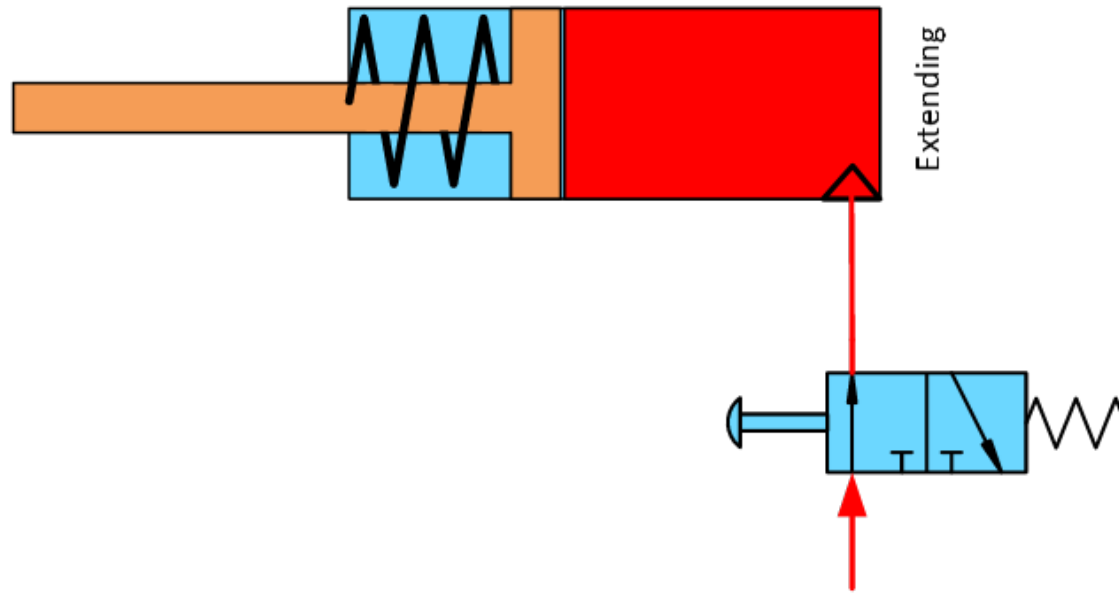


Homework for Week 7 – Storage and Flow

- The single acting spring return air cylinder picture below requires 1 cubic foot of compressed air and actuates to full stroke in 3 seconds. If the cylinder actuates 2 x per minute, what is the peak and average flow?

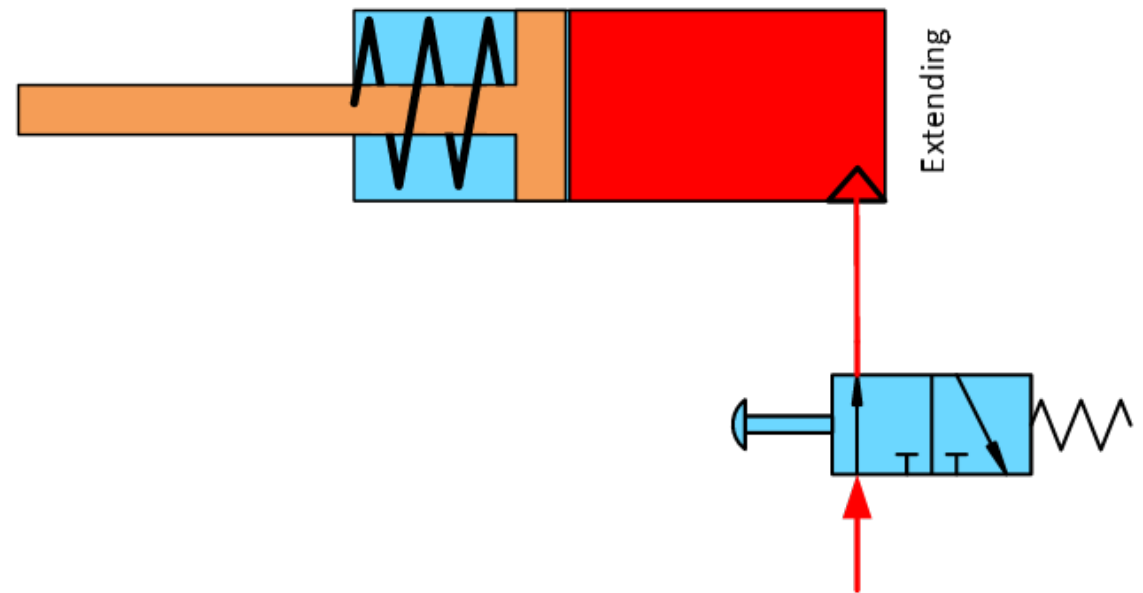


Homework for Week 7 – Storage and Flow

- Answers:
 - Average flow = 2 cfm
 - Peak flow – 20 cfm

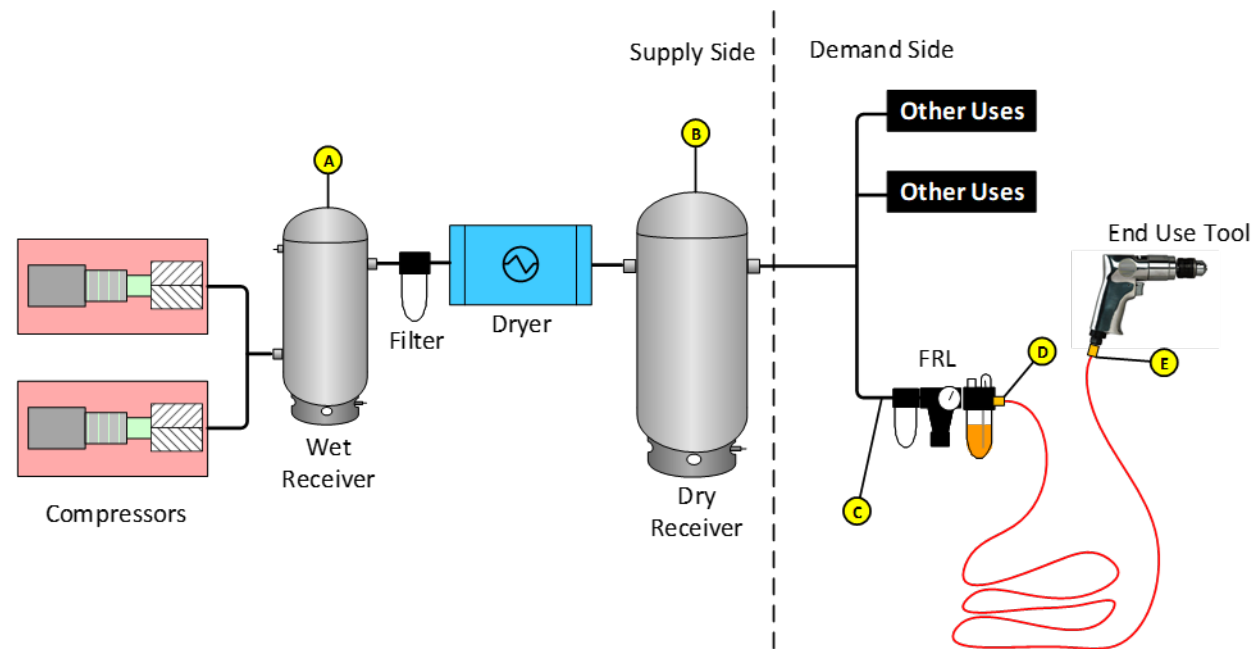
$$\frac{1cf}{3\text{sec}} \times \frac{60\text{sec}}{1\text{min}} =$$

$$\frac{60}{3} = 20cfm$$



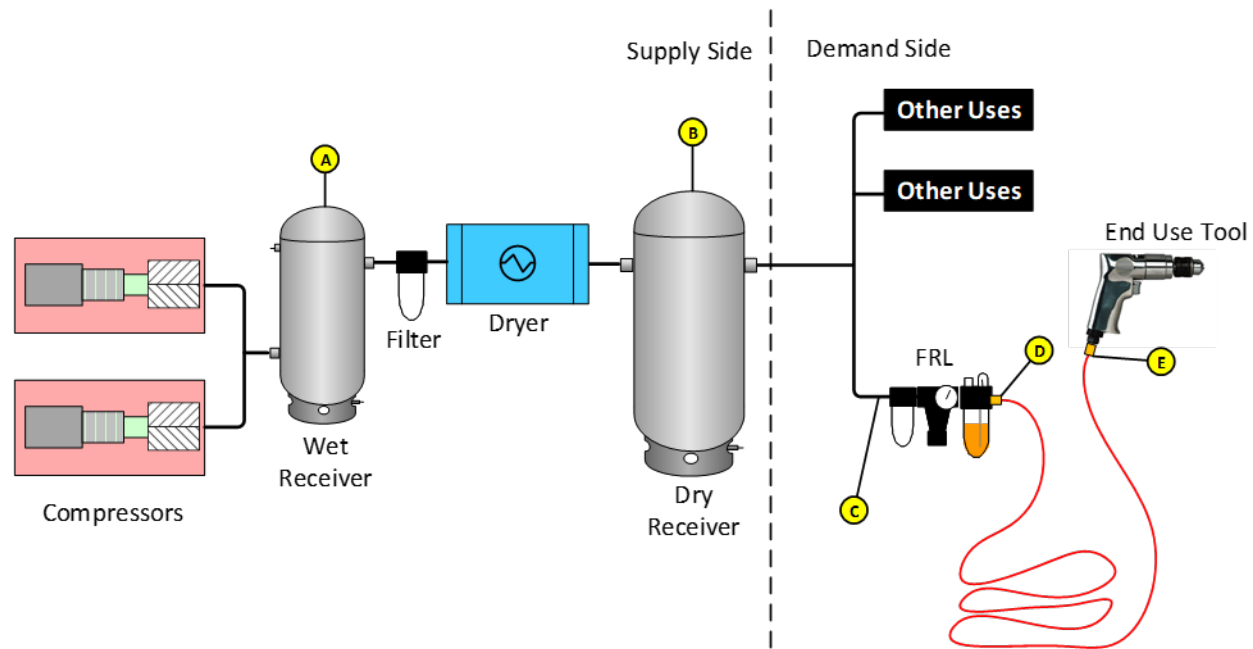
Homework for Week 7 – Storage and Flow

- The operator for the end use tool pictured below has complained of lower torque and has opened the regulator to full header pressure, yet the problem still exists. Which of the yellow flag location would be the correct measurements points to identify the problem?



Homework for Week 7 – Storage and Flow

- Answer: D and E



Homework for Week 7 – Storage and Flow

- A demand event results in a 200 scfm airflow rate being supplied from the system's air storage volume which is 1,000 gallons. What is the pressure drawdown rate in psi/sec that will result?

Homework for Week 7 – Storage and Flow

- Answer

$$\text{DrawDownRate} = \frac{\text{debitflow}_{\text{cuftsec}}}{\text{capacit}_{\text{cuftpsi}}} \times \text{Time}_{\text{sec}}$$

$$\text{DrawDownRate} = \frac{3.333_{\text{cfs}}}{9.09_{\text{cfpsi}}} \times 1_{\text{sec}}$$

$$\text{DrawDownRate} = .37 \text{ psi / sec}$$

$$\frac{1000 \text{ gal}}{7.48 \text{ gal / cf}} = 133.7 \text{ cf}$$

$$\text{Capacitance} = \frac{133.7_{\text{cf}}}{14.7_{\text{psia}}} = 9.09_{\text{cfpsi}}$$

Homework for Week 7 – Storage and Flow

- A system operates with 100 scfm demand deficit for 30 seconds of time. If the system pressure must be no lower than 90 psig and at the beginning of the event the pressure is 100 psig, what size receiver is necessary?

Homework for Week 7 – Storage and Flow

■ Answer

$$V_{cf} = \frac{T_{\min} \times (C - R) \times P_a}{P_1 - P_2}$$

$$V_{cf} = \frac{.5 \times (100) \times 14.7}{10}$$

$$V_{cf} = 73.5$$

$$V_{gal} = 73.5_{cf} \times 7.48_{galcf} = 549.78_{gal}$$



RECEIVER TANK SIZING

Calculation Method	Dedicated Storage
Length of Demand	.5 min
Air Flow Requirement	100 scfm
Atmospheric Pressure	14.7 psia
Initial Tank Pressure	100 psig
Final Tank Pressure	90 psig

Receiver Volume

549.78 gal

Homework for Week 7 – Storage and Flow

- What is the pneumatic capacitance of a 2000-gallon receiver at sea-level 14.7 psia
- Answer should be in cubic foot/psi

Homework for Week 7 – Storage and Flow

- Answer:

$$Cap = \frac{cuft}{P_a}$$

$$Cap = \frac{267.38}{14.7}$$

$$Cap = \frac{267.38}{14.7} = 18.189_{cfpsi}$$

Homework for Week 7 – Storage and Flow

- Use the MEASUR Tool for this one:
 - A 55-gallon bag is placed over a leak and takes 10 minutes to fill up. What size leak is it in scfm?

Homework for Week 7 – Storage and Flow

- Use the MEASUR Tool for this one:
 - Answer



LEAK LOSS ESTIMATOR - BAG METHOD

Annual Operating Hours	<input type="text" value="8760"/>	hrs/yr
Total Flow Rate	4.55 SCFM	
Total Annual Compressed Air Leakage	2,391,480 SCF	

Leak 1		
Bag Fill Time	<input type="text" value="600"/>	s
Height of Bag	<input type="text" value="40"/>	in
Diameter of Bag	<input type="text" value="50"/>	in
Flow Rate	4.55 SCFM	
Annual Consumption	2,391,480 SCF	