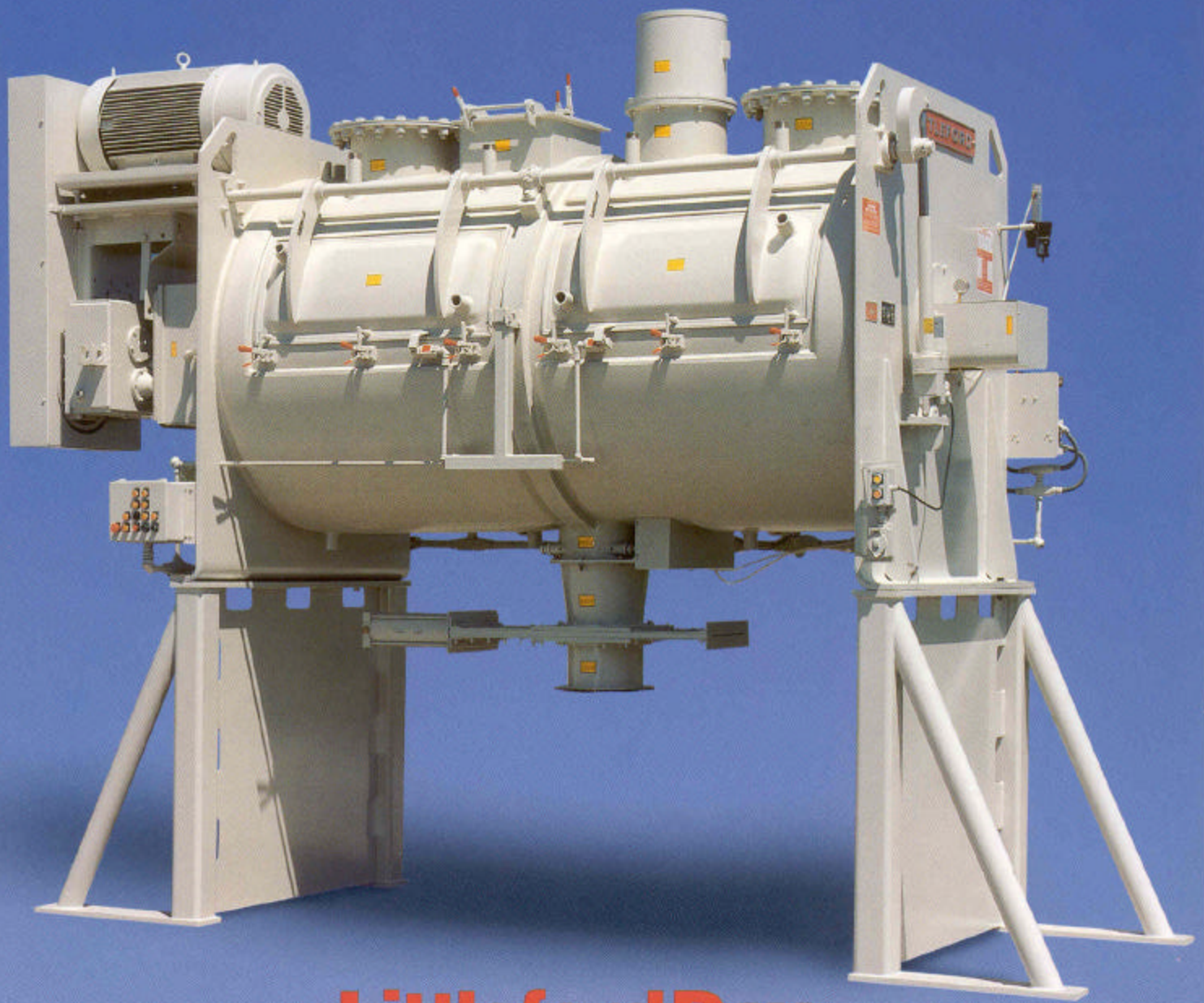


SPECIALTY POLYMERS MIXING & COMPOUNDING SYSTEMS



Littleford Day
Where Processing Ideas Become Reality

LITTLEFORD WILL HELP YOU SET THE PACE IN PLASTICS

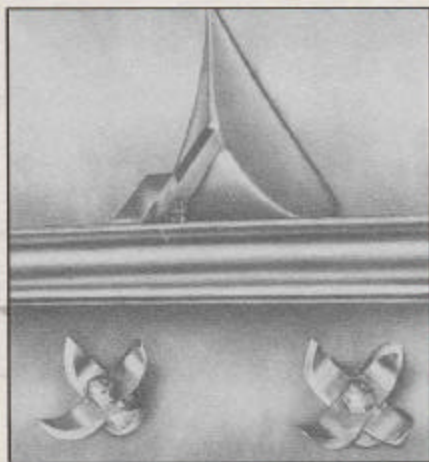
Plastic compounds require a thorough dispersion of chemical modifiers, pigments or reinforcing agents with basic resins prior to final forming into finished products. The type of mixing action necessary may vary with the application — ranging from gentle to intermediate to high intensity. The auxiliary functions required of the mixer may be heating and/or cooling for exact temperature control, liquid injection, deagglomeration or vacuum drying.

Littleford has the experience and equipment to perform the necessary operations to process plastic compounds. Gentle to intermediate mixing action is available in the Littleford Horizontal Batch or Continuous Mixer. For high intensity applications, Littleford offers the vertical "W" series mixer in eight sizes.

HIGH SPEED CHOPPERS

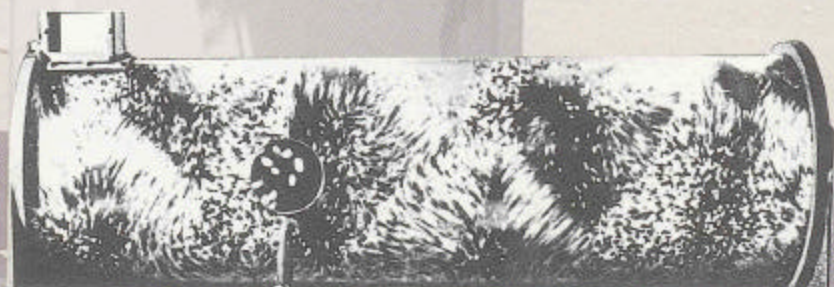
Supplementing the gentle mixing action of the plows are integrally mounted, but individually powered high speed choppers. By providing intermediate shear action, the choppers when activated, disperse pigments and plasticizers, deagglomerate, or create uniform suspensions of fine powders in viscous liquids.

Plow and high speed choppers



MECHANICALLY FLUIDIZED BED MIXER

Littleford's gentle mechanically fluidized bed mixing action is developed with plow shaped mixing elements. Rotating in a horizontal cylindrical vessel, the size, shape, geometric arrangement and peripheral speed of the mixing elements force the product into a three dimensional motion. This motion "individualizes" each particle surface area for mixing, coating, lubrication, coloring and absorption. The result — unmatched mixing precisions — often in a fraction of the time required by conventional mixing equipment.



Fluidized bed mixing action

Littleford Mixers Standard Sizes

Model	Total Volume Cubic Feet	Working Cubic Feet*
BATCH		
M-5-R	0.2	0.1236
M-20	0.7	0.494
FM-50	1.8	1.2
FM-130	4.6	3.2
FM-300	10.6	7.4
FKM-600	21.2	14.8
FKM-1200D	42.4	29.7
FKM-1200E	42.4	29.7
FKM-2000D	70.6	49.4
FKM-2000E	70.6	49.4
FKM-3000	105.9	74.2
FKM-4200	148.3	103.8
FKM-6000	211.9	148.3
FKM-8000	282.5	197.8
FKM-10000	353.2	247.2
FKM-13500	476.8	333.7
FKM-15000	529.7	370.8
FKM-20000	706.3	494.4
FKM-25000	882.9	618.0
CONTINUOUS		
KM-150	5.3	2.6
KM-300	11	5.3
KM-600	21	11
KM-1200	42	21
KM-2000	71	35
KM-3000	106	53
KM-4200	148	74
KM-6000	212	106
KM-8000	283	141
KM-10000	353	177
KM-13500	477	238
KM-15000	530	265
KM-20000	706	353
KM-25000	883	441

*Capacity based upon 70% fill.

In applications where heat transfer is critical, the jacketed Littleford mixer is one of the most efficient heat transfer vessels available to the plastics industry. The combination of particle surface exposure and constant movement produce intimate contact of all particles with the heat transfer surfaces.

REINFORCED THERMOPLASTICS

Mix Includes:

Thermoplastic Powders, Beads and Chopped Strand Fiberglass

ADVANTAGES:

*30 Second Mix Cycles
No Filamentizing of Glass Strands
No Stratification of Discharged Product
Uniform Blend*

REINFORCED THERMOSETS

Mix Includes:

Phenolic Resin
Wood Flour
Fibers
Pigment

ADVANTAGES:

*Short Mix Cycles
No Filamentation of Fibers
No Stratification of Discharged Product
Uniform Blend*

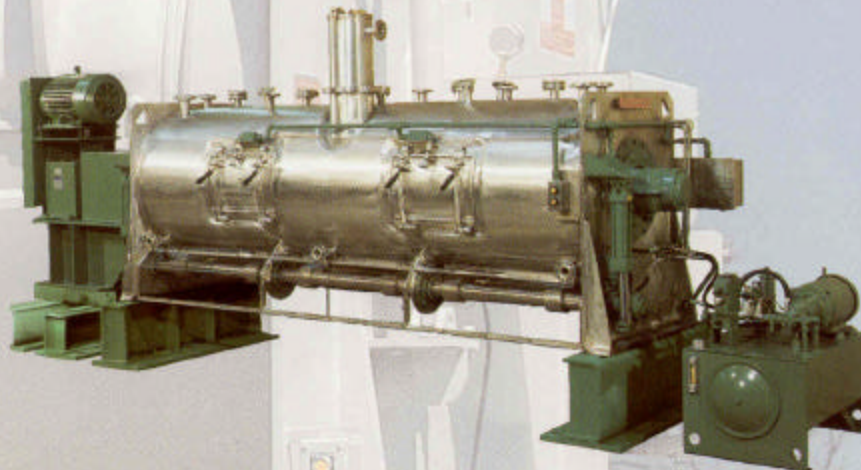
THERMOPLASTIC RESINS

Mix Includes:

Polyethylene, or Polypropylene Resin
Trace Amounts of Additive

ADVANTAGES:

*Short Mix Cycles
Uniform Additive Dispersion
High Volume Processing
Simultaneous Cooling*



Prior to extrusion or injection molding, bundles of chopped strand fiberglass must be uniformly mixed with thermoplastic pellets, chips, beads, or powder without filamentizing the fiberglass strands.

The mechanically fluidized bed mixing action of the Littleford Blender separates the thermoplastic particles and gently blends in the fragile glass bundles. In a short mix cycle, often 15 to 30 seconds, a 30% glass blend can be attained to an accuracy of less than $\pm 1.0\%$. There is no degradation of the fiberglass. The Blend is discharged with the plows rotating to prevent stratification of the mixed materials.

The very short mix cycles attainable in a Littleford mixer enable more frequent batching. This means a reduction in capital investment by utilizing a smaller volume Littleford mixer rather than a large volume and long cycle tie conventional mixer. Also, the Littleford mixer lends itself well to totally automated operation.

Thermosetting molding compounds require high shear to disperse the pigments, fillers, and reinforcing fibers, plus exact temperature control to protect the resin. With conventional mixing equipment, pre-milling and post-milling operations are usually required.

A uniform flow, labyrinth-design jacket surrounds the circumference of the Littleford mixer, thus providing exact temperature control. The unique mix action creates outstanding particle to heat transfer surface contact, resulting in an exceptionally high coefficient of heat transfer.

The mixers, when equipped with high speed choppers, produce the high shear required to disperse and develop the pigment in a short mix cycle.

Reinforcing fibers are dispersed uniformly without breakage or damage. Liquid additives can quickly be dispersed without agglomerate formation.

Premilling of the batch components can be greatly reduced and postmilling and homogenization operations completely eliminated.

To meet the special requirements of certain finished products, trace amounts of additives must be introduced and uniformly dispersed throughout thermoplastic resins. These processed resins are often produced in high volumes (2,500 to 50,000 lbs./hr.)

The Littleford intermediate intensity batch or continuous mixer, with its unique dual mix action, is capable of meeting these high volume demands with a minimum retention time. The accuracy of additive dispersion is often within 1% coefficient of variation.

When equipped with a uniform flow cooling jacket, the Littleford batch or continuous mixer can eliminate conventional post-mix cooling equipment by simultaneously mixing and cooling. This is accomplished without any significant increase in mixing cycle time.

For such an application, for example, the Littleford Model KM3000 (53 cubic feet working capacity) would be capable of an approximate throughput of 35,000 lbs./hr.

DRYING

Mix Includes:
Plastic Resins

ADVANTAGES:


Excellent Heat Transfer
Coefficients
Dry to Low Moisture Levels —
Less Than .05%
Vacuum, Atmospheric or
Air Purge Operation

PLASTISOLS

Mix Includes:
Fine PVC Resin
Pigment
Plasticizer
Stabilizer

ADVANTAGES:

*Short Mix Cycles
No Heat Generation
Thorough Dispersion — Usually
off the Hegeman Grind Gauge
Mixing and Deaeration in same
Littleford Mixer*



Drying, often important to the value and usefulness of many finished products, is of vital importance in the plastics industry. It is crucial to remove even trace amounts of moisture prior to final processing. The Littleford mixer is an ideal dryer. Individual particle separation is created by the unique dual mix action. The entire surface of each particle is exposed for drying continuously throughout the operation.

When equipped with a heating jacket, drying results as each particle comes in contact with the heated jacket surface.

For heat sensitive materials, warm dry air may be injected into the product at atmospheric pressure. The dry air absorbs moisture and is removed from the unit, carrying the moisture with it.

The Littleford Mixer, when equipped for vacuum operation, is capable of dynamically removing moisture within a short drying cycle. Vacuum operation also allows the removal and recovery of expensive solvents.

The unique plow-shaped design of the Littleford mixing-tools creates a shear action which develops a suspension of extremely fine powdered PVC resins in plasticizers to produce agglomerate free plastisols.

The mix cycles are very short, hence the plastisol is formed with little or no heat generation. The mixing action is so uniform that there is no tendency to form gels.

In some cases, plastisols of lower viscosity require a higher degree of shear action. This can be provided in the Littleford mixer by equipping the unit with a high speed chopper located such that the mixing plows constantly bring fresh material into their path for effective dispersion.

The mixer may be equipped for vacuum operation to permit the dynamic removal of entrained air from the plastisol.

The mixing cylinder can also be completely jacketed to maintain optimum temperature for reactions, solvations and viscosity adjustments.

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