

MasterFLEX[®] High-Performance Pump Head- Flow Rate Performance with Different Back Pressures

Introduction

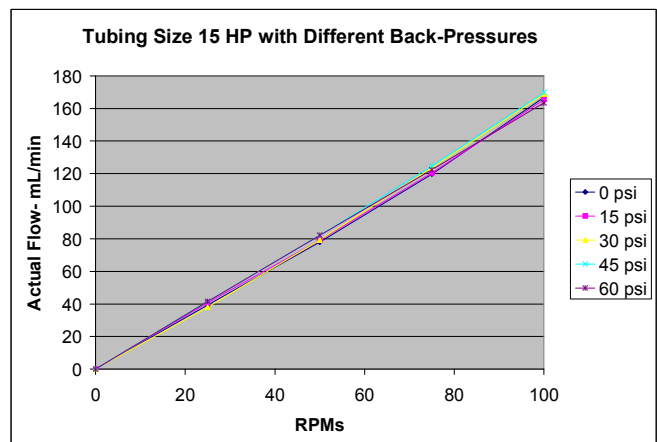
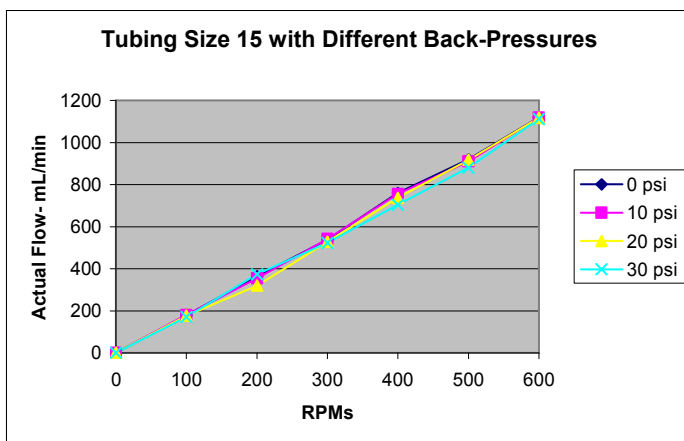
PendoTECH Process Control Systems as part of their automation features can control pump speeds and start/stop pumps. Peristaltic pumps are frequently the choice for pumping liquids in laboratory scale processes and are also used for larger scale processes. A big advantage of the pump is in the nature of its design where the moving pump rotors contact only the outer surface of the tubing containing the fluid but not the fluid itself. A potential disadvantage is that as pressure builds downstream of the pump, as can happen in filtration and chromatography processes, the rotors may begin to “slip” over the surface of the tube and not deliver the prescribed flow. This can lead to a flow rate deficiency and data discrepancy. Adding a flow meter to measure the flow is not always the best option because this: 1) introduces another piece of hardware, and 2) complex software adjustments are required for feedback to the pump for correction of the user entered flow rate to attempt to maintain the flow rate.

Testing

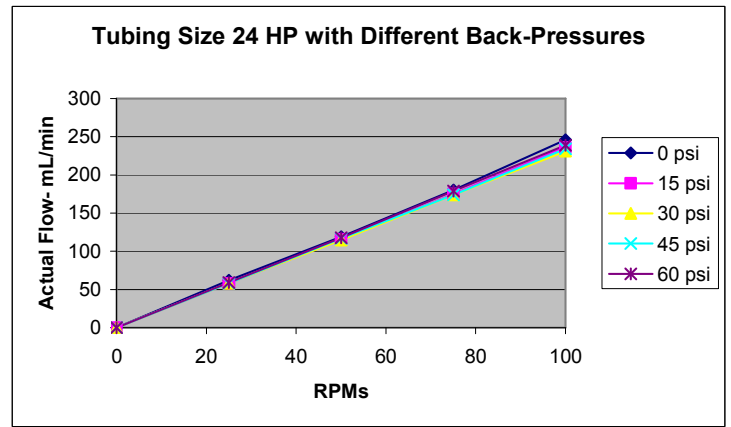
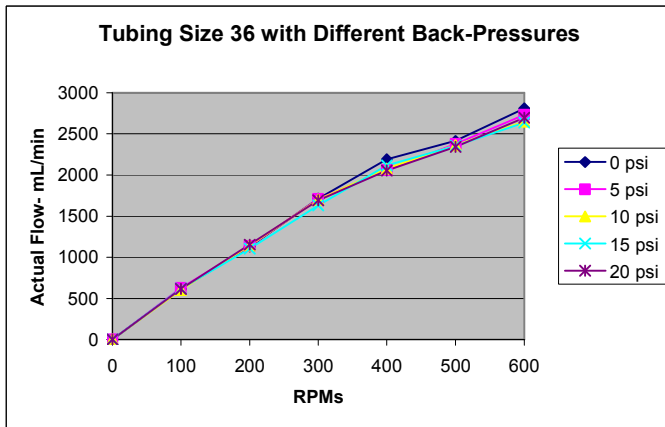
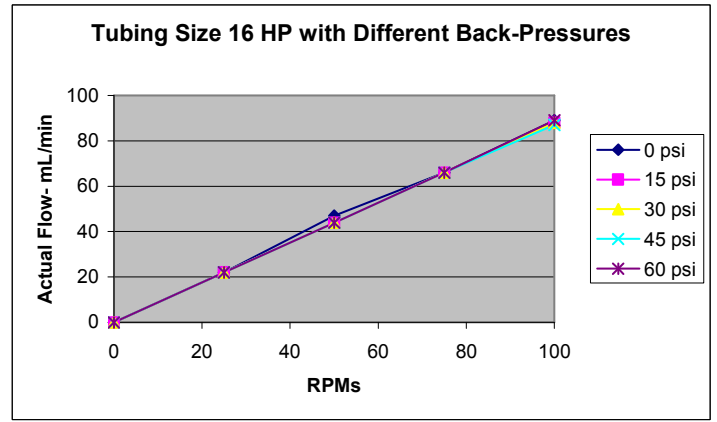
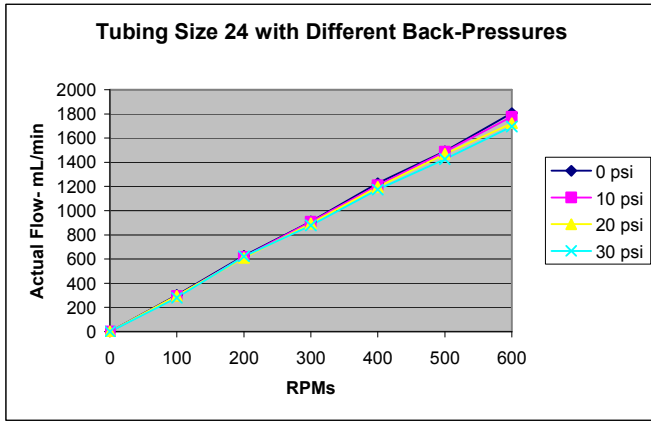
The Masterflex High-Performance Pump Head is designed to work with the Masterflex High-Performance Precision tubings and minimize the slip that results in a loss of flow as pressure increases. Testing was conducted on a number of different tubing sizes including the newer tubing sizes with the suffix HP. The HP size tubings are designed with a thicker wall to operate at higher back pressures but are limited to use in the range of 0-100 RPMs.

Results

The results indicate that the this pump head performs well and for most processes will deliver the desired flow rate within an acceptable percentage. The data is presented in the following graphs and tables.



Application Note



SIZE L/S 15

RPMs	mL/rev at 0psi	mL/min at 0psi	% at 10psi	% at 20psi	% at 30psi
100	1.78	178	101%	99%	96%
200	1.82	364	97%	88%	103%
300	1.79	538	101%	98%	97%
400	1.90	760	99%	97%	93%
500	1.84	920	99%	100%	96%
600	1.87	1120	100%	100%	99%

SIZE L/S 15HP *

RPMs	mL/rev at 0psi	mL/min at 0psi	% at 15psi	% at 30psi	% at 45psi	% at 60psi
25	1.57	39.3	104%	97%	105%	106%
50	1.56	78	102%	102%	105%	105%
75	1.60	119.7	101%	103%	104%	102%
100	1.67	166.8	99%	101%	102%	98%

SIZE L/S 24

RPMs	mL/rev at 0psi	mL/min at 0psi	% at 10psi	% at 20psi	% at 30psi
100	3.02	302	97%	98%	93%
200	3.13	626	99%	97%	99%
300	3.03	910	100%	98%	96%
400	3.07	1226	99%	97%	96%
500	2.98	1490	100%	99%	96%
600	3.01	1806	98%	95%	94%

SIZE L/S 16HP *

RPMs	mL/rev at 0psi	mL/min at 0psi	% at 15psi	% at 30psi	% at 45psi	% at 60psi
25	0.88	22	100%	100%	100%	100%
50	0.94	47	94%	94%	94%	94%
75	0.88	66	100%	100%	100%	100%
100	0.89	89	99%	99%	98%	100%

SIZE L/S 36

RPMs	mL/rev at 0psi	mL/min at 0psi	% at 5psi	% at 10psi	% at 15psi	% at 20psi
100	6.16	616	102%	98%	101%	100%
200	5.66	1132	100%	101%	98%	102%
300	5.71	1714	100%	99%	95%	99%
400	5.48	2192	94%	95%	97%	94%
500	4.83	2414	99%	98%	98%	97%
600	4.69	2812	97%	94%	94%	96%

SIZE L/S 24HP *

RPMs	mL/rev at 0psi	mL/min at 0psi	% at 15psi	% at 30psi	% at 45psi	% at 60psi
25	2.48	62	94%	94%	94%	95%
50	2.38	119	97%	97%	98%	99%
75	2.40	180	97%	97%	97%	99%
100	2.46	246	96%	94%	95%	97%

Conclusion

Using a PendoTECH Process Control System in conjunction with the Masterflex High-Performance Pump Head to set the flow rate should lead to consistent flow rates as pressure builds downstream of the pump up to the tubing pressure limits.