stamixco……mix it up

SMB Extrusion Melt Blender

mixing equipment with no moving parts for the extrusion of viscous polymers, resins, foods and other materials……

INTRODUCTION

StaMixCo manufacturers all three commercially proven static mixer designs used for extrusion service (see page 3). As with most pieces of process equipment, each static mixer design has specific advantages and disadvantages that make it more or less suitable for a specific application and installation.

The Static Mixer Melt Blender (Figure #1) is installed just in front of the extruder die. It is installed as the last piece of equipment to correct all irregularities created by the extruder screw, empty piping and downstream auxiliary equipment such as screen changer and gear pump. In some applications such as multi-layer film, small diameter mixing elements are installed within the die flow channels,

The Static Mixer Melt Blender contains no moving parts. Molten polymer, driven by the screw, flows through the static mixer as it enters the die. The static mixer homogenizes the melt in a remarkably short length by continuously dividing and recombining material flowing through its geometric structure. In virtually all applications, the Melt Blender can accommodate the length and pressure drop constraints of the extrusion system.

Process Improvements

The fundamental process improvement that a static mixer creates is the optimization of conditions of the molten polymer at the face of the die. This allows for an improved extruded product. The process improvements are:

- Radial temperature gradients are virtually eliminated.
- Viscosity gradients are virtually eliminated.
- Composition gradients are virtually eliminated with regards to colorant, chemical additives, fillers and regrind.
- Stagnant polymer wall-creep material is incorporated into the bulk polymer stream.

Operating Benefits

A static mixer creates outstanding homogenization of the polymer melt at the face of the die. With the polymer melt being homogeneous with regard to temperature, viscosity, colorant/additive distribution and elimination of wall-creep material, the following operating benefits are realized:

- Reduction of color additives with comparable extrudate color density.
- Even thickness across the entire extrudate width.
- Streak-free product.
- Improved quality when using regrind material.
- Foam cell size and cell distribution uniformity.
- Improved surface quality
- Improved mechanical characteristics.
- Rapid color change-over.

Extrusion Applications

Static Mixers are used in most extrusion applications including the following:

- Sheet
- Blown Film
- Foam sheet
- Profile
- Co-Extrusion
- Pipe
- Extrusion Blow Molding
- Rod & Tubing
- Wire & Cable
- Coatings
- Cereals and other foods
- Fibers & Monofilaments

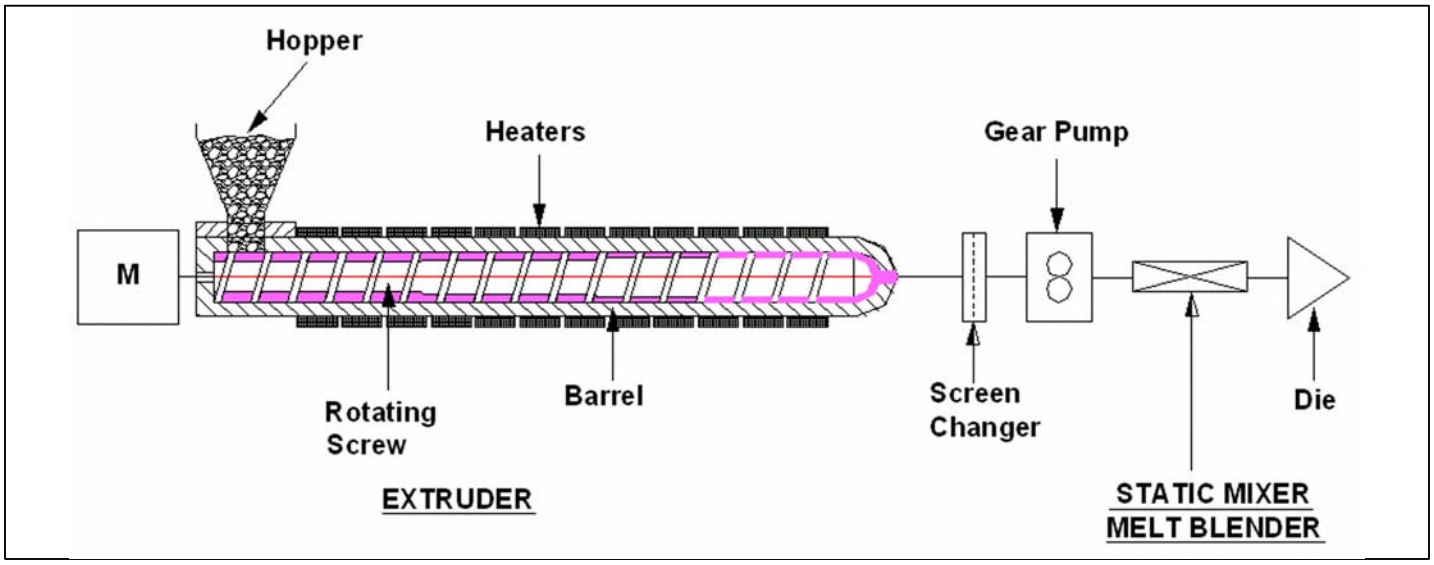


Figure #1: *The Static Mixer Melt Blender is installed just in front of the die to homogenize the polymer melt.*

EQUIPMENT SCOPE OF SUPPLY

As with most process equipment, there is no one design that is best suited for all applications. Static Mixers are no exception to this general rule.

For this reason, StaMixCo manufactures a broad range of static mixer designs of different geometric structures. This allows us to make an unbiased recommendation as to which design is best for a specific application.

Below is a short guide that may help you identify the static mixer best suited for your particular application and needs. We have taken the liberty of our previous experience to create the below broad-stroke comparison. If you wish to discuss any of the statements, please do not hesitate to contact us.

The remainder of this brochure discusses the details of each design.

ITEMS OF COMPARISON	MIXING ELEMENT MODEL		
	SMB-R	**SMB-GX**	**SMB-H**
GEOMETRY & FABRICATION COMPARISONS			
Geometric Structure	Double Roof Disk with 45° Crossing-Bar Grid Structure	Crossing-Bar Grid Structure at 45° to pipe axis.	Helical twist with adjacent elements of opposite twist
Construction	Mixing bars are joined to each other and to the ring wall via a single molten metal pour.	Cast construction in ≤ 2" with plates cut and welded in larger sizes	Available as twisted/welded or machined from solid round bar stock of metal with no welding.
Surface Finish	Glass-Bead-Blasted	Glass-Bead-Blasted, Or Electro-Polished	32 RMS standard polish finish. 18 RMS Mirror polish finish for one-piece machined version
MIXING COMPARISONS			
Overall Mixing Performance	Excellent	Excellent	Poor – Modest
Length-to-Diameter Ratio Required to Achieve a Mixing Quality Coefficient of Variation of 0.2 (80% mixed)	L/D = 4	L/D = 4	L/D = 18
Thermal Homogenization	Excellent	Excellent	Poor – Modest
Viscosity Homogenization	Excellent	Excellent	Poor – Modest
High-Low Viscosity mixing	Excellent	Excellent	Poor
SELF CLEANING COMPARISONS			
Wall Cleaning Capabilities	Excellent	Excellent	Poor
Self Cleaning Abilities	Excellent	Excellent	Modest-Acceptable
Plug Flow Capabilities	Excellent	Excellent	Acceptable
PRESSURE DROP & SHEAR COMPARISONS			
Pressure Drop	~ 36 times open pipe	~ 36 times open pipe	~ 6 times open pipe
Shear Rate	Medium	Medium	Low
STRENGTH COMPARISONS			
Normal Operations	Excellent	Excellent	Excellent
High Pressure Drop Installations	Excellent	Good	Excellent
Cold Start Resistance	Good	Poor	Good
COMPACTNESS COMPARISONS			
Approximate Mixer Diameter Compared to Extruder Screw	~ 75% of Extruder Screw Diameter	~ 100% of Extruder Screw Diameter	~ 50% of Extruder Screw Diameter
Length-to-Diameter ratio Required to Create a Mixing Quality Coefficient of Variation of 0.2 (80% mixed)	L/D = 4	L/D = 4	L/D = 18

HOMOGENEITY REQUIREMENTS FOR EXTRUSION SERVICE

In extrusion service, the fundamental purpose of a static mixer is to create a homogeneous polymer melt at the face of the die. This includes:

- Temperature Homogenization.
- Viscosity Homogenization.
- Composition Homogenization of colorants, chemical additives, regrind and fillers.
- Self-Cleaning and Homogenization of irregularities created by upstream equipment such as: extruder screw & piping colorant hang-up release material; gear pump teeth footprints; and incorporation of flaked wall-creep degraded polymer hang-up.

Achieving the above optimized polymer melt conditions at the die face dramatically improves extrusion operations, product quality and consistency.

Temperature & Viscosity Homogenization

An extruder screw is an effective specialty device for creating high shear to plasticize pellets, incorporate additives and supply a polymer melt at a pressure necessary for further processing. As shown in Figure #2, the extruder screw unfortunately delivers the molten polymer with a very wide temperature gradient of about 40 F^o (blue line). The Type SMB-R and SMB-GX static mixers typically decrease this temperature gradient to about 3 F^o (purple line).

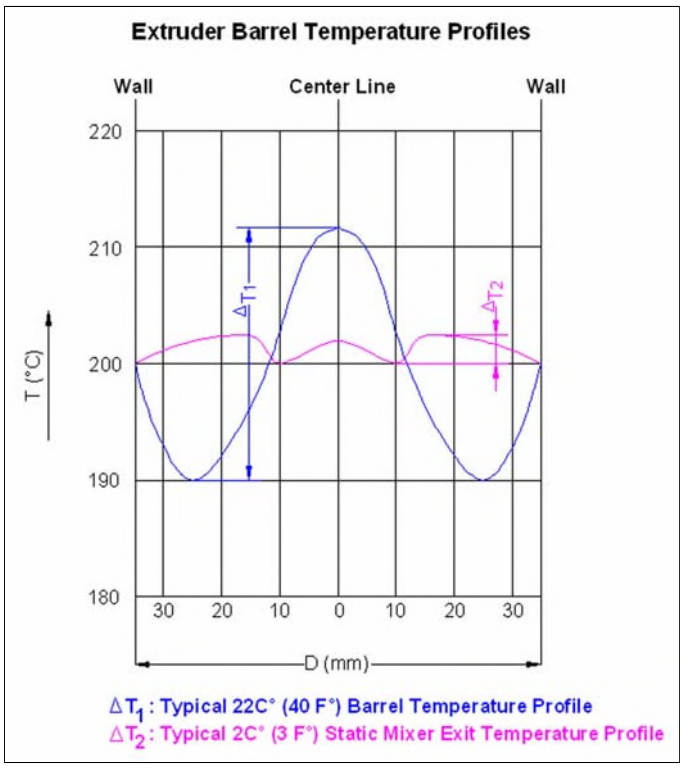


***Figure #2**: An extruder screw (blue line) typically delivers molten polymer with a high temperature gradient which effects product quality. The Type SMB-R and SMB-GX mixing elements reduce the temperature variation to less than 3 F^o(purple line).*

Viscosity gradients are a result of temperature gradients. Once the static mixer creates a melt with a relatively flat radial temperature profile, viscosity gradients will also be eliminated.

Temperature and viscosity gradients cause uneven flow conditions at the die face. For example, let us consider a sheet line with polymer exhibiting the typical temperature profile noted in Figure #2. Without the use of a static mixer, uneven sheet thickness will result as described below and in Figure #3.

- Where polymer temperature is low, polymer viscosity is high. This means that at the low temperature (T_{LT}) polymer positions at the die, the sheet will extrude thin because flow is low due to the high viscosity polymer.
- Where polymer temperature is high, polymer viscosity is low. This means that at the high temperature (T_{HT}) polymer positions of the die, the sheet will extrude thick because flow is high due to the low viscosity polymer.

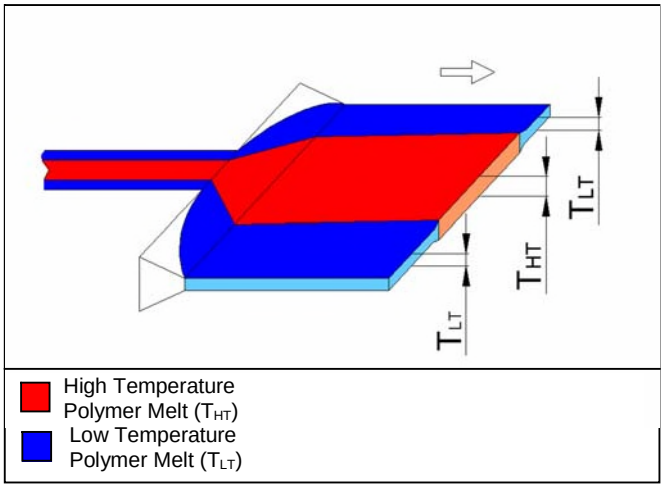


***Figure #3**: Polymer melt temperature gradients at the die result in sheet thicknesses that vary.*

Elimination of temperature gradients with the use of a static mixer (Figure #4) will allow the extrusion of a sheet with even thickness along the entire width. In foam sheet applications, additional benefits include even foam cell size and even distribution of foam throughout the entire sheet.

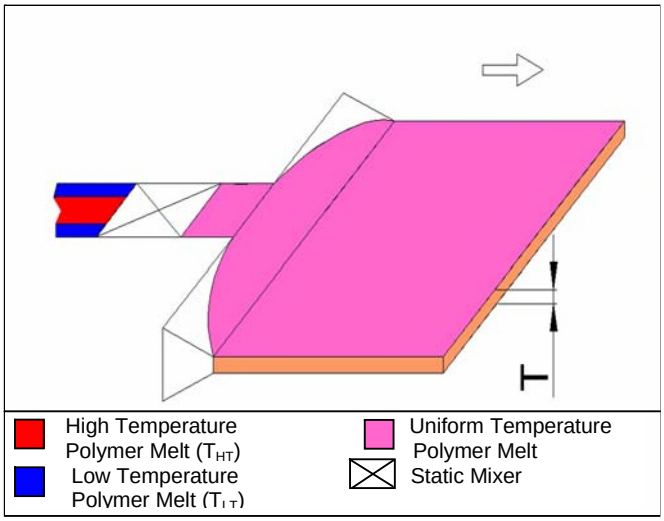


***Figure #4**: A flat polymer melt temperature at the die face results in a even sheet thickness allowing the ability to operate continuously at minimum thickness specifications.*

Composition Homogenization & Self-Cleaning

There are three fundamental flow regimes associated with the movement of fluids: turbulent, transitional and laminar flow. The flow regime that a fluid in motion falls within is a function of the viscosity, density, velocity and pipe diameter. The movement of low viscosity fluids such as water and gases is normally in the turbulent flow regime where mixing occurs as a result of the pattern of motion of fluids in turbulent flow. Given a long enough length of pipe, fluids traveling in turbulent flow will mix very well.

The flow of polymers, resins and other materials with viscosities greater than 100 cp is usually laminar. As shown in Figure #5, the laminar flow regime creates no mixing in an empty pipe (top) while a Type SMB-R static mixer (bottom) creates a homogeneous mix in a short length.

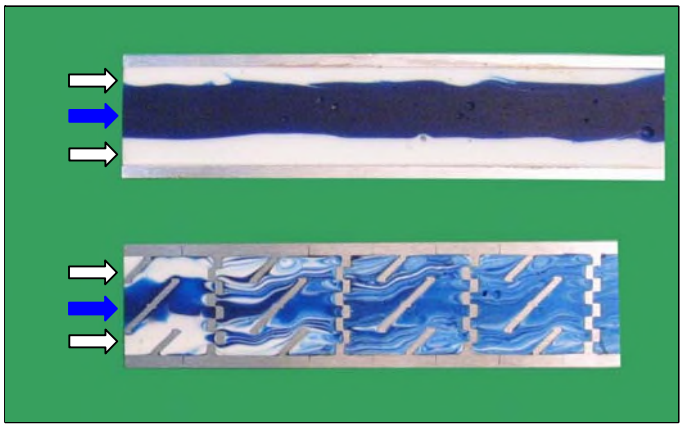


Figure #5: *Mixing of blue and white viscous resins is demonstrated (1:1 volumetric ratio). In an empty pipe (top), no mixing occurs. With eight SMB-R mixing elements, a high degree of mixing is achieved in a short length.*

When processing viscous materials in laminar flow, the phenomenon of no mixing occurring in an empty pipe is further described in Figure #6. In laminar flow, material in the center of the pipe travels at twice the average velocity while material at the wall is virtually stagnant. In addition, the fluid velocity vectors (shown in red) are always parallel to the pipe axis where there is no movement of material in the radial flow direction (pipe wall-to opposite-pipe wall). For mixing to occur, there must be fluid movement-intermixing in the radial flow direction (pipe wall-to opposite-pipe wall).

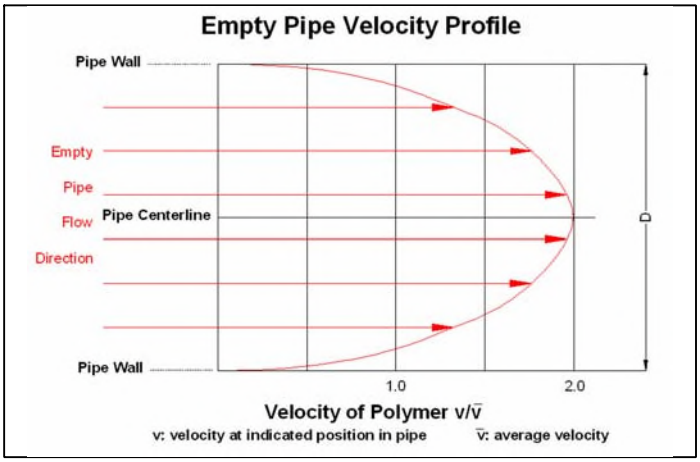


Figure #6: *Velocity profile in an empty pipe.*

In extrusion service, the stagnant-very slow moving boundary layer of polymer at the pipe wall surface, which exists everywhere between the extruder screw and the die, creates a number of issues as shown in Figure #7. First, thermally sensitive polymers creeping along a hot barrel wall degrade and break-off as black specks. Second, the stagnant boundary layer results in long periods of time to affect color changeover (wash away stagnant wall material). With both of these issues, the longer the empty pipe sections between the extruder and the die, the more severe the problem. A static mixer eliminates the stagnant polymer wall layer as shown in Figures #8 and #9.

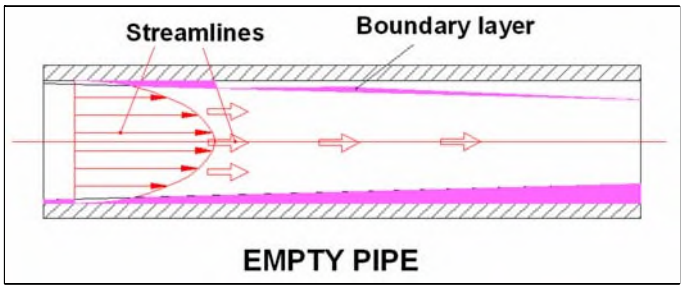


Figure #7: *In an empty pipe, thermally sensitive polymers at the stagnant-slow moving wall boundary layer can degrade and also cause long periods of time required for proper color changeover.*

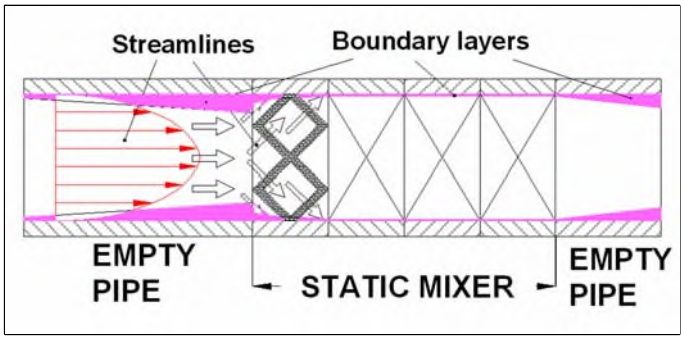


Figure #8: *A static mixer retards the formation of a boundary layers along its entire length. In addition, it homogenizes into the bulk stream all irregularities created by upstream equipment such as extruder screw & piping boundary layers and colorant hang-up release, gear pump teeth footprints and flaking off of wall-creep degraded polymer hang-up.*

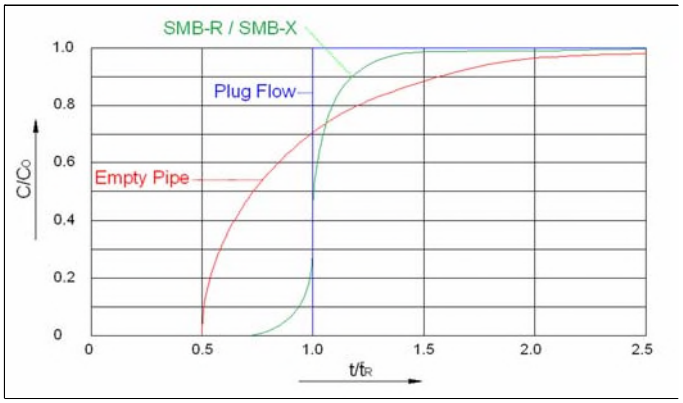


Figure #9: *Step Response curve of Type SMB-R & SMB-GX mixing elements show good self cleaning abilities as compared to an empty pipe.*

SMB-R Static Mixer Melt Blender

The standard SMB-R static mixer for extrusion service (licensee of Bayer AG, Leverkusen, Germany) contains eight (8) very efficient mixing elements that homogenize the polymer melt as it enters the extruder die. The mixing elements are virtually indestructible due to their monolithic cast construction and create an acceptable pressure drop to fit most installations.

***Figure #10**: StaMixCo SMB-R Extrusion Melt Blender with the standard eight (8) Mixing Elements, Flanged Housing, Heater Bands and Thermocouple.*

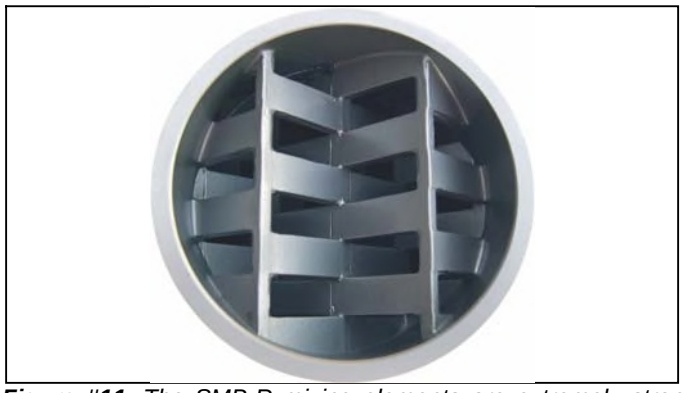


***Figure #11**: The SMB-R mixing elements are extremely strong due to their monolithic cast construction where the mixing bars are joined to each other and to the ring wall via a single molten metal pour.*

The SMB-R mixing element is a high performance design. It creates a very high degree of mixing in a short length as shown in Figure #12. The recommended number of mixing elements for a specific application is as follows:

- Four (4) mixing elements for mild thermal homogenization (L/D = ~2).
- Standard eight (8) mixing elements for compositional and thermal homogenization (L/D = ~4.0).
- Twelve (12) or more mixing elements for critical mixing and thermal homogenization applications (L/D = ~6).

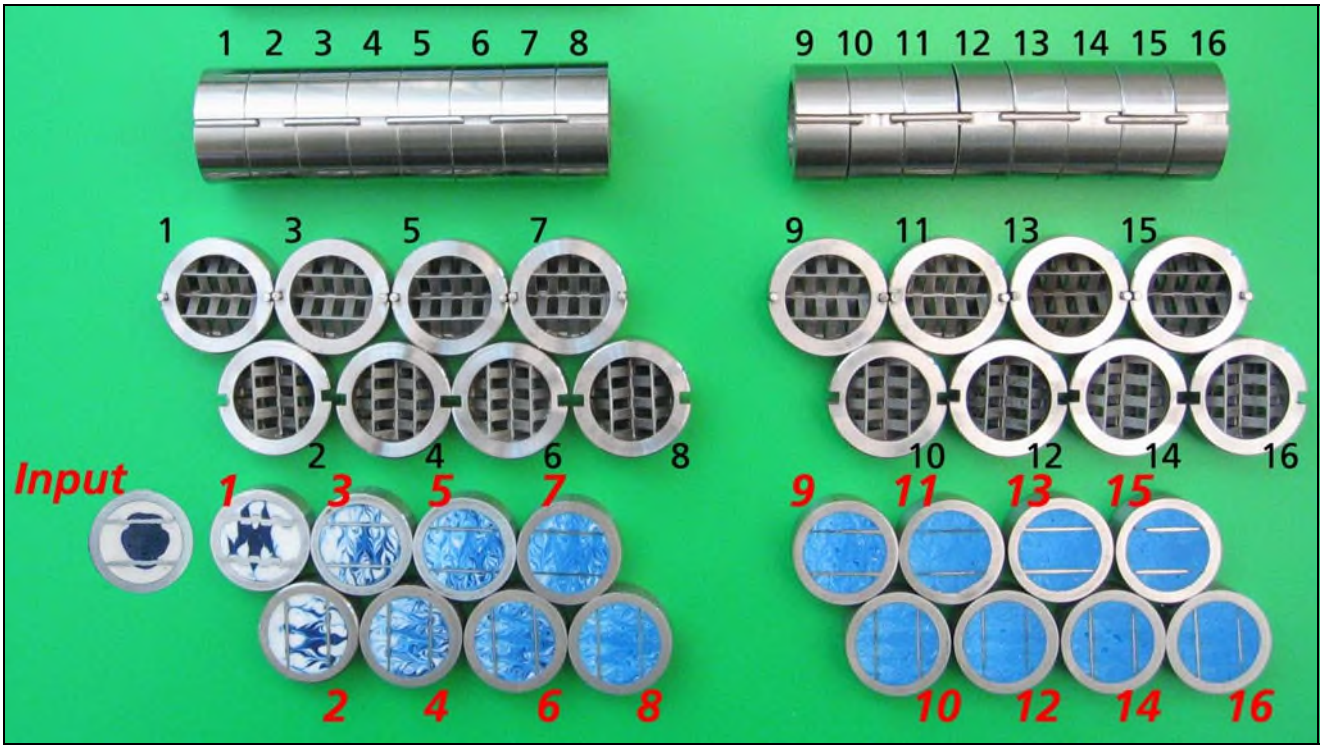


***Figure #12:** Blue and White resin (1:1 volumetric ratio) is pumped through a total of sixteen (16 -SMB-R mixing elements, allowed to harden and cross-sectional cuts are made at the outlet of each mixing element. Notice how quickly the streams are mixed and that adjacent mixing element blades are oriented 90° to assure mixing over the entire pipe cross-section. Depending on the application, the number of mixing elements required normally range from four (4) mixing elements (L/D = ~2) for mild thermal homogenization requirements; the standard eight (8) mixing elements for most compositional and thermal homogenization requirements (L/D = ~4.0); and twelve (12) mixing elements (L/D = ~6) for critical applications requiring a very high degree of mixing.*

SMB-R Static Mixer Sizing

The proper size SMB-R Melt Blender for a specific application is a function of the available pressure drop; degree of mixing required and polymer flow rate and viscosity at the operating conditions. For most applications, Table #1 provides a conservative estimate of required static mixer size based on extruder screw diameter and high or low viscosity polymer being processed.

The standard SMB-R Extrusion Melt Blender contains 8-mixing elements as shown in Figures #13 and #14 with key dimensions shown in Table #1. The mixing elements are made of heat treated high strength 17-4 PH stainless steel material.

The mixing elements easily disassemble from one-another for inspection or cleaning as shown in Figure #10 and #12.

For pressure drop critical applications; the processing of specialty engineering plastics we are not familiar with; or for mixer installations inside of die blocks, we have the know-how to properly size the mixing unit. To perform the necessary design calculations, polymer rheology information (shear rate vs. viscosity at operating conditions) is required. If you or we feel that your application requires special calculations, we will contact your resin supplier with your permission and manage the effort of obtaining the necessary technical information to perform the detailed calculations.

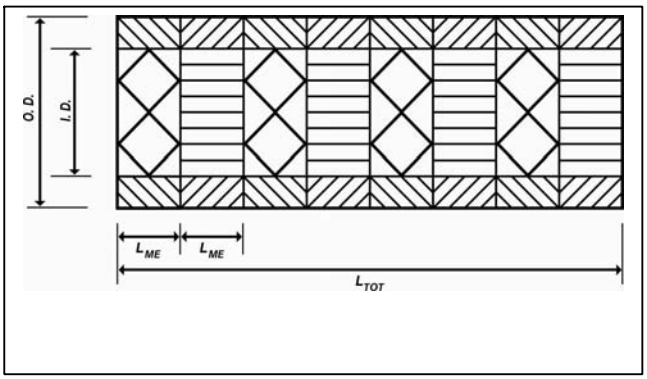


***Figure #13**: Dimensions of eight (8) SMB-R mixing elements. See also Figure #10, #11 and #12 for visualization.*

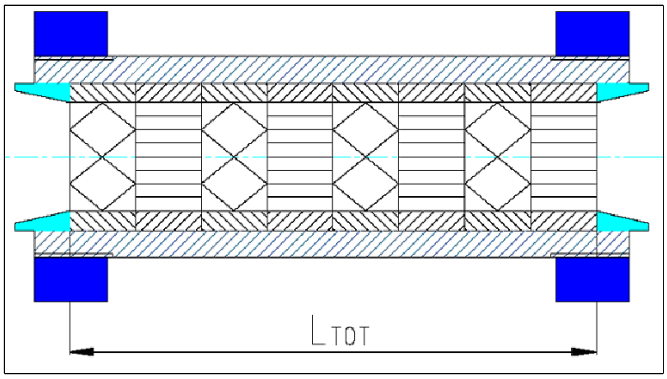


***Figure #14**: Complete SMB-R Melt Blender in Housing.*

***Table #1**: Key Sizing and Dimensional Parameters for eight (8) standard SMB-R Mixing Elements as shown in Figures #13 & #14.*

Extruder Screw Diameter (mm)		**Melt Blender**	**Mixing Elements**[1)]				**Housing**
High Viscosity Polymer	Low Viscosity Polymer	Model Number	I.D. (mm)	O.D.[2)] (mm)	L_{ME} (mm)	L_{TOT} 8 Mixing Elements	Bore (mm)
10 mm	20 mm	SMB-R12/18-8	12 mm	18 mm	8.0	64	18
10 mm	25 mm	SMB-R18/26-8	18 mm	26 mm	11.2	90	26
25 mm	30 mm	SMB-R20/28-8	20 mm	28 mm	12.5	100	28
25 mm	35 mm	SMB-R22/30-8	22 mm	30 mm	13.5	108	30
25 mm	45 mm	SMB-R27/35-8	27 mm	35 mm	16.5	132	35
35 mm	50 mm	SMB-R33/42-8	33 mm	42 mm	20.0	160	42
50 mm	60 mm	SMB-R40/50-8	40 mm	50 mm	24.0	192	50
60 mm	75 mm	SMB-R52/60-8	52 mm	60 mm	30.0	240	60
75 mm	100 mm	SMB-R66/75-8	66 mm	75 mm	37.5	300	75
90 mm	120 mm	SMB-R80/90-8	80 mm	90 mm	45.0	360	90
120 mm	150 mm	SMB-R102/115-8	102 mm	115 mm	57.5	460	115
150 mm	200 mm	SMB-R126/140-8	126 mm	140 mm	68.8	560	140
200 mm	240 mm	SMB-R153/175-8	153 mm	175 mm	85.5	684	175
230 mm	280 mm	SMB-R175/200-8	175 mm	200 mm	95.5	764	200
275 mm	320 mm	SMB-R200/225-8	200 mm	225 mm	115	920	225
Tolerances			-	f7	0/-0.1	0/-0.8	H7

[1)] All sizes in stock for next day shipment
[2)] The O.D. of the mixing elements can be adjusted.

SMB-GX Static Mixer Melt Blender

The standard SMB-GX static mixer for extrusion service contains four (4) very efficient mixing elements that homogenize the polymer melt as it enters the extruder die.

The Type SMB-GX static mixer (StaMixCo version of the Sulzer Chemtech SMX Static Mixer)*, is a design that has been in use on extruders for over 25 years. It has the same fundamental crossing-bar structure as the StaMixCo SMB-R static mixer (Figure #11 and #12), but without the support ring around the mixing blade structure which gives the SMB-R its remarkable strength. The SMB-GX mixing grid design creates a very high degree of mixing in a short length. Since it is manufactured from metal plates that are welded together, virtually any plate thickness can be used and any mixer diameter can be fabricated to meet installation requirements.

Figure #15: *StaMixCo SMB-GX Extrusion Melt Blender mixing elements with the standard four (4) Mixing Elements shown with and without a retaining ring.*

Figure # 16: *Type SMB-GX mixing elements are available in sizes as small as 10 mm (0.40") for installation inside extrusion dies and other small cavities.*

The SMB-GX mixing element is a high performance design. It creates a very high degree of mixing in a short length as shown in Figure #17. The recommended number of mixing elements for a specific application is as follows:

- Two (2) mixing elements for mild thermal homogenization (L/D = ~2).
- Four (4) standard mixing elements for compositional and thermal homogenization (L/D = ~4.0).
- Six (6) or more mixing elements for critical mixing and thermal homogenization applications (L/D = ~6+).

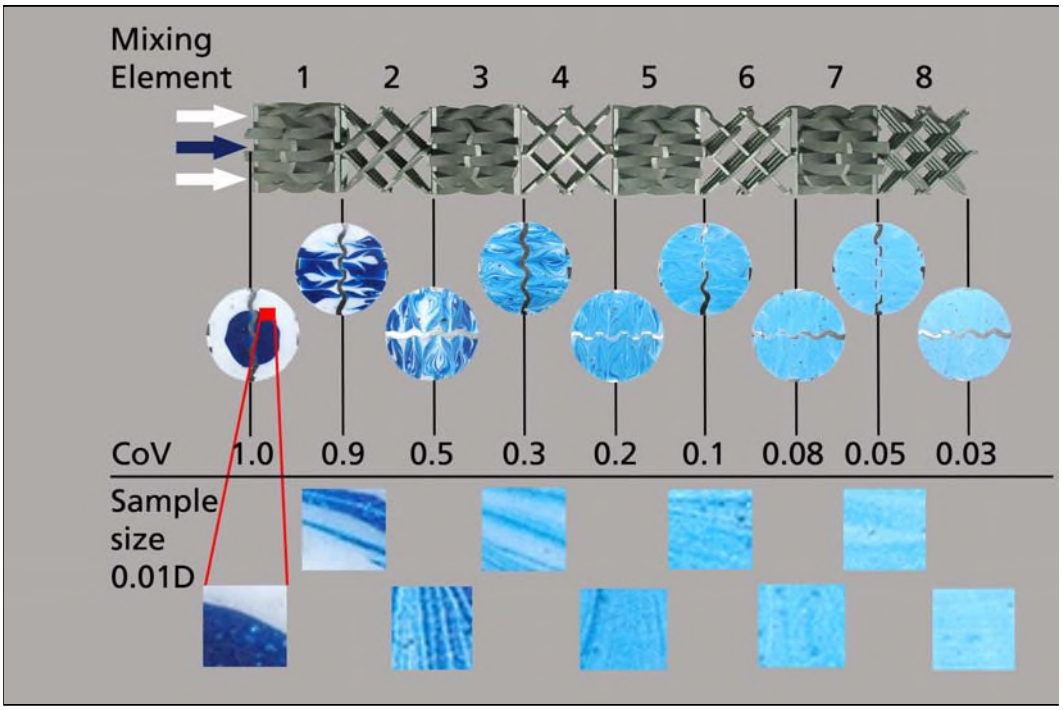


Figure #17*: Blue and white viscous resin (1:1 volumetric ratio) is pumped through eight (8) SMB-GX static mixing elements, allowed to harden and cross-sectional cuts are made at the outlet of each mixing element.*

Notice how rapidly the streams are mixed. The magnified sample of 0.01D (D=diameter) reveals that homogeneity is achieved in both the macro and micro scale.

The Coefficient of Variation of mixing (CoV) at the outlet of each SMB-GX static mixing element is indicated.

- *Four (4) mixing elements create a CoV of 0.2 CoV which means that 80% of mixing has been achieved.*
- *Six (6) mixing elements create a CoV of 0.08 which means that 92% of mixing has been achieved.*

***** StaMixCo is not a distributor of, authorized by or affiliated with Sulzer Chemtech. SMX is a brand of Sulzer Chemtech.

SMB-GX Static Mixer Sizing

The proper size SMB-GX Melt Blender for a specific application is a function of the available pressure drop; degree of mixing required and polymer flow rate and viscosity at the operating conditions. For most applications, a conservative estimate of required static mixer size is matching it to the extruder screw diameter.

The standard SMB-GX Extrusion Melt Blender contains 4-mixing elements as shown in Figures #18 with key dimensions shown in Table #2. The mixing element sizes are made of heat treated high strength 17-4 PH stainless steel material.

For pressure drop critical applications; the processing of specialty engineering plastics we are not familiar with; or for mixer installations inside of die blocks, we have the know-how to properly size the mixing unit. To perform the necessary design calculations, polymer rheology information (shear rate vs. viscosity at operating conditions) is required. If you or we feel that your application requires special calculations, we will contact your resin supplier with your permission and manage the effort of obtaining the necessary technical information to perform the detailed calculations.

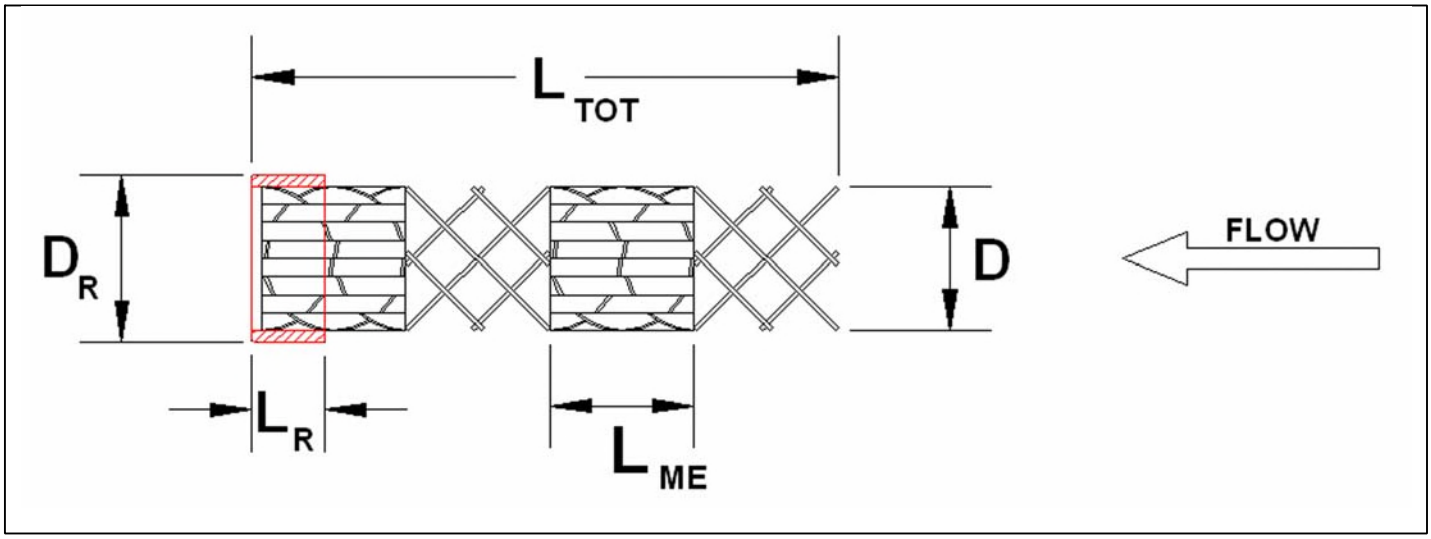


Figure #18: *Dimensions of four (4) SMB-GX mixing elements (see Table #2)*

Table #2: *Key dimensions of four (4) Standard SMB-GX Mixing Elements as shown in Figure #18*

Bore Size		Melt Blender	Mixing Elements			Support Ring[1)]	
Inch Sizing (inch)	Millimeter Sizing (mm)	Model Number	**D** (mm / inch)	**L_{ME}** (mm / inch)	**L_{TOT}** 4-Mixing Elements (mm / inch)	**D_R**[1)] (mm / inch)	**L_R**[1)] (mm / inch)
	10 mm	SMB-GX-10-4	9.8 mm	9.8 mm	42 mm	14 mm	15 mm
	13 mm	SMB-GX-13-4	12.4 mm	12.4 mm	52 mm	17 mm	15 mm
	16 mm	SMB-GX-16-4	15.8 mm	15.8 mm	67 mm	21 mm	16 mm
	21 mm	SMB-GX-21-4	20.2 mm	20.2 mm	84 mm	26 mm	20 mm
	27 mm	SMB-GX-27-4	26.8 mm	26.8 mm	110 mm	33 mm	23 mm
1 1/2”		SMB-GX-1.5-4	1.47”	1.47”:	6.125”	2.0”	1.0”
	48 mm	SMB-GX-48-4	41.3 mm	41.3 mm	167.0 mm	48.0 mm	30 mm
2”		SMB-GX-2.0-4	1.97”	1.97”	8,125”	2.5”	1.25”
	53 mm	SMB-GX-53-4	51.8 mm	51.8 mm	210 mm	60 mm	37 mm
2 1/2”		SMB-GX-2.5-4	2.47”	2.47”	10.125”	3.0”	1.75”
	68 mm	SMB-GX-68-4	66.5 mm	66.5 mm	270 mm	75 mm	45 mm
3”		SMB-GX-3.0-4	2.97”	2.97	12.125”	3.5”	2.0”
	82 mm	SMB-GX-82-4	80.2 mm	80.2 mm	328 mm	90 mm	53 mm
3 1/2”		SMB-GX-3.5-4	3.47”	3.47”	14.125	4.0”	2.25”
4”		SMB-GX-4.0-4	3.97”	3.97”	16.25”	4.5”	2.50”
	103 mm	SMB-GX-103-4	101.5 mm	101.5 mm	412 mm	115 mm	65 mm
4 1/2”		SMB-GX-4.5-4	4.44”	4.44”	18.0”	5.0”	2.75”
5”		SMB-GX-5.0-4	4.94”	4.94”	20.0”	5.625”	3.0”
	128 mm	SMB-GX-128-4	126.2 mm	126.2 mm	512 mm	140 mm	80 mm
6”		SMB-GX-6.0-4	5.94”	5.94”	24.0”	6.750”	3.50”
	155 mm	SMB-GX-155-4	153.5 mm	153.5 mm	625 mm	175 mm	98 mm
	175 mm	SMB-GX-175-4	173.5 mm	694.8 mm	720 mm	200 mm	120 mm
	200 mm	SMB-GX-200-4	198.5 mm	198.5 mm	820 mm	230 mm	135 mm
8”		SMB-GX-8.0-4	7.94”	7.94”	33.0”	9.0”	5.5”

1) Support Ring Outside Diameter (D_R) and Length (L_R) can be supplied in any configuration.

SMB-H Static Mixer Melt Blender

The Type SMB-H Helical static mixer (StaMixCo version of the Kenics Thermogenizer Static Mixer)*, is the design that pioneered the static mixing industry and has been used on extruders for over 37 years. The SMB-H helical design is considered a low mixing performance-long length static mixer design (Figure #20) as compared to the later developments of high performance static mixers such as the SMB-R (Figure #12) and SMB-GX (Figure #17) static mixer designs.

The SMB-H continues to remain a popular design for simple low-demand applications because it exhibits a low pressure drop; imparts low shear on the polymer; can be highly polished at reasonable cost; has a low surface area exposed to the polymer; is easy to clean; difficult to crush; and allows for installation in small cost effective diameters with a reasonable pressure drop. With pressure drops of approximately 6-times an open pipe, as compared to 36-times an open pipe for the high performance static mixers, the design continues to be popular for simple mixing requirements.

StaMixCo manufactures SMB-H static mixers in the traditional method of twisting a strip of metal and welding together as well and an advanced proprietary manufacturing technique where it is machined from a solid rod of round bar stock material without welding. This machining process allows for the mixer to be fabricated in any L/D twist, in very small sizes, with very high strength, straight and true dimensioning and to have a mirror polish surface finish of RMS 12 which is a much improved surface finish as compared to the traditional 32 RMS finish.

Figure #19: *The SMB-H static mixers shown above are machined from a solid rod of round bar stock material, in one piece and without welding. The machining process allows any L/D twist to be supplied. The second static mixer from left is L/D=0.7; the fourth static mixer from left is L/D = 1; and the remainder are L/D = 1.5.*

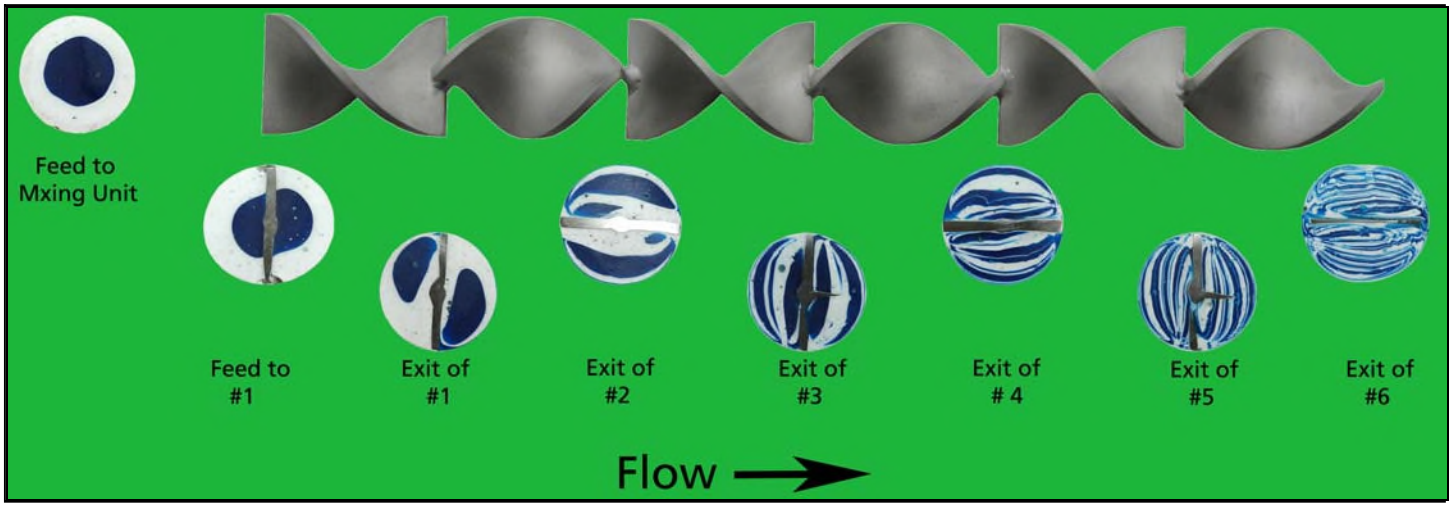


Figure #20*: Blue and white viscous resin (1:1 volumetric ratio) is pumped through six (6) SMB-H static mixing elements, allowed to harden and cross-sectional cuts are made at the outlet of each mixing element. The SMB-H static mixer is considered a low performance mixing device of long length and is therefore used for non-demanding applications. Compare the SHB-H low degree of mixing to the high performance SMB-R (Figure #12) and SMB-GX (Figure #17) static mixers. The SMB-H however has a very low pressure drop that allows it to be used in smaller diameters for the same extruder screw size.*

***** StaMixCo is not a distributor of, authorized by or affiliated with Kenics Corporation. Thermogenizer is a brand of Kenics Corporation.

SMB-H Static Mixer Sizing

The proper size SMB-H Melt Blender for a specific application is a function of the available pressure drop; degree of mixing required and polymer flow rate and viscosity at the operating conditions. For most applications, a conservative estimate of required static mixer size is half the extruder screw diameter.

The SMB-H is available in 316L S/S material and is available in standard configurations of:

- 6-helical mixing elements with a twist of L/D=1.5
- 9-helical mixing elements with a twist of L/D=1.0
- Any twist L/D is available as tight as approximately 0.7 with the machined version of the helical mixer.

SMB-H static mixers with 6-helical mixing elements having an L/D = 1.5 twist are the preferred choice for thermal homogenization and 9-helical mixing elements of L/D = 1 twist are preferred for equalization of concentration, color and additive homogenization. The pressure drop of an SMB-H Melt Blender depends on the number of helical mixing elements and their L/D ratio. A unit with L/D = 1.5 helical twist has a lower pressure drop than a unit with L/D = 1 helical twists.

Standard 6-element units with L/D = 1.5 twist are shown in Figure #21 and Table #3. Standard 9-element units with L/D = 1 twist are shown in Figure #22 and Table #4.

***Figure #21**: SMB-H Helical Melt Blender with 6-Elements and L/D = 1.5 twist.*

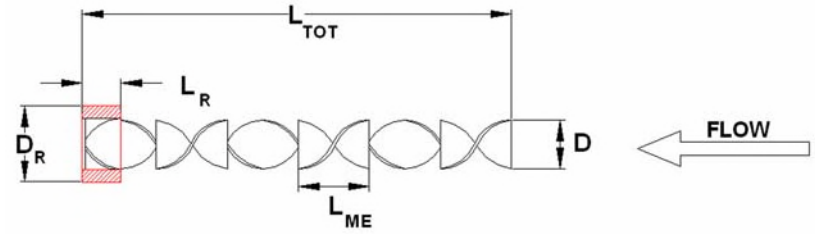


***Table #3:** Key dimensions of SMB-H Helical Melt Blender with 6-Mixing Elements of L/D=1.5 twist.*

Bore Size	Melt Blender	Mixing Elements			Support Ring[1)]	
inches	Model Number	**D** inches	**L_{ME}** inches	**L_{TOT}** 6-Mixing Elements inches	**D_R**[1)] inches	**L_R**[1)] inches
3/4""	SMB-H-0.75-6x1.5	0.65"	1.125"	6.875"	1.125"	0.75"
1"	SMB-H-1.0-6x1.5	0.9"	1.5"	9.125"	1.60"	0.75"
1 1/2"	SMB-H-1.5-6x1.5	1.4"	2.25"	13.625"	2.25"	1.125"
2"	SMB-H-2.0-6x1.5	1.9"	3.0"	18.125"	3.0"	1.5"
2 1/2"	SMB-H-2.5-6x1.5	2.4"	3.75"	22.625"	4.25"	2.25"

***Figure #22**: SMB-H Helical Melt Blender with 9-Elements and L/D = 1 twist.*

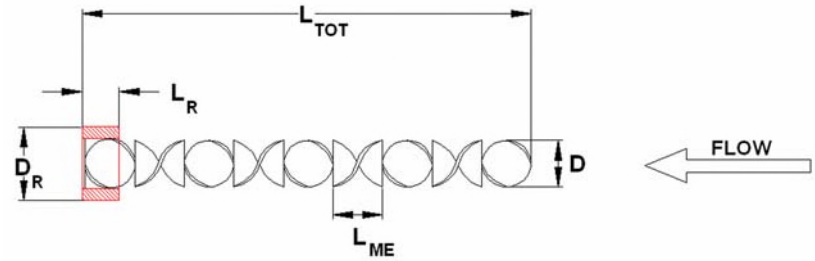
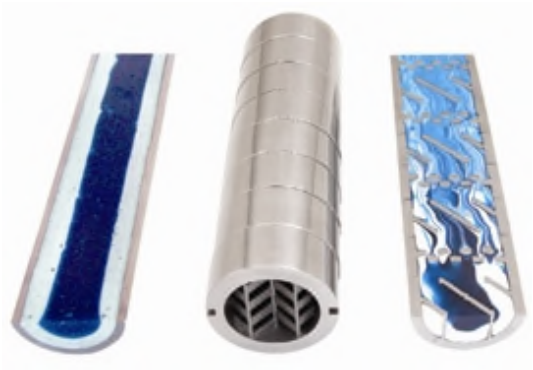
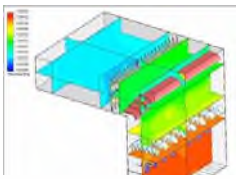


***Table #3:** Key dimensions of SMB-H Helical Melt Blender with 9-Mixing Elements of L/D=1 twist.*

Bore Size	Melt Blender	Mixing Elements			Support Ring[1)]	
inches	Model Number	**D** inches	**L_{ME}** inches	**L_{TOT}** 6-Mixing Elements inches	**D_R**[1)] inches	**L_R**[1)] inches
3/4""	SMB-H-0.75-6x1.5	0.65"	1.125"	6.875"	1.125"	0.75"
1"	SMB-H-1.0-6x1.5	0.9"	1.5"	9.125"	1.60"	0.75"
1 1/2"	SMB-H-1.5-6x1.5	1.4"	2.25"	13.625"	2.25"	1.125"
2"	SMB-H-2.0-6x1.5	1.9"	3.0"	18.125"	3.0"	1.5"
2 1/2"	SMB-H-2.5-6x1.5	2.4"	3.75"	22.625"	4.25"	2.25"

Other StaMixCo Static Mixing Products

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www.stamixco.com

A young company with over 50 years of employee accumulated experience in mixing technology.

North & South America
StaMixCo LLC
235 – 84th Street
Brooklyn, NY 11209, USA
Tel: (718) 748-4600
Fax: (718) 833-8827
E-mail: stamixco@msn.com
Web site: www.stamixco.com

Europe, Asia-Pacific, Africa
StaMixCo Technology Ltd.
Ebnetstrasse 8
CH-8474 Dinhard, Switzerland
Tel: + 41 52 338 17 11
Fax: + 41 52 338 17 33
E-mail: info@stamixco.com
Web site: www.stamixco.com

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