Dramatic Improvements In Radome Production With Flex Molding Process

Based on the Geodesic Dome invented by Buckminster Fuller in the 1954, Radar Domes, or Radomes, have been used to protect microwave and radar antennas around the world for more than half a century.

A Radome is constructed of material that minimally attenuates the electromagnetic signal transmitted or received by the antenna. In other words, the Radome is “transparent” to the radar or radio waves.

They are designed to protect the antenna surfaces from harsh environmental conditions including wind, rain, ice, sand, etc., or to conceal the antenna from public view. They also provide a measure of protection for personnel working around antennas with moving parts.

Radomes can be produced in multiple shapes (spherical, geodesic, planar, etc.) depending upon the particular application, using multiple materials including fiberglass, PTFE-coated fabrics and more.

In January 2003 a new company entered the market to produce and sell Radomes made using GRP products. That company is Micris, Ltd.

Located in the United Kingdom, Micris, Ltd. began by producing enclosures for the fire and safety industry, and began manufacturing Radomes after purchasing a small company that specialized in producing small Radomes. Since that time, Micris Ltd. has expanded the Radome product line and now offers them in sizes that vary from 1.1 meter in diameter up to 4.8 meter diameter standard, with specific designs up to 6.0 meter.

They began producing Radomes using both the “traditional” solid laminate open molding production method, and two layer sandwich construction using a variety of core materials and vacuum infusion.

Both the solid laminate and sandwich core Radomes are assembled from multiple panels, the number of panels depending on the size of the Radome. The number of panels is the same for each production method, but the sandwich core/infusion method provides a degree of thermal insulation, high strength, lower weight and improved dielectric performance not available with the solid lamination method.

The challenge with these “standard” production methods is a lack of part consistency with solid lamination, and the higher cost and increased labor required of the vacuum infusion bagging. After completing a three year study in conjunction with Manchester University, Micris decided they needed to find a more effective way to manufacture their products that would increase production and precision from part-to-part that would allow them to be tuned to any given frequency.
Micris Operations Manager Mike Boyle turned to Magnum Venus Plastech distributor MVP-Europe for help. MVP-Europe had been working with Micris in supplying various injection systems used in their production. In October 2010, after discussing the production challenges Micris was having, Neil Scott of MVP-Europe invited Mike Boyle and Mick Thompson to a demo day they were co-hosting with Cray Valley Resins to showcase a new production method developed by Magnum Venus Plastech called Flex Molding Process.

Flex Molding Process is a comprehensive package that consists of the Patriot Innovator Injection Systems, accessories and patent pending seals specifically designed to optimize infusion with a better control of the production, training kit and training courses.

Flex Molding Process achieves an unmatched level of precision with new accessories including the IVx3 Three-Position Injection Valve, Pneumatic Pressure Vacuum Sensor (PPVS-Infusion), infusion specific Turbo Autosprue (TAS-14) and more. It also offers a new, unique, “lockable” reusable membrane, generally made from silicone, that allows for the production of complicated parts with undercut flanges (like a Radome), impossible to produce with Light RTM.

After seeing the demonstration of Flex Molding Process, Mr. Boyle and Mr. Thompson realized that it seemed to be exactly what was needed to continue the development they had begun with Manchester University.

They returned to their facility and over the next few months designed a new tool for their 4.5 meter Radome that would be used with Flex Molding Process. Their greatest challenge in designing this tool was the loose flange (the mold had negative return edges), however in consultations with MVP-Europe and MVP RTM/Infusion Technical Specialist Charles Tur, the challenge was overcome and the tool was ready to use in production.

They have now been using Flex Molding Process for a couple of months, and according to Mr. Boyle, “The quality of the product has drastically improved in the context of control over the resin and glass ratios, and most importantly to us, the consistency and accuracy of the thickness of the dome.” He continues, “It is the design of the thickness of the panel (using foam core) that allows us to tune the Radome to a given frequency, this being the main driving point to use the Flex Molding Process.”

While they have not yet been using Flex Molding Process long enough to complete any comprehensive studies on Styrene emissions or material/ labor savings, empirical evidence since switching suggests that the drop in emissions, and reduction of material waste and labor time, will be significant.

Given the success of Flex Molding Process in producing this one product, Mr. Boyle believes that it will become the manufacturing process within Micris, “as it will allow us to continue to develop the Radome business, and already we are looking to produce a further two new Radomes for our customers because of the performance gains we have achieved with the 4.5 meter Radome.”

Mr. Boyle says of Flex Molding Process, “We believe this system will bridge the gap between Light RTM and the old-style infusion process. Especially in the production of parts that are required to be produced from split tools. We have received excellent support and advice from the start, and right through to the conclusion of the project from Magnum Venus Plastech and MVP-Europe.”