

# The Art & Science of Stack Testing



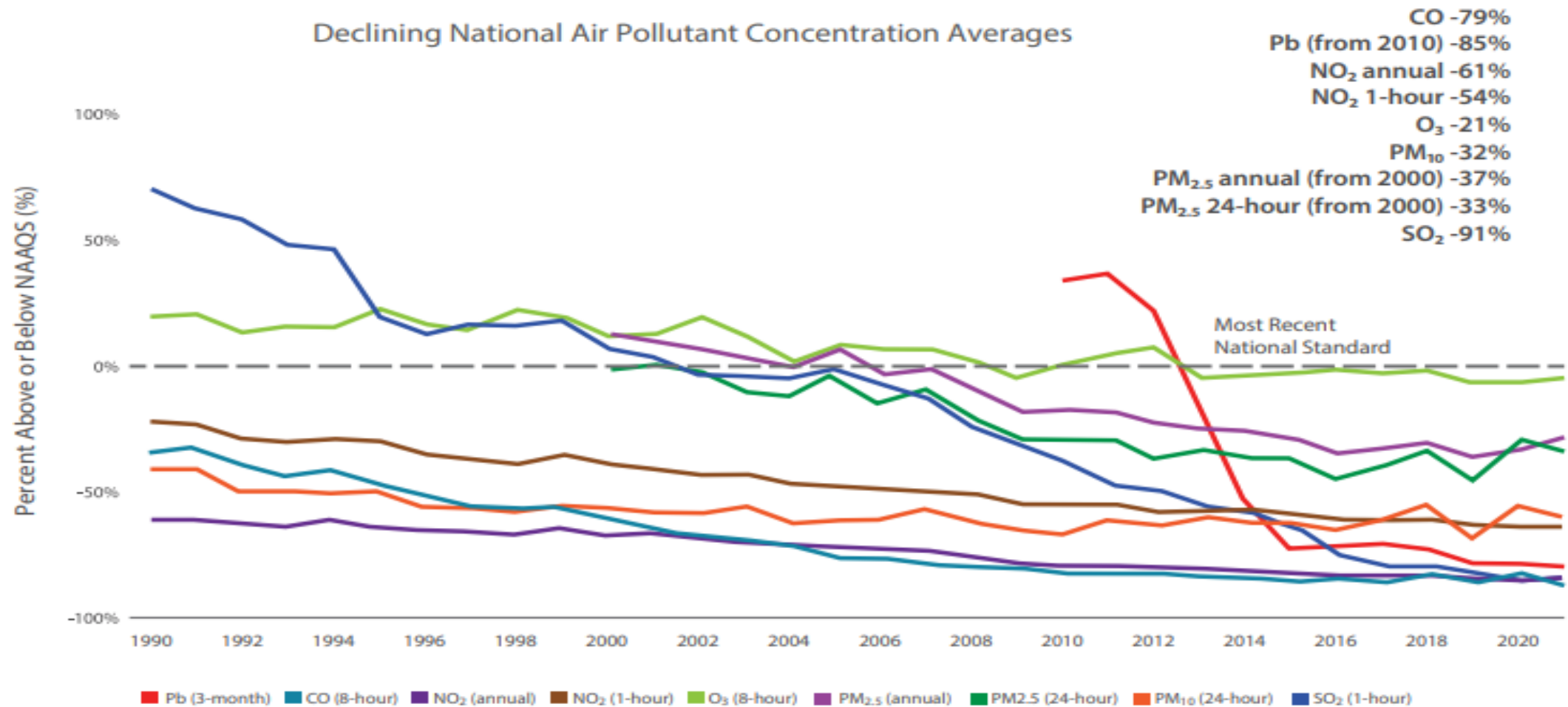
**AIRSOURCE**  
TECHNOLOGIES, INC.  
THE EXPERTS IN STACK TESTING.

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913 422 9001

# Air Quality Trends Show Clean Air Progress

While some pollutants continue to pose serious air quality problems in areas of the U.S., nationally, criteria air pollutant concentrations have dropped significantly since 1990 improving quality of life for many Americans. Air quality improves as America grows.

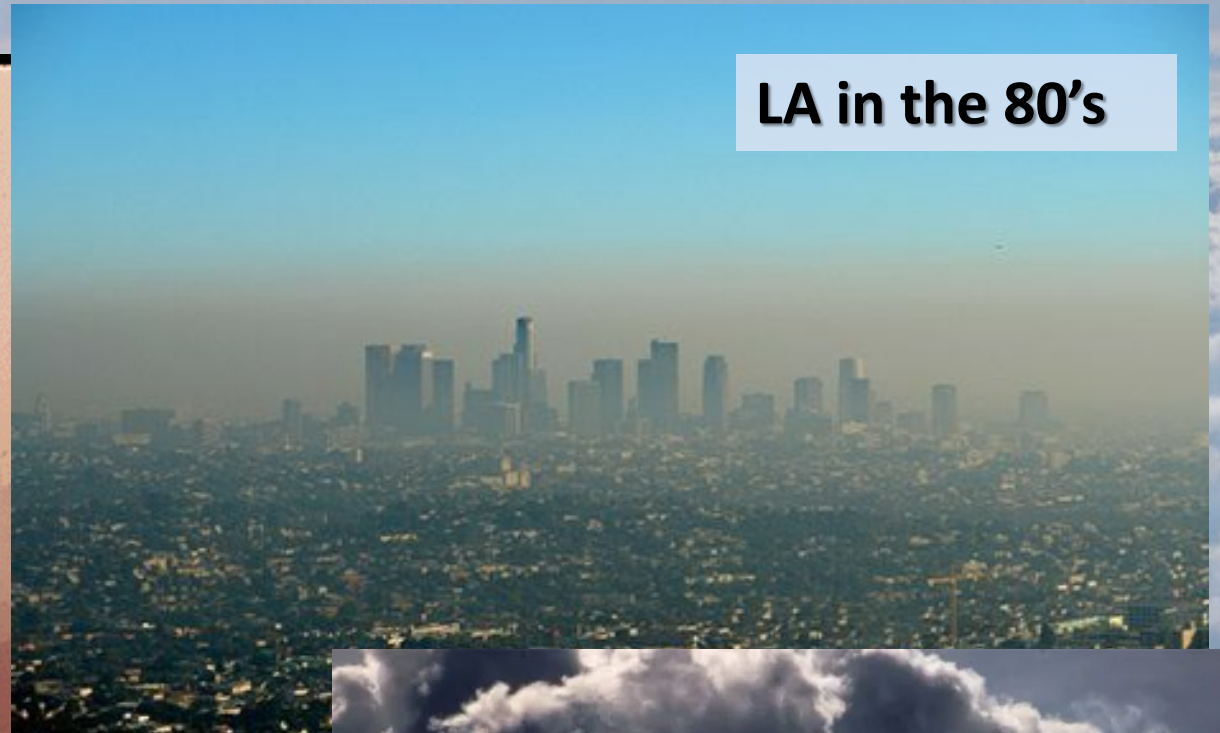
Declining National Air Pollutant Concentration Averages



**NYC 1973**



**LA in the 80's**



**Houston 1973**



# Kansas City 1971

*From Kansas City Star*

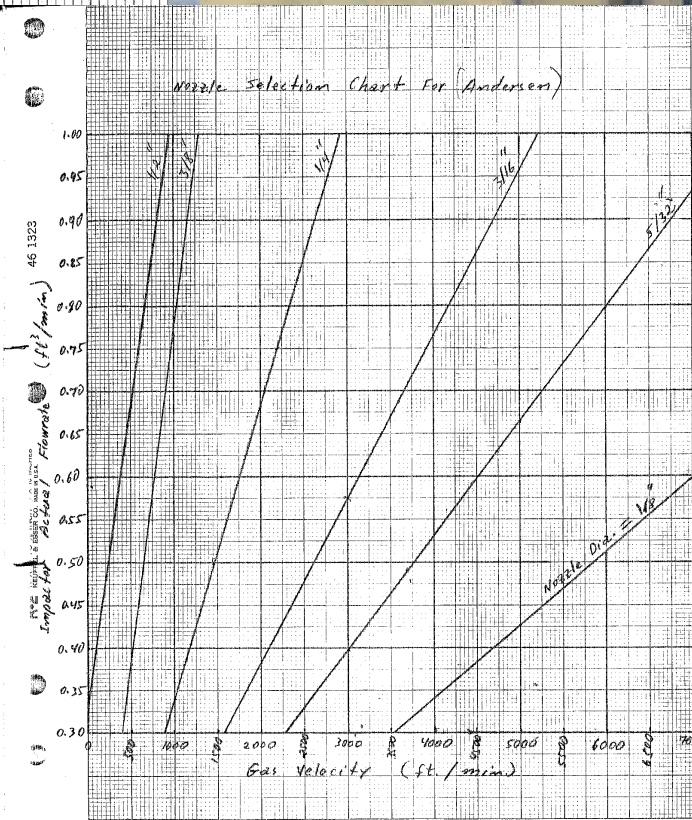
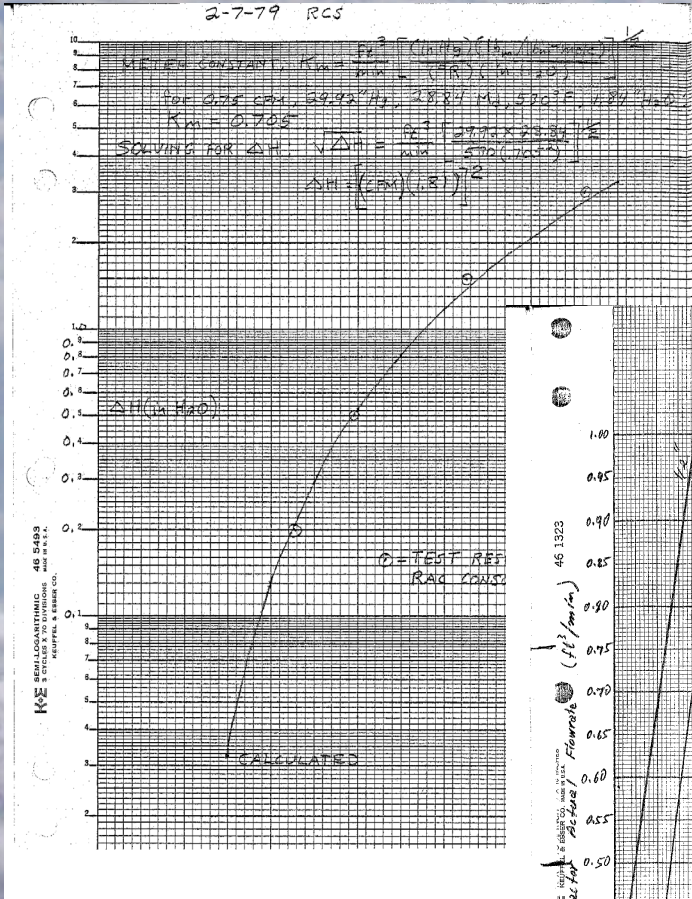




**Kansas City - June 1973**

*From Kansas City Star*

# SSSAP – “Pioneers Retiring”



$$VM = \frac{VMSTD \times (TM+460)}{17.71 \times (PB + \frac{PM}{13.6})}$$

$$\frac{100 \times VS \times TT \times PS \times MD \times (DN)^2}{1032 \times (TS+460)} = VMSTD$$

$$VM = \frac{100 \times VS \times TT \times PS \times MD \times (DN)^2 \times (TM+460)}{1032 \times (TS+460) \times 17.71 \times (PB + \frac{PM}{13.6})}$$

$$VM = \frac{100 \times TT \times PS \times MD \times (TM+460) \times (DN)^2 \times 85.48 \times 60 \times Cp \sqrt{DPS \times (TS+460)}}{1032 \times (TS+460) \times 17.71 \times PB \times VPS \times MW}$$

$$VM = \frac{TT \times MD \times (TM+460) \times (DN)^2 \times Cp \times 28.06 \times \sqrt{DPS}}{\sqrt{TS+460} \times VPS \times MW} \leftarrow 10\% \text{ error}$$

$$VM = \frac{5.24 \times TT \times MD \times (TM+460) \times (DN)^2 \times Cp \times \sqrt{DPS}}{VPB \times \sqrt{TS+460}}$$

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# Who wouldn't want to be a Stack Tester?

- After all, there are methods and processes and good equipment, and...
  - I have a degree in Environmental Engineering, Physics, or Chemistry, or
  - I know manufacturing processes, or
  - I love the outdoors and climbing, and
  - I care about the environment...
- 
- **How hard can it be?!**

# Challenges – Learning/Gaining Experience

## **Learning involves understanding a broad range of variables:**

- EPA and state regulations dictate methods depending on type of facility, measurement of “stack”, type of processing, type of material being processed, age of facility, etc., etc.
- With those multiple methods and method variations comes a range of sampling instruments and glassware and reagents for each, and then there are all the exceptions.
- Becoming competent means mastering multiple aspects of sampling, data capture, analysis, and reporting. involved with the method(s) you’re testing.
- Precision is required, no guesswork or cutting corners, samples can be easily ruined and money lost with a filter misaligned or failure to watch pressures on a console during 3 hour runs.



# Challenges – Physical/ Practical

## **Field work is done at facilities that:**

- Have hazardous conditions and materials
- Generally have outdoor access to stacks that are tested in extreme hot or cold
- Require climbing and ability to work at heights and navigate probes on lifts or in cages
- Lifting and managing heavy equipment
- Require PPE such as harnesses, goggles, steel toed boots, sleeves

## **Most tests result in:**

- Long days
- Overnight travel

**Have to do all this safely and within scheduled testing time.**

# Tips

- Double check your packing lists & leak check trains
- Bring an extra train
- Have extras in stack kits
- Have a back up plan for crew and equipment
- Be proactive on equipment and glassware maintenance
- Be prepared to ship anything anywhere overnight and...  
make sure office personnel know where to find equipment!
- When something unexpected happens - take field notes, cover with the whole the team, add to calculator notes, and update packing lists



*Scar*

*(Lion King)*

**“The Customer is always right”** .. *Harry Gordon Selfridge*

**But check the permit anyway!**

# Tips

Cross train – balance generalists and specialists

- More people to assist with prep, post-work such as calibrations and quality assurance
- Mixing crews can uncover errors or misconceptions
- Challenge your ability to react to customers' changes – be agile
  - To do that, have to have back-up and cross training

Upgrade infrastructure & processes as well as equipment –remote access

- Document core knowledge and repeatable processes

“Believe in yourself and in your team's ability to overcome any challenge.”

*Andy Reid*



# Know Your Stack Testing Community

- Regulators
- Equipment and Lab Vendors
- Consultants & Competitors
- Industry forums: SES/AWMA
- KU, Johnson County – jobs postings



**AIR & WASTE MANAGEMENT  
ASSOCIATION**  
MIDWEST SECTION | Nebraska, Iowa, Kansas, Missouri

**EPA Region 7  
(Midwest)**



**IOWA DEPARTMENT OF  
NATURAL RESOURCES**



**45<sup>th</sup> STATIONARY SOURCE SAMPLING  
AND ANALYSIS FOR AIR POLLUTANTS CONFERENCE**

50<sup>th</sup> Anniversary of SES  
March 24<sup>th</sup> - March 29<sup>th</sup>, 2024  
MeadowView Conference Resort & Convention Center  
Kingsport, Tennessee

Chair Tommy Leach    Co-Chair Tom Graham



**NEBRASKA**  
DEPT. OF ENVIRONMENT AND ENERGY



**MISSOURI**  
DEPARTMENT OF  
NATURAL RESOURCES

*I get by with a little help from my friends*

# Who wouldn't want to be a Stack Tester?

- Over the Rainbow
  - Balance office work with travel and enjoying the outdoors
  - Balance brains and brawn
- Constant learning
  - Creative problem solving
  - Learn about manufacturing
  - Can be a generalist and specialist
  - “Work your way down”
- Environmental Hero
  - Get to be Spiderman, McGyver, and Superman to friends and family

