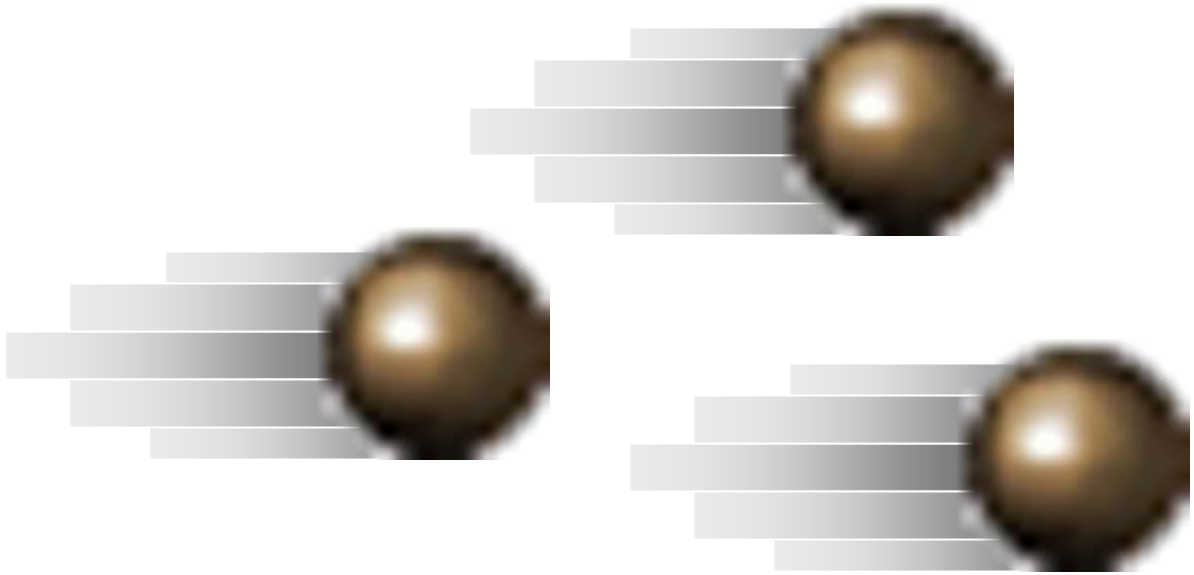
Media Blasting with Compressed Air



Air systems & blast equipment variables influence labor efficiency, operating cost, & finish quality

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You must be able to distinguish the difference between symptom observation & root cause analysis

Examples:

Low pressure doesn’t necessarily mean insufficient supply.

It can be nozzle wear or attrition.

It can be higher volume, which results in the differential pressure which increases as the square of the flow change.

It could be another systems demand such as vacuum venturies used to remove water from component cavities.

The root cause and the solution are usually within 200’ of the symptom.

Nozzle Attrition

Nozzle	Pressure at the Nozzle				Scfm/Abrasive
Psig	70	80	90	100	
No. 5	101	113	126	137	scfm
5/16”	604	672	740	812	lb/hr abrasive
No. 6	143	161	173	196	scfm
3/8”	864	960	1052	1152	lb/hr abrasive

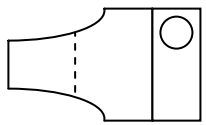
When the nozzle wears 1/16”, the blast pattern increases with the same media volume, the linear momentum of the media reduces, the man unit cost increases, and the quality of the finish reduces. Increasing the pressure 10 psig including the wear increases the air volume by 53%, but will not deliver a 10 psig increase in nozzle pressure, nor increase the media delivered. Measure the nozzle and change it when the operating cost exceeds the nozzle change cost and before the finish quality reduces.

Nozzle Attrition or Wear

New #5 nozzle

#5 nozzle
w/ 1/16” wear

Nozzle caliper shape
with indicator



Wear is typically
asymmetrical.

Understanding Nozzle Pressure

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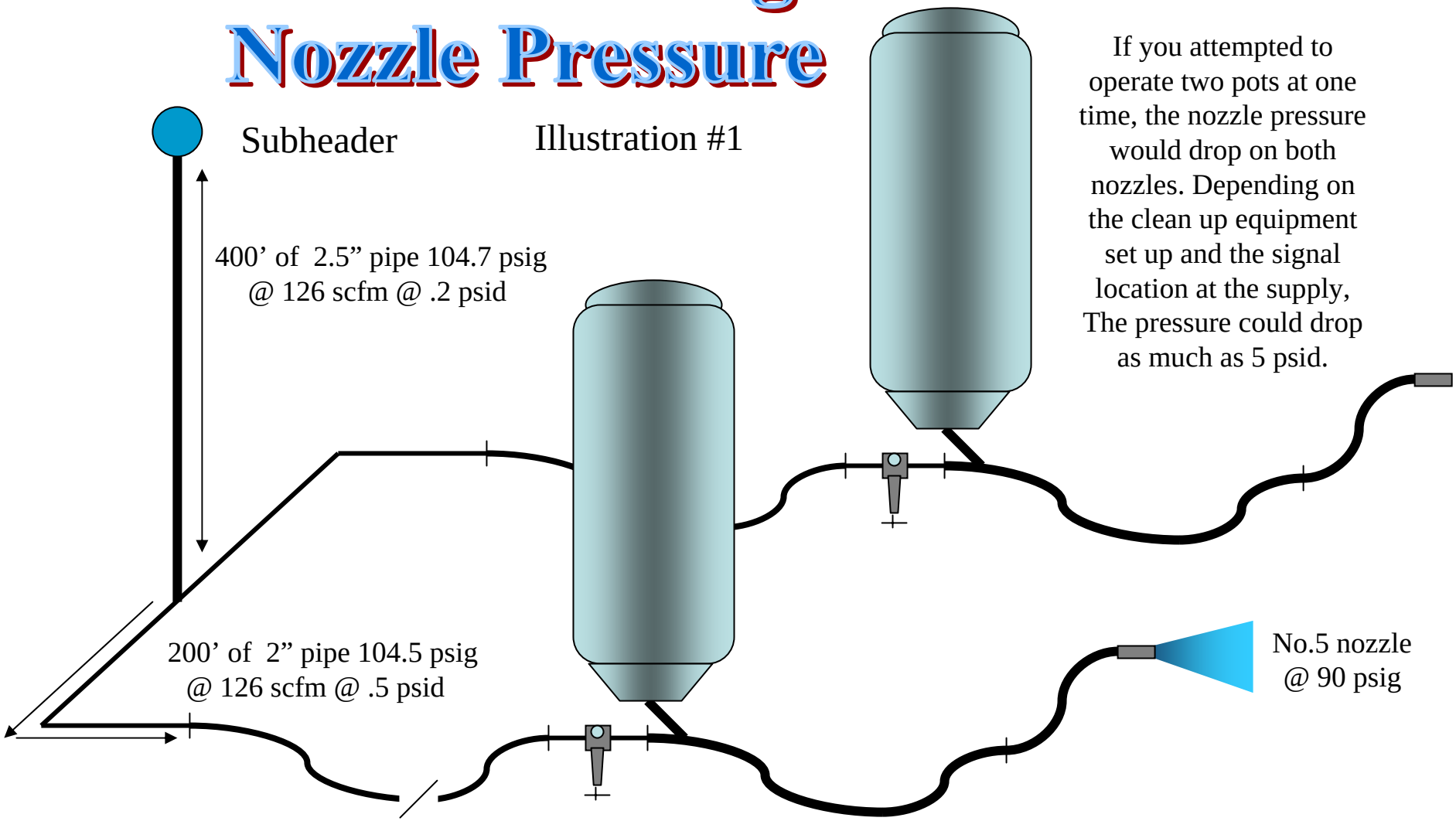
Illustration #1



If you attempted to operate two pots at one time, the nozzle pressure would drop on both nozzles. Depending on the clean up equipment set up and the signal location at the supply, The pressure could drop as much as 5 psid.

Understanding Nozzle Pressure

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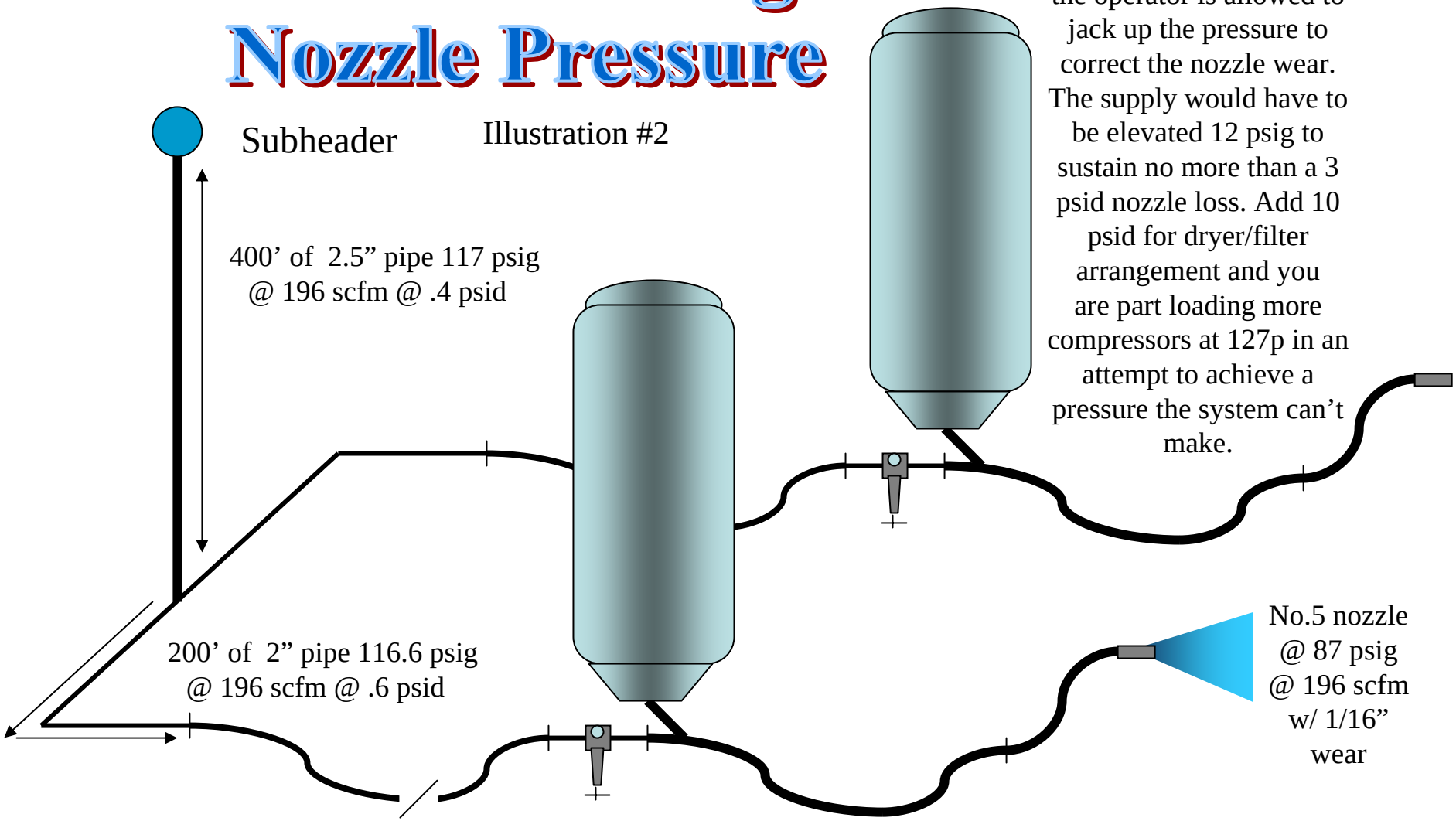
Illustration #2



It would be typical that the operator is allowed to jack up the pressure to correct the nozzle wear. The supply would have to be elevated 12 psig to sustain no more than a 3 psid nozzle loss. Add 10 psid for dryer/filter arrangement and you are part loading more compressors at 127p in an attempt to achieve a pressure the system can’t make.

Consequences of Increasing Supply Pressure

- Depending on the configuration and control of the supply system, elevating the supply pressure 10 psid could increase the supply energy by 30-50%. In addition it will increase the water in the system by 6.5%. This increase in latent heat can overload the drying equipment.

- Increasing the supply pressure will allow for higher flow at the point of use. At a higher flow, the differential at all points in the system will increase. A 5 psi increase will result in a 25% increase in delta pressure.

- If the differential across the system is 12 psid before the increase in psig, the differential would increase to 15 psid netting a 7 psig increase at the pots. Less for more. Define the problem & fix it. Don’t force the problem with power.

Start the Process Correctly

Determine the lb/hr of the media you want to deliver for the finish desired.

Select the nozzle for the media required at a realistic pressure which you feel you can deliver. More air volume at a lower pressure will deliver the same work as lower volume at higher psig.

Select & specify your desired end results for blasting equipment.

Design & select the installation components to deliver the pressure at the pot regulator and the nozzle based on the volume of air at your acceptable level of wear.

Use an ID caliper to measure nozzle wear on a per use basis. When the caliper indicates a benchmark value has been reached, change the nozzle.

Get Your Priorities Straight

- 95% of all point of use problems have nothing to do with the supply.
- Don’t spend $100,000 solving a $500 problem.
- Measure the issues and define the real problem.
- Engineer a solution
- It is infinitely cheaper for the pot vendor to reengineer his equipment than for you to change your system.

Where the Problem Starts

Materials engineering focuses on the desired results.

Production provides their input based on bad experience.

The equipment is purchased based on the desired end results at the lowest capital cost.

Operating cost, system’s design, impact on other equipment, and equipment design verses system’s capabilities generally are not considered in the process.

Demming's Spin on This Subject

When minimum or highest possible pressure is your operating standard, the results will be off quality at the highest possible cost.

Demming called this philosophy" Minus nothing ....Plus anything". He suggests that plus nothing, minus something will produce accurate quality at the lowest possible cost.

Control the variables and you control the quality and the cost.