

Water System Simulation Report - 640-gal Pressure Tank Model

Generated: 2025-08-12 18:45

1) System Description & Parameters

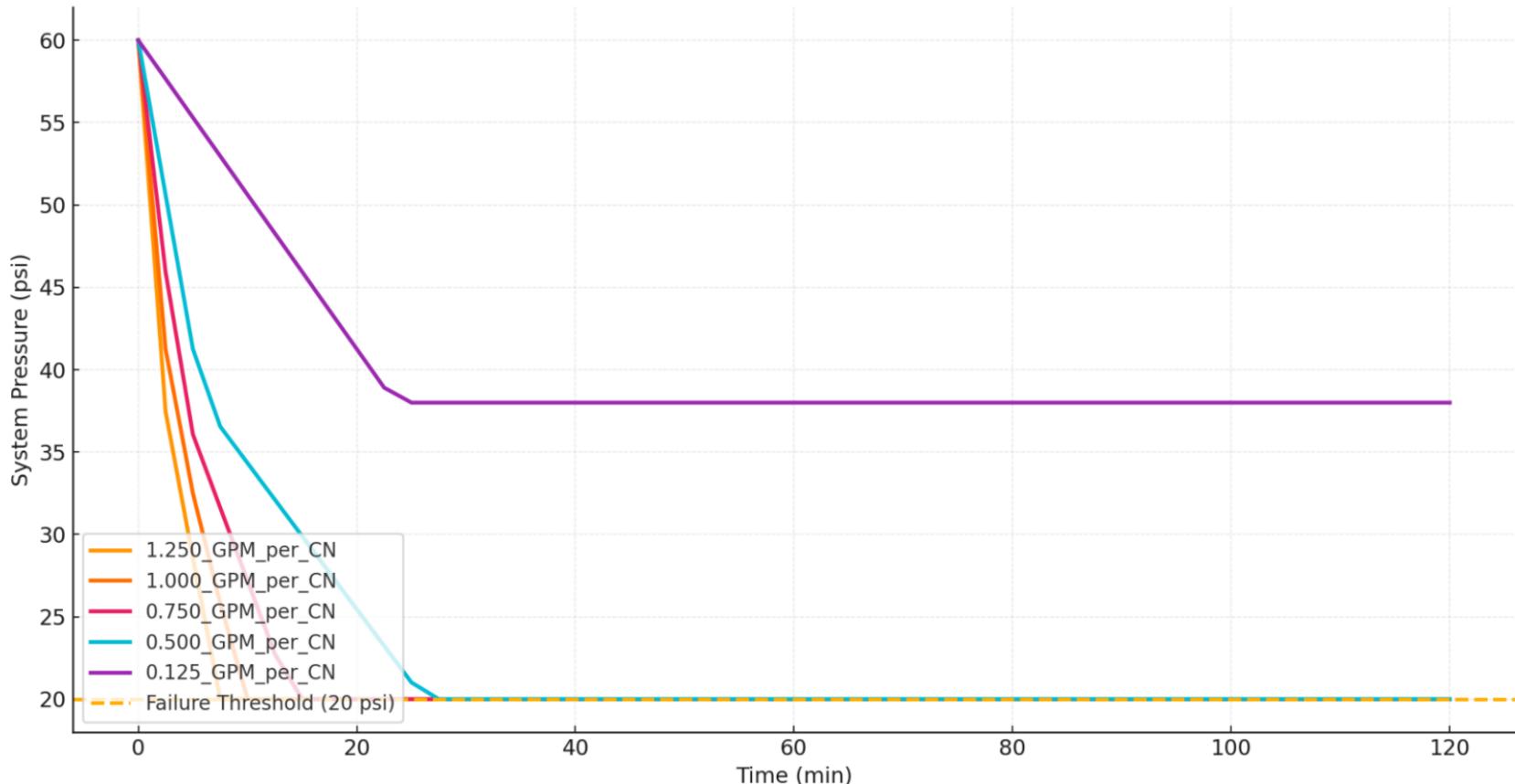
- Pressure tank effective volume (model): 640 gal
- Booster pump(s): one @ 20 GPM (cut-in = 38 psi; cut-out/initial = 60 psi)
- Well (supply): 20 GPM (steady)
- Failure threshold: 20 psi
- Connection nodes: 80
- Flow scenarios per CN: 1.250, 1.000, 0.750, 0.500, 0.125 GPM
- Time step: 2.5 min; Simulation duration: 120.0 min

2) Methodology & Equations (script-conformant)

- Phase-split of pressure tank drawdown using proportion of pressure drop:
 $V_{phase1} = V_{TANK} \times (P_{OUT} - P_{IN}) / P_{OUT}$
 $V_{phase2} = V_{TANK} - V_{phase1}$
- Phase 1 ($P_{OUT} \rightarrow P_{IN}$):
 $t1 = V_{phase1} / Q_{total}; P(t) = P_{OUT} - ((P_{OUT} - P_{IN})/t1) \cdot t$
- Phase 2 ($\leq P_{IN}$): booster provides 20 GPM; deficit $dQ = Q_{total} - 20$
If $dQ > 0$: $t2 = V_{phase2} / dQ; P(t) = P_{IN} - ((P_{IN} - P_{FAIL})/t2) \cdot (t - t1)$ up to P_{FAIL}
If $dQ \leq 0$: P holds at P_{IN} (no further tank drawdown)

Note: The steady well is not throttled in these constant-demand stress tests;
tank drawdown is the dominant buffer to maintain pressure between 60→38→20 psi.

Combined Pressure Decay - 640-gal Pressure Tanks
(1 booster @20 GPM, well 20 GPM, dt=2.5 min)



Time (min)	System Pressure (psi)	Total Demand (GPM)	Booster Flow (GPM)	Net Deficit (GPM)	Pressure Tank Volume Remaining (%)
0.0	60.0	100.0	0.0	100.0	640.0
2.5	37.46	100.0	20.0	80.0	393.07
5.0	28.57	100.0	20.0	80.0	193.07
7.5	20.0	100.0	20.0	80.0	0.0
10.0	20.0	100.0	20.0	80.0	0.0
12.5	20.0	100.0	20.0	80.0	0.0
15.0	20.0	100.0	20.0	80.0	0.0
17.5	20.0	100.0	20.0	80.0	0.0
20.0	20.0	100.0	20.0	80.0	0.0
22.5	20.0	100.0	20.0	80.0	0.0
25.0	20.0	100.0	20.0	80.0	0.0
27.5	20.0	100.0	20.0	80.0	0.0
30.0	20.0	100.0	20.0	80.0	0.0
32.5	20.0	100.0	20.0	80.0	0.0
35.0	20.0	100.0	20.0	80.0	0.0
37.5	20.0	100.0	20.0	80.0	0.0
40.0	20.0	100.0	20.0	80.0	0.0
42.5	20.0	100.0	20.0	80.0	0.0
45.0	20.0	100.0	20.0	80.0	0.0
47.5	20.0	100.0	20.0	80.0	0.0
50.0	20.0	100.0	20.0	80.0	0.0
52.5	20.0	100.0	20.0	80.0	0.0
55.0	20.0	100.0	20.0	80.0	0.0
57.5	20.0	100.0	20.0	80.0	0.0
60.0	20.0	100.0	20.0	80.0	0.0
62.5	20.0	100.0	20.0	80.0	0.0
65.0	20.0	100.0	20.0	80.0	0.0
67.5	20.0	100.0	20.0	80.0	0.0
70.0	20.0	100.0	20.0	80.0	0.0
72.5	20.0	100.0	20.0	80.0	0.0
75.0	20.0	100.0	20.0	80.0	0.0
77.5	20.0	100.0	20.0	80.0	0.0
80.0	20.0	100.0	20.0	80.0	0.0
82.5	20.0	100.0	20.0	80.0	0.0
85.0	20.0	100.0	20.0	80.0	0.0
87.5	20.0	100.0	20.0	80.0	0.0
90.0	20.0	100.0	20.0	80.0	0.0
92.5	20.0	100.0	20.0	80.0	0.0
95.0	20.0	100.0	20.0	80.0	0.0
97.5	20.0	100.0	20.0	80.0	0.0
100.0	20.0	100.0	20.0	80.0	0.0
102.5	20.0	100.0	20.0	80.0	0.0
105.0	20.0	100.0	20.0	80.0	0.0
107.5	20.0	100.0	20.0	80.0	0.0
110.0	20.0	100.0	20.0	80.0	0.0
112.5	20.0	100.0	20.0	80.0	0.0
115.0	20.0	100.0	20.0	80.0	0.0
117.5	20.0	100.0	20.0	80.0	0.0
120.0	20.0	100.0	20.0	80.0	0.0

Scenario Table - 1.250 GPM per CN (Total Demand = 100 GPM)

Time (min)	System Pressure (psi)	Total Demand (GPM)	Booster Flow (GPM)	Net Deficit (GPM)	Pressure Tank Volume Remaining (%)
0.0	60.0	80.0	0.0	80.0	640.0
2.5	41.25	80.0	0.0	80.0	440.0
5.0	32.49	80.0	20.0	60.0	281.33
7.5	25.83	80.0	20.0	60.0	131.33
10.0	20.0	80.0	20.0	60.0	0.0
12.5	20.0	80.0	20.0	60.0	0.0
15.0	20.0	80.0	20.0	60.0	0.0
17.5	20.0	80.0	20.0	60.0	0.0
20.0	20.0	80.0	20.0	60.0	0.0
22.5	20.0	80.0	20.0	60.0	0.0
25.0	20.0	80.0	20.0	60.0	0.0
27.5	20.0	80.0	20.0	60.0	0.0
30.0	20.0	80.0	20.0	60.0	0.0
32.5	20.0	80.0	20.0	60.0	0.0
35.0	20.0	80.0	20.0	60.0	0.0
37.5	20.0	80.0	20.0	60.0	0.0
40.0	20.0	80.0	20.0	60.0	0.0
42.5	20.0	80.0	20.0	60.0	0.0
45.0	20.0	80.0	20.0	60.0	0.0
47.5	20.0	80.0	20.0	60.0	0.0
50.0	20.0	80.0	20.0	60.0	0.0
52.5	20.0	80.0	20.0	60.0	0.0
55.0	20.0	80.0	20.0	60.0	0.0
57.5	20.0	80.0	20.0	60.0	0.0
60.0	20.0	80.0	20.0	60.0	0.0
62.5	20.0	80.0	20.0	60.0	0.0
65.0	20.0	80.0	20.0	60.0	0.0
67.5	20.0	80.0	20.0	60.0	0.0
70.0	20.0	80.0	20.0	60.0	0.0
72.5	20.0	80.0	20.0	60.0	0.0
75.0	20.0	80.0	20.0	60.0	0.0
77.5	20.0	80.0	20.0	60.0	0.0
80.0	20.0	80.0	20.0	60.0	0.0
82.5	20.0	80.0	20.0	60.0	0.0
85.0	20.0	80.0	20.0	60.0	0.0
87.5	20.0	80.0	20.0	60.0	0.0
90.0	20.0	80.0	20.0	60.0	0.0
92.5	20.0	80.0	20.0	60.0	0.0
95.0	20.0	80.0	20.0	60.0	0.0
97.5	20.0	80.0	20.0	60.0	0.0
100.0	20.0	80.0	20.0	60.0	0.0
102.5	20.0	80.0	20.0	60.0	0.0
105.0	20.0	80.0	20.0	60.0	0.0
107.5	20.0	80.0	20.0	60.0	0.0
110.0	20.0	80.0	20.0	60.0	0.0
112.5	20.0	80.0	20.0	60.0	0.0
115.0	20.0	80.0	20.0	60.0	0.0
117.5	20.0	80.0	20.0	60.0	0.0
120.0	20.0	80.0	20.0	60.0	0.0

Scenario Table - 1.000 GPM per CN (Total Demand = 80 GPM)

Time (min)	System Pressure (psi)	Total Demand (GPM)	Booster Flow (GPM)	Net Deficit (GPM)	Pressure Tank Volume Remaining (%)
0.0	60.0	60.0	0.0	60.0	640.0
2.5	45.94	60.0	0.0	60.0	490.0
5.0	36.07	60.0	20.0	40.0	361.78
7.5	31.62	60.0	20.0	40.0	261.78
10.0	27.18	60.0	20.0	40.0	161.78
12.5	22.74	60.0	20.0	40.0	61.78
15.0	20.0	60.0	20.0	40.0	0.0
17.5	20.0	60.0	20.0	40.0	0.0
20.0	20.0	60.0	20.0	40.0	0.0
22.5	20.0	60.0	20.0	40.0	0.0
25.0	20.0	60.0	20.0	40.0	0.0
27.5	20.0	60.0	20.0	40.0	0.0
30.0	20.0	60.0	20.0	40.0	0.0
32.5	20.0	60.0	20.0	40.0	0.0
35.0	20.0	60.0	20.0	40.0	0.0
37.5	20.0	60.0	20.0	40.0	0.0
40.0	20.0	60.0	20.0	40.0	0.0
42.5	20.0	60.0	20.0	40.0	0.0
45.0	20.0	60.0	20.0	40.0	0.0
47.5	20.0	60.0	20.0	40.0	0.0
50.0	20.0	60.0	20.0	40.0	0.0
52.5	20.0	60.0	20.0	40.0	0.0
55.0	20.0	60.0	20.0	40.0	0.0
57.5	20.0	60.0	20.0	40.0	0.0
60.0	20.0	60.0	20.0	40.0	0.0
62.5	20.0	60.0	20.0	40.0	0.0
65.0	20.0	60.0	20.0	40.0	0.0
67.5	20.0	60.0	20.0	40.0	0.0
70.0	20.0	60.0	20.0	40.0	0.0
72.5	20.0	60.0	20.0	40.0	0.0
75.0	20.0	60.0	20.0	40.0	0.0
77.5	20.0	60.0	20.0	40.0	0.0
80.0	20.0	60.0	20.0	40.0	0.0
82.5	20.0	60.0	20.0	40.0	0.0
85.0	20.0	60.0	20.0	40.0	0.0
87.5	20.0	60.0	20.0	40.0	0.0
90.0	20.0	60.0	20.0	40.0	0.0
92.5	20.0	60.0	20.0	40.0	0.0
95.0	20.0	60.0	20.0	40.0	0.0
97.5	20.0	60.0	20.0	40.0	0.0
100.0	20.0	60.0	20.0	40.0	0.0
102.5	20.0	60.0	20.0	40.0	0.0
105.0	20.0	60.0	20.0	40.0	0.0
107.5	20.0	60.0	20.0	40.0	0.0
110.0	20.0	60.0	20.0	40.0	0.0
112.5	20.0	60.0	20.0	40.0	0.0
115.0	20.0	60.0	20.0	40.0	0.0
117.5	20.0	60.0	20.0	40.0	0.0
120.0	20.0	60.0	20.0	40.0	0.0

Scenario Table - 0.750 GPM per CN (Total Demand = 60 GPM)

Time (min)	System Pressure (psi)	Total Demand (GPM)	Booster Flow (GPM)	Net Deficit (GPM)	Pressure Tank Volume Remaining (%)
0.0	60.0	40.0	0.0	40.0	640.0
2.5	50.62	40.0	0.0	40.0	540.0
5.0	41.25	40.0	0.0	40.0	440.0
7.5	36.55	40.0	20.0	20.0	372.67
10.0	34.33	40.0	20.0	20.0	322.67
12.5	32.11	40.0	20.0	20.0	272.67
15.0	29.89	40.0	20.0	20.0	222.67
17.5	27.67	40.0	20.0	20.0	172.67
20.0	25.45	40.0	20.0	20.0	122.67
22.5	23.23	40.0	20.0	20.0	72.67
25.0	21.01	40.0	20.0	20.0	22.67
27.5	20.0	40.0	20.0	20.0	0.0
30.0	20.0	40.0	20.0	20.0	0.0
32.5	20.0	40.0	20.0	20.0	0.0
35.0	20.0	40.0	20.0	20.0	0.0
37.5	20.0	40.0	20.0	20.0	0.0
40.0	20.0	40.0	20.0	20.0	0.0
42.5	20.0	40.0	20.0	20.0	0.0
45.0	20.0	40.0	20.0	20.0	0.0
47.5	20.0	40.0	20.0	20.0	0.0
50.0	20.0	40.0	20.0	20.0	0.0
52.5	20.0	40.0	20.0	20.0	0.0
55.0	20.0	40.0	20.0	20.0	0.0
57.5	20.0	40.0	20.0	20.0	0.0
60.0	20.0	40.0	20.0	20.0	0.0
62.5	20.0	40.0	20.0	20.0	0.0
65.0	20.0	40.0	20.0	20.0	0.0
67.5	20.0	40.0	20.0	20.0	0.0
70.0	20.0	40.0	20.0	20.0	0.0
72.5	20.0	40.0	20.0	20.0	0.0
75.0	20.0	40.0	20.0	20.0	0.0
77.5	20.0	40.0	20.0	20.0	0.0
80.0	20.0	40.0	20.0	20.0	0.0
82.5	20.0	40.0	20.0	20.0	0.0
85.0	20.0	40.0	20.0	20.0	0.0
87.5	20.0	40.0	20.0	20.0	0.0
90.0	20.0	40.0	20.0	20.0	0.0
92.5	20.0	40.0	20.0	20.0	0.0
95.0	20.0	40.0	20.0	20.0	0.0
97.5	20.0	40.0	20.0	20.0	0.0
100.0	20.0	40.0	20.0	20.0	0.0
102.5	20.0	40.0	20.0	20.0	0.0
105.0	20.0	40.0	20.0	20.0	0.0
107.5	20.0	40.0	20.0	20.0	0.0
110.0	20.0	40.0	20.0	20.0	0.0
112.5	20.0	40.0	20.0	20.0	0.0
115.0	20.0	40.0	20.0	20.0	0.0
117.5	20.0	40.0	20.0	20.0	0.0
120.0	20.0	40.0	20.0	20.0	0.0

Scenario Table - 0.500 GPM per CN (Total Demand = 40 GPM)

Time (min)	System Pressure (psi)	Total Demand (GPM)	Booster Flow (GPM)	Net Deficit (GPM)	Pressure Tank Volume Remaining (%)
0.0	60.0	10.0	0.0	10.0	640.0
2.5	57.66	10.0	0.0	10.0	615.0
5.0	55.31	10.0	0.0	10.0	590.0
7.5	52.97	10.0	0.0	10.0	565.0
10.0	50.62	10.0	0.0	10.0	540.0
12.5	48.28	10.0	0.0	10.0	515.0
15.0	45.94	10.0	0.0	10.0	490.0
17.5	43.59	10.0	0.0	10.0	465.0
20.0	41.25	10.0	0.0	10.0	440.0
22.5	38.91	10.0	0.0	10.0	415.0
25.0	38.0	10.0	20.0	0.0	405.33
27.5	38.0	10.0	20.0	0.0	405.33
30.0	38.0	10.0	20.0	0.0	405.33
32.5	38.0	10.0	20.0	0.0	405.33
35.0	38.0	10.0	20.0	0.0	405.33
37.5	38.0	10.0	20.0	0.0	405.33
40.0	38.0	10.0	20.0	0.0	405.33
42.5	38.0	10.0	20.0	0.0	405.33
45.0	38.0	10.0	20.0	0.0	405.33
47.5	38.0	10.0	20.0	0.0	405.33
50.0	38.0	10.0	20.0	0.0	405.33
52.5	38.0	10.0	20.0	0.0	405.33
55.0	38.0	10.0	20.0	0.0	405.33
57.5	38.0	10.0	20.0	0.0	405.33
60.0	38.0	10.0	20.0	0.0	405.33
62.5	38.0	10.0	20.0	0.0	405.33
65.0	38.0	10.0	20.0	0.0	405.33
67.5	38.0	10.0	20.0	0.0	405.33
70.0	38.0	10.0	20.0	0.0	405.33
72.5	38.0	10.0	20.0	0.0	405.33
75.0	38.0	10.0	20.0	0.0	405.33
77.5	38.0	10.0	20.0	0.0	405.33
80.0	38.0	10.0	20.0	0.0	405.33
82.5	38.0	10.0	20.0	0.0	405.33
85.0	38.0	10.0	20.0	0.0	405.33
87.5	38.0	10.0	20.0	0.0	405.33
90.0	38.0	10.0	20.0	0.0	405.33
92.5	38.0	10.0	20.0	0.0	405.33
95.0	38.0	10.0	20.0	0.0	405.33
97.5	38.0	10.0	20.0	0.0	405.33
100.0	38.0	10.0	20.0	0.0	405.33
102.5	38.0	10.0	20.0	0.0	405.33
105.0	38.0	10.0	20.0	0.0	405.33
107.5	38.0	10.0	20.0	0.0	405.33
110.0	38.0	10.0	20.0	0.0	405.33
112.5	38.0	10.0	20.0	0.0	405.33
115.0	38.0	10.0	20.0	0.0	405.33
117.5	38.0	10.0	20.0	0.0	405.33
120.0	38.0	10.0	20.0	0.0	405.33

Scenario Table - 0.125 GPM per CN (Total Demand = 10 GPM)