regarded as reliable and durable equipment that can produce ionizing radiation for a number of applications.

On the industrial scale, accelerators are used to generate electrons in between 0.1-100 MeV energy range. These accelerators are used mainly in plastics, automotive, wire and electric cables, semiconductors, healthcare, aerospace and environmental industries, as well as numerous researches.

Cross-linking of Wires and Cables with E-Beam

Electron beam cross-linking of wire insulation and cable jackets is usually done with electron energies in the range from 500 keV to 1.5 MeV, although some facilities use higher energies up to 3 MeV. The energy is determined by the thickness, density and atomic composition of the insulation and the diameter of the conductor. The processing technique is highly precise as the stability of the small electron beam diameter in the focus is the basis for high geometrical precision.

Elaborating on the gradual demand shift, the growing potential of the E-Beam wires and cables and their role, Mr. N Srinivasa Rao, President, Thermo Cables Limited says that "with an estimated potential of Rs. 2,000 crore per year in the domestic market for E-beam wires and cables, we would like to have as much share as possible from this consistently rising demand. We are educating our customers about the advantages of the E-beam cables over conventional cables."

Benefits of E-beam Processing

E-beam cross-linking protects wire and cable insulation from the heat of short-circuits as a result of high-temperatures. The processing improves a range of properties of Electron Beam Cross-Linked (EBXL) wires and cables such as – tensile strength, especially at elevated temperatures, abrasion-resistance, thermal-resistance, flame-propagation-resistance, deformation-resistance, and cut through-resistance. Moreover, it also increases the shear and compressive strength of the wires and cables.

Emphasizing upon the numerous benefits of the E-Beam processing technique, Mr. K R Chandrasekhar, Executive V.P., Polycab India Limited, says: "the E-beam curing process has a number of advantages over other conventional curing processes including the fact that it is an eco-friendly and green process causing zero environmental pollution."

Time is not far when EBXL wires and cables will be soon replacing the normal cables in key strategic applications – in fact, the process has already begun with various companies offering E-beam cables for the past few years. However, the market for e-beam cables in India is yet to achieve a considerable benchmark and fulfill the industry's expectations.

APAR Industries: Foreseeing a Promising Potential and Future for the E-Beam Wires and Cables

> "In my opinion, the entire PVC wire and cable market will switch to EBXL wires and cables as the awareness for EBXL is projected to increase substantially."

Excerpts of the interview with Mr. Ajeet Singh, General Manager – Sales & Marketing, APAR Industries Limited:

Mr. Ajeet Singh

Brief Overview of the Company

Established in 1958, APAR Industries Limited, having revenue of Rs 7500 Cr, provides solutions to its customers in more than 125 countries in the business segments of – specialty oils and lubricants, overhead transmission conventional and high-temp conductors, copper catenary wires, OPGW, electrical and telecommunication cables in India.

We, at APAR, are poised to embark on our mission "To design and manufacture building blocks for energy infrastructure, transportation and telecommunication sectors that contribute meaningfully to a safer place". We have always believed to be in the leadership position in all the product segments. In 2008, Apar took over Uniflex Cables Ltd. and merged it with APAR Industries Ltd. with effect from 1st April 2010. We have grown year after year from about INR 100 crore to over INR 1600 crore in the period of ten-eleven years, registering a growth rate of > 25 % CAGR. Now, we are well positioned among the top five- six power cable manufacturers in India and are known for the high quality of all our products.

By leading the innovation curve, we deliver to our global customers - "Tomorrow's Solutions Today". The word 'innovation' is an integral part of our DNA and the concept is widely spread among our team members, and is not limited to a few. The innovation is not only for the end products, but also in our processes across various functions.

The cable division of APAR is a pioneer in the manufacturing of various kinds of cables. We cater to sectors including – power generation, transmission & distribution as well as specialized sectors such as marine and shipyard, oil & gas, railways including loco/coach wiring and metro railway, mining, renewable energy, etc. We are an ISO & OHSAS-accredited manufacturer and we also hold the UL-certification for certain sections of cables. Moreover, our testing Lab is accredited by NABL as per ISO: 17025.

Our range of wire and cable products include: LV/MV/HV, XLPE power cables up to 66 kV, building wires/house wires/flexible/FRLS/FS/control/instrumentation cables, medium voltage covered conductors (MVCC); and elastomeric (rubber) cables up to 33 kV. In addition, we also provide – optical fiber cables (including fire-resistant/survival type), windmill and solar DC cables as per EN/TUV standards (renewable sector), specialty composite/hybrid cables, electron-beam irradiated cables; and 105°C XLPE cables.

Product Portfolio and Technical Capabilities

APAR has developed specialty EBXL (Electron Beam Cross Linked) cables that are in-house manufactured. Company's Anushakti wires come with PVC of 105°C rating that enhances physical and electrical properties of the insulation material. This improves the insulation resistance, reduces leakage current, makes the wires non-melting, improves the current carrying capacity by over 50%, thereby, it provides protection against electric shock/short-circuit, for fire safety. The wires are far superior to any conventional FR PVC wires available in the market that do not catch fire.

Abreast of the technologies worldwide, APAR "Anushakti wires" are manufactured with E-BEAM technology and exhibit extended properties such as – high-temperature withstanding capacity up to 105°C, high-current carrying capacity, and prevents short-circuits. They are heat and melt-resistant and thereby, are solder iron-resistant. Moreover, the wires qualify the Hot Deformation Test, they are able to reduce smokes, and have a longer operating life span.

In addition to the aforesaid properties, the wire and cable products are also environment-friendly, safe, and ideal for the high-end and safety projects. The area range of APAR Anushakti wires are: single core from 0.75 sq. mm to 240 sq. mm conductor area.

Manufacturing and Technical Setup

We have set up a state-of-the-art 1.5 MeV, 2.5 MeV and 3.0 MeV Electron Beam Accelerators, along with suitable handling systems that have been installed in our facility in western India, which is based at Khatalwada in South Gujarat. Our two E-BEAM equipment were installed in 2011 and we have almost a decade long experience in the manufacturing of the e-beam wires and cables.

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We have a fully trained in-house team to handle the machinery, and to manufacture world-class products. Also, AERB (Atomic Energy Regulatory Board) has been supervising the installation periodically.

Market Footprint

At present, we are operational in the southern and western India market. However, we are also intermittently serving the markets in Delhi-NCR, and Kolkata. We are open to serve anywhere in India for bulk orders.

We are exporting huge quantities of EBXL solar cables in the international market, besides being a leading player for EBXL supplies to railway coaches, locomotives and ship building applications.

APAR Anushakti wires can be widely used wherever fire safety, short circuit and overloads are some of the major concerns. As a matter of fact, it must be used in all residential and commercial applications, especially in highly crowded area viz. hotels, hospitals, schools and colleges, airports, malls, and multiplexes and high rise buildings.

We are planning to explore the market through - retail, project, OEM industry, and the government through — our channel and directly. To create awareness about EBXL products, we are exploring digital and BTL routes. We have our team in the field who are consistently working to create awareness among the influencer mainly electricians, builders, consultants, and the government and semi-government departments.

Raw Material and Quality

The various materials used for EBXL are PVE and Polyolefins. All of these require specialty formulations, which is done in-house in our compounding facility. This gives us a sense of control on the quality, and also, it keeps the costs under control. The extrusion equipment



are also specially customized to meet the various requirements pertinent to these wires and cables. Ably supported by a competent engineering team, and quality control systems, we are able to offer the highest quality.

Market Potential and Demand Shift

In my opinion, the entire PVC wire and cable market will switch to EBXL wires and cables as the awareness for EBXL is projected to increase. Some more players have already ventured in the segment and this will enhance the awareness about the EBXL wires and cables. Some of our competitors are also intending to install the e-beam facility and some of them have already installed it. However, at present, they are not using it for wires. The customer shift to e beam wire cable is a bit slow in pace, because of the lack of awareness among end-consumers and influencers.

> "APAR has been working diligently to create awareness among all the stakeholders; mainly through BTL and Digital routes; we are closely working with all the influencers and installers. They are mainly electricians, retailers, dealer, consultant, contractor, interior designer-architect, industries and Govt. departments."

APAR has been working diligently to create awareness among all the stakeholders; mainly through BTL and Digital routes; we are closely working with all the influencers and installers. They are mainly electricians, retailers, dealer, consultant, contractor, interior designer-architect, industries and Govt. departments. We are frequently organizing meets and webinar too. To create mass awareness, we do participate in exhibitions such as – Elecrama, Ace-tech and others.

Now, we have also taken the digital route to promote the EBXL products, especially, on the social media platforms i.e. LinkedIn, YouTube, Twitter, and Facebook, where our brand is showing footprints, and is gaining good reach. Similarly, we are also planning to venture into the e-commerce space.

We are quite confident and assured that the EBXL segment has a great future in the domestic market, developing countries as well as developed countries. This is the need of the hour, and it must be installed in all the electrical installation systems, be it residential or commercial, private or public. To make the premise fire-safe, APAR Anushakti wires and Mahashakti cables are highly recommended.

Advantages Over Conventional Curing Process

The conventional method of cross-linking is based on thermally induced "chemical cross- linking", which has drawbacks including – it is carried out at high temperature which affects the life of polymers due to degradation caused by high temperature exposure.

On the other hand, the electron beam cross- linking is carried out at room temperature and with the electron–beam accelerators; the insulation materials can be cross–linked within a few seconds. The homogeneous irradiation ensures that the homogeneous cross-linking is achieved. The term 'irradiation' simply implies the act of applying radiation (for radiant energy) to some materials.