



Products

Despite the many challenges resulting from the COVID pandemic, at Barnes Group, we continued to make progress in 2020 on our transformational journey to position the Company as a leading global provider of engineered products and diversified industrial technologies. We furthered the evolution of our Barnes Enterprise System (BES) by beginning to develop detailed playbooks for Commercial, Operational, and Financial Excellence to help employees clearly understand how our BES business processes work in theory and practice. We established our Innovation Hub and added resources to develop state-of-the-art molding technologies, allowing the Company to build on its strong position in engineering development and expand into applied and fundamental research and development. By leveraging BES to “Power Performance Excellence,” our Company is excelling at selling, delivering, and realizing the value we bring to the marketplace. Part of that value proposition involves our ability to consistently deliver high-quality products to our customers.



Ongoing key strategic investments in the BES, Innovation, and TMS continued to be instrumental in enabling us to achieve our goals. In the last year, many of the products we delivered and the processes we used to manufacture these products embodied socially and environmentally responsible concepts and methods.

Barnes Industrial

Molding Solutions:

Our Molding Solutions strategic business unit continues to develop plastic injection molding technology used to produce cutting-edge structural and cosmetic components that reduce vehicle mass, improve aerodynamics, and improve fuel efficiency, which directly reduces vehicle emissions.

Barnes Group continues to engage the complete circular economy and is aligning its efforts to support the European Green Deal, European Single Use Plastics Directive, and many others. Key leaders within the business unit are actively engaged in many industry consortiums and leading enablers across the environmentally friendly circular economy. The objective of these partnerships is to enable our injection molding process technology to efficiently and effectively support the introduction of environmentally friendly plastics to the world.

Our research and development efforts are actively involved in supporting many game-changing materials such as biodegradable and recyclable based products. Barnes Group also is committed and focused on further advancing its Innovation Hub, which was introduced in 2019, as its innovation accelerator focused on strengthening our commitment to research and development of game-changing technologies. With connectivity and alignment with all site level research and development centers located around the world, our Innovation Hub has built a diverse team of engineers and research scientists dedicated to delivering the most advanced plastic solutions to our markets. Most notably, and directly aligned with the global focus on the mitigation of plastic waste, its research efforts are actively involved in establishing advanced material conversion processes that directly enable the use of new game-changing materials, such as biodegradable and recyclable based products.

Our high-quality injection molds for the plastics industry, specifically our cube-mold technology, continue to move forward. With ongoing manufacturing value in the reduction of cycle time, our cube mold technology reduces our customers' energy consumption while directly improving the manufacturability of products made with plastic injection molding in the personal care, healthcare, packaging, and automotive industries around the world.

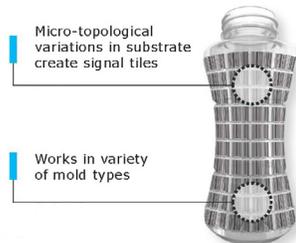
The reduction in plastic processing waste continues to be improved in markets such as packaging and personal care applications. The new generation of our eGate® system, an electric-drive valve gate solution, is available for larger components and ensures complete pin movement control at each individual nozzle. This control achieves the highest performance levels for flawless surfaces and outstanding part-to-part consistency, as well as reduces waste for our customers.

With the ongoing dedication of our Innovation Hub and our commitment to leading the world in the processing of new environmentally friendly plastics, Barnes Group will continue to be a role model in its business commitment to environmentally friendly processes and products.

The Circular Economy

Under the facilitation of the European Brands Association (AIM), Barnes Group is actively engaged with several manufacturers of branded consumer goods focused on addressing key issues which affect the industry's ability to design, distribute and market their brands. This consortium known as "Holygrail2.0" unites approximately 100 companies and organisations from the complete packaging value chain to jointly drive the next phase of cross-value chain initiative in the circular economy. One of the most pressing challenges in achieving a circular economy for packaging is to better sort post-consumer waste by accurately identifying packaging, resulting in more efficient and higher-quality recycling. The use of digital watermarks may have the potential to revolutionize the way packaging is sorted in the world's waste management system. Barnes Group has and will continue to actively participate in the Holygrail2.0 consortium and is supporting a dedicated workgroup for the technical implementation of digital watermarks in injection moulds, with an initial focus on packaging applications.

Digital Watermarks @work FOR MOLDS



Force & Motion Control:

Our Force & Motion Control strategic business unit continues to develop advanced metal and metal-alloy forming technology that allows vehicle designers and manufacturers to introduce highly complex shapes and structures, ultimately reducing vehicle weight and optimizing the use of materials. Our products and systems allow for flexible transfer of force and motion from one place to another, yielding enhanced production rates and efficiencies for our customers, including those customers engaged in the manufacturing of electric vehicles.

In the transportation and logistics markets, our business is actively providing technology that directly improves ergonomics and safety, helps reduce carbon emissions, and supports the next generation of hybrid, electric, and autonomous vehicle technologies currently being introduced to the world. Such offerings range from fundamental chassis elements to user-supported solutions that all contribute to the end goal of sustainability and improving the human experience.

Our counterbalance solutions directly improve safety by reducing or eliminating the most dangerous points of injury due to overexertion while moving heavy structures. Counterbalanced, machined components, and assemblies are used in many ways to improve aerodynamics while reducing weight that leads to significant reduction in carbon emissions and improved range. These various elements are also being successfully adopted in prototype and early production heavy truck applications to support hybrid, electric, and autonomous carryover applications that create the bridge from current technology to future technology.

By developing sound customer relationships and leveraging key Barnes Group tools, our Force & Motion Control strategic business unit is well-positioned to support the sustainable technology requirements of the future. From improving human interface, to supporting foundational design components, we will continue to grow and play an important support role in many health, environmental, and safety-related end uses.



Engineered Components:

Our Engineered Components strategic business unit continues to offer unconventional vehicle components using advanced alloys and manufacturing principles, delivering leading engine and powertrain components to improve fuel efficiency and lead the way to vehicle electrification.

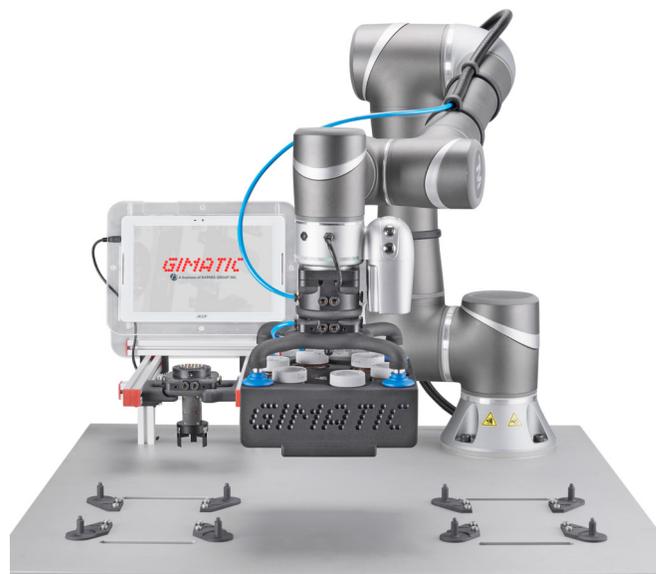
Engineered Components most recently strengthened its position as a technology leader in the vehicle turbocharger market by supplying critical enabling sub-systems to support cutting edge Variable Turbine Geometry (VTG) turbochargers to the global vehicle hybrid market. Such technology offers benefits for modern hybrid and combustion engines, including improved power output, reduced emissions, and higher temperature capabilities.

Relative to internal manufacturing processes, most notable is the conversion from traditional oils used in its many steel quenching processes to organic polymer quenchants. Such polymers contain several organic inhibitors that decrease energy consumption, mitigate combustion risks associated with oil fires, prevent carbon residues, and eliminate the creation of oil sludge.

Automation

Our Automation strategic business unit continues to advance its robotic grippers, advanced end-of-arm tooling systems, vacuum cups, sensors, and other automation components for intelligent robotic handling solutions and industrial automation applications in end markets such as packaging, healthcare, transportation, and food and beverage. Advancements in robotic technology are rapidly increasing the ability to accomplish more complex tasks at higher speeds and with improved control and repeatability. With greater affordability of robotics, Gimatic's customized mission-critical systems directly benefit from a large and growing global installed base of over two million industrial robots.

Identification and evaluation of significant environmental aspects is a top priority for Gimatic. Gimatic has an environmental management system to drive performance in this area, which has been registered under ISO 14001 since 2016. In addition, Gimatic achieved another milestone in its ongoing sustainability monitoring and improvement process in 2020 when it received the EcoVadis certification Silver Medal. Such accomplishments demonstrate the business' commitment to advancing its sustainability practices within four primary focus areas: environment, labor & human rights, ethics, and sustainable procurement.



Barnes Aerospace

OEM:

Our Barnes Aerospace divisions that manufacture new components are continuing their work with our aerospace customers to introduce component designs that will reduce the weight of the aircraft and engine parts. For airlines, reducing the weight of the aircraft or its engines through lower-weight parts and components drives lower fuel usage and lower carbon emissions. The projects are focused on reducing the weight of the components without sacrificing strength, durability, or safety. These lower weight components will contribute to a reduction in fuel usage of the affected airplanes each year. During 2020, our Barnes Aerospace, Ogden, Utah location ramped production of a lower-weight airframe structural assembly and worked with its customers on several additional design refinements. We are proud that our employees continuously support our customers in their efforts to help lower the industry's fuel usage and reduce emissions.

Our sites are also working with customers to reduce the amount of excess raw material consumed in the manufacturing processes. Our Lansing, Michigan site introduced new nacelle structural components for one of our customers, which utilizes our fabrication expertise to produce a part with significantly less material waste than the existing machined process that our customer was using for these components. In machining applications, forgings and castings must be machined to the final part dimensions. The closer to the final part dimensions the initial forging or casting form can be, the lower the level of waste that must be recycled. The Windsor, Connecticut division introduced a near-net forging for an engine component, which reduced the amount of wasted material by over 300 lbs per component. Our Ogden and Lansing locations worked to reduce the metal sheet stock usage for their various fabricated components by optimizing the size of purchased sheets to minimize any scrap or wasted material. We recognize the importance of working with our customers to be more efficient with our material usage as an industry and continue to actively partner with our end customers and our raw material suppliers.

MRO:

Within the Barnes Aerospace Aftermarket strategic business unit, our divisions are focused on component repair work and collaborate closely with our engine OEM and airline customers to develop new and innovative repair methods for the various engine components that become worn as the airplane is flown. In many cases, our highly-trained MRO repair engineering teams have helped to develop approaches to repair components back to the original new component conditions, instead of scrapping the worn part and replacing it with a new part. Our new repairs reduce waste and conserve the usage of exotic alloy metals. This year, our Singapore facility developed a new repair for a large commercial engine high-pressure compressor case that had been typically scrapped in the past. For these compressor cases, the airline would have no choice but to purchase a new casing. Our new repairs allow this part to avoid being scrapped and avoid all the material waste associated with manufacturing a new part. These types of novel repairs provide not only value for our customers but also benefit the environment by reducing the amount of waste and avoiding the resources that would be consumed to manufacture a new part.

Both our OEM and Aftermarket strategic business units are also working to reduce the use of consumable cutting tools through optimization of our machining programs, application of smart factory monitoring, and increased use of cutting tool regrinds to extend the tool lives. The use of additive printing – both plastic and metal based – is also increasing within our divisions for manufacturing and inspection tooling. As 3D printing reduces the amount of material and energy used to manufacture the tools, we continue to look for innovative ways to utilize this new technology.

Product Safety

At Barnes Group, providing the highest quality products and solutions for our customers is our business. To ensure we deliver on this commitment, we utilize the Barnes Enterprise System (BES). BES drives every aspect of our culture and performance, and provides a significant competitive advantage in the global marketplace. BES ensures that the organization is aligned through flow down of the Goal Deployment Process (GDP), Leadership Standard Work (LSW), Key Process Indicators (KPI's) and continuous BES Assessment. A key element of continuous improvement is our focus on product quality and safety. We investigate product safety issues and strive to identify the root cause and disseminate corrective actions or field instructions to affected stakeholders, and we cooperate with regulatory authorities as appropriate. Most notable is our commitment to prevention – we establish both quality and safety through our use of robust advanced quality planning methodologies by engaging and listening to the needs of our stakeholders, both internal and external, prior to the introduction of new products and processes.

Our Response to COVID-19

Barnes Group joined the fight against COVID-19 by adapting many of our technologies and critical applications to support the medical industry. Some examples include our Gimatic business, which used its 3D printing capabilities to produce valves that fit oxygen masks to support their local hospitals. Our Force & Motion Control team in Sweden also used its additive manufacturing capabilities to create components for face shields that were donated to their local health care workers. Our Engineered Components, Associated Spring business and Force & Motion Control, Associated Spring Raymond business met the heightened demand for compression springs used in applications such as ventilators, hospital beds, and RVs that temporarily housed medical staff working on the frontlines of the pandemic.

In addition to support for our customers and communities, Barnes Aerospace generated various 3D-printed and hot formed applications such as “hands-free” door handles, lanyard keys, and door openers in order to reduce the transmission of the virus within our factories. These are just a few instances of how our employees produced essential products that helped in the concerted effort to minimize the impact of the coronavirus crisis.



Employees from our Force & Motion Control, Strömsholmen location in Trånas, Sweden created and donated PPE for local first responders to support their community during the COVID-19 pandemic.



Employees from our Automation, Gimatic location in Bagnolo Mella, Italy supported their local hospital by donating 200+ 3D-printed respirator masks.



Please visit the [ESG page](#) on our Corporate website for more information on our efforts in environmental sustainability, diversity and inclusion, employee health and safety, and the Company's support of social and charitable causes. We invite our stakeholders to learn more about our commitments and all the ways we are working towards being a more sustainable organization.

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