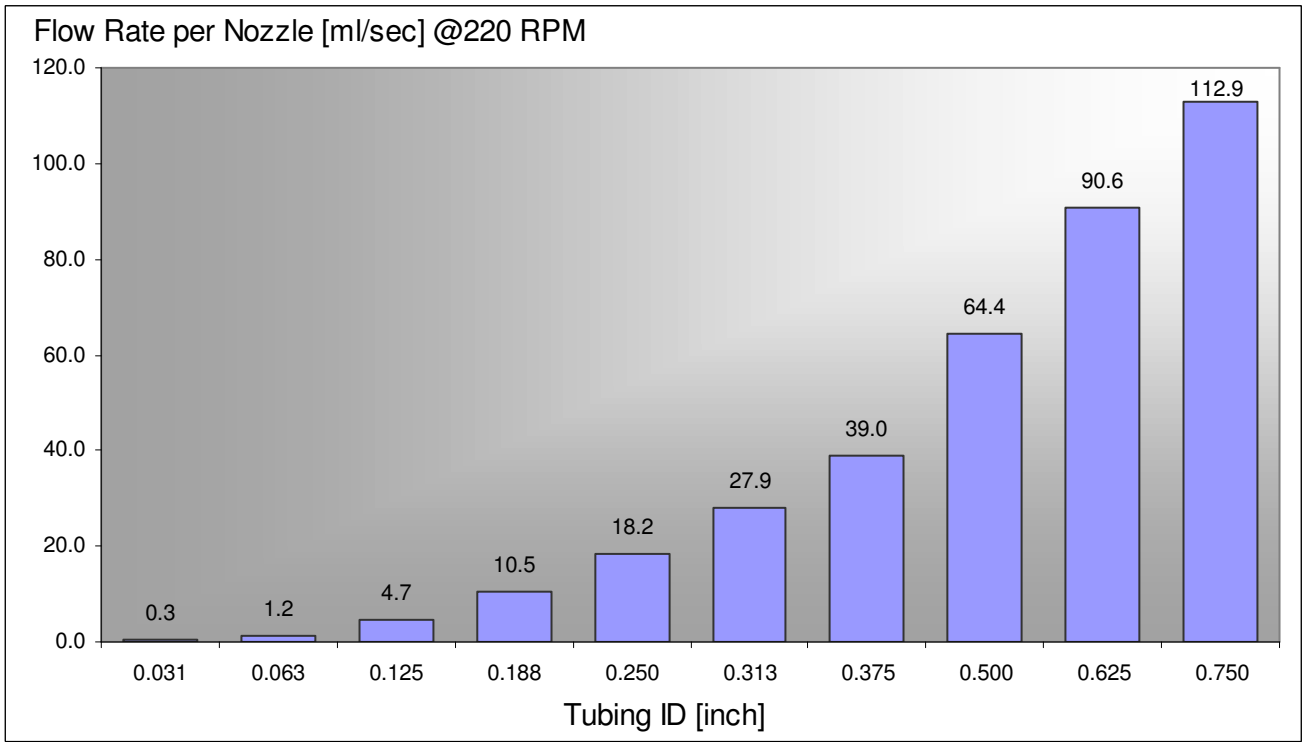
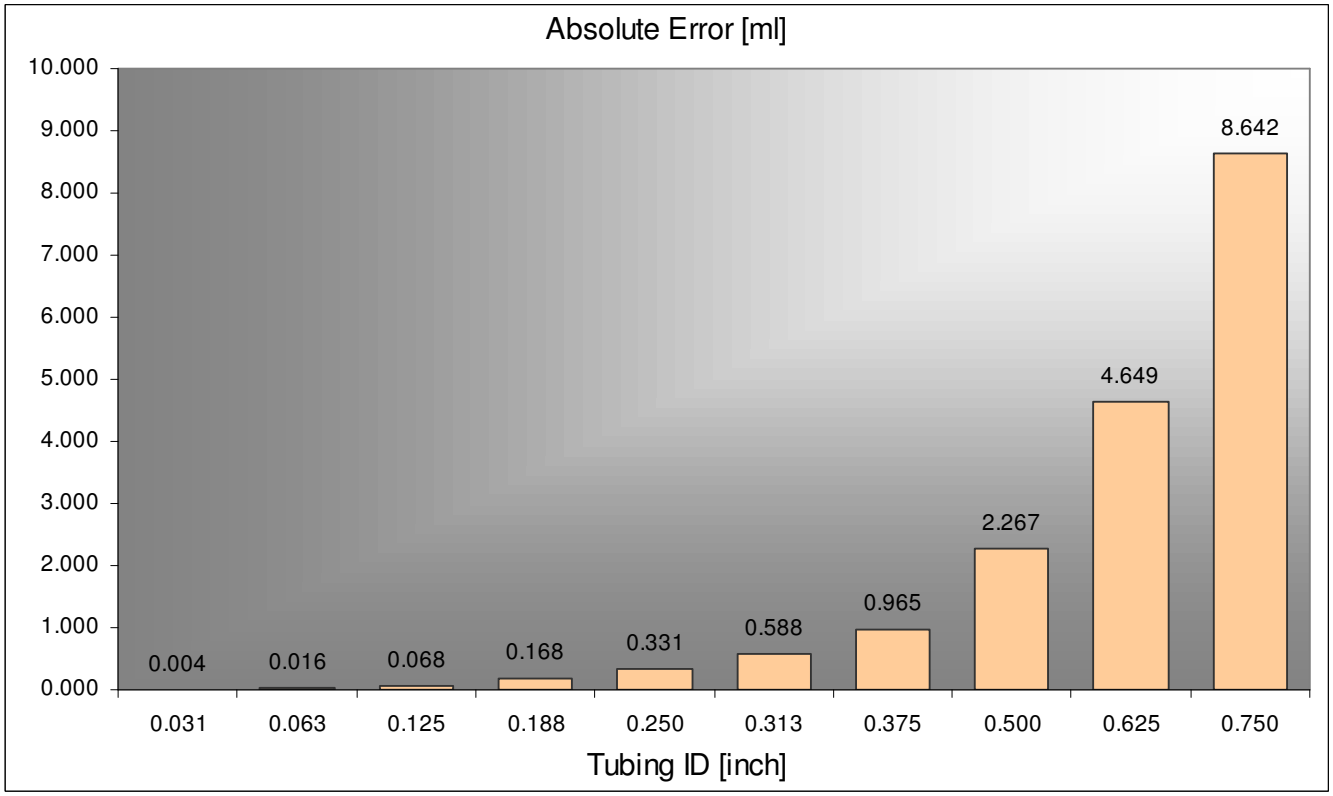
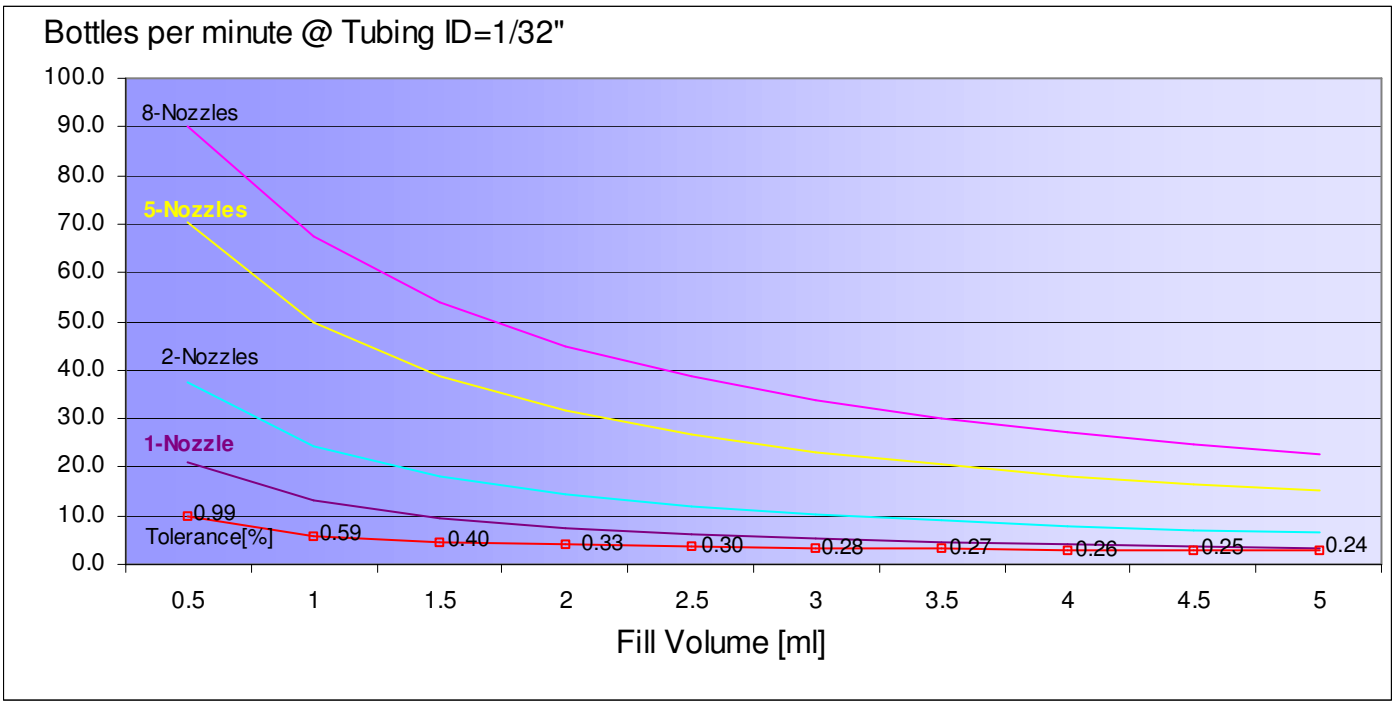
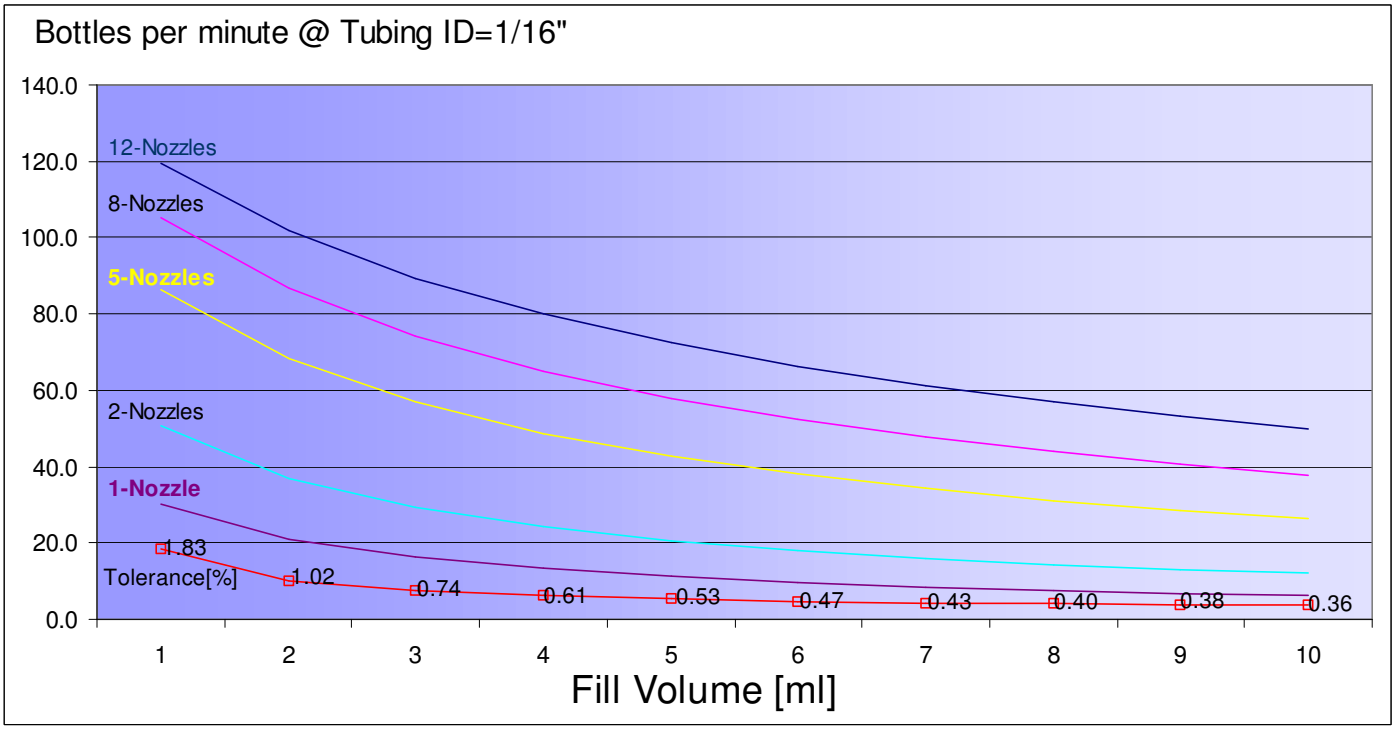
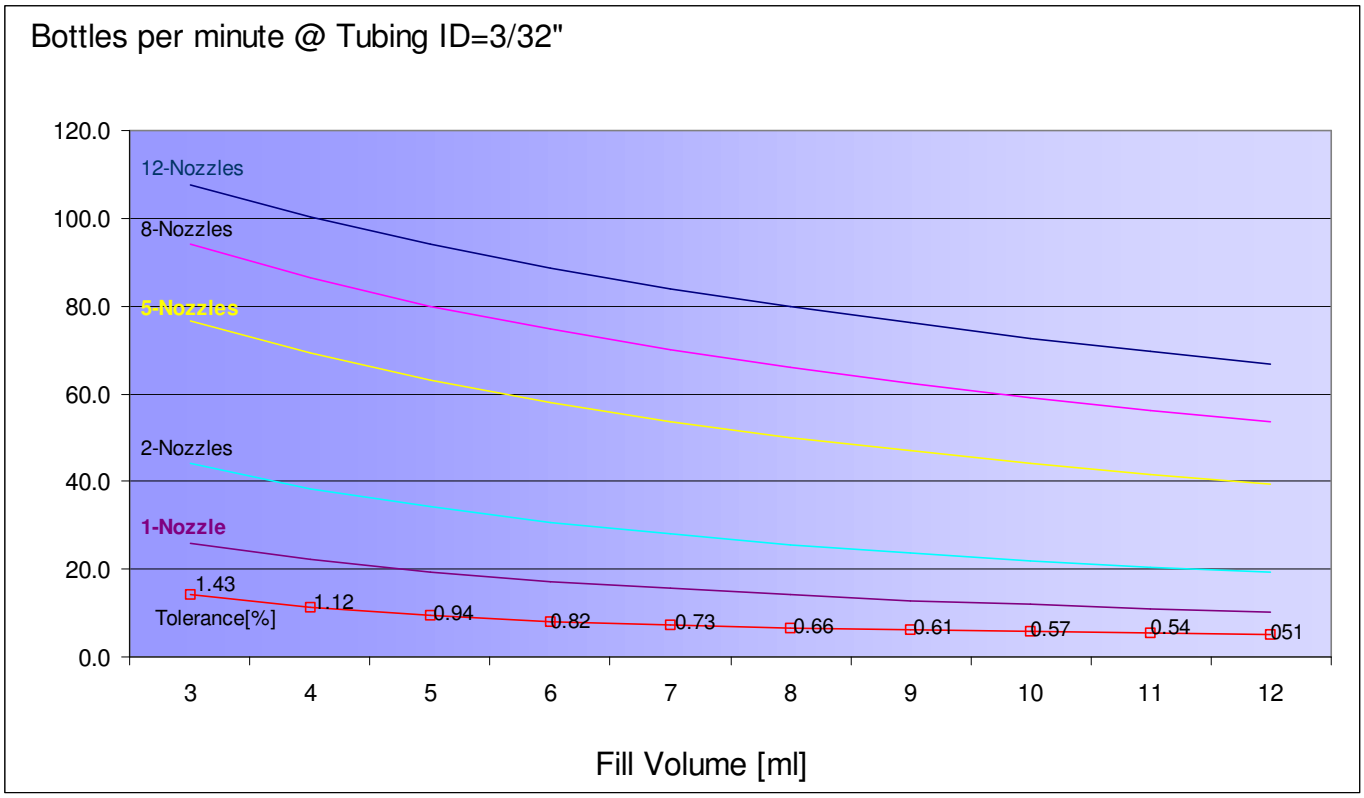

Flow Rate per Nozzle [ml/sec] @220 RPM
120.0
100.0
80.0
60.0
40.0
20.0
0.0
0.3
1.2
4.7
10.5
18.2
27.9
39.0
64.4
90.6
112.9
0.031
0.063
0.125
0.188
0.250
0.313
0.375
0.500
0.625
0.750
Tubing ID [inch]

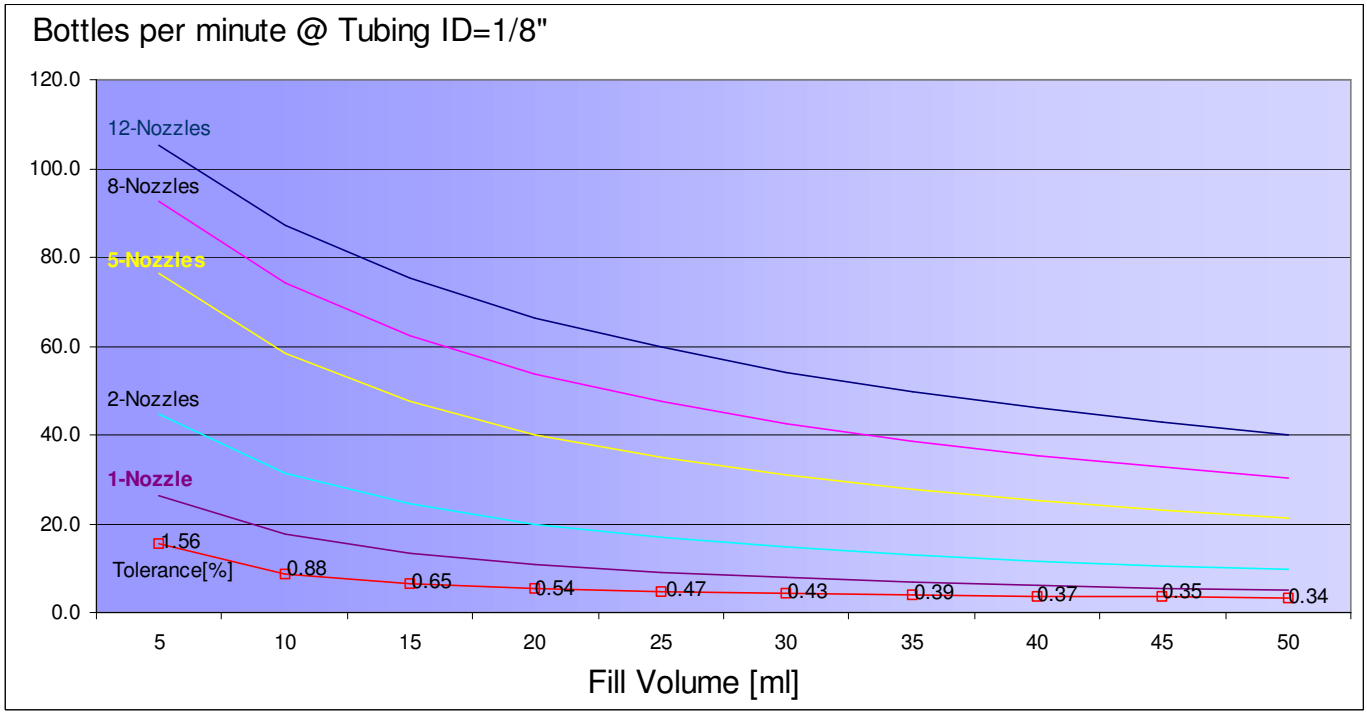

Absolute Error [ml]
10.000
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
0.004
0.016
0.068
0.168
0.331
0.588
0.965
2.267
4.649
8.642
0.031
0.063
0.125
0.188
0.250
0.313
0.375
0.500
0.625
0.750
Tubing ID [inch]

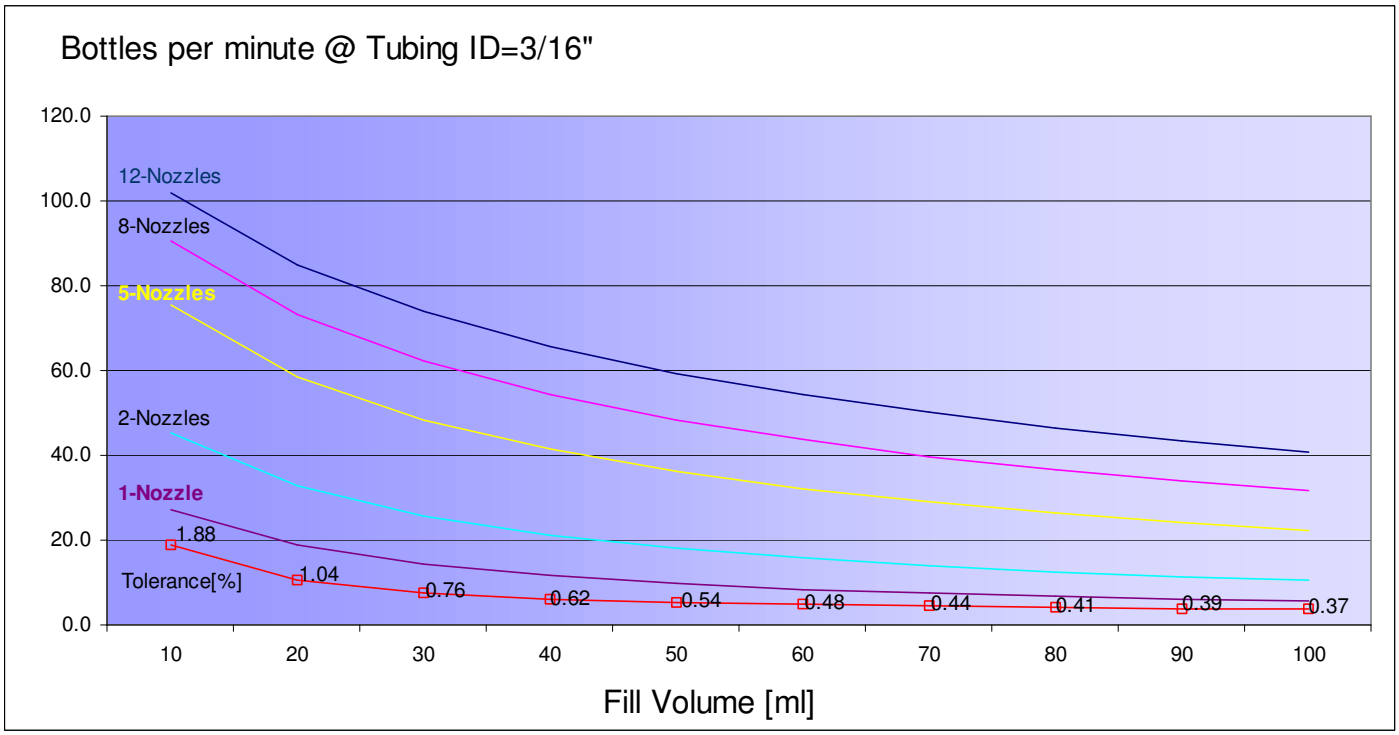
NOTE: ***Production speeds as much as twice higher from shown are achievable. (See NOTE- 1 at the bottom)***

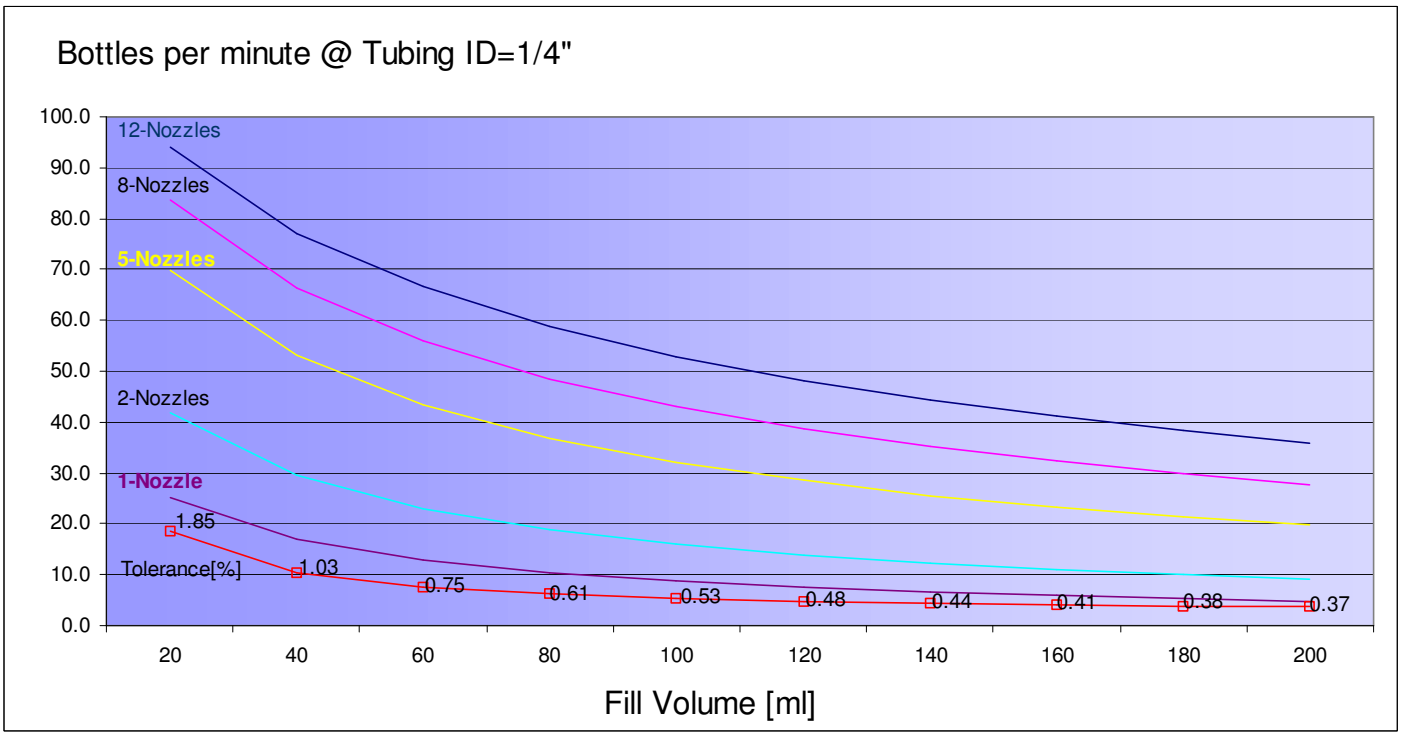


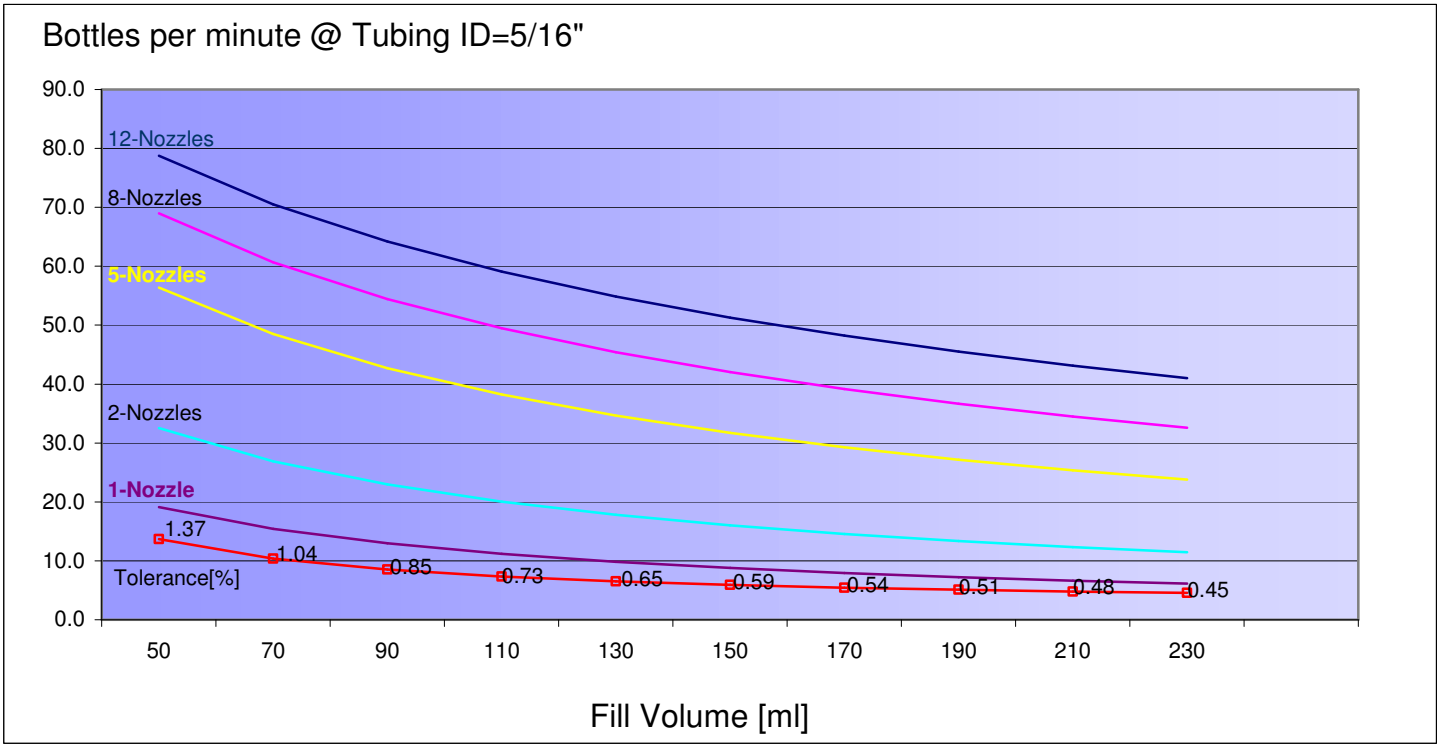


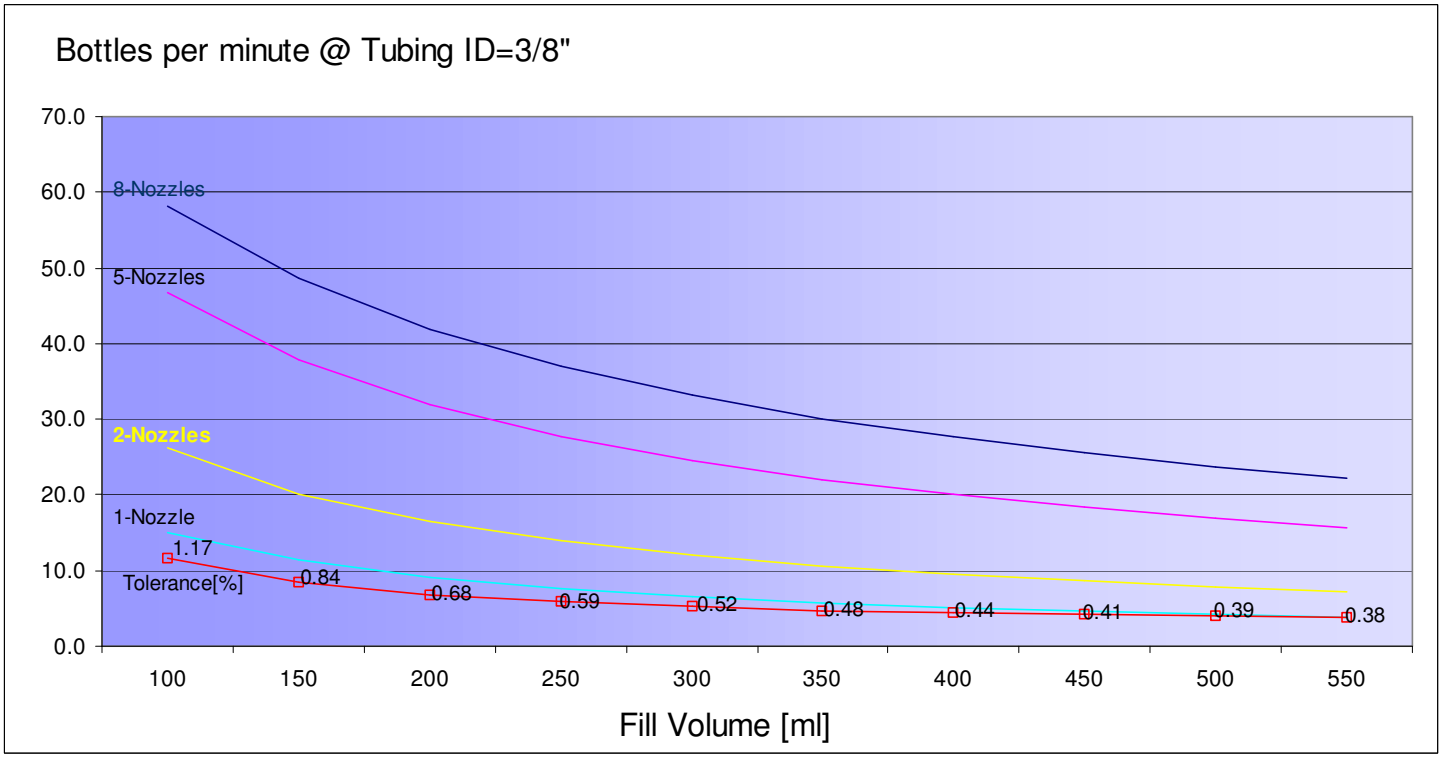

Bottles per minute @ Tubing ID=3/32"
120.0
100.0
80.0
60.0
40.0
20.0
0.0
12-Nozzles
8-Nozzles
5-Nozzles
2-Nozzles
1-Nozzle
1.43
1.12
0.94
0.82
0.73
0.66
0.61
0.57
0.54
051
Tolerance[%]
3
4
5
6
7
8
9
10
11
12
Fill Volume [ml]

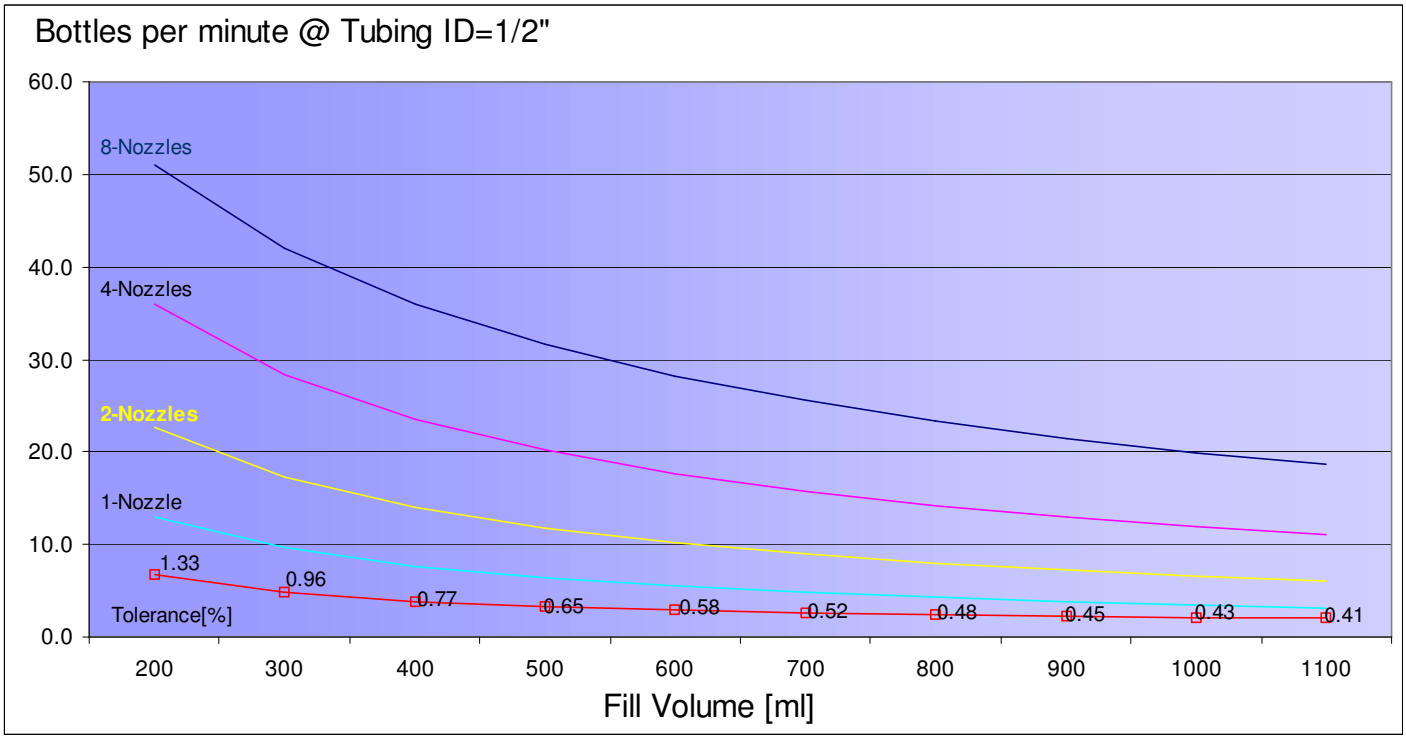

Bottles per minute @ Tubing ID=1/8"
120.0
100.0
80.0
60.0
40.0
20.0
0.0
12-Nozzles
8-Nozzles
5-Nozzles
2-Nozzles
1-Nozzle
1.56
0.88
0.65
0.54
0.47
0.43
0.39
0.37
0.35
0.34
Tolerance[%]
5
10
15
20
25
30
35
40
45
50
Fill Volume [ml]

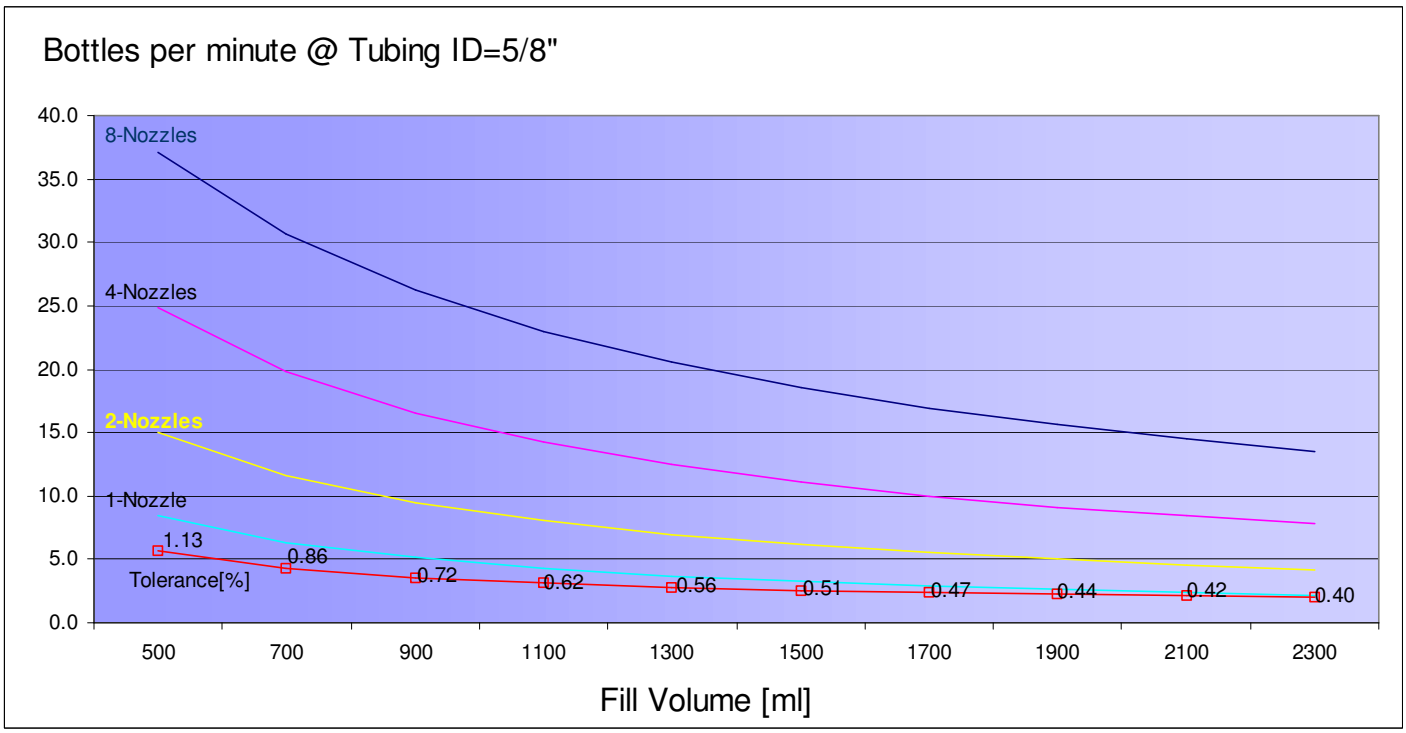

Bottles per minute @ Tubing ID=3/16"
120.0
100.0
80.0
60.0
40.0
20.0
0.0
12-Nozzles
8-Nozzles
5-Nozzles
2-Nozzles
1-Nozzle
Tolerance[%]
1.88
1.04
0.76
0.62
0.54
0.48
0.44
0.41
0.39
0.37
10
20
30
40
50
60
70
80
90
100
Fill Volume [ml]

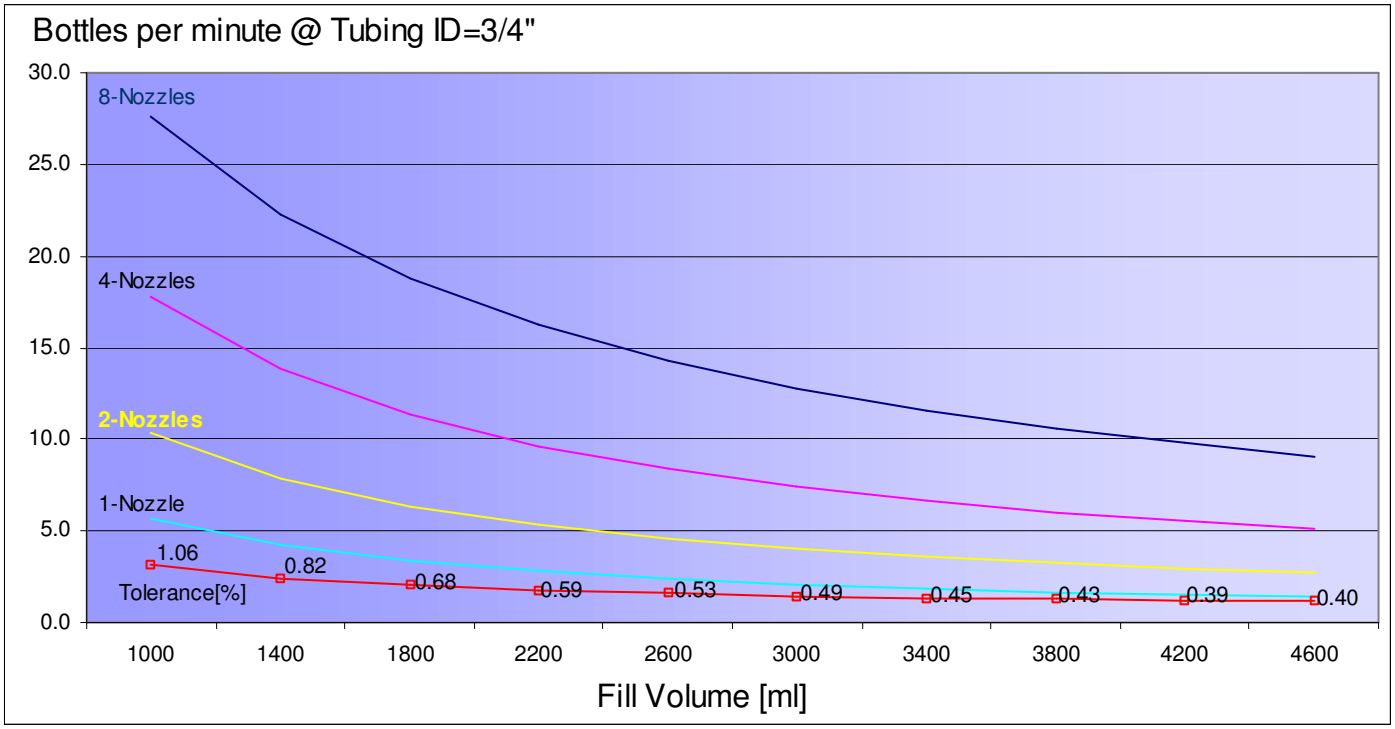

Bottles per minute @ Tubing ID=1/4"
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
12-Nozzles
8-Nozzles
5-Nozzles
2-Nozzles
1-Nozzle
Tolerance[%]
1.85
1.03
0.75
0.61
0.53
0.48
0.44
0.41
0.38
0.37
20
40
60
80
100
120
140
160
180
200
Fill Volume [ml]


Bottles per minute @ Tubing ID=5/16"
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
12-Nozzles
8-Nozzles
5-Nozzles
2-Nozzles
1-Nozzle
Tolerance[%]
1.37
1.04
0.85
0.73
0.65
0.59
0.54
0.51
0.48
0.45
50
70
90
110
130
150
170
190
210
230
Fill Volume [ml]


Bottles per minute @ Tubing ID=3/8"
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
8-Nozzles
5-Nozzles
2-Nozzles
1-Nozzle
Tolerance[%]
1.17
0.84
0.68
0.59
0.52
0.48
0.44
0.41
0.39
0.38
100
150
200
250
300
350
400
450
500
550
Fill Volume [ml]


Bottles per minute @ Tubing ID=1/2"
60.0
50.0
40.0
30.0
20.0
10.0
0.0
8-Nozzles
4-Nozzles
2-Nozzles
1-Nozzle
Tolerance[%]
1.33
0.96
0.77
0.65
0.58
0.52
0.48
0.45
0.43
0.41
200
300
400
500
600
700
800
900
1000
1100
Fill Volume [ml]


Bottles per minute @ Tubing ID=5/8"
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
8-Nozzles
4-Nozzles
2-Nozzles
1-Nozzle
Tolerance[%]
1.13
0.86
0.72
0.62
0.56
0.51
0.47
0.44
0.42
0.40
500
700
900
1100
1300
1500
1700
1900
2100
2300
Fill Volume [ml]



NOTES:

1. As much as twice higher production speeds than shown are achievable with our newest servo drives. The above theoretical data are for silicon tubing with 1/8" wall, 220 RPM peristaltic pump servo drive, and water-like product. These data are provided for reference only. The pump speed can be increased up to 500 RPM with our new larger and more efficient servo drivers. At higher flow rates, product splashing and foaming can be dramatically reduced via precise servo programmable bottom-up nozzles.

2. Multiple filling modules with increased number of nozzles are available for higher production speeds. 20-nozzle machines are running production over 300 containers per minute, some of them in pharmaceutical clean rooms. Systems with up to 40 nozzles were also custom developed.

3. The fill volume tolerance may vary with application. Absolute fill error depends upon peristaltic tubing material, product viscosity, and pressure/vacuum fluctuation of the product supply system. Average relative fill error is approximately 0.2%, and may vary upon peristaltic tubing wear and tubing material instability.

4. Production speed is proportional to the flow rate and to the bottle index time. The bottle index time varies upon conveyor speed, bottle diameter, and bottle shape. Flow rate can be optimally adjusted via programming the servo peristaltic pump RPM. Maximum flow rate depends upon product viscosity, foaming, and splashing.