HEXPOL Compounding Americas Site Capabilities

Site Locations	Line	Mixer	Liter	Batch Weight (Average Lbs.)	Type	Non-Black Mixing	Straining	Pelletizing	Takeoff (Size In.)
Aguascalientes, MX	1	HF	90	190	Intermesh - PES5	No	In-Line Gear Pump	In-Line	0.44 – 12
	2	HF	90	190	Intermesh - PES5	No	In-Line Gear Pump	No	0.44 – 12
	3	HF	90	190	Intermesh - PES5	No	In-Line Gear Pump	No	0.44 – 12
Akron, OH (Silicone)	1	J. H. Day	568	1,100	Sigma Blade	Yes	No	Off-Line	1 – 18
	2	Littleford Day	757	2,000	Sigma Blade	Yes	In-Line Gear Pump	Off-Line	1 – 18
	3	Battaggion	568	1,100	Sigma Blade	Yes	In-Line Gear Pump	Off-Line	1 – 18
	4	Littleford Day	190	200	Sigma Blade	Yes	No	Off-Line	1 – 18
	5	Stewart Bolling	N/A	100	2 Roll Mill	Yes	No	Off-Line	1 – 18
Barberton, OH	11	Farrel	237	460	Tangential - 2 Wing	No	In-Line Gear Pump	No	1.25 – 28
	12	Bolling	270	525	Tangential - 2 Wing	No	No	No	1.25 – 28
Burton, OH	3	Shaw	257	475	Intermesh - NR5	No	Off-Line Gear Pump	Off-Line	1- 28
	4	Farrel	285	550	Tangential - NST	No	Off-Line Gear Pump	Off-Line	1- 28
	5	Shaw	257	475	Intermesh - NR5	No	In-Line Screw Extruder	Off-Line	1- 28
	8	Kneader	75	150	Tangential	No	Off-Line Gear Pump	Off-Line	1- 28
	9	Kneader	75	150	Tangential	Yes	Off-Line Gear Pump	Off-Line	1- 28
Dyersburg, TN	D	Bolling	220	450	Tangential - 2 Wing	Yes	In-Line Gear Pump	No	1.25 - 30
	E	Bolling	312	550	Tangential - 2 Wing	Yes	No	No	1.25 - 30
	F	Shaw	257	475	Intermesh - NR5	No	No	No	1.25 - 30
	G	Shaw	257	475	Intermesh - NR5	No	No	No	1.25 - 30
	K	Farrel	270	500	Tangential - 2 Wing	Yes	No	No	49 - 52
	H	Bolling	620	1,400	Tangential - 4 Wing	No	No	No	1.25 – 30
Huntingdon, TN	4	Farrel	270	500	Tangential - 4 Wing	No	In-Line Gear Pump	No	1.25 – 28
	5	Farrel	270	500	Tangential - 4 Wing	No	In-Line Gear Pump	No	1.25 – 28
Kennedale, TX	T1	Kobelco	120	250	Tangential	Yes	Off-Line Screw Extruder	Off-Line	1.5 – 12
	T2	TMP	75	150	Tangential	Yes	Off-Line Screw Extruder	Off-Line	1.5 – 12
	60	Adamson United	N/A	250	2 Roll Mill	Yes	Off-Line Screw Extruder	Off-Line	1.5 – 8
	PA2	Lufkin	N/A	250	2 Roll Mill	Yes	Off-Line Screw Extruder	Off-Line	1.5 - 8
Long Beach, CA	L1	Farrel	237	460	Tangential - 2 Wing	No	Off-Line Gear Pump	No	1.25 - 24
	L2	Farrel	270	500	Tangential - 2 Wing	No	Off-Line Gear Pump	No	1.25 - 24
	L4	Shaw	143	230	Intermesh	No	Off-Line Gear Pump	No	1.25 - 24
	L5	TMP	75	150	Tangential	No	Off-Line Gear Pump	No	1.25 - 24
	B1	Baxter	27	40	Tangential	Yes	Off-Line Gear Pump	No	12 - 16
Middlefield, OH	1	HF	257	475	Intermesh - PES5	Yes	In-Line Screw Extruder	No	1 - 28
	2	HF	257	475	Intermesh - PES5	No	In-Line Screw Extruder	No	1 - 28
	3	HF	257	475	Intermesh - PES5	No	No	In-Line	1 - 28
	7	HF	45	100	Intermesh - PES5	Yes	No	No	1 - 15
Queretaro, MX	1	Shaw	320	550	Intermesh - NR5	No	Off-Line Gear Pump	No	1.25 - 28
	2	HF	135	330	Intermesh - PES6	No	In-Line Gear Pump	No	1.25 - 28
	3	HF	135	330	Intermesh - PES6	No	In-Line Gear Pump	No	1.25 - 28
	4	Kneader	75	150	Tangential - 2 Wing	Yes	No	No	1 - 16
San Luis Potosi, MX	R	Farrel	270	500	Tangential - 4 Wing	No	No	No	1.25 - 28
	S	Farrel	270	500	Tangential - 4 Wing	No	No	No	1.25 - 28
	T	Farrel	270	500	Tangential - 4 Wing	No	In-Line Gear Pump	No	1.25 - 28
	U	Kneader	75	150	Tangential - 2 Wing	Yes	No	No	1 - 17
Statesville, NC	1	HF	90	190	Intermesh - PES5	No	In-Line Gear Pump	No	0.44 - 10
	2	HF	90	190	Intermesh - PES5	No	In-Line Gear Pump	In-Line	0.44 - 10
Tallapoosa, GA	1	Farrel	237	460	Tangential - 2 Wing	No	No	No	1.25 - 28
	2	Shaw	252	430	Intermesh - NR5	No	No	No	1.25 - 28
	3	Farrel	237	460	Tangential - 2 Wing	Yes	In-Line Gear Pump	No	1.25 - 28
	4	TMP	75	150	Tangential - 2 Wing	Yes	In-Line Screw Extruder	No	1.25 - 16
	5	Moriyama	55	150	Tangential - 2 Wing	Yes	No	In-Line	1.25 - 16
Whitewater, WI	K5	Shaw	143	230	Intermesh - NR5	No	Off-Line Barwell	No	1 - 17
	K1	Kneader	3.5	6	Intermesh	Yes	Off-Line Barwell	No	14 - 16

All Sites are ISO 9001 and ISO 14001 Certified

HEXPOL Compounding Americas

Site Capabilities & Glossary of Terms

HEXPOL® A Material Difference

www.HEXPOL.com/rubber

Introduction - There are three components to rubber processing: mixing, shaping, and curing. The overview of mixing includes loading ingredients into the mixer, actual mixing, and emptying the compound from the mixer for final form, cooling, and packaging. These activities are the essence of HEXPOL Compounding Americas (HCA).

General shaping and curing processes are how HCA customers use its compounds; extrusion, calendaring, and molding (compression, transfer, or injection). The proper integration of the compound and the process is essential to achieve the right end product. Extensive cooperation between HCA, as compounder and mixer, and the customer is critical.

ISO 9001 Quality Management System - Guidelines developed by the International Organization for Standardization to help organizations implement the fundamentals of a Quality Management System and to meet regulatory requirements related to a product. ISO 9001 standards facilitate error-free, quality end products and/or services. All HCA sites operate within an integrated system certified to ISO 9001.

ISO 14001 Environmental Management Systems - ISO 14001 is part of the family of management system standards developed by the International Organization for Standardization to help organizations to minimize environmental impact and to comply with laws and regulations related to protecting the environment. All HCA sites operate within an integrated system certified to ISO 14001.

Sustainability - HCA has embraced the definition of Sustainability as meeting current needs without compromising future generations' ability to meet theirs.

HCA is committed to identifying, exploring, and executing operational process improvements that enhance and elevate outcomes for people, planet, and business performance (3P's). Embodying sustainable practices and embracing the subsequent culture; adds value and reduces risk to all stakeholders in the short and long term.

Mixer - A variety of brands and styles of mixers are in use at HCA sites. The tilt style mixer used at several HCA sites rotates the entire mixing chamber to discharge the batch and uses a lubeless style of dust stop rotor seals. This is an advantage for compounds that may be sensitive to oil bleed and cross contamination, such as those used in medical and aviation applications.

Internal mixers, regardless of the manufacturer, have two common features that impact the overall effectiveness of mixing. First, they exert high-localized shear stress to the material being mixed - a nip action where the tip of the rotor meets the chamber sidewall or between rotor tips in the case of an intermesh design. And second, they provide a lower shear rate stirring or homogenizing action. Both actions are required to provide high shear stress and large shear deformation.

Intermesh - The intermesh rotor design is dispersive. That is, particles of a substance are scattered throughout the mix to determine the interaggregate separation and filler network characteristics. The rotors rotate at the same speed. Advantages of intermesh rotors include better heat exchange to control temperature. They are suited for complex, difficult to mix compounds that require a long mixing time, during which a lot of heat is generated. Intermesh rotors are ideal for technical rubber goods where good dispersion is needed.

Tangential - These rotors can rotate independently and at different speeds. The mixing occurs between the rotors and the mixer's walls. Water is circulated through the hollow rotors and chamber wall to provide cooling or heating. This design is distributive, meaning that particles are distributed throughout the polymer mix to obtain good spatial distribution by random patterns of mechanical mixing. This type of rotor is typically found in tire mixing sites and for applications where high-volume mixing is required. Tangential rotors are suited for general-purpose type compounds.

Sigma Blade - For silicone processing, at our Akron site, HCA has a sigma blade mixer for compounds that are generally lower viscosity than organic rubber. This batch type mixer, designed with tangential blade action and heavy-duty gears, achieves thorough mixing of high viscosity compounds.

Two-Roll Mill - Mills are rarely used today for primary mixing. These mills were used before the introduction of internal mixers. They are, however, still used for small volume applications, specialty compounds or secondary mixing.

Non-Black Mixing - Employs non-black carbon fillers for rubber during mixing. The most widely used non-black fillers are calcium carbonate, kaolin clay, and precipitated silica. These fillers modify the properties of rubber products and offer benefits that contribute to processing the rubber. Non-conductive electrical applications and colored goods often specify non-black carbon fillers.

Straining - Traditional in line screw type rubber extruders are used to strain master batch compound though multi-layer screens to remove impurities from raw materials and processing for many applications. Several HCA sites also utilize in-line gear pump technology for straining/screening final compound purposes. In addition to using the gear pump for straining, it can be used for pelletizing, off-line stripping, and pre-forming. A single screw extruder can be used to feed the gear pump to better control exiting strip dimensions. The gear pump is a cost-effective solution for large production volumes and generates high straining pressures without causing excessive temperatures.

Pre-Forming - This is an off-line process with the gear pump or a Barwell in which the compound is put into a variety of shapes and weights used for compression and transfer molding applications.

Pelletizing - As an intermediate product, the size, shape, and consistency of pellets impact subsequent processing. Pellets come in multiple sizes, shapes, and polymer variations - firm enough to be transported in bulk and be free flowing. HCA can perform pelletizing in-line or off-line covering a variety of polymer types.

Takeoff Form - Cuts sheets, strips, or slabs to specified width. Strips are usually less than six inches in width and slabs are over six inches. Strips are continuous and slabs are cut to length. Continuous slabs, also known as "wig-wag" are available as well.

Packaging - When material is formed to customer requirements: slab, strip, pellets, pre-forms, and sheet, it is sent to packaging. Packaging options are automated, manual, and rolls. Typical packaging choices include open skid (stretch wrapped), cardboard box, and returnable.

Manufacturing Execution System (MES) HCA utilizes a combination of proprietary and externally developed software designed to optimize the manufacturing process by monitoring, tracking, documenting, and controlling the entire production lifecycle. The MES improves quality control and increases uptime while also reducing inventory and costs MES facilitates the ability to develop and manufacture high-performance compounds and are vital for delivering product quality and batch-to-batch consistency. These systems contain all formula information and machine instructions, ensuring accuracy and process consistency. The system also provides specific instructions during each production process, including mix time, power, temperatures, and packaging.

Production Laboratory Capabilities - Every site has basic laboratory capabilities for production release testing. These tests include rheology (moving die and oscillating disc rheometers and viscosity), hardness and physical properties (tensile strength, modulus, and elongation). Several sites have complex rheology testing equipment. They are used to determine the dynamic properties of raw elastomers or mixed rubber before, during and/or after cure. They also can perform cure, temperature sweep, frequency sweep, and stress relaxation tests. (Rubber Process Analyzers).

Research and Development Laboratory Capabilities - There are multiple development laboratories within HCA. In addition to the production release testing, capabilities exist for lab mixing and extrusion, heat aging, compression set, oil and fluid immersions, ozone, low temperature, stain and rebound characteristics. The Burton site development laboratory is certified to ISO 17025.

Analytical Testing Laboratory Capabilities – The Burton site has analytical testing capabilities for all of HCA. Tests include thermogravimetric analyzer (TGA) for compositional analysis, reverse engineering, material identification, and stability studies. Differential Scanning Calorimeter (DSC) for determining melt and glass transition temperatures and oxidative studies. Fourier Transform Infrared Spectroscopy (FTIR) material identification. Interferometer (IMF) for dispersion analysis. Optical Microscope for particulate analysis.

HEXPOL is the leading global developer and manufacturer of quality polymer compounds. The company provides proprietary and standard rubber compounding solutions for an array of applications in multiple industries and markets.