

# stamixco .....mix it up

## Injection Molding Static Mixing Nozzle

*Better melt flow, means.....*

*.....better cash flow.*

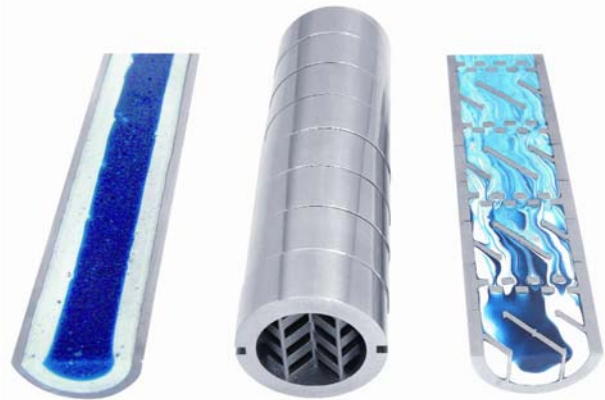
### INTRODUCTION

The StaMixCo SMN\* Mixing Nozzle contains eight (8) very efficient static mixing elements that homogenize the polymer melt during injection. The static mixing elements have no moving parts and accomplish mixing by the geometric structure of mixing bars that continuously divide and recombine the molten polymer flowing through them. Since there are no moving parts, the static mixing unit requires little maintenance, is virtually indestructible and creates a low pressure drop.

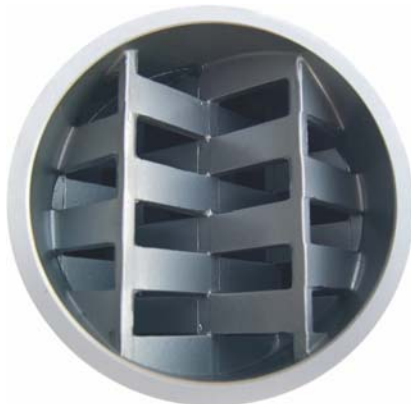
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**Figure #1:** StaMixCo Injection Molding Mixing Nozzle with eight (8) Mixing Elements, Heater Bands and Thermocouple.



**Figure #3:** Mixing of blue and white epoxy resins. Empty tube (left) provides no mixing. Eight (8) SMN mixing elements (center and right) provide an excellent mix quality in a short length.



**Figure #2:** The SMN 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.

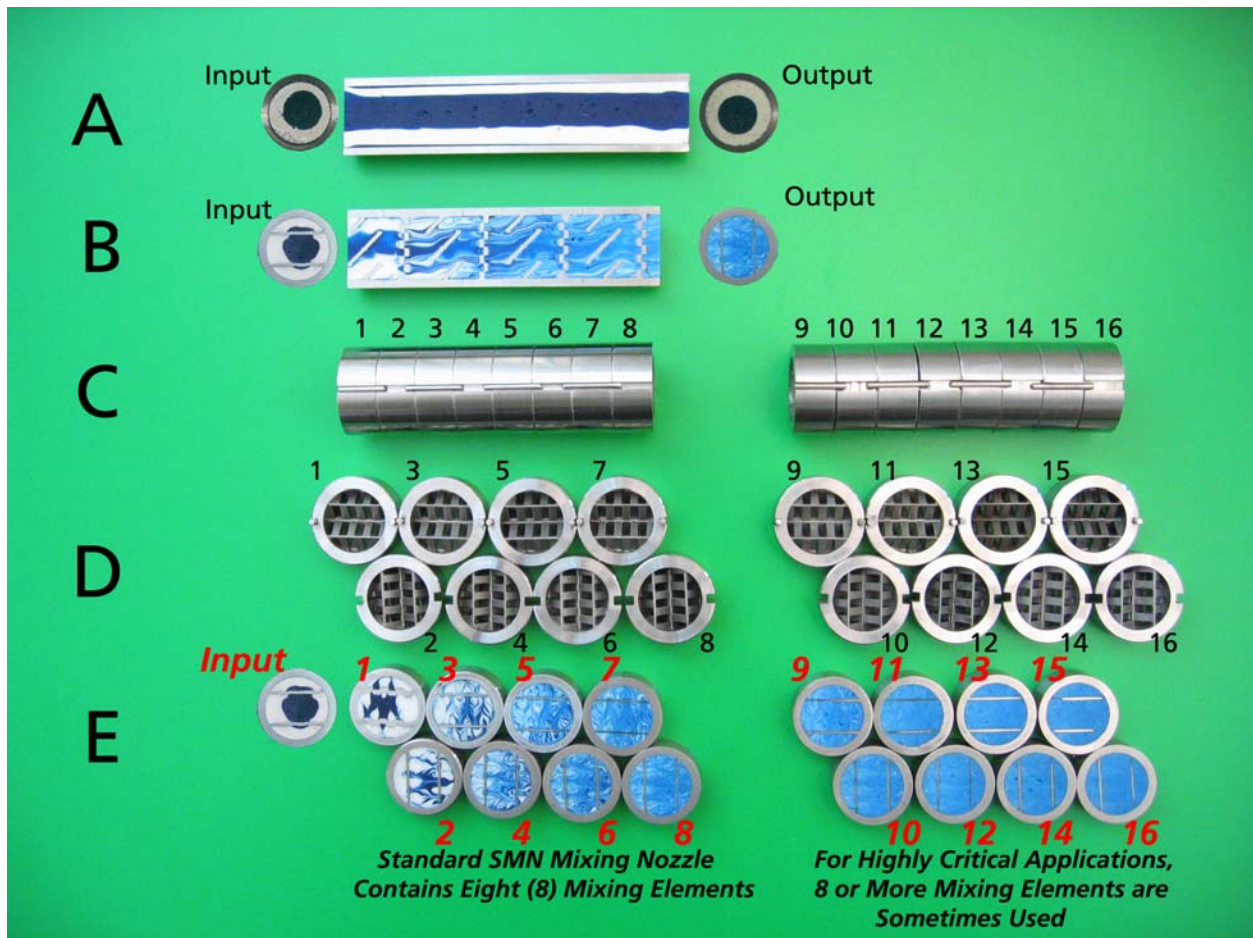


**Figure #4:** SMF Filter-SMN Mixing Element combination used to retain particles to protect hot runner system and tools when processing regrind material.

## MIXING QUALITY

The optimum melt quality for injection molding applications is to have at each location inside the polymer melt volume, just prior to injection into each cavity, a well mixed/uniform concentration of colorant and additives and the same melt temperature. Once this optimum mix quality is achieved; the following benefits will be realized:

- Reduced spots, streaks and clouds of color.
- Reduced colorant usage (10% - 40%).
- Improved part quality when using regrind.
- Increased use of regrind material.
- Narrower part tolerances.
- Reduced reject rates.
- Less part distortion.
- Less part weight variation.
- Improved surface and mechanical properties.
- Blended thermal degradation products (i.e. PET)
- Shorter cycle time.
- Uniform filling of multi-cavity dies.



**Figure #5:** Mixing of Blue and White resins (1:1 volumetric ratio) is demonstrated where the blue resin is injected into the center of the tube.

Row A: In an empty tube, an axial slice along the tube length reveals the well known phenomena that no mixing occurs when processing viscous materials.

Row B: With eight (8) SMN mixing elements that are standard for injection molding applications, an axial slice along the mixer length reveals that a high degree of mixing is achieved.

Row C: The standard eight (8) SMN mixing element assembly used for most injection molding applications is shown on the left side. On the right side is an additional 8-mixing element assembly for special applications..

Row D: The SMN mixing element assemblies in Row C are shown face-side in Row D. Notice that each mixing element is oriented 90° relative to the adjacent mixing element so that the first mixing element transports material up-down, the second left-right, and the process repeats itself along the entire length of the mixing unit.

Row E: The degree of mixing achieved at the outlet of each mixing element shown in Rows C and D is shown in Row E. Notice the blending of the blue-and-white resins follows the geometric pattern of the eight mixing bars within each mixing element

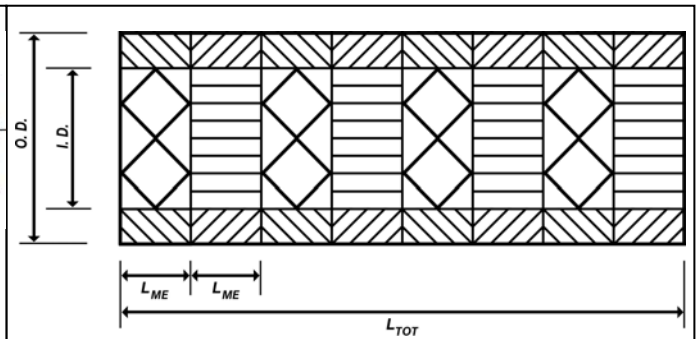
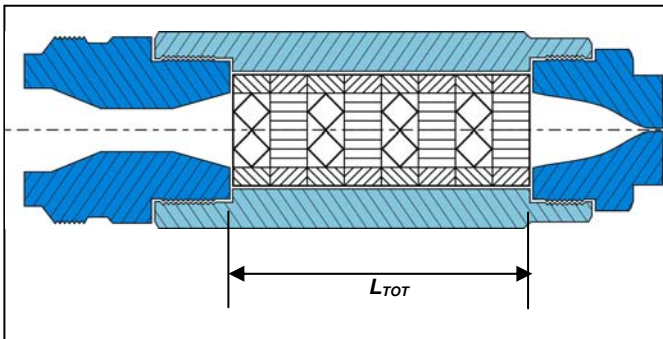
## SIZE OF SMN MIXING NOZZLE FOR YOU APPLICATION

The proper size of SMN Mixing Nozzle is a function of the injection flow rate and viscosity of the polymer melt at the operating conditions. For most applications, the below Table #1 provides a conservative estimate of required size based on the operating experience of thousands of mixing nozzles supplied to injection molders. For budget sizing purposes, a conservative choice will be to choose the largest size nozzle resulting from your machines characteristics of Clamping Force (Technique①), Screw Size (Technique②) and Injection Flow Rate (Technique③).

For critical applications such as the installation of mixing elements inside mold hot runner channels or when processing specialty engineered plastics, StaMixCo has 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, with your permission, we will contact your resin supplier and manage the effort to obtain the necessary technical information to perform the detailed calculations.

**Table #1: Budget Sizing to Determine Correct Mixing Nozzle Size for Your Application**

SMN Mixing Nozzle Model Number	Technique ① Clamping Force Method (tons)	Technique ② Screw Size Method (mm)	Technique ③ Injection Flow Rate Method	
			Low Viscosity Polymer (cm <sup>3</sup> /s)	High Viscosity Polymer (cm <sup>3</sup> /s)
SMN-12-8	Up to 120 tons	20 - 50	300	200
SMN-18-8	Up to 450 tons	40 - 75	1,000	700
SMN-22-8	Up to 800 tons	50 - 90	1,800	1,200
SMN-27-8	Up to 1,100 tons	70 - 120	3,400	2,300
SMN-33-8	Up to 1,500 tons	80 - 140	6,200	4,000
SMN-40-8	Up to 2,000 tons	100 - 180	11,000	7,400
SMN-52S-8	For Very Large Machines or Very Viscous Polymers such as PET			



**Figure #6:** Complete SMN Mixing Nozzle fundamental design **Figure #7:** Dimensions of 8-SMN mixing elements (Table #2)

**Table #2: Key Dimensions of SMN Mixing Elements**

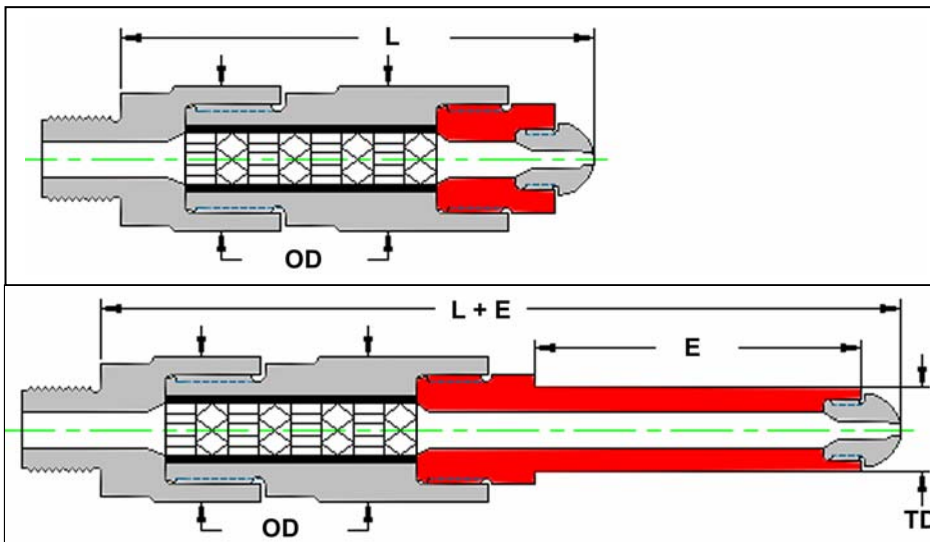
SMN Mixing Element Assembly Model Number	Mixing Elements				Nozzle Bore (mm)
	I.D. (mm)	O.D. (mm)	L <sub>ME</sub> (mm)	8 Mixing Elements L <sub>TOT</sub> (mm)	
SMN-12-8	12	18	8.00	64.0	18
SMN-18-8	18	26	11.25	90.0	26
SMN-22-8	22	30	13.50	108.0	30
SMN-27-8	27	35	16.50	132.0	35
SMN-33-8	33	42	20.00	160.0	42
SMN-40-8	40	50	24.00	192.0	50
SMN-52S-8	52	62	31.50	252.0	62
Tolerances (mm)	-	f7	0/-0.1	0/-0.8	H7

For larger sizes, please contact us. Dimensions are approximate

## Dimensions of Complete Ready-to-Run Mixing Nozzle

SMN Mixing Nozzles are available in six standard sizes that will satisfy the processing requirements of most injection molders. The Standard SMN Mixing Nozzle

dimensions are shown in Figure #8. Extended Nozzle bodies are also available as shown in Figure #9. Key dimensions of the units are shown in Table #3



**Figure #8:** Standard SMN Mixing Nozzle with eight (8) mixing elements

**Figure #9:** Extended Nozzle Body with standard eight (8) mixing elements. Added length can also be designed in the nozzle input adaptor.

**Table #3:** Key Dimensions of Standard and Extended Nozzle Body Mixing Nozzles

SMN Mixing Nozzle Model Number	Nozzle Tip (in)	Standard Unit (Figure #8)		Extended Nozzle Body Unit (Figure #9)			
		OD (in)	L (in)	OD (in)	TD (in)	E (in)	L + E (in)
SMN-12-8	7/8"	1.750"	5.250"	1.750"	1.500"	Typically $\leq 6.750$ "	Typically $\leq 12.0$ "
SMN-18-8	7/8"	2.125"	7.250"	2.125"	1.500"	Typically $\leq 6.750$ "	Typically $\leq 14.0$ "
SMN-22-8	7/8"	2.750"	8.750"	2.750"	1.500"	Typically $\leq 6.750$ "	Typically $\leq 15.5$ "
SMN-27-8	7/8"	3.000"	9.625"	3.000"	1.500"	Typically $\leq 6.750$ "	Typically $\leq 16.5$ "
	1-1/4"	3.000"	9.750"	3.000"	1.750"	Typically $\leq 6.750$ "	Typically $\leq 16.5$ "
SMN-33-8	7/8"	3.500"	11.750"	3.500"	1.500"	Typically $\leq 6.750$ "	Typically $\leq 18.5$ "
	1-1/4"	3.500"	11.750"	3.500"	1.750"	Typically $\leq 6.750$ "	Typically $\leq 18.5$ "
SMN-40-8	7/8" or 1-1/4"	4.000"	14.000"	4.000"	1.750"	Typically $\leq 10.750$ "	Typically $\leq 24.5$ "
SMN-52S-8	Specialty Nozzle For Very Large Machines or Very Viscous Polymers such as PET						

**stamixco**  
www.stamixco.com

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

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