MATERIALS RESEARCH INSTITUTE
UNIVERSITY OF MICHIGAN

MMRI Seminar Series

Spray Transfer Molding (STM) Technology
Robot-based Technologies for Manufacturing Sustainable High Throughput Interior Automotive Composite Parts

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We create chemistry

Monday, March 21, 2022 3:00 p.m. – 4:00 p.m.
Zoom Meeting: https://umich.zoom.us/j/97832909671
Meeting ID: 978 3290 9671 Passcode: 348956

Abstract: Spray Transfer Molding (STM) is a high throughput process that is utilized to manufacture automotive load floors. In this process a glass fiber fabric sheet covers a corrugated paper honeycomb core from both sides to form a sandwich blank, then a robot controlled program takes the blank to spray polyurethane using high pressurized spray nozzle to pre impregnate the sheets outside the mold thereafter, the impregnated sheet will be put in press for low cycle press time to form a completed finished part based on the tool shape. The high-pressure nozzle creates an atomized polyurethane that enables a good wet out without distorting the fibers while the spray pattern is programed to locally impregnate the fabric to minimize waist as well.

This study will introduce a new formulated sustainable polyurethane that has high percentage of bio renewable contents will be strayed on the sandwich blank to make around 30% sustainable part by weight, a mechanical performance will be compared vs traditional polyurethane on a glass fiber blank sheet. In order to achieve higher percentage suitable, the glass fiber matts will be replaced with natural fiber matts such as flax or jute matts reinforced with either bamboo sheet or basalt blanks. The natural fiber honeycomb blanks then will be compared with mechanical performance and environmental performance with the glass fiber parts.

A Computer Aided Engineering (CAE) will model the deflection of a 100kg load by 100 mm spherical ball (Automotive test that is called knee load test) on a honeycomb board load vs testing results. Due to the loading results a new design will showcase how introducing built in ribs out of honeycomb with optimized spray polyurethane pattern improves the mechanical performance.

Utilizing the outcome blank results and the development of the new bio renewable polyurethane, a seatback tool will be used to make an actual seatback prototype part and will be tested in the knee load to identify best built-in rib design to pass the automotive spec requirements

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Bio: Dr. Shakour is technology leader for composites technologies at BASF Corporation in North America. He joined BASF in 2014 and started working on developing structural composites for automotive applications in the thermoset applications. During his tenure at BASF, with a team of chemists, he developed and commercialized the formulation of polyurethane systems for numerous main processes: pultrusion, spray transfer molding, and reaction injection molding (RIM). He was also a key player in the BASF investment to build a prototype spray cell lab in Wyandotte, MI to drive development with OEMs and Tier suppliers to help build their prototype parts.

Currently, Dr. Shakour is working on utilizing the spray cell lab to build sustainable automotive parts using green polyurethane formulas to develop sustainable composites parts reinforced with natural fiber. Most of his work is focused to run metal replacements with high strength sustainable composites for several industries such as automotive industry, construction and consumer.

Dr. Shakour received his Ph.D. from Michigan State University in Materials Science and Mechanics and his Master of Business Admiration from Technion- Israel Institute of Technology.