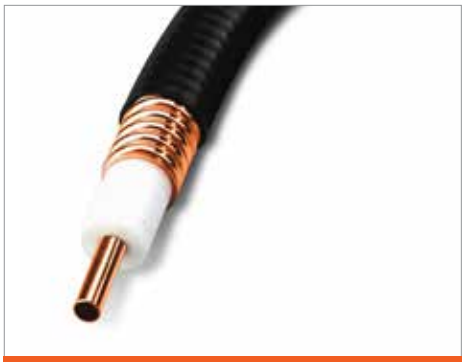
Dow Electrical & Telecommunications

RFS and Dow Design and Test 10-year RF Cables for Better Cellular Reliability and Quality

Case

As mobile data consumption and demands on 4G networks increase at an explosive rate, and are expected to grow 13-fold between 2012 and 2017, the data capacity for radio frequency (RF) cables is growing to meet the demand[1]. Higher-efficiency data cables are required, which in turn drives the need for higher-performing components. Dow Electrical & Telecommunications (Dow E&T) is a provider of materials-science-based solutions for the telecommunications industry, with products that deliver signal efficiency, cable protection, ease of cable manufacturing and installation.



Radio Frequency Systems (RFS) is a global designer and manufacturer of cable and antenna systems, plus active and passive RF conditioning modules, providing total-package solutions for wireless infrastructure. The company serves OEMs, distributors, system integrators, operators and installers in the broadcast, wireless communications, land-mobile and microwave market sectors.

Challenge

In order to meet the increased data capacity needs reliably, the electrical throughput of high frequency RF cables needs to be maximized. This was a challenge for RFS due to passive intermodulation (PIM). In a transmission line, reasons for PIM are frequently related to three specific supply chain issues – metallic fragments remaining in or on one of the conductors or the foam, poor-quality seam welding, and the differences in thermal expansion between the inner and outer connectors. PIM can be controlled by selecting proper materials and following strategic procedures throughout the complete design and construction of a site.

Another challenge in switching to a new product is the qualification of new raw materials. Supply-chain considerations are very important as impurities can be introduced during the transportation and storage of the raw materials prior to cable fabrication.

Solution

The Dow E&T R&D team developed new products to improve the performance of high-frequency RF cables and partnered with RFS. Their goal was to install a cable on a tower that would last for more than 10 years without performance degradation.

RF cable constructions and insulation performance improvements can be challenging. Improved signal loss cannot be incurred at the expense of other criteria like material compatibility, manufacturing efficiency, supply-chain cleanliness or efficiency.

[1] Cisco 2013 Visual Networking Index Global Mobile Data Traffic Forecast

Providing RFS with the new Dow AXELERON™ CX 1258 NT Compound (CPD) component for the insulation gave RFS an opportunity to improve upon the design of some of its traditional cable products – such as RFS CELLFLEX® and CELLFLEX® Lite Transmission Lines. CELLFLEX® cables provide reliable and technically superior solutions, trusted as backbone feeders in cellular radio systems, including GSM, UMTS, CDMA, PDC and LTE, as well as WIMAX. CELLFLEX® Lite is a foam-dielectric corrugated coaxial cable with an aluminum outer conductor and a copper inner conductor.

The new RF cable insulation is composed of three components from Dow: The new AXELERON™ CX 1258 NT CPD, an LDPE product that allows for finer cell structure, combined with AXELERON™ CX 6944 NT CPD, an HDPE product, that provides stiffness and foaming capability, and finally a nucleating masterbatch that helps control the cell-size structure.

Dow also developed a new manufacturing process to reduce problematic impurities and then utilized a world-class supply chain and logistics network to maintain that purity. Additionally, Dow created a telemetry inventory system where they know the storage levels on the RFS tank and automatically re-order when levels drop below a critical point, thereby keeping RFS running no matter what the production schedule.

"Dow improved our entire CELLFLEX® product line," said Tom McKeon, R&D manager, transmission lines, RFS. "Together, we did the qualification and testing and found that we were getting better results with the new RF cables than was experienced in the past. The new AXELERON™ CX 1258 NT CPD, combined with AXELERON™ CX 6944 NT CPD enabled improved cable attenuation performance by having the best-in-class material dissipation factor characteristics. Dow also optimized its process and raw materials to reduce impurities, thereby increasing electrical performance that resulted in less loss in the cable. That's what we were looking for from Dow and that's what they delivered."

Please contact your Dow representative for more information or www.axeleron.com.

Project summary	
Customer	Radio Frequency Systems (RFS)
Applications	RF cable insulation
Materials used	AXELERON™ CX 1258 NT CPD, AXELERON™ CX 6944 NT CPD, nucleating masterbatch
Functional requirements	Higher-efficiency RF cable that will last for 10 years with no performance degradation
Commercialization	Commercial quantities of Dow solutions for RF cables along with insulation and jacketing for copper/copper twisted pair, coaxial and fiber optic cables are now available globally

Chief benefits using Dow materials:

- Manufacturing efficiency
- Cable longevity
- Transmission efficiency
- Lower cable signal loss

AXELERON™

Dow Electrical & Telecommunications
Houston Dow Center
1254 Enclave Parkway
Houston, TX 77077
USA

North America
Toll Free 800 441 4369

International
Latin America + 55 11 5184 8722
Europe + 800 3 694 63 67
+ 31 115 67 2626
Italy + 800 783 825
Pacific + 800 7776 7776
+ 60 3 7965 5392
China + 400 889 0789
+ 86 21 3851 4988

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Axeleron.com

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