**Fluid Power Basics – Pneumatics**

**2018 – 2019**

**Lecture Quiz Answers**

**Quiz 1a: List three advantages of Pneumatics over Hydraulics**

* Contamination free operation (such as oil)
* Lower cost of installation
* Fluid medium is abundant and easy to manage

**Quiz 1b: List three unique applications of pneumatic in industry**

* Sheet metal pressing
* Nut bolt tooling gun in assembly plant
* Part holding jig

**Quiz 1c: Numerical**

Clamp Force = Fc = 500 N

Piston Dia = Ø = 32 mm

Stroke = Ls = 100 mm

Pressure inlet = Pi = ?

Counter force = FL = 1000

Volume in Cylinder (fully extended) = Vc = ?

New Volume in Cylinder after counter force = V2 = ?

* A = πr2 = π \* 2.56e-4 = 8.04e-4 m2

P = $\frac{F}{A}$ = $\frac{500}{8.04e-4}$ = 6.2e5 Pa = **6.2 Bar**

* Vc = 8.04e-4 \* 0.1 = **8.04e-5 m3**

P1Vc = $\frac{FL}{A} $V2 > 6.2e5 \* 8.04e-5 = $\frac{1000}{8.04e-4}$ V2  > V2 = **4.01e-5** **m3**

**Quiz 2a: List two superiority of piston compressor over screw type**

* Reciprocating compressors are marginally more efficient than rotary compressors, generally being able to compress the same amount of gas with between 5 and 10 percent less energy input.
* Initial installation cost is cheaper than rotary compressor

**Quiz 2b: Name 4 types of compressor based on structure**

* Reciprocatory
* Screw
* Vane
* Centrifugal

**Quiz 2c: Numerical**

Va = 20 m3

T1 = 30 C

T2 = 20 C

r.h = 65%

mc @ 20C = ? (Water condenses out)

Dew Point at 30 C = 20 g/m3 (from the chart) > For 20 m3 of air = 400 g

* r.h = $\frac{mc at 30C}{400}$ > 65% \*400 = mc = 260 g of actual water content in the air at 30 C

The reduced volume of compresses airt at 6 bar:

* p1.V1 = p2.V2 > V2 = $\frac{1.013 bar (atmospheric pressure)}{6 \left(gauge\right)+1.013 }$ \* 20 m3  = 2.89 m3

Dew Point at 40 C = 60 g/m3 (from the chart) > For 2.89 m3 of air = 173.4 g maximum water content

Water condenses out = 260 – 173.4 = **86.6 g**

**Quiz 3a: List three types of directional valve actuation (example: Lever type)**



**Quiz 3b: Name three pneumatic systems in a bus**

1. Door opening/Closing
2. Air brakes
3. Air suspension (For pneumatic kneeling system)

**Quiz 3c: List two superiority of piston compressor over screw type**

Cushioning of some sort normally is required to decelerate a cylinder's piston before it strikes the end cap. Reducing the piston velocity as it approaches the end cap lowers the stresses on cylinder components and reduces vibration transmitted to the machine structure.

**Quiz 3d: What does the symbols below represent?**

1. FRL/Service Unit
2. Air Compressor
3. Air Dryer
4. Double acting cylinder with variable cushioning

**Quiz 4a: A compressor is required for continuous flow at 7.5 bar pressure in the network, low maintenance cost, 500 m3/hr.**

* Screw Type compressor, Atlas Copco GA45 7.5 variant

**Quiz 4b: A FRL unit which can regulate pressure from 7.5 bar to 7 bar, ¾’’ pneumatic connection, grade filter 5μm, condensate volume of 43 cm3, 2800 l/min flow volume**

* FESTO – FRC-D7 MIDI model

**Quiz 4c: In industry, the pneumatic tooling is routinely disconnected from the main line and the flexible hose is used with an easy to plug connector. Name?**

* Push pull connector 