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Technical Bulletin

March 1, 2004 **TB-001**

Subject: Air Receiver Volume Calculations For Short Term Demands

The following equation enables one to calculate the air receiver volume in terms of gallons necessary to power an air caster system for a specified length of time, given an undersized compressor:

$$V = \frac{T(C-S)P_0}{(P_1-P_2)}$$

Where:
- **V** is the receiver capacity in cubic feet
- **T** is time in minutes
- **C** is the air requirement of the air casters (scfm)
- **S** is the air being delivered to the receiver from a compressor (scfm)
- **P_0** is the atmospheric pressure, psia (refer to table 1 below)
- **P_1** is the initial receiver pressure, psig
- **P_2** is the final receiver pressure, psig

Table 1

Altitude above sea level, ft	Atmospheric pressure psia	Altitude above sea level, ft	Atmospheric pressure psia
0	14.69	7,500	11.12
500	14.42	8,000	10.91
1,000	14.16	8,500	10.70
1,500	13.91	9,000	10.50
2,000	13.66	9,500	10.30
2,500	13.41	10,000	10.10
3,000	13.16	10,500	9.90
3,500	12.92	11,000	9.71
4,000	12.68	11,500	9.52
4,500	12.45	12,000	9.34
5,000	12.22	12,500	9.15
5,500	11.99	13,000	8.97
6,000	11.77	13,500	8.80
6,500	11.55	14,000	8.62
7,000	11.33	14,500	8.45

Air Receiver Volume Calculations For Short Term Demands (Continued)

Example:

A customer currently owns a 15 HP Rotary Screw Air Compressor capable of delivering 56 scfm @ 125 psig. The load to be moved is at 1000 feet above sea level and weighs 10,000 pounds with equal loading on all casters. Aeris recommends using a 4LD21SL (rated at 32,000 pounds, 125 scfm @ 32 psig) with a 50 foot supply hose. What receiver tank size is required to provide continuous operation for 2.0 minutes.

V is the tank (cubic feet)
T is the time (2.0 minutes)
C is the air requirements of the 4LD21SL on a smooth sealed concrete surface (125 scfm)
S is the compressor air delivery (56 scfm)
$\mathbf{P}_0$ is the pressure at 1000 feet above sea level (14.16 psia)
$\mathbf{P}_1$ is the rated pressure of the compressor (125 psig)
$\mathbf{P}_2$ is the final pressure. The air casters will operate at 10 psig
This is calculated based upon the ratio of the actual load to the system capacity times the pressure at system capacity or (10,000/32,000) * 32 = 10 psig
At this point we want to add in the pressure drop from the tank to the air casters and a safety factor to guarantee a continuous supply of air. Therefore add an additional 25 psig to the 10 psig = 35 psig.

$$V = \frac{2.0 \text{ min} \times (125 \text{ scfm} - 56 \text{ scfm}) \times 14.16 \text{ psia}}{(125 \text{ psig} - 35 \text{ psig})}$$

$$V = 21.7 \text{ ft}^3 \text{ or } 162.4 \text{ gallons}$$

Solution:
Supply a ASME 200 gallon Air Receiver Tank (21.7 ft^3 * 7.48052 = 162.4 gallons)[1].

List price of this vertically mounted tank is approximately $773.00. Prices are subject to change without notice. Check with factory for current pricing.

Dimensions: 30 inch diameter x 72 inch long.

Typically equipment is moved at a safe pace of 40 feet per minute. Therefore this arrangement will allow for an 80 foot move prior to recharging the tank.

[1]To convert cubic feet to gallons (US liquid) multiply by 7.48052.

Air Receiver Volume Calculations For Short Term Demands (Continued)

In applications where it is desired to charge an air receiver tank and then discharge only the tank (ie the compressor does not operate during the discharge cycle) then in the equation found on page 1 set S = 0.

Using Air Receiver Tanks to supplement existing plant air systems is a viable method of allowing air casters to be used on an intermittent basis. It's low cost and Aeris can deliver these systems in less than 4 weeks and installation is easy.

If you have any questions or comments concerning the above please contact us:

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