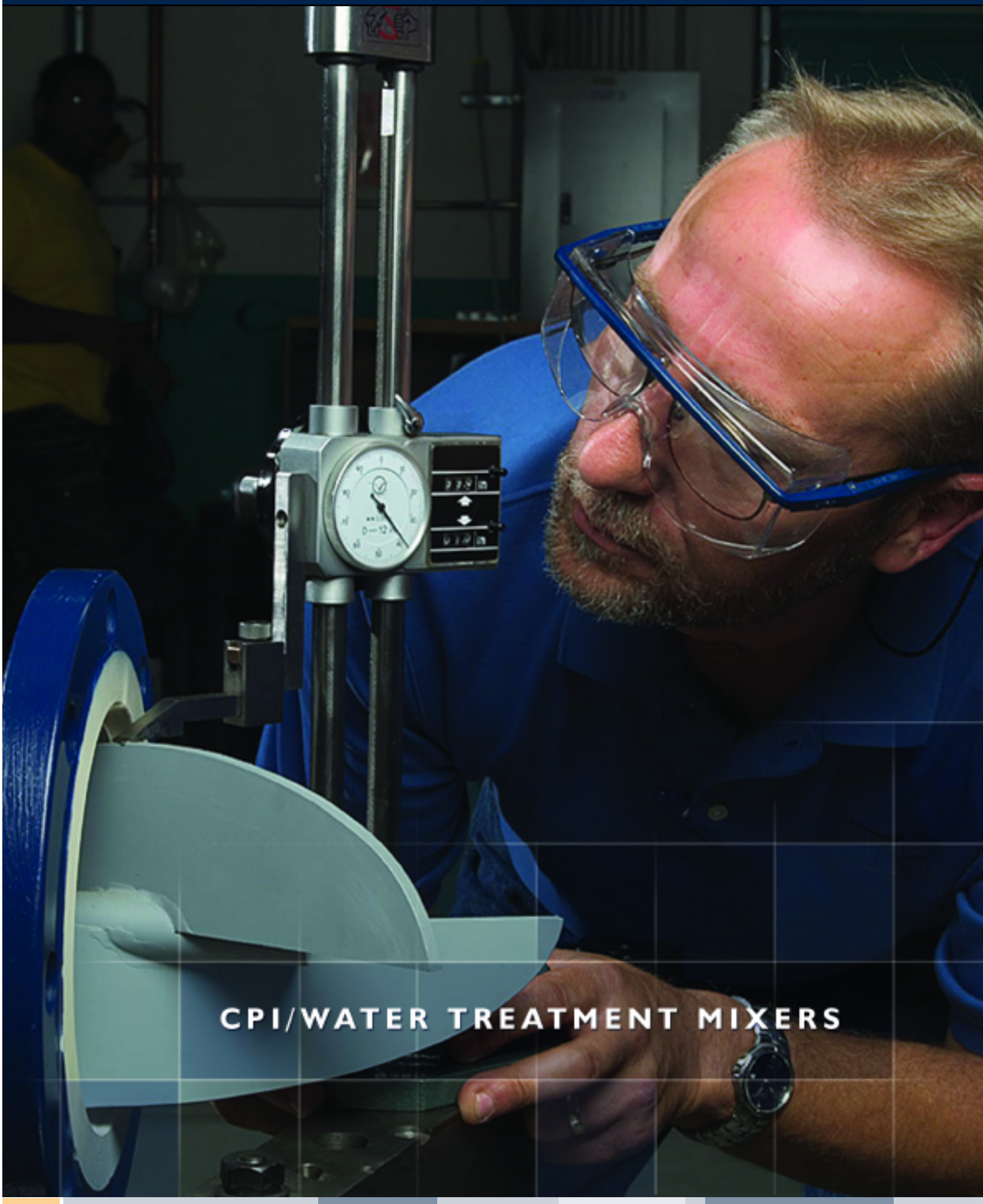


CPI/WATER TREATMENT MIXERS

CPI/Water Treatment Mixers

For the chemical processing industries (CPI) and water treatment facilities, TAH has developed a line of motionless mixers featuring low shear, continuous in-line units which mix materials that can be pumped to the required consistency. Materials may include combinations of fluids, powders, granular, and gases. These mixers are maintenance-free and require no external power source except for a pump to overcome pressure losses.

Mixer Types

TAH's industrial-sized CPI/Water Treament mixers are constructed of PVC, CPVC, polypropylene, Kynar®, stainless steel, or carbon steel. These mixers have improved heat and mass transfer characteristics. By increasing flow rate, decreasing diameter, or increasing the number of elements, the Pressure Drop energy will increase—as well as the mixedness of the exiting material. The Mixer Section of this catalog has detailed information about how our mixers work. TAH offers two geometries of mixers for this specific area:

- Spiral Mixers™
- Stata-Tube™ Mixers

CPI/Water Treatment Mixer Quick Reference

MIXERS		
SERIES NO.	DESCRIPTION	GEOMETRY
Series 50	PVC, CPVC, Polypropylene	Stata-Tube
Series 100	Stainless Steel	Spiral
Series 130	Stainless Steel	Spiral
Series 340	Kynar®	Spiral, Stata-Tube
Series AL	Epoxy-Lined Carbon Steel, PVC, CPVC	Stata-Tube
Series P	Stainless, Carbon Steel	Spiral
Series T	PVC, CPVC	Stata-Tube

TAH'S STEP-BY-STEP GUIDE FOR CPI/WATER TREAMENT MIXER SELECTION

1. **Material of Construction:** What piping or tubing material(s) will be connected to the mixer upstream and downstream? Operating temperature, pressure, and chemical compatibility should be considered. Match the mixer housing with the piping or tubing type.
2. **Line Size:** What size piping or tubing is carrying fluids upstream and downstream of the mixer? The general rule is to match the pipe or tube diameter with the closest diameter of motionless mixer. If the diameter creates too high a pressure drop across the mixer, upsize to a diameter with an acceptable pressure drop. Transition pieces (reducer, increaser, bushing, etc.) will need to be installed between the piping or tubing and the motionless mixer.
3. **Disassembly and Maintenance:** If the mixer or the mixing assembly need to be removed, consider a flanged mixer or models with removable mixing sections.
4. **Operating Conditions:** In addition to piping material selection, the following information is useful to proper selection and sizing of motionless mixers: application (see table); viscosity of mixed flow (cps); total flow through the mixer (gpm); specific gravity of mixed flow.
5. **Determination of Pressure Drop Across Motionless Mixer:** Since the presence of a mixer in the fluid line creates back pressure, a model should be specified which will provide the desired mixing action at the minimum pressure drop. Loss of head can result in additional pumping requirements, higher operating costs, and possible effects on downstream processes. To calculate the pressure drop, take the following steps:

Step One: Calculate the Reynolds Number

Determine the flow regime by calculating the open pipe Reynolds Number. For purposes of this calculation, assume a mixer diameter equal to the process line size, and use the following formula:

$$N_{RE} = \frac{3157 \times Q \times S}{D \times ③}$$

(continued on the next page)

For the latest products from TAH, visit www.tah.com/cpi

Typical Applications

SPIRAL MIXER™	
APPLICATIONS	ELEMENTS*
Adhesives and Sealants	16-40
In-line Aeration	4-8
Ozone Absorption	8-12
Oil or Gasoline Blending	3-6
Gas/Gas Blending	3-6
pH Correction	3-6
Dilution of Chemicals	3-6
Admixing of Additives	3-6
Polyelectrolyte Dilution	12-18
Dilute Polymer Blending	3-6
Other: Transitional Flow, N_{RE} = 500 - 1000	3-6
Other: Transitional/Laminar Flow, N_{RE} < 500	12-40

STATA-TUBE™ MIXER	
APPLICATIONS	STAGES*
Ozone Absorption	7
Oil or Gasoline Blending	3-4
Gas/Gas Blending	7
pH Correction	3-7
Dilution of Chemicals	3-7
Admixing of Additives	3-7
Polyelectrolyte Dilution	10-14
Dilute Polymer Blending	7
Other: Transitional Flow, N_{RE} = 500 - 1000	10-14
Other: Turbulent Flow, N_{RE} > 1000	3-7

* No. of stages and elements shown as a guide. It is not a guarantee for individual mixing processes.

Reynolds No. Calculations

SERIES 50 MIXERS	
REYNOLDS NO.	MIXING ELEMENTS
800 - 1000	14
>1000	7

SERIES P & T MIXERS		
REYNOLDS NO.	ELEMENTS	FLOW
< 10	18	Laminar (creeping)
10 - 100	12	Laminar
100 - 1,000	6	Transitional
1,000 - 5,000	3	Turbulent
5,000	3	Turbulent

SYMBOLS	
Q	Flow, gpm
③	Viscosity, centipoise (cps)
N_{RE}	Reynolds Number, dimensionless
S	Specific Gravity (water = 1.0)
L	Laminar Flow Pressure Drop Factor
T	Turbulent Flow Pressure Drop Factor
D	Actual Inside Pipe Diameter, inches
Delta P	Pressure Drop, psi
N	Number of Mixing Stages



SYMBOLS	
Q	Flow, gpm
③	Viscosity, centipoise (cps)
N_{RE}	Reynolds Number, Dimensionless
S	Specific Gravity (water = 1.0)
L	Laminar Flow Pressure Drop Factor
T	Turbulent Flow Pressure Drop Factor
D	Actual Inside Pipe Diameter, Inches
Delta P	Pressure Drop, psi
N	Number of Mixing Stages

Step Two: Calculate Delta P (Pressure Drop)

A For turbulent flow (Reynolds Number > 500), use the following formula and pressure drop table to determine pressure drop, in psi:

Delta P, psi = Q^2 x S x T

B For laminar flow (Reynolds Number < 500), use the following formula and pressure drop table to determine pressure drop, in psi:

Delta P, psi = Q x ③ x L

C For turbulent flow applications with Stata-Tube mixers not listed in the pressure drop factor tables, use the following formula to determine pressure drop, in psi ***per mixing stage***:

Delta P, psi = 0.0033 x Q2 x S x ③ $^{0.06}$ / D^4 per stage

Then, total Delta P, psi = Delta P x N

D For laminar flow applications with Stata-Tube mixers not appearing in the pressure drop factor tables, use the following formula to determine pressure drop, in psi ***per mixing stage***:

Delta P, psi = 0.00029 x Q x ③ / D^3 per stage

Then, total Delta P, psi = Delta P x N

E For applications with large Spiral Mixers not listed in the tables, consult our Technical Service or Sales Department for more information.

SERIES 50 & 60 MIXER PRESSURE DROP TABLE

PART NO.	HOUSING SIZE	STAGES	L FACTOR	T FACTOR
050-031F, 060-031	3/8"	7	0.0600	1.9000
050-032F, 060-031	3/8"	14	0.1200	3.8000
050-061, 060-061	3/4"	7	0.0150	0.2400
050-062, 060-062	3/4"	14	0.0300	0.4800
050-081, 060-081	1"	7	0.0066	0.0800
050-082, 060-082	1"	14	0.0130	0.1600
050-121, 060-121	1-1/4"	7	0.0018	0.0150
050-122, 060-122	1-1/4"	14	0.0036	0.0300
050-161, 060-161	2"	5	0.0003	0.0016
050-162, 060-162	2"	10	0.0006	0.0032

SERIES 100 MIXER PRESSURE DROP TABLE

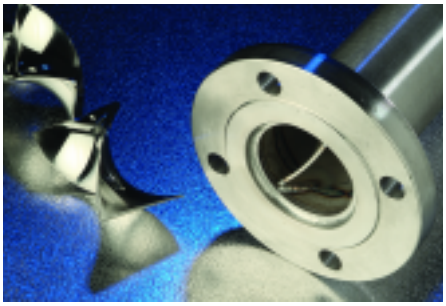
PART NO.	HOUSING SIZE	ELEMENT	L FACTOR	T FACTOR
100-106	1/8" MNPT	6	0.0588	6.1000
100-112	1/8" MNPT	12	0.1176	12.2000
100-206	1/4" MNPT	6	0.0237	1.9000
100-212	1/4" MNPT	12	0.0474	3.8000
100-306	3/8" MNPT	6	0.0092	0.5500
100-312	3/8" MNPT	12	0.0184	1.1000
100-406	1/2" MNPT	6	0.0055	0.2200
100-412	1/2" MNPT	12	0.0110	0.4400
100-606	3/4" MNPT	6	0.0020	0.0400
100-612	3/4" MNPT	12	0.0040	0.0800
100-806	1" MNPT	6	0.0012	0.0260
100-812	1" MNPT	12	0.0024	0.0520
101-206	1-1/2" MNPT	6	0.00029	0.0040
101-212	1-1/2" MNPT	12	0.00058	0.0080
101-606	2" MNPT	6	0.00015	0.0015
101-612	2" MNPT	12	0.00030	0.0030

"L" = Laminar flow—for transitional N_{RE} 100-499, multiply pressure drop by 1.4
"T" = Turbulent flow—for transitional N_{RE} 500-1000, multiply pressure drop by 1.1

SERIES 340 MIXER PRESSURE DROP TABLE

PART NO.	HOUSING SIZE	ELEMENTS	L FACTOR	T FACTOR
345-606	1/8"	6	0.080	13.400
345-612	1/8"	12	0.160	26.800
345-806	1/4"	6	0.024	2.140
345-812	1/4"	12	0.048	4.280
346-206	3/8"	6	0.010	0.615
346-212	3/8"	12	0.020	1.230
346-406	1/2"	6	0.005	0.264
346-412	1/2"	12	0.010	0.528
346-606	3/4"	6	0.0023	0.048
346-612	3/4"	12	0.0046	0.096
346-806	1"	6	0.0018	0.320
346-812	1"	12	0.0036	0.064
347-206	1-1/2"	6	0.0005	0.005
347-212	1-1/2"	12	0.0010	0.010
347-606	2"	6	0.0002	0.0016
347-612	2"	12	0.0004	0.0032
P-.75-R57-R61	3/4"	6	0.0023	0.048
P-.75-R57-R121	3/4"	12	0.0046	0.096
P-1-R57-R61	1"	6	0.0018	0.032
P-1-R57-R121	1"	12	0.0036	0.064
P-1.5-R57-R61	1-1/2"	6	0.0005	0.005
P-1.5-R57-R121	1-1/2"	12	0.0010	0.010
P-2-R57-R61	2"	6	0.0002	0.0016
P-2-R57-R121	2"	12	0.0004	0.0032

Spiral (Helical) Process Mixer Pressure Drop



For 3" to 12" diameter spiral mixers:

1. Pressure drop figures are per **three** Spiral Mixer elements, expressed in lbs. per square inch (psi). For the pressure drop of a 6 element mixer, simply double the number shown on the chart for a 3 element mixer. The pressure drop of mixers with other numbers of elements is proportional to the figures shown for three elements (eg. two elements would be two-thirds of figure on chart).
2. Figures are for standard metal Spiral Mixers with Sch. 40 pipe housings. For non-standard sizes, and mixers larger than 12" diameter, call our Technical Service or Sales Department.
3. Figures are for mixing liquids having a specific gravity of 1.0 and a viscosity of 1.0 centipoise (water-like). For higher viscosity fluids or other conditions, consult our Technical Service or Sales Department for more information on these mixers.

3" MIXERS	
FLOW*	DELTA P*
25.00	0.07
30.00	0.09
35.00	0.13
40.00	0.17
45.00	0.21
50.00	0.26
60.00	0.37
70.00	0.50
80.00	0.65
100.00	1.00
150.00	2.20
200.00	4.00
250.00	6.30
300.00	9.10
400.00	16.00

4" MIXERS	
FLOW*	DELTA P*
30.00	0.04
35.00	0.05
40.00	0.06
45.00	0.07
50.00	0.09
60.00	0.13
70.00	0.17
80.00	0.22
100.00	0.35
150.00	0.75
200.00	1.35
250.00	2.10
300.00	3.00
400.00	5.00
500.00	8.50

6" MIXERS	
FLOW*	DELTA P*
80.00	0.05
100.00	0.07
150.00	0.15
200.00	0.25
250.00	0.40
300.00	0.55
400.00	1.00
500.00	1.60
600.00	2.20
700.00	3.00
800.00	3.85
900.00	4.90
1000.00	6.00

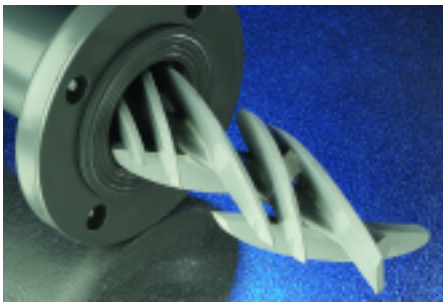
8 " MIXERS	
FLOW*	DELTA P*
150.00	0.05
200.00	0.08
250.00	0.13
300.00	0.19
400.00	0.33
500.00	0.50
600.00	0.70
800.00	1.30
1000.00	2.00
1200.00	2.90
1500.00	4.60
2000.00	8.30
2500.00	13.00

10" MIXERS	
FLOW*	DELTA P*
200.00	0.04
250.00	0.05
300.00	0.08
400.00	0.13
500.00	0.20
600.00	0.28
800.00	0.50
1000.00	0.75
1200.00	1.10
1500.00	1.75
2000.00	3.10
2500.00	4.80
3000.00	7.10

12" MIXERS	
FLOW*	DELTA P*
800.00	0.23
1000.00	0.35
1200.00	0.50
1500.00	0.75
2000.00	1.90
2500.00	2.20
3000.00	3.15
3500.00	4.30
4000.00	5.15
5000.00	8.50
5500.00	10.50
6000.00	13.00
6500.00	15.30

* Flow is in GPM; Delta P is psi (lbs. per square inch) per 3 Elements

Stata-Tube™ PVC/CPVC Mixer Pressure Drop



For 3" to 12" diameter Stata-Tube mixers:

1. Pressure drop figures are per **three** Stata-Tube™ Mixer stages, expressed in lbs. per square inch (psi). For the pressure drop of a 6 stage mixer, simply double the number shown on the chart for a 3 stage mixer. The pressure drop of mixers with other numbers of elements is proportional to the figures shown for three stages (e.g., 2 stages would be two-thirds of figure on chart).
2. Figures are for standard Stata-Tube™ PVC/CPVC mixers with Sch. 80 PVC/CPVC pipe housings. For non-standard sizes and mixers larger than 12" diameter, consult our Tech. Service or Sales Dept.
3. Figures are for mixing liquids having a specific gravity of 1.0 and a viscosity of 1.0 centipoise (water-like). For higher viscosity fluids, or other conditions, consult our Technical Service or Sales Department.

3" MIXERS*	
FLOW**	DELTA P**
25.00	0.09
30.00	0.13
35.00	0.17
40.00	0.22
45.00	0.28
50.00	0.35
60.00	0.50
70.00	0.67
80.00	0.90
100.00	1.40
150.00	3.15
200.00	5.60
250.00	8.75
300.00	12.60
400.00	22.40

4" MIXERS*	
FLOW**	DELTA P**
30.00	0.04
35.00	0.06
40.00	0.07
45.00	0.09
50.00	0.12
60.00	0.17
70.00	0.23
80.00	0.29
100.00	0.46
150.00	1.03
200.00	1.84
250.00	2.88
300.00	4.14
400.00	7.36
500.00	11.50

6" MIXERS*	
FLOW**	DELTA P**
80.00	0.06
100.00	0.09
150.00	0.20
200.00	0.36
250.00	0.56
300.00	0.80
400.00	1.44
500.00	2.25
600.00	3.24
700.00	4.40
800.00	5.75
900.00	7.28
1000.00	9.00

8" MIXERS*	
FLOW**	DELTA P**
150.00	0.07
200.00	0.12
250.00	0.18
300.00	0.26
400.00	0.47
500.00	0.73
600.00	1.05
800.00	1.87
1000.00	2.92
1200.00	4.21
1500.00	6.57
2000.00	11.68
2500.00	18.26

10" MIXERS*	
FLOW**	DELTA P**
200.00	0.05
250.00	0.07
300.00	0.10
400.00	0.19
500.00	0.30
600.00	0.43
800.00	0.76
1000.00	1.19
1200.00	1.71
1500.00	2.67
2000.00	4.74
2500.00	7.40
3000.00	10.67

12" MIXERS*	
FLOW**	DELTA P**
800.00	0.38
1000.00	0.59
1200.00	0.85
1500.00	1.33
2000.00	2.36
2500.00	3.69
3000.00	5.31
3500.00	7.23
4000.00	9.44
5000.00	14.75
5500.00	17.85
6000.00	21.24
6500.00	24.93

* Series 50 PVC Mixers only
** Flow is in GPM; Delta P is psi (lbs. per square inch) per 3 Elements

