

Modeling Carbon Monoxide Reduction in a Single Compressor Hookah Dive System

June 19, 2014



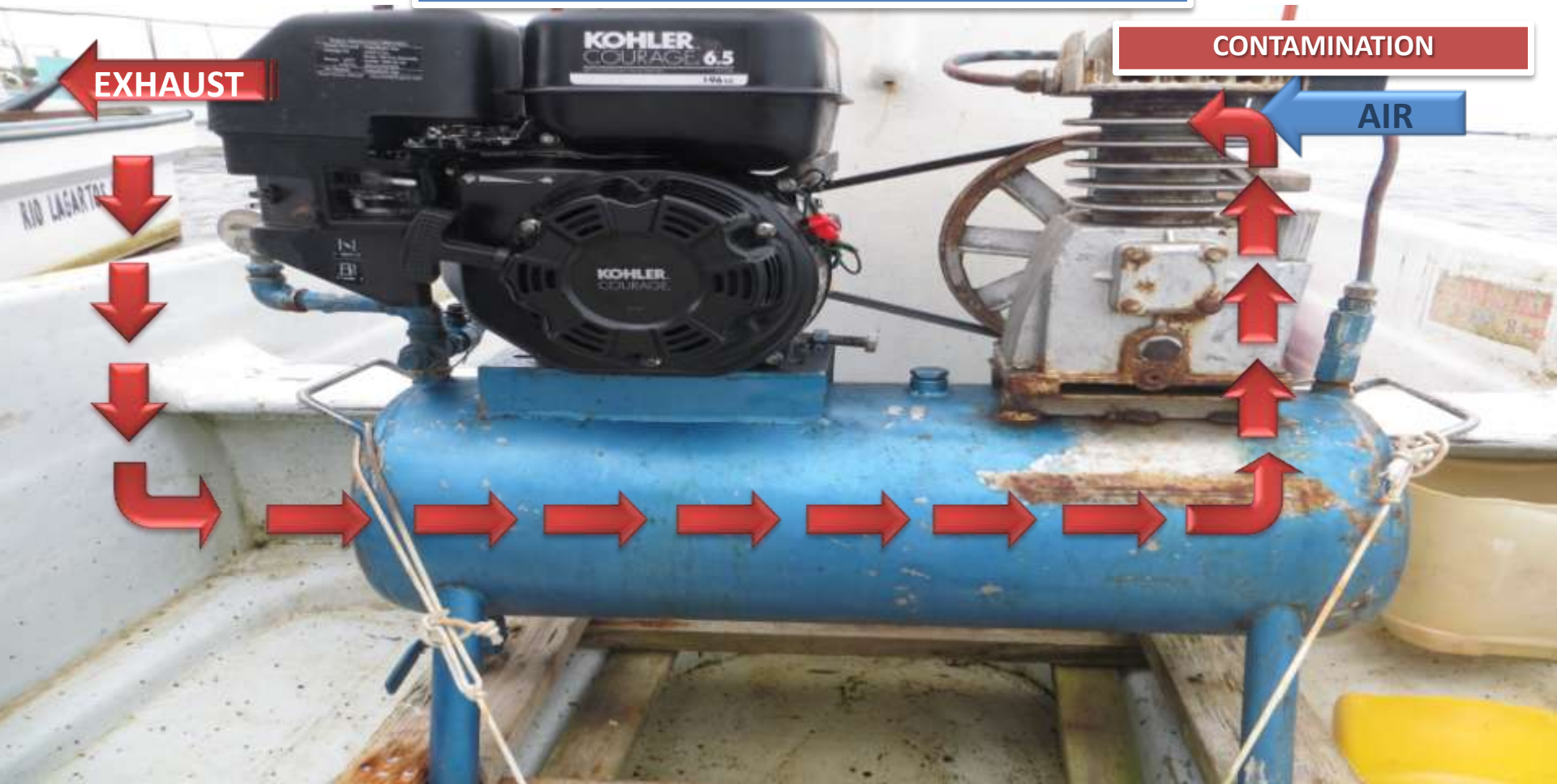








AIR SOURCE CONTAMINATION?



Problem Statement

- Artisanal fishermen are diving with contaminated gas
 - CO in diving gas exceeds dive safety standards (10 ppm)
 - Average CO content in diving gas is **42 ppm**
- Gas filtration is ineffective
 - Filters are not reducing CO content

Questions

- Can we develop a model of the artisanal HDS at UCLA?
- Can we use that model to develop an intervention to comprehensively improve air quality?
- Can we do this for little or **no** money?
 - Ultimate application of model intervention must fit the budget constraints of an artisanal fisherman

Costly Reduction of CO

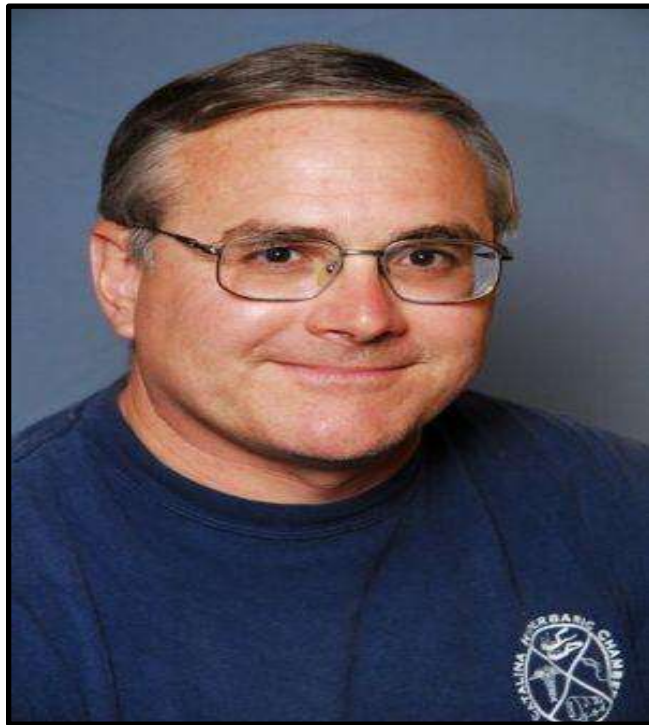


I've learned to ask smart people for help

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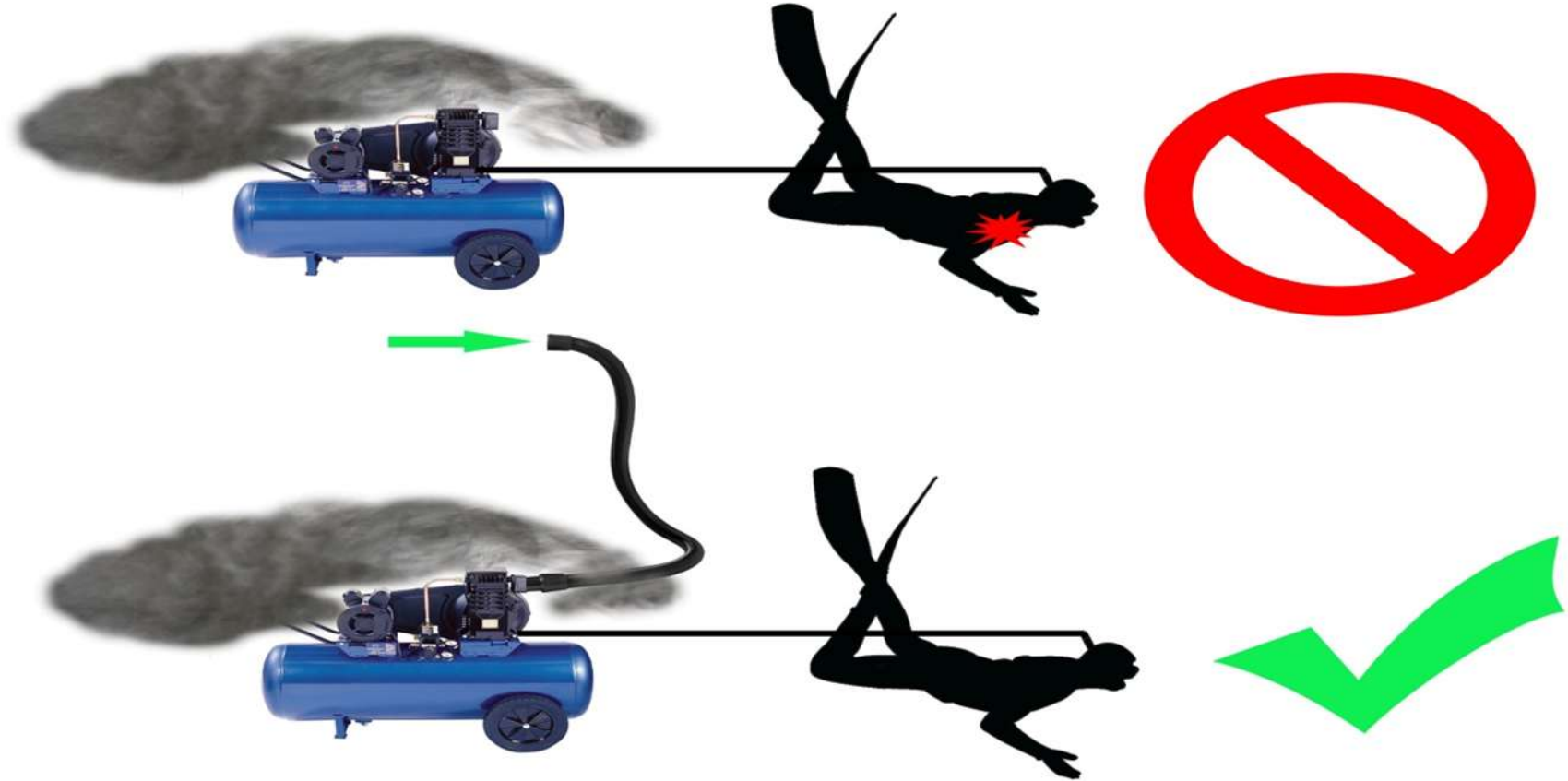
Shout-Out:

Karl Huggins



Cost-Effective Reduction of CO

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Theory

- Separation of air intake from gas engine exhaust would improve air purity
- Diving gas purity will fall into safety standard range
- An affordable intervention to improve air purity will be applied by artisanal fishermen

Hitachi® EC2510E 1ft³ Air Compressor

- 5.5 HP engine
(4,000 rpm)
- 145 PSI gas delivery



Materials

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C-Squared Carbon
Monoxide Analyzer
(± 1 ppm)



Visi-Float[®] Flowmeter
($\pm 5\%$)



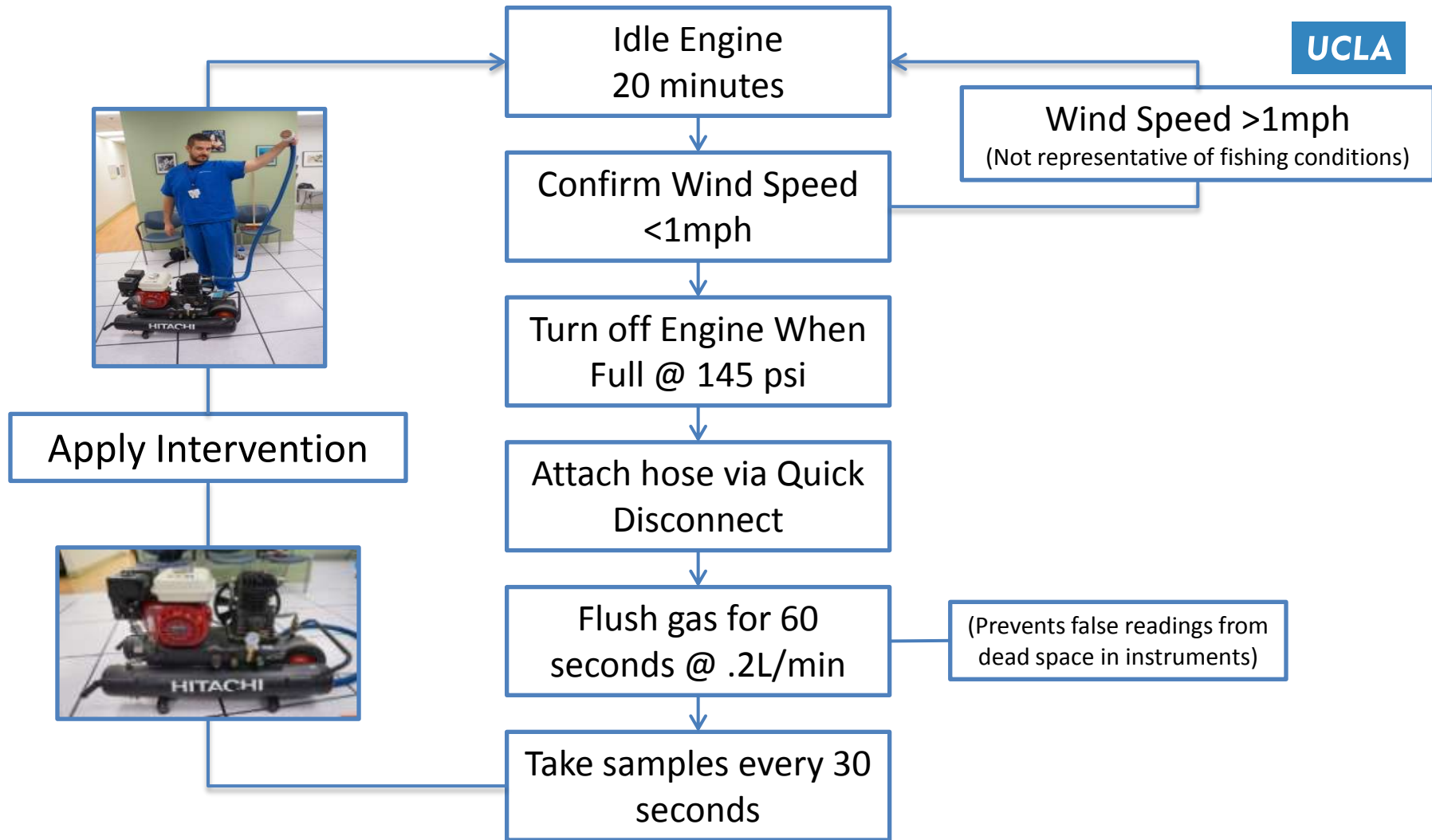
0.25" 4ft Swagelok[®]
Special Tubing Hose



Intervention

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Statistical Analysis

- IBM SPSS
 - Univariate Analysis
 - Normality Test
 - Levene's Test for Homogeneity of Variances
 - Mann-Whitney U Test
 - Median comparison

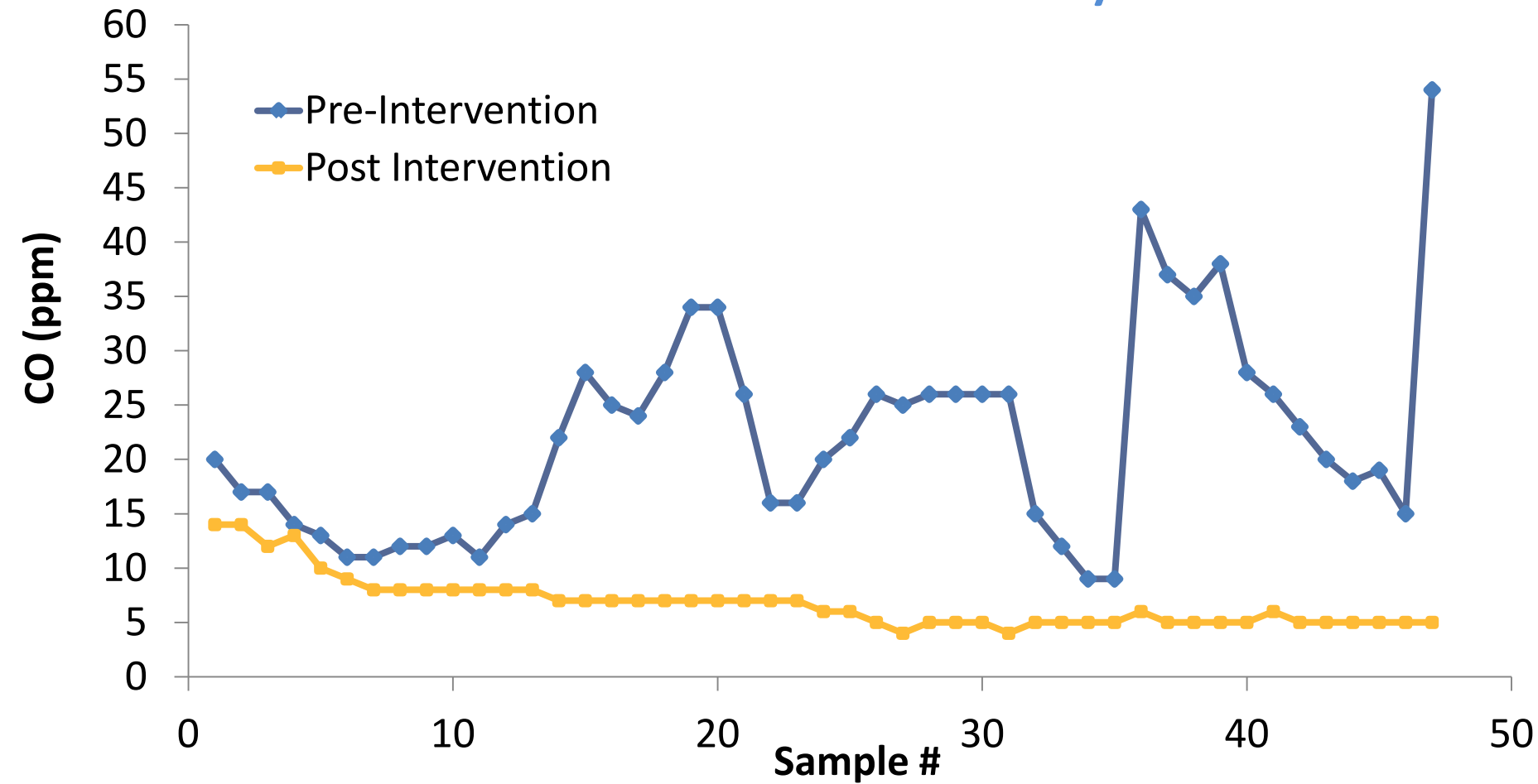
Results: CO Comparison

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CO Results	N	Mean	Median	Range
Pre-Intervention CO (ppm)	47	22	20	9-54
Post-Intervention CO (ppm)	47	7	6	4-14

CO Intervention Analysis

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Results: CO Median Comparison

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	N	Mean Rank	Mann-Whitney U	Wilcoxon W	Z	<i>p</i> (2-tailed)
Pre-Intervention	47	70.14	40.5	1168.5	-8.084	<0.001
Post-Intervention	47	24.86				

Conclusion

- Separating compressor air intake from gas engine exhaust reduces CO in the diver's air source.
- This intervention can be easily implemented to any HDS for under \$50.
- This is a realistic intervention for artisanal fishermen in the Yucatan Peninsula.

Thanks for Listening

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