

Imperial Units

$$P_1 V_1 / T_1 = P_2 V_2 / T_2$$

$$V_2 = V_1 * (P_1 / P_2) * (T_2 / T_1)$$

Expanding volume means extracting heat from the environment and lower temperature

Convection, i.e. Gravity will return the cooler water at the top of the column to the bottom.

Density of water: 62.34 lb/ft³ 62.34

Density of air: 0.01 lb/ft³ 0.01

Depth (ft)	T (F)	Pg (psi)	Pa (psi)	T (C)	T (K)	V (ft ³)	V (H ₂ O)	F 1	F 2	F 1 – F 2
2	55.0	0.87	15.57	12.8	285.9	2.00	0.00	124.68	0.02	124.66
4	55.0	1.73	16.43	12.8	285.9	1.89	0.11	124.68	6.59	118.09
6	55.0	2.60	17.30	12.8	285.9	1.80	0.20	124.68	12.51	112.17
8	55.0	3.47	18.17	12.8	285.9	1.71	0.29	124.68	17.86	106.82
10	55.0	4.33	19.03	12.8	285.9	1.64	0.36	124.68	22.72	101.96
12	55.0	5.20	19.90	12.8	285.9	1.56	0.44	124.68	27.16	97.52
14	55.0	6.07	20.77	12.8	285.9	1.50	0.50	124.68	31.23	93.45
16	55.0	6.93	21.63	12.8	285.9	1.44	0.56	124.68	34.98	89.70
18	55.0	7.80	22.50	12.8	285.9	1.38	0.62	124.68	38.43	86.25
20	55.0	8.67	23.37	12.8	285.9	1.33	0.67	124.68	41.63	83.05
22	55.0	9.53	24.23	12.8	285.9	1.28	0.72	124.68	44.60	80.08
24	55.0	10.40	25.10	12.8	285.9	1.24	0.76	124.68	47.37	77.31
26	55.0	11.27	25.97	12.8	285.9	1.20	0.80	124.68	49.95	74.73
28	55.0	12.13	26.83	12.8	285.9	1.16	0.84	124.68	52.36	72.32
30	55.0	13.00	27.70	12.8	285.9	1.12	0.88	124.68	54.62	70.06
32	55.0	13.87	28.57	12.8	285.9	1.09	0.91	124.68	56.75	67.93
34	55.0	14.73	29.43	12.8	285.9	1.06	0.94	124.68	58.75	65.93
36	55.0	15.60	30.30	12.8	285.9	1.03	0.97	124.68	60.63	64.05
38	55.0	16.47	31.17	12.8	285.9	1.00	1.00	124.68	62.41	62.27
40	55.0	17.33	32.03	12.8	285.9	0.97	1.03	124.68	64.10	60.58
42	55.0	18.20	32.90	12.8	285.9	0.95	1.05	124.68	65.69	58.99
44	55.0	19.07	33.77	12.8	285.9	0.92	1.08	124.68	67.21	57.47

Output: 50 lb force or about 110Kg is moved 42 ft in 60 seconds

Input: 1 cu. ft. air at 35 psi

Work: force * distance : 2100 ft-lb

Power: Work / time : 35 ft-lb/sec

Compressor

HP required to compress air

Source: <http://www.truetex.com/aircompressors.htm>

Desired air pressure (psig)	100	
Atmospheric Pressure	14.7	
R	6.8	
Single stage compressor (HP per CFM)	$HP = 0.015 * P * (R^{0.29} - 1)$	0.16
Two stage compressor (HP per CFM)	$HP = 0.030 * P * (R^{0.145} - 1)$	0.14