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Amphenol LTD

INTERconnection Newsletter

The Dilemma of ILS - Amphenol demonstrate a solution for Fibre Optics

Military communication systems for the digitised battle space, naval applications and shore installation are increasing at a phenomenal rate.

This in tom throws many real challenges to the interconnection industry. With the continued development of fibre optics on such a
large scale, a maintenance policy needs to be adopted. Amphenol Limited have already demonstrated a splice philosophy for copper cable assemblies, which has become a successful, recognised method of termination within the Army. Amphenol now take this opportunity- to demonstrate their solution for the fibre optic market.

Integrated Logistics Support - ILS is becoming increasingly important, especially due to the perceived risk involved in fibre optics -for this reason Amphenol took the initiative to manufacture fibre optic tactical cable in purple to eliminate the possible confusion between copper and fibre interconnection systems.

Over the last few years Amphenol has seen a growing need from their customers for a simple low cost tactical fibre optic repair system. This is by no means a surprise, as all programs and projects need support from infancy to mortality. The MOD demanded that a system be adopted to address this problem, incorporating two important issues **ECONOMICAL AND EFFECTIVE.**

As with copper, replacement of the cable assemblies can be expensive and perhaps impractical. Amphenol customers are faced with the option to repair existing cable assemblies, either using a method of single repair or by splicing pre-terminated pigtails.

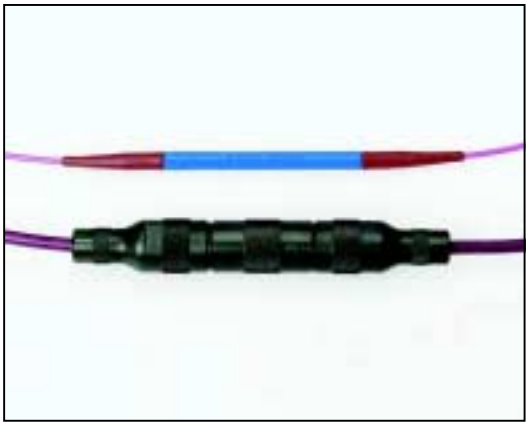
The conventional method of terminating fibre optic cable is by pot and polish, using epoxy, heater blocks etc. This procedure entails a high skill level, external power supplies and is impractical in many military environments.

Amphenol Limited have developed a true field usable splice tool kit and repair system, using NO external **HEAT** or **POWER** and requiring a minimum skill level. **The *Harsh Environment Impact Splice*** has been designed to splice all types of tactical cable 3.5mm, 4.5mm and 5.5mm in Simplex, Duplex, Quad or Hybrid.

The consumables such as polishing paper, are sold within the individual splice unit which can be placed into the splice kit. All shelf life items as used when terminating a conventional fibre optic connector have been eliminated. The optical performance of the impact splice Insertion Loss is typically less than 1 db. The tensile strength of the cable will be returned to 80 plus % of its specified tensile strength.

The entire procedure of the splice system is mechanical giving very high repeatability and performance. When the Termini is impacted using Amphenol's proprietary Impact Tool it forms the metal tip around the fibre. There is no epoxy used between the fibre and termini as found in standard termination methods therefore the environmental performance is excellent. The fibre is cleaved and polished in the conventional way with the cleave tool incorporated within the impact tool. The Termini is sprung loaded and the alignment sleeve is integral to reduce the number of components within the unit.

The ***Impact Splice Kit*** contains all the necessary specialist tools to carry out an Impact Splice termination in the field. The ***Harsh Environment Impact Splice Unit*** contains the splice itself, and consumables.



The future of 62GB in military communications

The 62GB Series of connectors based on Mil-C-26482 (Patt 105), is the current bedrock connector of UK military communications, having been in existence for over 40 years. With new communications programmes such as Bowman, the question arises as to the future of the 62GB Series.
At Amphenol we believe that the future is golden, as the range of connectors is developed further, to meet the requirements of the 21st Century Battlefield. Working closely with their customers and the M.o.D., Amphenol are in a position to face the changing requirements head on.

▪ NBC Attack - The traditional way of mounting a connector, is by way of a jam nut, fitted from the front of the equipment box. Unfortunately, this method does not guarantee full protection against chemical attack, as materials can become trapped under the jam nut, causing difficulties with cleaning during the wash down process. By fitting a jam nut from the inside of the equipment box, we are able to offer a flush surface for easy cleaning. These connectors are now available as the 62-5147 (for pintail) and the 62-5167 (for solder bucket) ranges.

▪ Increased Data Lines - Front line soldiers now require more information, which in turn requires more data lines, The simple option would be to introduce more connectors, but in most cases there is no available space. The solution, therefore, was to move towards higher density planforms, using size 22 contacts. Amphenol have now developed a range of 62GB, high density plarrforms, which will enable the connector count to remain the same.

▪ Power Lines - Traditionally, this has been an area not previously covered by Amphenol's 62GB Series, but in order to complete the range and support our customers needs, we have developed a number of planforms with power contacts, capable of carrying up to 45 amps. The planforms now covered are 14-02,14-04, 14-22, 16-04, 18-22, and 22-04.

▪ Battery Packs -One connector is currently needed to charge the battery and another to run equipment off the battery. As with other equipment, space is at a premium, so Amphenol have designed a single connector which will manage the requirements of both charging and discharging, whilst keeping the live lines protected by the insert moulding. This connector, commonly known as the "plocket", is available under part numbers, 62-5171-14-94 (for the receptacle) and 62-5172-14-94 (for the free plug).

▪ EMC/EMP Protection - Customers are primarily concerned with saving space and Amphenol have been able to help by way of a filtered 62GB connector (482 Series). Because the filtering and EMP elements are housed within the connector, the need for the customer to have separate decoupling boards within their equipment has been removed, thereby reducing the overall size of the radio packs.

Through listening to their customers, Amphenol have developed the 62GB range of connectors to meet the needs of the 21st Century Battlefield.

UBoB eliminates connector damage

During introduction of the Challenger 2 Main Battle Tank, the U.K. M.o.D. Army Technical Support Agency (ATSA) identified a potential servicing problem whilst fault finding on the electrical cable harness and equipment connectors. Historically test probes are used on the contacts of the connectors to check for electrical supply or cable continuity. With the advent of the high density MIL-C-38999 S III there is a possibility that damage may be caused to the small size 22 connector contacts.
Amphenol produced a Universal Breakout Box (UBoB) which consists of a box containing all 9 sizes of high density connectors on two sides, internally connected to one hundred and thirty, 2mm diameter test probe sockets on the top. The technician connects the box to a vehicle harness or electronic / electrical equipment by interconnecting cables. The UBoB is in U.K. M.o.D. Army service and technicians are carrying out tests in relative comfort on the test box rather than on the vehicle cables or equipment. In addition the use of the UBoB prevents inadvertant damage to the connector contacts, which would result in costly equipment repair and vehicle down time.

Avionics to Vetronics, Copper to Fibre Optics Amphenol leading the field

The term avionics is familiar to most people in the aircraft fraternity, however, vetronics is a fairly recent addition to the vocabulary of personnel in the land vehicle defence industry. The rapid growth of electronic equipment specified on Army vehicles has necessitated the standard of "black box" interconnection to be upgraded in a dramatic way. Programmes such as AS90 and Challenger 2 initiated the transition from connectors and wiring similar to that used on pre-war automobiles to relatively sophisticated systems and components that can be compared to present day fighter aircraft.
Amphenol recognised that expertise gained in high performance avionic connectors, data bus components and EMC/harsh environment cable harnesses, could be used to satisfy requirements in the Army platform and electronic equipment sector. This requires interconnection systems that are smaller, lighter, EMI/EMP protected, capable of NBC washdown and soldier proof!
Having successfully negotiated major contracts to supply high performance power, signal and data bus connectors, plus complete cable harnesses to the AS90 and Challenger 2 projects, Amphenol are now working on interconnection products and systems that will be considered for use on vehicles under development.
The trend to follow the avionic world continues with the progression of the data transmission medium from copper to fibre optics. There is little doubt that programmes such as TRACER and MRAV will specify these systems therefore Amphenol Limited have developed a suite of harsh environment, fibre optic connectors and systems specifically for land systems. By continuing to work with customers on their challenging requirements, Amphenol will remain at the forefront of VETRONIC interconnection technology.

Distribution for the 21st Century

The market demands service, that is why Amphenol Limited is committed to its Distribution support policy, a policy which they have been developing and nurturing over the past four years.
Amphenol clearly recognises that its core business is the development and manufacture of connectors and interconnection systems. In the competitive environment in which we live, it is imperative that the product quality is maintained to the highest levels and are offered to the customer at the lowest cost. The customer in turn will also be concerned about the true cost of acquisition. It is a costly exercise to trade with a large amount of vendors, who each supply a few products. Not only will this result in a large often over stretched procurement section, it will also vastly reduce their purchasing power.
Amphenol are constantly looking at all indirect costs along the supply chain and actively implementing sales policies, logistic systems and procedures to provide their customers with the lowest solutions.
The reality often shows that the lowest cost of aquisition for a customer is via a distributor who not only gives instant vendor reduction by offering one point of purchase for a large number of manufacturers parts, but who also offer real value added services with automated systems and technologies to drive out any unnecessary cost.
Amphenol's strategic policy is to work with its Distributors in the majority of technology developing companies focusing heavily on the inter-connection systems market to ensure Amphenol will be developing for the general market, products that will be available and relevant well into the 2lstcentury This strategy necessitates many cultural changes for both Amphenol and some of Amphenol's historical customers to ensure Amphenol can achieve the lowest cost of acquisition targets into the market place.
Amphenol have some 12 distributors incorporating Pan European and catalogue broad liners who offer vast inventories of active passive electro mechanical and connector products and provide hi-tech added value services to specialist distributors and stockists who tend to offer expert technical product knowledge. This breadth of distributor enables users of Amphenol connectors to purchase product from suppliers who meet their purchasing needs.
Amphenol's franchised distributors are not only geared to support a large number of products but can also offer very competitive costs for volume application. Because of the large batch sizes they order from Amphenol, more accurate forecasting and the ever improving electronic transfer of information via E-mail/EDI etc ensures the true cost of trading with a franchised distributor becomes minimal. Not only is this reduction in cost passed on to the end customer but the distributor can also provide the customer with an unrivalled level of service. Amphenol ensure that pricing from any franchised distributor to the customer should be very similar if not the same, and certainly no more than buying from Amphenol direct. Amphenol's Business Development Manager will ensure that the correct route to market for Amphenol is maintained and will work with customers to allow the customer to choose where the point of purchase will be made, based on the service that is required and advising where suitable stock of the product may be obtained from within the distribution network, which currently have an inventory value in excess of £4.5 million.

Amphenol Smart Interconnect Solutions

Amphenol Limited is committed to eveloping their product range, in line with the ever increasing demands for more sophisticated, interconnect products.

- Amphenol's recent acquisition of Advanced Circuit Technologies, with twenty years experience in manufacturing modular ffexi circuits, has allowed Atnphenol to continue to expand their capabilities.
- Our corporate strategy of acquiring companies gives greater control of costs, not only for the traditional connector components, but also for complete interconnection assemblies.
- Historically the manufacturer of a product would source from various suppliers for the required components. Now Amphenol can reduce part of this BOM by- removing all interconnect components, and replacing them with one plug-in interconnection assembly module.
- Our new range of smart interconnect solutions also incorporates our extensive range of EMI/EMC technologies, allowing us to supply a fully EMC compliant assembly.
- Where will the smart interconnect solution benefit you?
- Amphenol can replace all components associated with connecting from the PC board level to the connectorised interface for ongoing connections, including any electronic components required for filtering and/or surge protection.
- Due to our recent acquisitions, we have greater control over costs associated with components that would have previously been procured. outside of the Amphenol group.
- Further cost reductions are available due to bulk purchases of standard electronic components and preferential business relationships, established with manufacturers of these products.
- We pride ourselves on an extensive range of both interconnection and EMI/EMC capabilities and technical expertise. Our in-house facilities now include PCB design engineers, modular flex circuit design engineers, and a dedicated ceramics chemist to name just a few. With these resources available within the Amphenol group, you can rest assured you will receive the dedicated support and engineering backup you require to develop a complete interconnection solution for all your requirements.

Future Soldiers get connected with Amphenol Active Webbing

Many of the worlds future fighting forces will have the same problem. The smart soldiers will have to carry more equipment around their bodies that requires electrical connection. Equipment such as remote weapon sights, GPS, radios, data terminals, printers, and body function sensors will feature as part of the standard kit for the Future Fighting Soldier.
One of the biggest concerns is that with so many pieces of electrical equipment being needed to make him more effective, how will the equipment be connected so as not to hinder his fighting capability.

Amphenol, in conjunction with its partner companies are developing the answer . . . "Active Webbing".

The Yoke load carriage system is generally worn in all circumstances so it makes logical sense to incorporate all the cabling within that one standard piece of equipment. The web can be woven with standard electrical conductors, twisted pair cables and miniature coaxial conductors in fact almost anything can be incorporated. However the problem does not end there as connection to the new equipment is required and so plastic mouldings, snatch release hi-density connectors are being developed to

compliment the system and also become an integral part of the webbing.
On the Amphenol stand at DSEi 99, a fully integrated development Yoke set will be shown, demonstrating its most important feature, the wearer doesn't know it's there.
Many of the worlds armed forces appreciate the problems and are today considering the use of "Active Webbing".
At Amphenol we are confident that we are at the forefront of personal electrical interconnection for the 21st century fighting soldier.

Interconnection of Tactical LANs

Information is key to the success of any task, so it is of paramount importance that the ability to handle and process such data is available. Within industry, this task would have been undertaken by an isolated individual, but this is no longer the case and help is needed. Companies are now able to link their computer systems through an integrated LAN (Local Area Network), making information available to everyone on the network. The modern army has chosen to use a similar system.

Modern industry and the modern army both use a "Fibre Optic Backbone" to link individual computers back to Hubs, Routers and Bridges. However, the installation of the "Fibre Optic Backbone" is fixed within modem industry, but due to being constantly on the move, the installation within the modern army has to be broken down and reconfigured (sometimes as often as four times a day), and in locations such as bombed out buildings or tented accomodation.

EIARRCIS is one such system currently operating with the UK NATO forces in the field, Amphenol was responsible for both the design and development of the "Fibre Optic Backbone" on the EIARRCIS system, in conjunction with EDS, the main contractor. In designing the system, Amphenol have had to take into account several key issues.

- Reliability - There was a need for the connectors to survive in the battlefield environment and be durable enough to withstand the constant breakdown and reconfiguration of the system, as the task force relocates while maintaining theoretical performance of the system.

- Configurability - With the constantly changing system setup, it is necessary to have a flexible system. The design comprises of 20m and 200m cable assemblies, using hermaphroditic butt joint connectors, enabling the system to be "daisy chained" together, in order to fit the required cable lengths and with out the need to orientate the assemblies.

- Cost - With cost as a major driver, it was clear that the use of a lensed fibre optic connector was too expensive and too large for the side of a PC so a new connector was designed to suit the specific environmental and optical conditions.

The LAN was not specified for use in front line tactical conditions, but to be employed in locations such as bombed out buildings or tents, a few miles back from the action. With this in mind, the cost could be considerably reduced by using a butt joint fibre optic connector, the HMFM. This provided the user with a connector capable of meeting the environmental conditions, without the added expense of using a tensed version.

- Size - Due to the use of butt joint hermaphroditic technology the connector could be designed to suit the Ruggedised PC and Hub. The design is half the size of the standard lens connector, with the receptacle incorporating the active components, thus reducing the overall size even further.

Low cost, high performance cable harness

Amphenol have developed the next generation of Armoured Vehicle cable harnesses using over moulded technology.

Cable harnesses installed on armoured vehicles currently entering service specify a "field repairable" heat shrink technology system and often custom designed cable. Whilst providing significantly improved EMC and environmental performance compared to previous open wire and conduit systems, these heatshrink technology harnesses are expensive to procure and maintain. Connector backshells, heatshrink boots and screen termination devices can be expensive. The operator skill level and the time required to construct and test the harnesses result in high manufacturing labour costs.

Vehicle constructors and end users are generally satisfied with the current cable harness performance but are constantly attempting to reduce total cost.

Overmoulded connectors on cable harnesses are now commonplace in the domestic appliance and computer hardware industry. The principle of disposable harnesses is well established and the consumer is enjoying the benefits of increased reliability and reduced cost.

Amphenol have for many years supplied low cost, high performance overmoulded cable links for M.o.D. Army equipment, including Clansman.

Cost saving and performance benefits are achieved by a reduction in components as the overmould is fused directly onto the cable and connector, creating an extremely rugged environmentally sealed assembly. The mould material compound can be specified to meet the environmental performance requirements of the system eg. diesel resistant, low smoke, zero halogen, abrasion resistance.

The NBC wash down performance of the mould compound exceeds that of heatshrink technology. The moulding can be shaped to achieve straight or angled cable entry. Idents, Nato stock numbers, finger grips etc. can be featured in the overmould. The initial manufacturing process is also less labour intensive than methods and carried out on an assembly line basis.

It is widely accepted that the complexity of future VETRONIC interconnection systems preclude the in service repair of the cable harnesses as the original build standard of the cable is difficult to achieve after repair.

Overmoulded cable harnesses are not repairable at the cable/connector interface, therefore a repair by replacement maintenance policy is recommended for permanent repairs. For temporary or battle damage repairs, overmoulded connectors with pigtails can be spliced into the damaged cable.

By specifying overmoulded cable harnesses, future armoured vehicle constructors and end users will benefit from low initial procurement cost, high environmental protection and EMC/EMP performance, high reliability, plus low through life training and maintenance cost.

We welcome your comments and suggestions.
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