Fiber optics applications pdf

Why are fiber optic systems revolutionizing communications? Compared to conventional metal wires (copper wires), optical fibers are: inexpensive - a few miles of optical cable can make it cheaper than the equivalent length of copper wire. This saves you money with your provider (cable TV, Internet). Diluents - fiber optics can be drawn in smaller diameters than copper wires. Higher carrying capacity - Because fiber optics are thinner than copper wires, more fibers can be tied together with cables with higher diameters than copper wires. This allows more phone lines through the cable to come through the cable to the cable TV box. Less signal decomposition - the signal loss of fiber optics is less than copper wire. Optical signal - Unlike the electrical signal of a copper wire, the light signal of one fiber does not interfere with the other fibers of the same cable. That means clearer phone conversations or TV reception. Low Power - Because the signal from the optical fiber is degraded, low-power transmitters can be used instead of the high-voltage electrical transmitters required for copper wires. Again, this can save you money with your provider. Digital signals - Fiber optics are ideal for conveying digital information that is particularly useful in computer networks. Non-resyn retardant - electricity does not pass through fiber optics, so there is no fire risk. Lightweight - Optical cables weigh less than similar copper wire cables. Fiber optic cables reduce space on the ground. Flexible - because fiber optics are very flexible and can transmit and receive light, medical imaging - bronchial, endoscopic, lapaoscopic mechanical imaging - are used in many flexible digital cameras to inspect sewer lines because of their many characteristics in mechanical welding inspections of pipes and engines (airplanes, rockets, space shuttles, automobiles). Especially communication and computer networks. For example, if you call Europe from the United States and the signal bounces from a communications satellite, you often hear echoes on the line. However, with transatlantic fiber optic cables, it connects directly without echoes. Now that you know how fiber optic systems work and why they're useful, how do you make them? Fiber optics are made of very pure optical glass. I think glass windows are transparent, but when the glass thickens, the impurities in the glass make it less transparent. However, glass in fiber optics has far fewer impurities than over-the-counter glass. One company's description of the quality of glass is as follows: If you're at the top of the ocean, which is a mile of solid-core fiber optic glass, you can clearly see the floor. To create fiber optics, you need: By removing the preform glass cylinder making fiber is manufactured by a process called chemical vapor deposition (MCVD) modified the fiber by testing the fiber. In MCVD, oxygen bubbles through a solution of silicon chloride (SiCl4), chloride (GeCl4) and / or other chemicals. Precision mixtures control a variety of physical and optical properties (refractive index, expansion coefficient, melting point, etc.). Gas vapor is performed on special shelves into the interior of synthetic silica or quartz tubes (cladding). When the shelves change, the torch moves up and down outside the tube. The extreme heat of the torch causes silicon and germanium to react with oxygen to form silicon dioxide (SiO2) and geo2 dioxide (GeO2). The silicon dioxide and germanium dioxide are stored inside the tube and fused together to form a glass. The shelf rotates continuously to create a uniform coating and consistent blank. The purity of glass is maintained by the use of corrosion-resistant plastics in gas transfer systems (valve blocks, pipes, seals) and precise control of the flow and composition of the mixture. The process of emptying a preformable is highly automated and takes several hours. After the preform blank has cooled, it has been tested for quality control (refractive index). Drawing fibers from preform blanks is loaded into the fiber drawing tower when the preform blank is tested. The white space is lowered to a graphite furnace (3,452 to 3,992 degrees Fahrenheit or 1,900 degrees Celsius), and the tip melts until the molten glow is dropped by gravity. When dropped, it cools down to form a thread. The operator connects a series of coated cups (buffered coatings) and UV curing ovens to the tractor control spool. The tractor mechanism is precisely controlled by slowly pulling the fibers out of the heated preproform blank and using a laser micrometer to measure the diameter of the fibers and feed the information back into the tractor mechanism. The fibers are pulled out of the bin at speeds of 33 to 66 ft/s (10 to 20 m/s) and the finished product is wound into the spool. It is not uncommon for spools to contain more than 1.4 miles (2.2 km) of fiber optics. The finished optical fiber testing the finished optical fiber is tested as follows: the length of the head - 100,000 lb/in2 or more must withstand a Proactive index profile - determine the screen as well as the numerical aperture for the optical fault fiber shape - The core diameter, cladding dimensions and coating diameter are uniform - determine the degree to which light signals of various wavelengths degrade at distance Information carrying capacity (bandwidth) - Number of signals that can be performed at a time (multi-mode fiber) color dispersion - Diffusion of wavelengths of light Depending on the operating temperature / humidity range temperature / humidity range temperature (important for bandwidth) can perform light underwater - important for undersea cables when the fibers pass quality control, they are sold to phone companies, cable companies and network providers. Many companies are now replacing traditional copper wire-based systems with new fiber-based systems to improve speed, capacity, and clarity. Technology to transmit light through transparent and flexible fibers of fiber optics, glass or plastic. Fibers, called fiber optics, can focus light on curved paths. You can use a burn of parallel fibers to illuminate and observe hard-to-reach places. Fiber optics of very pure glass can carry light with a little dimming over long distances ranging from a few inches or centimeters to more than 100 miles (160 km). Cables containing these fibers are used in certain types of communication systems. Some individual fibers are thinner than human hair and have a diameter of less than 0.00015 inches (0.004 mm). Fiber optics are based on an optical phenomenon known as full internal reflection. Light entering one end of the fiber with the simplest form of fiber strikes the boundary of the fiber and reflects it inwards. The light moves through the fiber in a series of zigzag reflections until it exits from the other end of the fiber. Other forms of optical fiber are designed in such a way that the zigzagging of light is greatly reduced or virtually eliminated. Most fiber optics created today consist of at least two parts: a protective cladding (glass or plastic) that surrounds the core where light is transmitted and prevents light from leaking from the core. Cladding bends or reflects rays that attack the inner surface inwards. Detectors such as a light meter or a human eye receive light from the other end of the fiber. Fiber optic buns are consistent or inconsistent. In a consistent bundle, fibers are arranged so that light is delivered as well as images. In inconsistent bundles, fibers are not arranged in a certain way and can only transmit lighting. There are two basic types: single-mode fibers and multi-mode fibers. Single-mode fibers are designed to transmit a single beam of light to the carrier and are used for high-speed signal transmission over long distances. It has a much smaller core than a multi-mode fiber and accepts light along the axis of the fiber. A small laser sends light directly to the fiber. Low-loss connectors can be used to join fibers within the system without reducing optical signals. These connectors also combine fibers to the detector. Multi-mode fibers are designed to carry multiple rays. they're much bigger Compared to single-mode fibers in diameter, they accept light with a variety of angles. Multi-mode fibers use more types of light sources and cheaper connectors than single-mode fibers. They are mainly used for communication over short distances. The use of fiber optics is a number of. In medicine, fiber optics allow doctors to see and work inside the body through small incisions without having to perform surgery. They are used in endoscopic instruments that can see the inside of hollow organs in the body. Most endoscopes have two sets of fibers: an outer ring of inconsistent fibers that supply light and an internal consistent bundle that transmits images. Endoscopes may be designed to investigate specific areas. For example, physicians use arthroscopic nerve to review knees, shoulders and other joints. In some models, a third set of fibers transmits laser beams that are used to stop bleeding or burn sick tissue. Body temperature can be measured using fiber optics. They can also be used for insertion into blood vessels to give a quick and accurate analysis of blood chemistry. In scientific research and manufacturing, fiber optic devices turn on and carry limited space within explosion-proof areas, vacuum chambers and machines. Some instruments use fiber optic coils as sensing devices. Changes in fibers produced by changes in pressure, temperature or other conditions produce measurable changes in the characteristics of light transmitted through the fibers. Fiber optics are used to measure temperature, pressure, acceleration and voltage in an industry. Fiber optic communication systems have a number of advantages over systems that use traditional copper cables to increase efficiency. They have a much larger information carrying capacity, are not disturbed by electrical interference, and require fewer amplifiers than copper cable systems. As part of a communication system, fiber optics typically transmit information in the form of light signals as flashes of light. The signal is generated by a small semiconductor laser or light emitting diode (LED) at one end of the fiber and detected by a light-sensitive device at the other end. Fiber optic cables can transmit much more information than electric cables of the same size. The main application of fiber optic cables is to connect the phone switching office. Many telecommunications companies have installed large networks of fiber optic cables on continents and oceans to provide information around the world. The first research on fiber optics took place in the late 1800s, but practical development did not begin until the early 1950s. The development of fiber optics was facilitated by the introduction of lasers in the early 1960s and the production of the first fiber optics of very pure glass in 1970. Commercial use of textiles Especially in the 1980s, when communication systems developed rapidly.

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