



# Benefits of “Closed Loop” Compressed Air Systems for Paint Operations

Presented to:  
Minnesota Paint and Powder Expo

# Overcoming the Challenges



- The challenges:
  - Conserve air, save money (plentiful air, reduced energy cost)
  - Provide clean, dry air to the shop (improved quality of paint and production processes)
  - Eliminate dust/dirt blowing in the facility (improve quality of work environment)
  - Reduce noise (noise pollution abatement)
- The Exhausted Air Recycling System (EARS):
  - New technology that solves each of these challenges
  - Creates a “closed loop” between the air compressor and the air tools
  - Universal applicability

# What is EARS?



- **EARS forms a closed-loop** that returns air under pressure from the exhaust of the pneumatic tools, effectively “supercharging” the air compressor and generating energy savings – in some cases > 40%
- **EARS components are:**
  - ✓ Specially-fitted air compressors with the patented air return management manifold
  - ✓ A flexible, robust, light-weight piping system for both high-pressure air and low-pressure returned air
  - ✓ Dual hoses and high-flow fittings
  - ✓ A series of pneumatic tools specifically-designed to return the exhaust to the compressor
- **EARS is:**
  - ✓ **Green** – recycling air helps the user, the shop owner and the environment
  - ✓ **Economical** – with an attractive payback in energy savings
  - ✓ **Safe** – quieter and cleaner than current technologies

# How EARS works



## *RETURNING THE AIR FROM THE TOOL*

- From a standard air tool, the exhausted air is normally allowed to discharge directly into the atmosphere
- By fitting the air tool with EARS, we direct the exhausted air into a single port, so that a low pressure return hose can be coupled to the air tool, directing the exhausted air back to the manifold installed on the compressor



Two ports: high pressure air in, low pressure exhausted air, out

# How EARS works



## *USING THE RETURN AIR FROM THE TOOL*

- EARS turns exhausted air back into energy by improving the amount of air produced in one cycle of an air compressor
- By containing the air in a closed circuit, airborne moisture is not introduced to the compressor
- The more air returned from existing pneumatics, the more available volume of clean, dry air becomes available for operations like paint



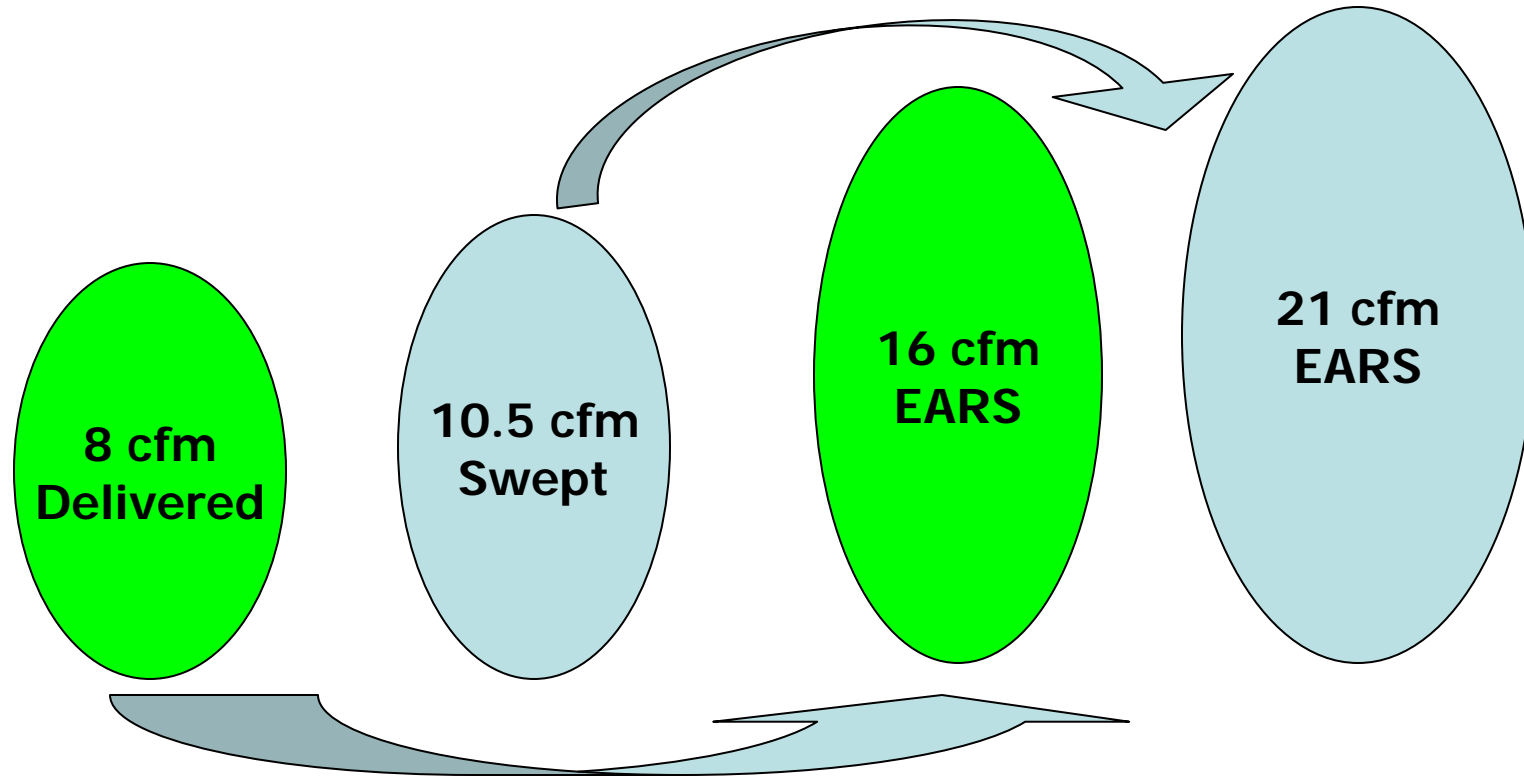
# How EARS works



## *IN SUMMARY,*

- EARS captures the cleaner, dryer air exhausted from the air tool and returns it to the intake of the air compressor – creating a “closed loop”
- An ordinary air compressor “pulls in” 1 atmosphere of ambient air before compressing
- When fitted with EARS, there are 2 atmospheres by volume (@ 30 PSI) available to feed the intake side of the compressor.
- Just like a supercharger, the compressor is capable of DOUBLE the volume of air.

# EARS delivers more CFM for less HP



**EARS tends to double the SWEPT volume of a piston compressor in CFM delivery on systems when no pulley changes are required (electric motor has more capacity than is being utilized)**

**When a smaller pulley is required, expect to deliver double the original DELIVERED CFM rating of the compressor**

# Applicability across industries



- Anywhere that compressed air is used to power tools, EARS can be employed
- Obvious applications: auto body shops, manufacturing facilities, assembly facilities, and woodworking shops
- Can be configured for any size of operation, from the single operation that uses a small, electric-powered mobile compressor to a manufacturing facility with multiple compressors using hundreds of horsepower

# What are the benefits?



- Abundant Clean Dry Compressed Air
  - ✓ The more pneumatic tools used in the facility, the greater the volume of clean, dry air available for paint operations
- Cost Management:
  - ✓ Reduces energy consumption
  - ✓ Improves tool and compressor life
  - ✓ Reduces the size requirement for the compressor
  - ✓ Enabler for attracting/retaining skilled workforce due to the creation of a preferred work environment
- Environmental Impact:
  - ✓ Dramatic reduction in noise
  - ✓ Capture normally exhausted airborne contaminants
  - ✓ Improve overall working environment

# What are the benefits?



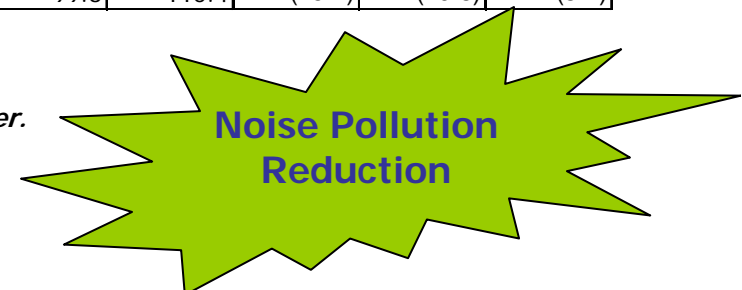
## INDEPENDENT NOISE TEST RESULTS

		With E.A.R.S.			Without E.A.R.S.			DIFFERENCE		
		LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)	LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)	LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)
Free Running	<b>Impact Wrench</b>									
	At operator's ear	69.1	74.4	84.2	93.1	97.0	105.8	(24.0)	(22.6)	(21.6)
	1 metre away from operator's hand	68.1	70.2	82.6	96.8	99.7	111.9	(28.7)	(29.5)	(29.3)
Working	Tightening wheel nuts – at operator's ear	88.2	97.5	119.2	92.7	99.9	120.5	(4.5)	(2.4)	(1.3)
	Tightening wheel nuts – 1 metre from operator's hand	80.4	91.6	108.0	86.9	95.5	112.4	(6.5)	(3.9)	(4.4)

		With E.A.R.S.			Without E.A.R.S.			DIFFERENCE		
		LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)	LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)	LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)
Free Running	<b>1800 rpm Screw Gun</b>									
	At operator's ear	70.8	73.5	87.8	89.3	93.8	102.7	(18.5)	(20.3)	(14.9)
	1 metre away from operator's hand	72	73.8	89.1	94	97.6	106.3	(22.0)	(23.8)	(17.2)
Working	Self tapping screws into pine – at operator's ear	76.8	85.4	98.5	90.4	97.5	110.5	(13.6)	(12.1)	(12.0)
	Self tapping screws into pine – 1 metre from operator's hand	76.8	88.5	102.2	91.9	99.3	110.4	(15.1)	(10.8)	(8.2)

**NOTE:** Decibel ratings are logarithmic. A ten (10) db increase is 10 times louder. A twenty (20) db increase is one hundred times louder.

*Example: A pneumatic tool that changes from 67 db to 89 db is 120 times louder.*



# What are the benefits?



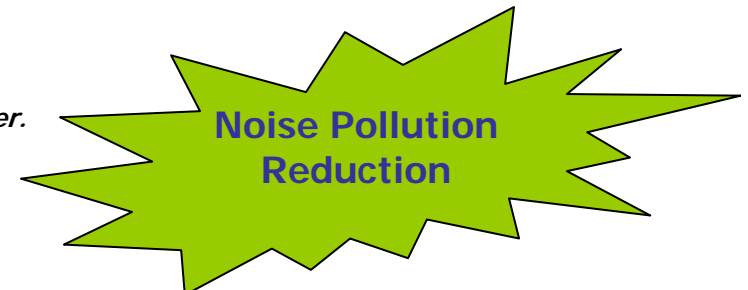
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		LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)	LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)	LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)
<b>3/8" Drill</b>										
Free Running	At operator's ear	71.4	75.6	89.3	86.1	87.9	99.1	(14.7)	(12.3)	(9.8)
	1 metre away from operator's hand	61.8	65.1	81	88.6	91.1	101.6	(26.8)	(26.0)	(20.6)
Working	Drilling into aluminium – at operator's ear	77.6	87.3	100.5	88.2	97	112.9	(10.6)	(9.7)	(12.4)
	Drilling into aluminium– 1 metre from operator's hand	79.5	89.7	103.4	89	97.9	113.9	(9.5)	(8.2)	(10.5)
	Drilling into 25mm pine– at operator's ear	76.7	85.7	98.5	88.2	91.1	103.1	(11.5)	(5.4)	(4.6)
	Drilling into 25mm pine– 1 metre from operator's hand	76.1	83.8	95.5	87.2	90.2	101.6	(11.1)	(6.4)	(6.1)

		With E.A.R.S.			Without E.A.R.S.			DIFFERENCE		
		LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)	LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)	LAeq dB(A)	SPLF Max dB(A)	C Peak dB(C)
<b>150mm Random Orbital Sander</b>										
Free Running	At operator's ear	83.7	86.8	98.3	90.5	95.4	108	(6.8)	(8.6)	(9.7)
	1 metre away from operator's hand	81.4	84.3	96.7	85.1	91.6	103.1	(3.7)	(7.3)	(6.4)
Working	Sanding 25mm pine – at operator's ear	86.6	88.7	100.6	88.9	90.8	103.9	(2.3)	(2.1)	(3.3)
	Sanding 25mm pine – 1 metre away from operator's hand	82.8	84.4	96.9	87.7	89.5	101.2	(4.9)	(5.1)	(4.3)

NOTE: Decibel ratings are logarithmic. A ten (10) db increase is 10 times louder. A twenty (20) db increase is one hundred times louder.

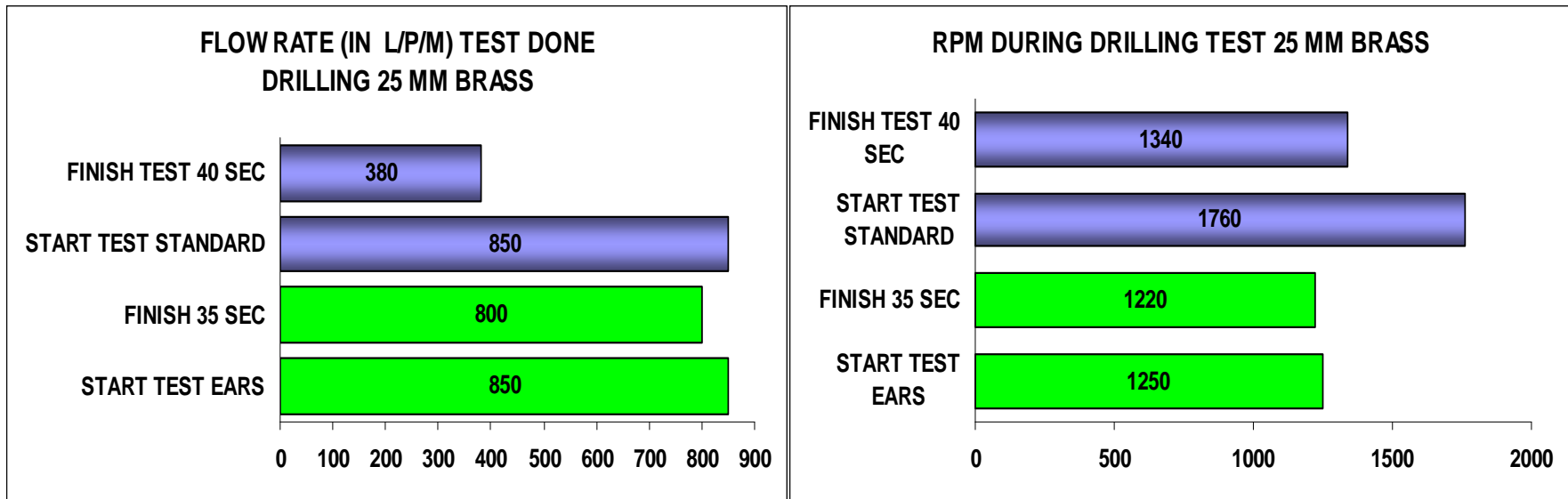
Example: A pneumatic tool that changes from 67 db to 89 db is 120 times louder.



# What are the benefits?



## FLOW RATE AND RPM COMPARISON



TEST DONE ON A 240V 3HP COMPRESSOR WITH A F.A.D OF 11 CFM (308 L/P/M) USING A 3/8 AIR DRILL 1800 RPM BEFORE MODIFICATION FOR EARS TEST

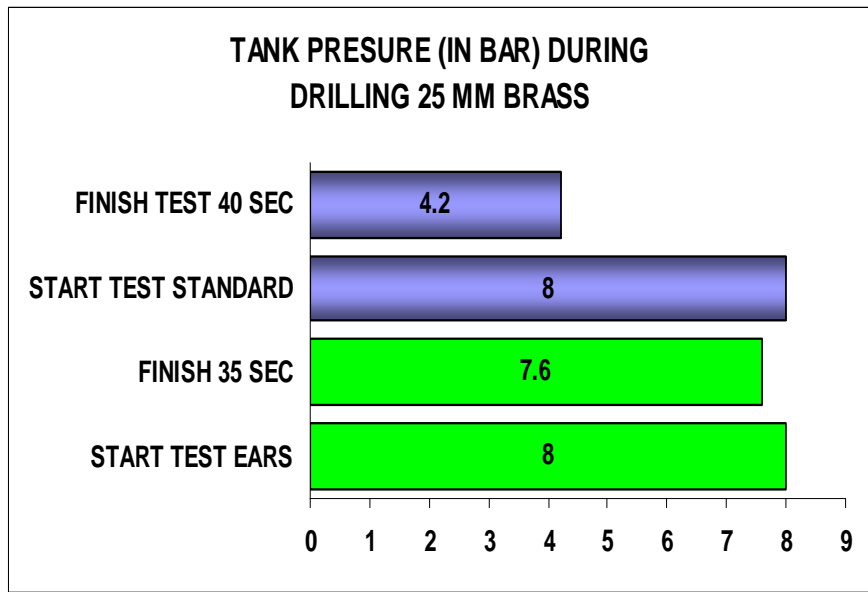
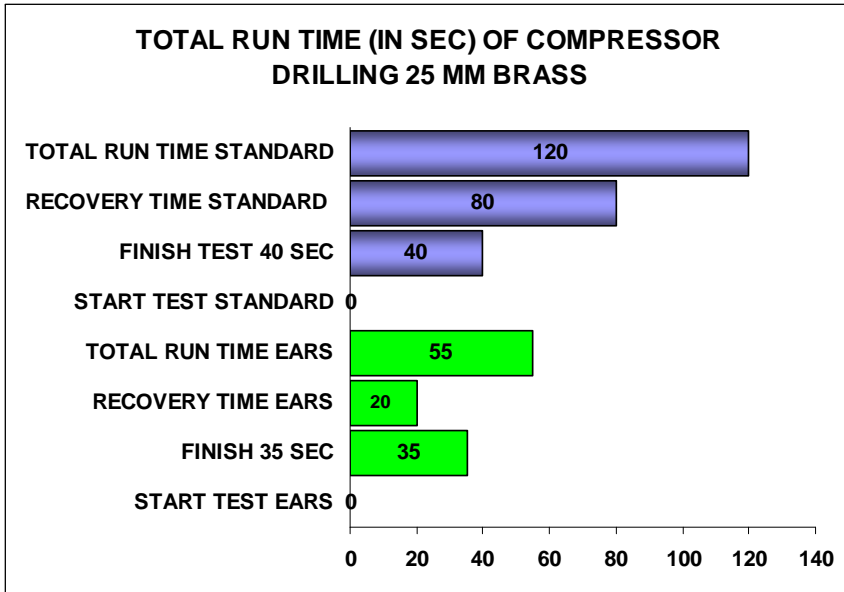
*Note the impact on flow rate and RPM with E.A.R.S:  
The steady flow and RPM mean more consistent results when using pneumatic tools.*



# What are the benefits?



## COMPRESSOR RUN TIME AND TANK PRESSURE COMPARISON



TEST DONE ON A 240V 3HP COMPRESSOR WITH A F.A.D OF 11 CFM (308 L/P/M) USING A 3/8 AIR DRILL 1800 RPM BEFORE MODIFICATION FOR EARS TEST

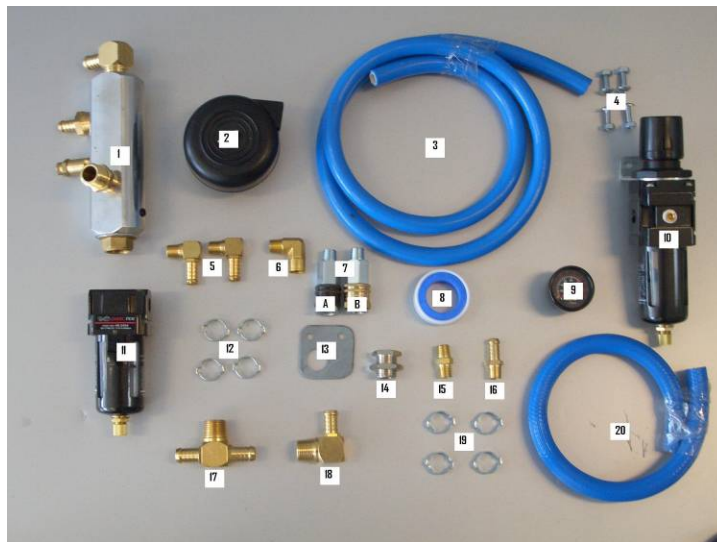
*Note the impact on recovery time and tank pressure with EARS: less air loss and less recovery time translates to energy cost savings.*



# Air compressor – retrofit



- **EARS is available for virtually all 5HP and above compressors in the form of the patented air return management manifold kit:**
  - This option is excellent for facilities that can benefit from the EARS value proposition but already have well-functioning air compressors
  - This preserves the value of the incumbent air compressor(s) and provides the benefits of EARS with an extremely attractive return on investment



Patented air-return management manifold kit



Patented manifold

# Compressed Air Pipe Systems

## - The new “gold standard”



- **With EARS, return air lines and high pressure lines can be installed using a new, flexible piping system - this is NOT PVC:**
  - P.E. Pipe is now considered the safest pipe system available at any cost - a lower pressure version now accounts for 95% of all natural gas installations world wide!
  - CAL OSHA approved - 800 psi burst strength on pipe rated for 200 psi
  - Air flow is 1/3 greater than standard pipe of the same diameter
  - The piping is high impact, flexible, durable, and 100% UV stabilized
  - It's incredibly easy to install - typically 1/10 the labor cost of black iron!
  - As such, it is designed as an affordable alternative
- **It gives all of the benefits – ease of installation, flexibility for future changes – without all the drawbacks and costs of conventional piping systems**

E.A.R.S. PIPE DN25 SDR9 PN20 S1 COMPRESSED AIR PE100 AS/NZS4130 070212 F1 MROP 1250KPa/20DEG

New, flexible piping system

# Pneumatic tools – new & retrofit



- **High quality EARS-fitted PNEUMATIC TOOLS are available purpose-built from the factory:**
  - Tools carrying the EARS designation are designed with the system in mind
  - Special gearing, ergonomics, and design for exhaust recycling are included to ensure that the customer is ready to work within the EARS shop environment
- **Retrofit kits for a variety of pneumatic tools from leading brands have been developed:**
  - This option is for the customer that wants to preserve the investment previously made in tools
  - Not all tools are able to be retrofitted (such as front-exhaust models)
  - Some tools require little or no modification at all (such as some models of sanders)



EARS-Fitted Pneumatic Tools



Adapters for  
Pneumatic Tools

# Hoses and fittings



- To connect the tools to the main air supply line and the exhausted air return line, a line of DUAL HOSES and a high quality line of FITTINGS are available
- EARS hoses are designed to be light-weight and compact, meeting the exacting standards of the professional
- A variety of options exists for all facilities and environments: straight hose, coil hose, and hose reels
- Fittings for tools and hoses are designed for the most demanding of high flow situations and are of the finest quality from anywhere in the world



Coil-type hose



Straight hose



High flow fittings

# Frequently asked questions



- ❑ How will EARS affect my other (i.e., non-EARS) air tools and equipment?
  - ✓ There is no negative impact on your existing installation of air & air powered equipment
  - ✓ The retrofitted compressor will deliver a more reliable source of clean, dry air
- ❑ Do I need to duplicate my entire air system for the return lines?
  - ✓ Only those areas of the facility that use EARS tools need return lines fitted.
  - ✓ Installation is easy with low-pressure flexible piping that is readily available
- ❑ Are there size limitations (large or small) for retrofitting air compressors with EARS?
  - ✓ Retrofits are available for nearly all sizes of air compressors
- ❑ Can my existing air tools be used?
  - ✓ The majority of handle-exhaust air tools can be retrofitted to EARS
  - ✓ Dedicated, EARS-designed tools may be more efficient, as non-EARS air tools may have significant restrictions in the exhaust path
- ❑ Does EARS work with 2-stage air compressors?
  - ✓ Yes it does
  - ✓ Potential energy savings may be reduced, due to the design of 2-stage compressors
  - ✓ All of the other benefits of EARS will realized
- ❑ Does EARS affect the life of my air tools or my air compressor?
  - ✓ Since your air compressor and air tools are now part of a closed loop system of clean, dry air, you should expect your tools and compressor to last longer

# Summary



- EARS provides a plentiful supply of CLEAN / DRY air, much dryer on average than with any common dryer systems
- EARS helps conserve energy by using exhausted air to supercharge the air compressor- which saves the facility real money on energy costs... up to 40%
- EARS dramatically reduces noise pollution at the technician/operator work location.
- EARS improves the shop environment, as airborne oils and pollutants from pneumatic tools are no longer exhausted to atmosphere.
- EARS improves the life of the tools and air compressors, as clean, dry, filtered air is re-circulated in the closed-loop environment that is created

# Thank You!



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To learn more about the Revolution in Compressed Air Technology - visit our website @ [www.doveequipment.com](http://www.doveequipment.com)