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Jon Jensen
Energy Efficiency Manager
SMC Corporation of America

COMPRESSED AIR MANAGEMENT MASTER CLASS

A ROADMAP TO TURNING COMPRESSORS OFF

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The top target areas:

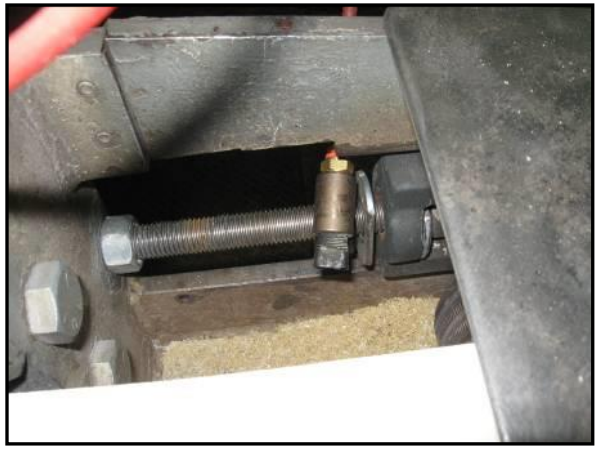
1. *Leaks*
2. *Air Blow & Energy Intensive Usage*
3. *Excessive Pressure*
4. *Idle Mode Savings*
5. *Design Choices*

Air Blow Applications

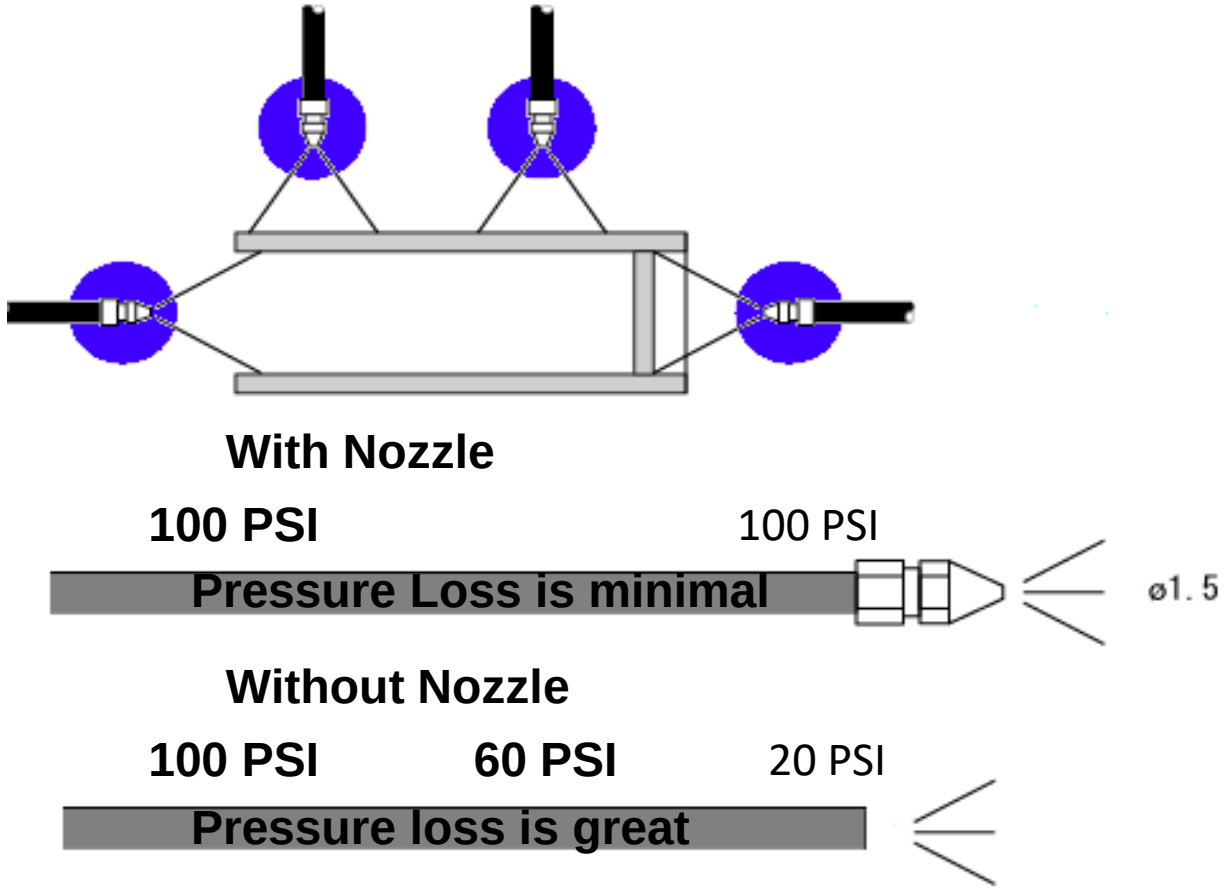
Examples/Solutions

- Properly size nozzles and piping
- Use minimum effective pressure
- Control duration
- Use alternate solutions

What not to do:

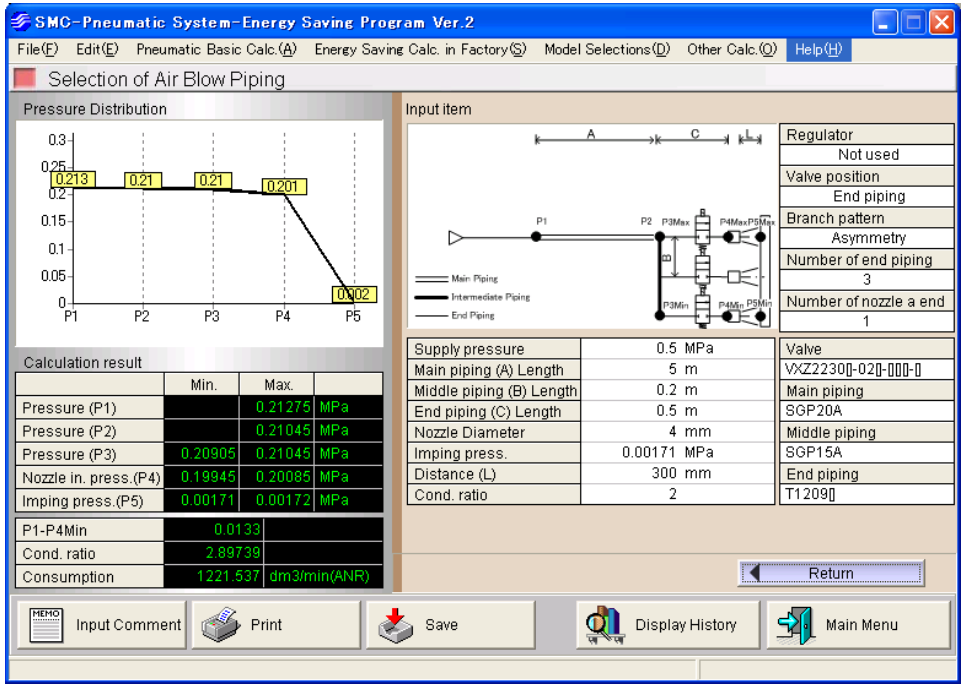


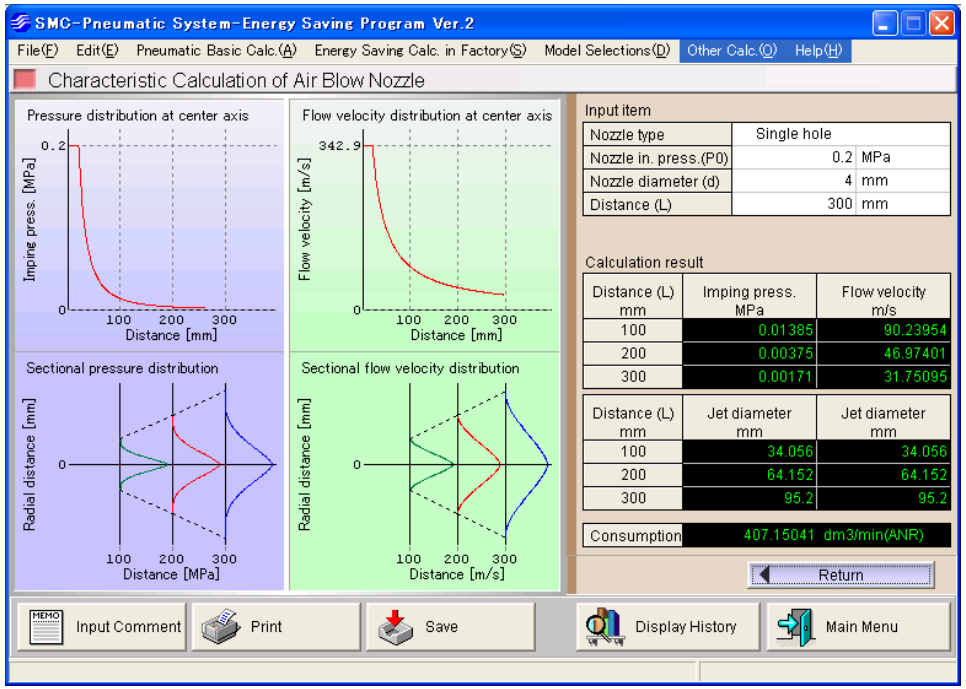
What to do:



Reduce pressure loss and air consumption while maintaining work surface impact.

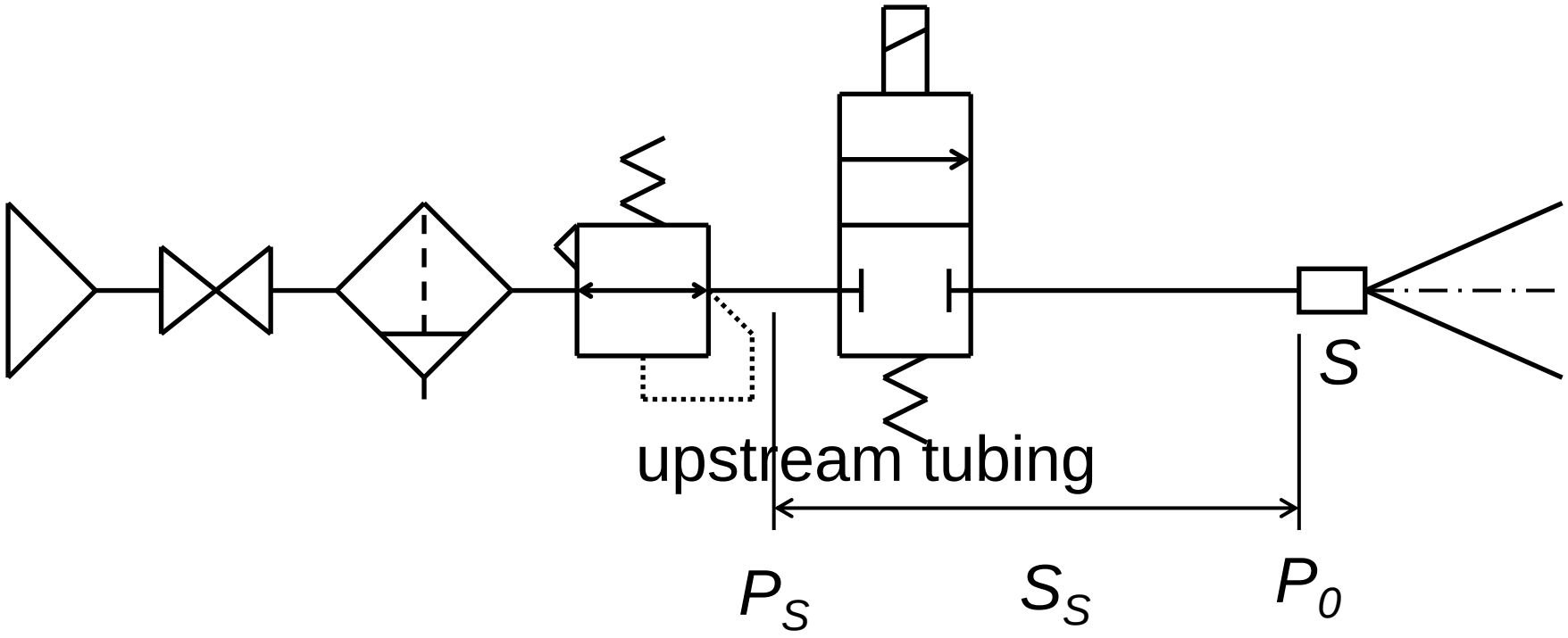
What to do:





	Nozzle Diameter mm	Pressure before nozzle MPa	Distance of work mm	Impact Pressure MPa	Air flow rate dm^3/min (ANR)
Current	4.0	0.02	100	0.0014	120
Improvement	1.8	0.09	100	0.0014	52
	1.0	0.29	100	0.0014	33

What to do:



- Conductance of components should be 3X that of the nozzle
- Regulate to lowest effective pressure/flow
- Use locking or tamper-resistant regulators
- Automate shut-off

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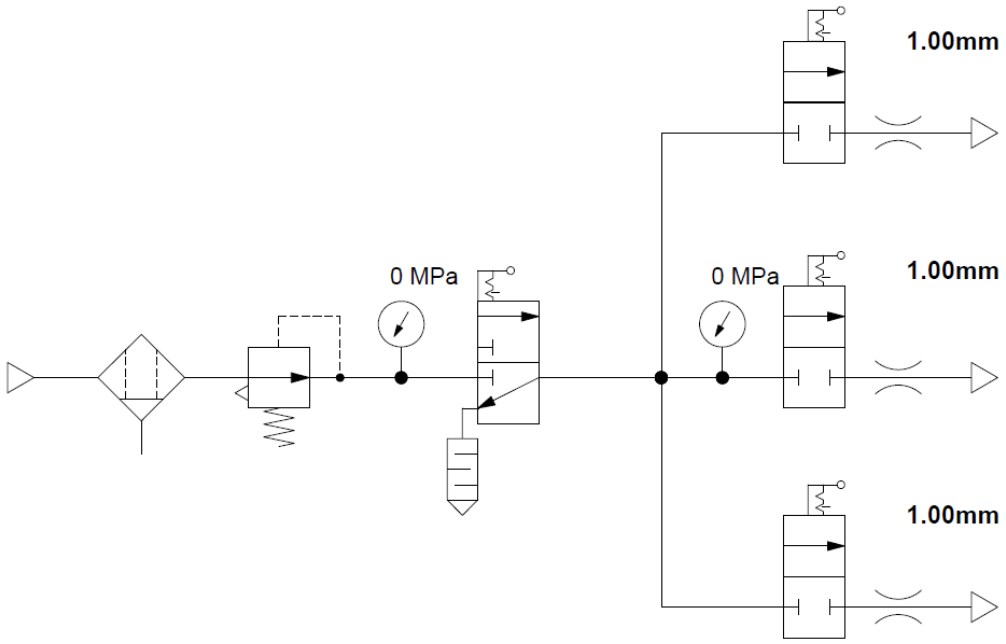
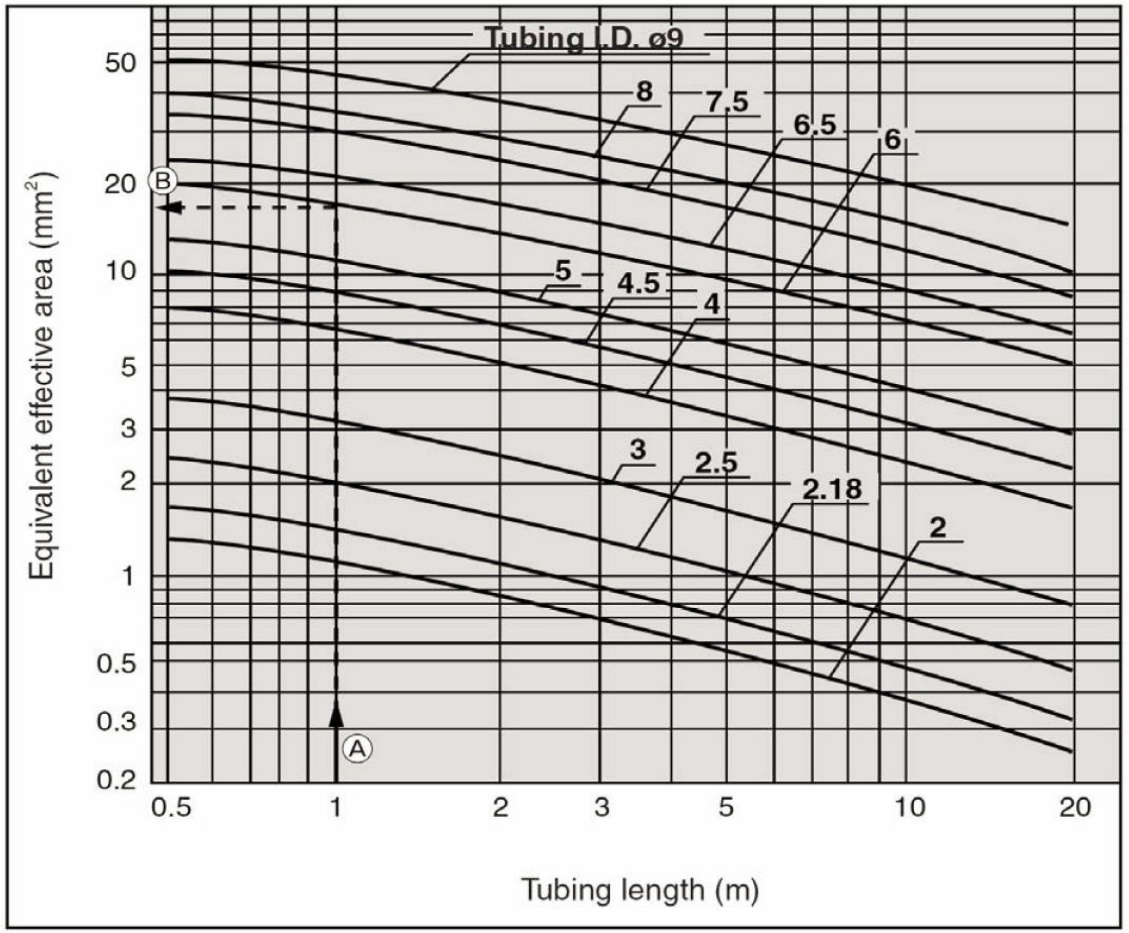
What to do: Lab #1 & #2

Air Blow Energy Saving- Energy Saving Lab #1



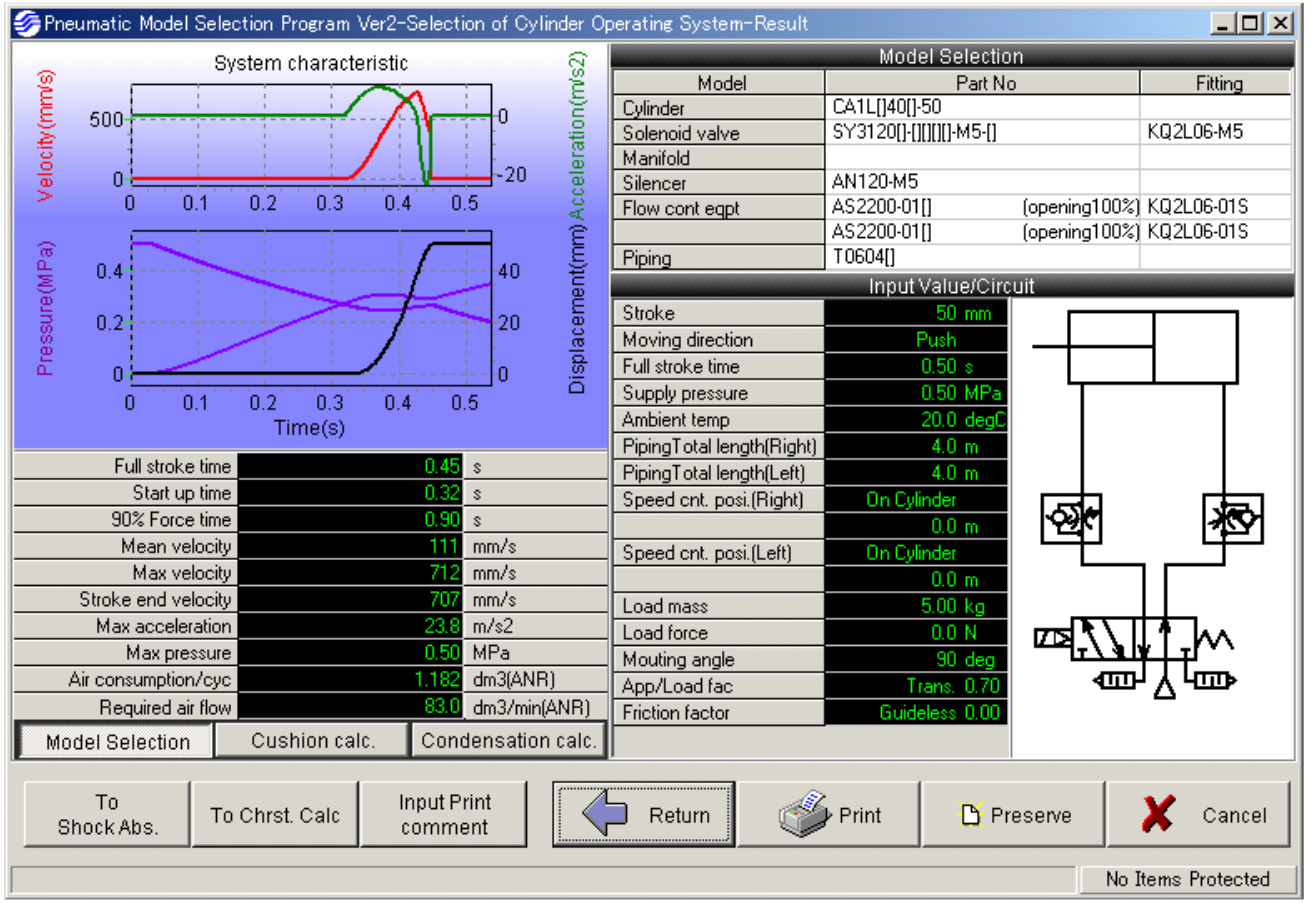
Selection Graph (5) Effective area of tubing I.D.



Review: Air Blow

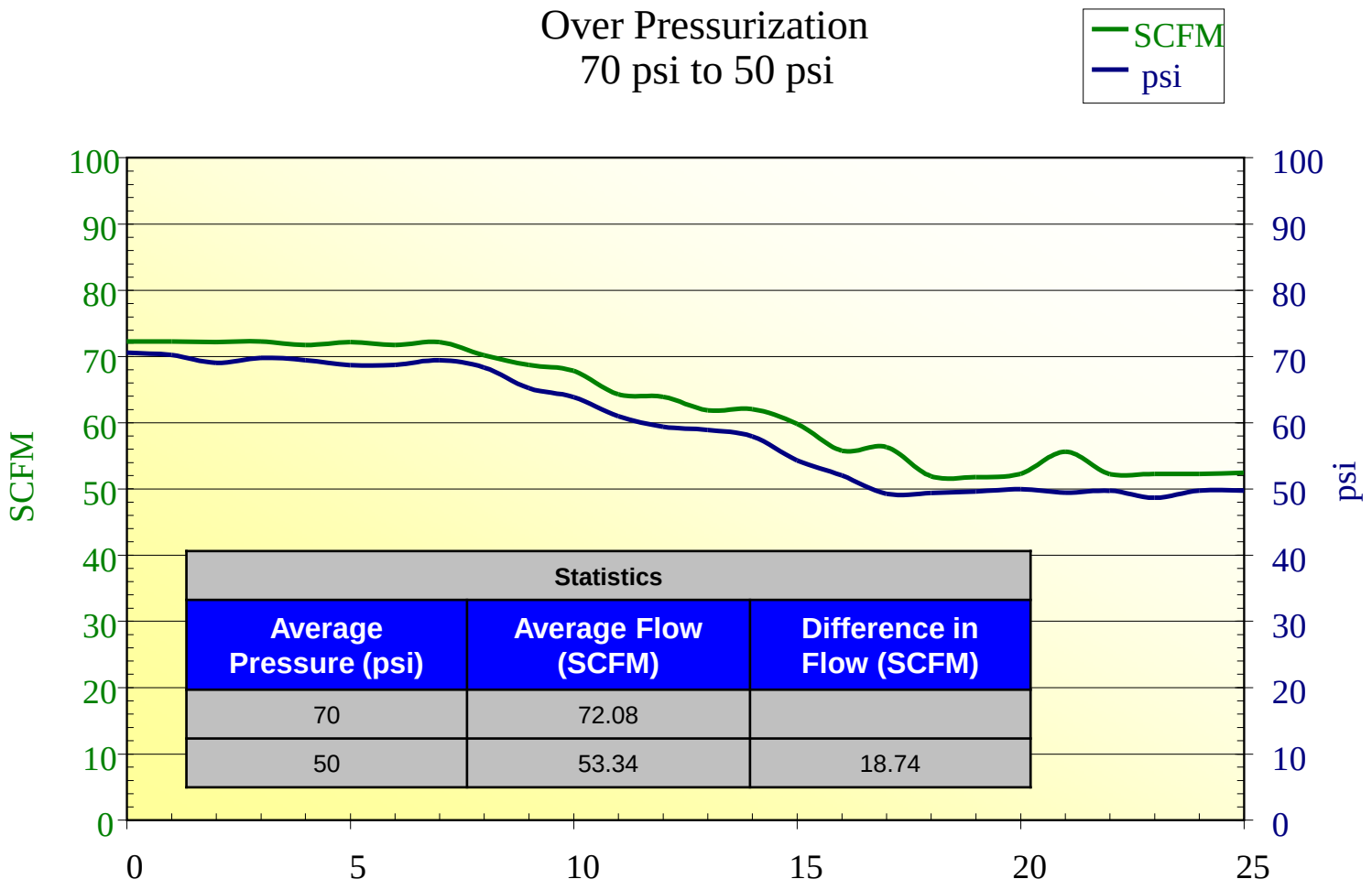
- **To improve the efficiency of the current state of air blow:**
- Remove air blow unnecessary to production
- Move air blow as close to the work surface as possible
- Regulate pressure to the lowest level of effectiveness
- Observe OSHA standards regarding orifice pressure
- Maintain supply pressure with a locking or fixed regulator
- Size supply tubing & components correctly (3:1 ratio)
- Replace existing nozzles with high-efficiency models
- Shut off circuits when not needed in the production process
- Consider installing centrifugal blowers as an alternative to air blow

Design Choices:



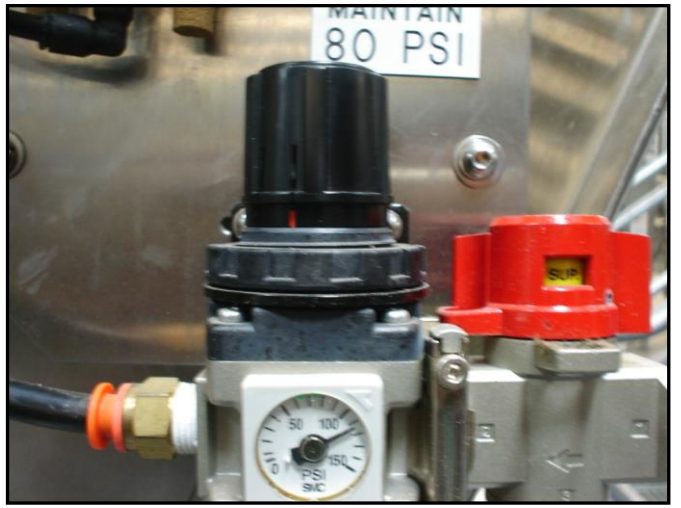
- Design (or re-design) for:
- Lowest pressure to do the job
  - Electro-pneumatic regulators
  - Low (or no) pressure when idle
- Actuator / Circuit Choice
  - Single Acting
  - Pressure on non-working stroke
  - Regenerative Circuits
- Tubing length / size

Design Choices: Pressure Reduction

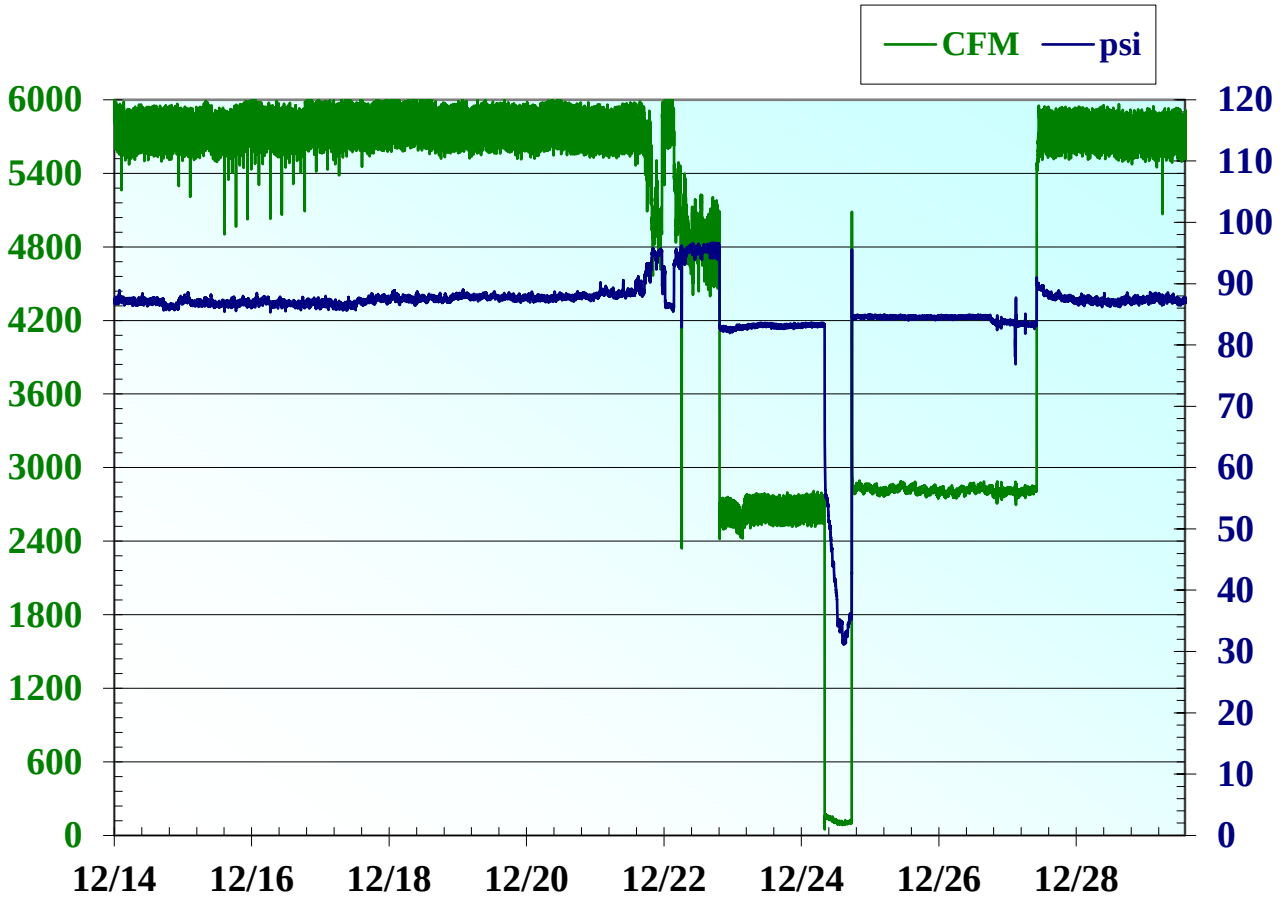


Statistics		
Average Pressure (psi)	Average Flow (SCFM)	Difference in Flow (SCFM)
70	72.08	
50	53.34	18.74

Difference in average flow: 18.74 SCFM = $3,152 annually.

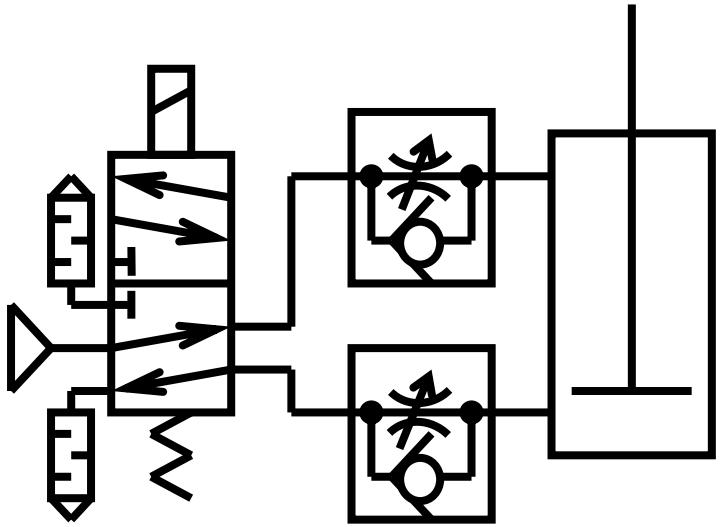


Design Choices: Idle Mode Savings

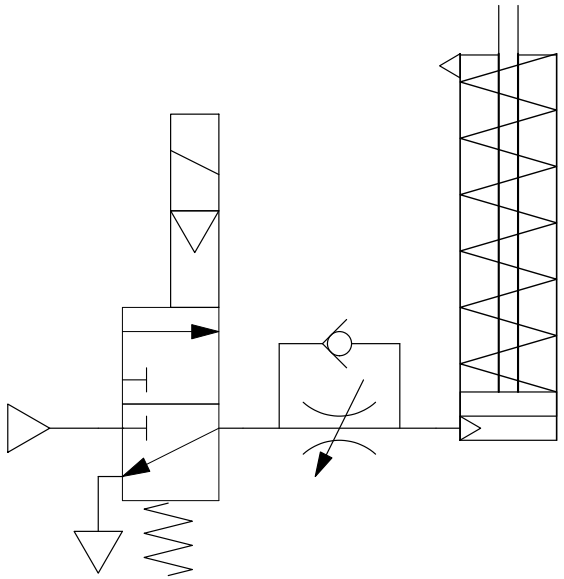


Low Pressure or No Pressure on each machine when idle!

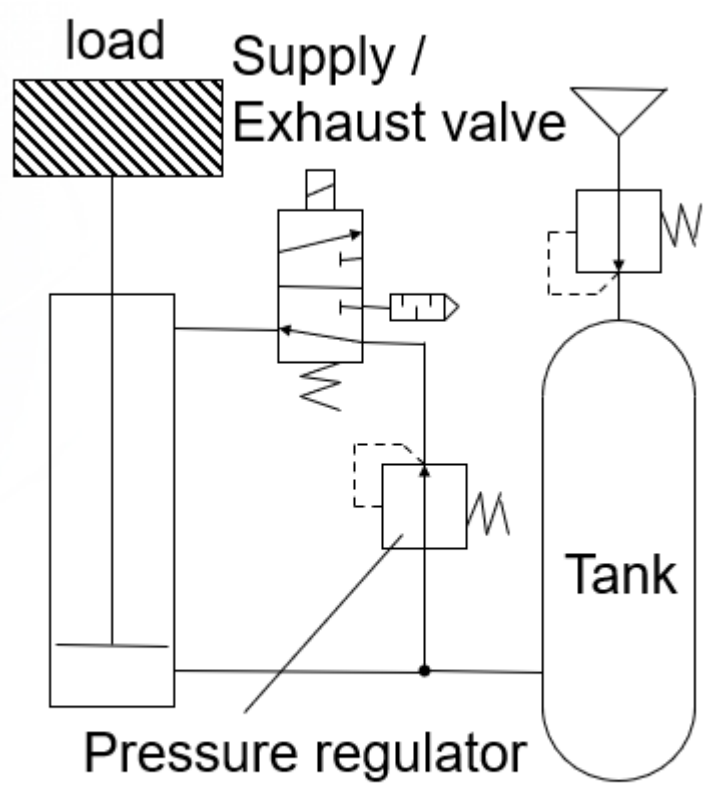
Design Choices: Circuit / Actuator Selection



Standard Circuit



50% Savings



75% Savings

Design Choices: Tubing Selection

- Air used to fill the tubing on the way to the actuator is wasted! There is no work being done by this air!
- The conductance of tubing decreases dramatically with an increase in length
  - Shorten tubing as much as feasible
  - Larger diameter = larger volume
  - Size tubing for flow required – don't guess!
- Note that volume before the directional control valve works in your favor!

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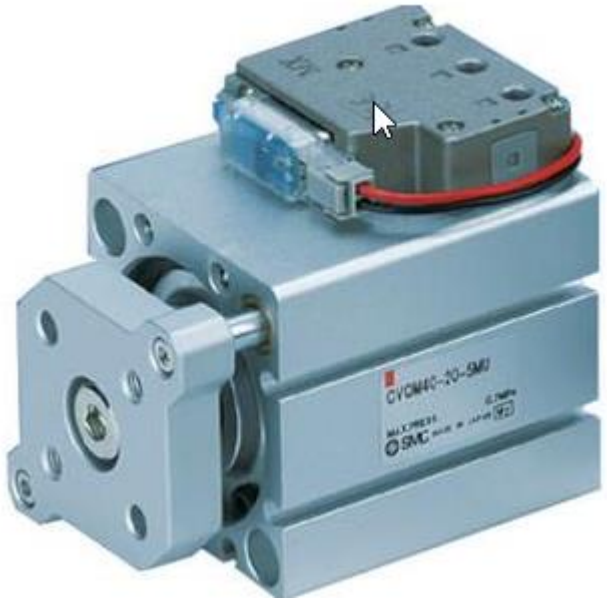
Design Choices: Tubing Selection

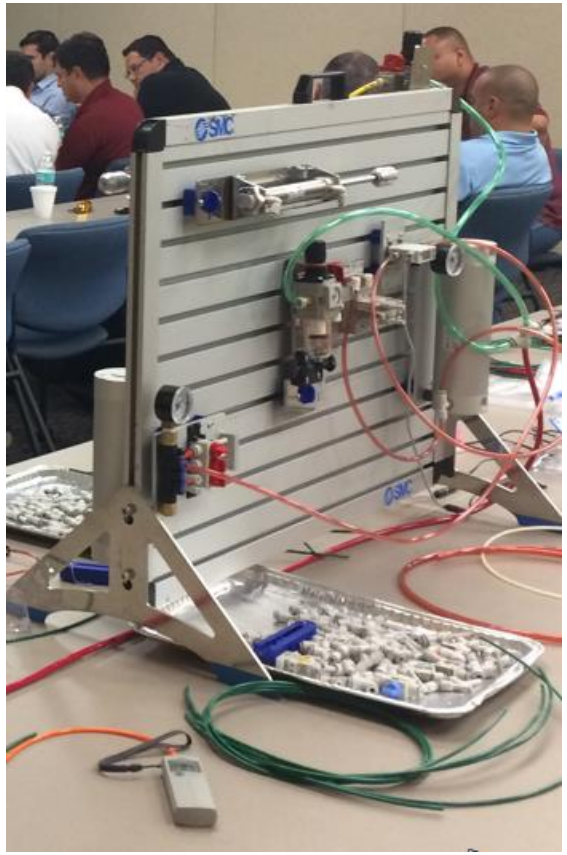
The savings is a reduction of 4.14CFM or 17.3%.

Of course, if you had used a cylinder with integrated valve, the savings would have been even greater!



Right Sizing Tubing Diameter – Example 4 cylinder simple machine		
	3/8" Tubing	1/4" Tubing
Operating Pressure	50	50
Bore (inch)	3	3
Stroke (inch)	3.41	3.41
# of cylinders	4	4
Tubing Length (inch)	96	96
Tubing I.D. (inch)	0.25	0.16
# of elbow fittings	2	2
Rate: Cycle Time (sec)	1.5	1.5
CFM Required	24	19.86
Annual Cost of Operation	$ 4,979	$ 4,120
ANNUAL SAVINGS		**$ 859**

Design Choices: Circuit Optimization (Lab #3)

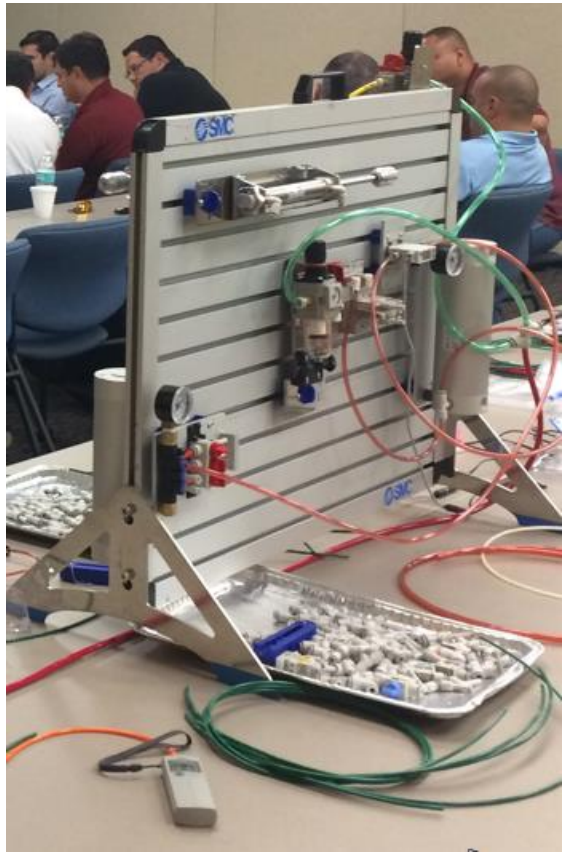


- Assemble the non-optimized circuit
- Fill tank to 60 PSIG
- Close supply valve
- Operate the circuit
- Count the number of cycles

Challenge:
What can you do to increase the number of cycles possible using the given volume of air?

Try several things, singly, and in combination, and record your results.

Circuit Optimization Lab: Review



- What was the initial number of cycles?
- What did you try?
- What had the most significant effect?

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Any Questions?

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