

HELPING OUR CUSTOMERS DESIGN FOR THE FUTURE

Technical Services

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We offer a comprehensive technical service model that reflects our knowledge in the marketplace. Over the past 50 years, we've worked with our customers around the globe to assist them with application development and testing. Our deep understanding of unique application requirements, extensive experience with our materials and expertise in applications testing makes us a strong partner for customers developing products that improve the world.

Please visit Celanese.com for a quick means of obtaining a technical data sheet, a product SDS, or to have access our comprehensive list of up-to-date registrations and accreditations. Quality ISO 9001 ISO/TS 16949 ISO 17025

Environmental ISO 14001

ISO 50001 RoHS Restrictions on Hazardous Substances





Material selection

In order to understand their unique applications, our material experts partner with our customers to do a thorough evaluation of their needs. We'll collaborate with you to help you develop or choose a material from our portfolio that fits your project's requirements.

Color development and matching services

Celanese offers engineered polymers that combine high performance, functionality and aesthetics for your most challenging applications. Our polymers are specifically formulated for longlasting performance and value in applications such as automotive interiors and exteriors, consumer products, appliances, water transfer applications, and specialty fabrics. Our color development team matches hundreds of custom colors a year. Where applicable, the team can characterize weathering performance for both interior and exterior applications.

Our outstanding technical expertise and industry knowledge can help your bottom line by eliminating the need for secondary operations, such as painting and plating operations and eliminate the use of expensive metals. We'll help bring value to applications with:

- Molded in colors
- UV stable colors
- MetalX[®] Metal Effect Polymers
- Laser-markable colors
- Low odor /low emissions colors
- Media-resistant colors
- Controlled gloss

This area of expertise is where fine art meets function and finance. Celanese has many years of experience helping customers to optimize their use of plastics to improve design aesthetics while meeting stringent engineering, ecological, and governmental standards. Using Celanese engineering polymers in challenging color and appearance applications can also help your bottom line as they can eliminate expensive metals, secondary operations, and painting and plating operations.

Field technical services

Our field technical services team will work with your engineers as they master the processing of our materials. This team provides strong support in troubleshooting processing problems and optimization of process conditions to make acceptable parts. Field Technical Services will support trials, provide training, and make recommendations for solutions and improvements specific to your situation. We are always available to provide informative technical support.

Training seminars and hands on workshops

Celanese offers comprehensive training seminars on a variety of topics for our customers. Whether the scope is to better understand our diverse material offerings, or to help our customers get the most value out of their product concepts, or a focused technical topic, we are ready to utilize our expertise. Some examples of these are Customer Technology and Innovation Days where we can collaborate on future ideation and provide hands-on processing workshops to allow customers to gain real time experience at the machines with our materials. At Celanese we have one of the most experienced CAE groups of any raw material supplier in the world. Our engineers are not just experts in simulation; they also have expertise in a wide range of associated skills, product design, tool making and molding. These skill sets combined with their extensive knowledge of Celanese materials, ensure that your design can be optimized to its fullest extent and can be manufactured in the most economical manner. In another example, the CAE group optimized an automotive instrument panel which was predicted to have a warpage from 26.52mm to 9.9mm. This dramatic reduction in warpage was made possible, not through design modifications, or changes in material, by subtle modifications to the proposed filling profile through the use of a valve gate system that changed the fiber orientations in the part, thus reducing the warpage.



panel through the use of sequential filling to minimize warpage.

Our CAE teams use state of the art simulation software at numerous global locations, thus delivering a fast response with local design and simulations expertise. The CAE team at Celanese has a proven track record in providing fast and cost effective design solutions in wide range of applications:

- Comparing different designs under similar conditions
- Optimizing a design for a range of different conditions
- Simulating the proposed production method to investigate potential problems

One recent example of this was working with an automotive OEM on a traditional metal design requiring 25 distinct parts and weighing 12kg. Our CAE Team was able to reduce the part count to 1, and the weight by 48% - a very cost effective solution for their application.

Deflection, all effects: = Z Component Scale Factor = 1.000



Warpage prediction, ensuring that the predicted trend and direction of the warpage is acceptable for the application.

Your designer will be able to work in partnership with the global Celanese design team and deliver more innovative and cost effective solutions faster than ever before.



Thermal simulation of a heat sink to ensure that the proposed design is optimized for a CoolPoly product.



Application development engineers

Celanese has development engineers that are industry experts and are available to provide technical consultation support to Celanese customers from concept to product launch. The engineers have a comprehensive knowledge of engineering thermoplastics and the applications they are used in. The engineers can provide customers with vital information regarding material selection, design recommendations, molding parameters and molding assistance.

The Celanese engineers work with our customers to assist in analyzing opportunities and problems, and then in turn suggest material, processes, and unique value propositions and solutions. The Celanese Engineers work through all of our customers' needs during the entire development cycle and at every point in the value chain. We target to support our customers' successful product launch and collaborate with your team to explore application opportunities.

Applications processing and prototyping

Celanese capabilities in plastic part forming has always been an important part of the solution package we strive to provide our customers. Our goal is to ensure that our customers have a deep understanding of the processes used to convert our pellets into the plethora of engineering plastic parts the world uses today. We support the expanded applications of tomorrow.

We have processing and prototyping experts and the equipment capabilities to support projects from initial part concept drawings, to CNC machining of plastic parts, and finalising with actual customer part prototype injection molding. Through this process, we enhance part performance through the use of customised materials, part design and tooling recommendations. The intent is to improve both equipment design and processing techniques to ensure optimum use of the materials in the customers' process. Creation of applicationrelevant parts, or even the actual customer part, facilitates testing of the required part performance.

Celanese labs have also expanded the primary processing capability, complementing advanced injection molding (i.e., multi-component, overmolding, precision plunger molding and in-mold sensing) with co-extrusion lab lines capable of film and tube. We have access to blow molding piloting facilities as well. Experts in these processes

are on staff to support projects and customers.

Together with our CAE part and mold design recommendations and our development of unique applications testing, we are well equipped to fulfil our goal as a premier solution provider.









While other suppliers stop at data sheet properties our extensive experience allows us to support you by providing state-of-the-art application, product testing and material processing services.

Our team of chemists and engineers are eager to collaborate with customers. Application testing consists of two main facets – environmental simulation and functional performance

Application testing environments

The environment that the finished part will be exposed to is an important consideration for proper material selection and design. Each part is unique, and a few examples of the more common environments that we simulate include:

- ► Temperature (cold, hot extremes) or both
- Humidity (low humidity or high humidity) or both
- Media immersion/exposure of diverse types at diverse conditions
 - Automotive fuels, transmission, brake fluid, wheel wash, etc.
 - Consumer suntan lotion, cosmetics, cleaners, etc.
 - Hydrolysis, Sea Water, Refrigerant
- Strain or deformation
- Sterilization, IR reflow, annealing

Application testing services

Our individualized testing simulations give our customers relevant insight, which we translate into benefits and improvements to their products' design. Our application testing team creates a custom simulation focusing on the part performance criteria. Each part is unique, and a few examples of the more common performance criteria that we characterize:

- Characterization of various properties at different durations of exposure (color, weight, dimensions, mechanical properties)
- Tensile, bending, torsion, compressive stresses, and anisotropic characterisations.
- Video extensometry with strain mapping
- Custom testing jigs unique to a part function
- High speed impact
- Wear/Friction, Abrasion, Scratch
- Fatigue (flex, tensile at room and elevated temperature)
- Color, fogging, and gloss
- Surface (warpage, flatness, surface energy)
- ► Thermal Imaging

By exposing a real part to both environment and simulated performance criteria, the Celanese lab can deliver data pertinent to your application and part design in a lab environment. The ultimate fit for use evaluation and approval lies with you, our valued customer. You'll be equipped to successfully bring your product to market.



Analytical Cores

Microscopy



SEM, EDS, Optical Analysis, Hot-stage, 3D and 2D dimensional characterization

Spectroscopy



Nuclear Magnetic Resonance (NMR) FTIR, TGA-IR, FTIR-Imaging, UV–Vis

Chromatography



Wet Chemistry

Gas Phase, GC, GC_MS; Liquid Phase, LC, LC–MS; Headspace, Thermal desorption, Tube-furnace, Pyrolysis, Olfactory: Combustion IC, GPC

Extraction, Titration, IV,

Permeation, Exposure,

Particle Size Analyzer, Contact Angle

Thermal/Rheology



Characterization

Core

MDSC, DSC, TGA, TMA, DMA, Rotational Rheometry High Pressure Capillary, Flow Initiation Temperature Thermal Conductivity via laser flash, DTUL, Vicat, Flammability, LOI, Shrinkage, Heat Seal, Hot Tack



Rheology/flow: MFR/MVR/ MI, MV Pellet quality and aesthetics Filler–Ash, fiber length



Instrumental/multi-axial,



Tensile, flex, compression, fatique, friction, shear, tear, Poisson's, video, creep, stress relaxation, hysteresis, fibers, films



Electrical

Gardner, tensile impact, drop tower, high speed impact/crash simulation, Elmendorf, Spencer, dart

Izod, charpy,

Dk/Df, Electrical Shielding, Arc resistance, Comparative Tracking Index, Dielectric Strength, Permittivity, Resistivity, Static decay

Physical



Abrasion, color, yellowness, haze, gloss, hardness, density, fiber length, specific gravity





ENGINEERED MATERIALS

celanese.com/engineered-materials

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