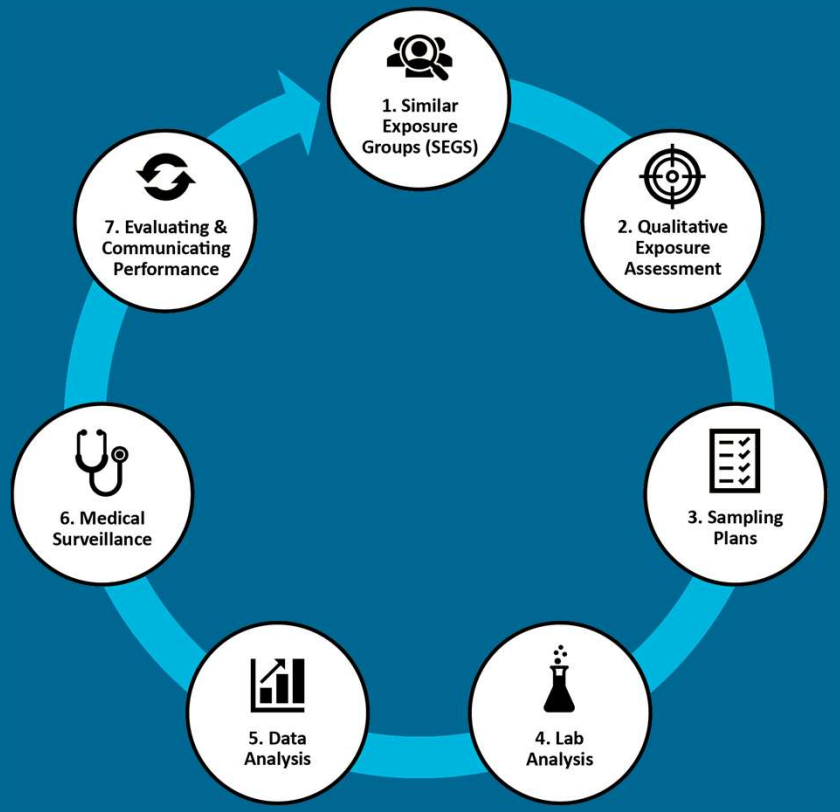
7 Steps to Improve Your Industrial Hygiene Program

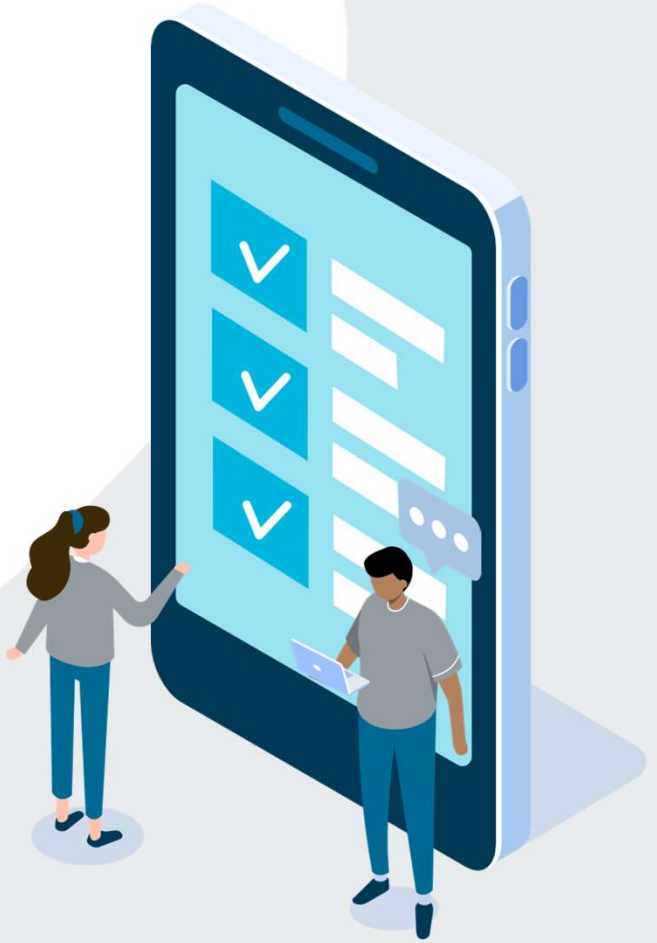


Presented by: Dave Risi, CIH, CSP

VelocityEHS®

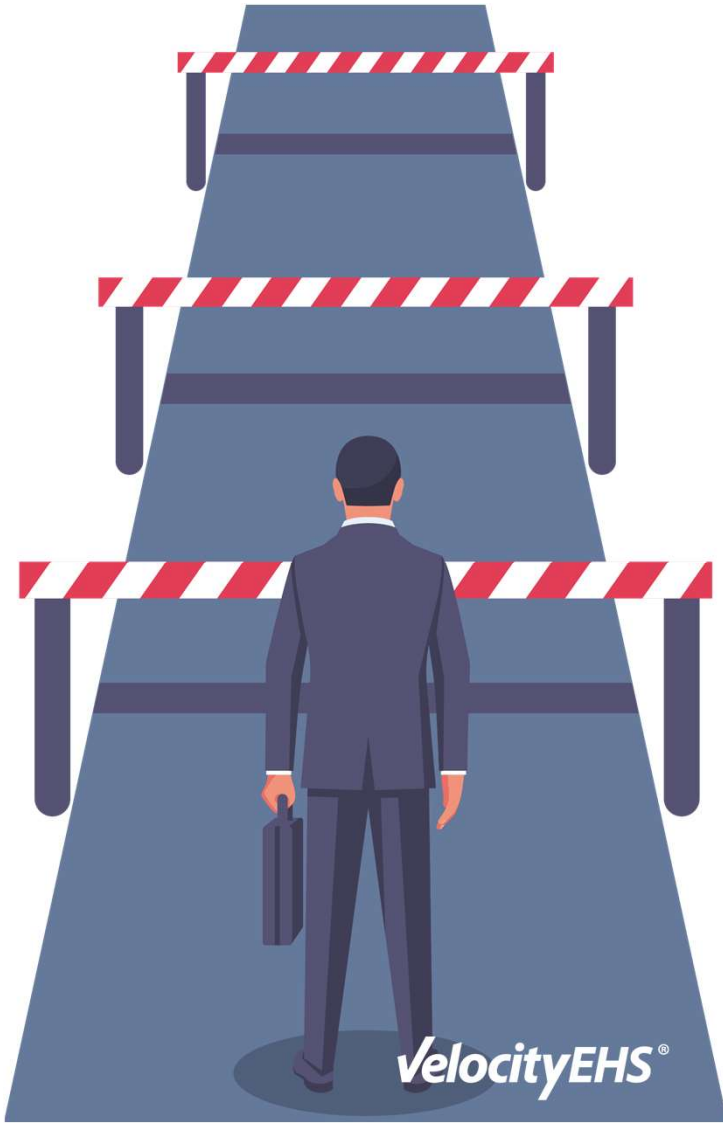
Goals

- Understand a simpler method to manage your IH program
- How to move from a reactive, compliance-based program to a proactive, risk-based program
- How to better communicate with workers and management



Current Trends in IH

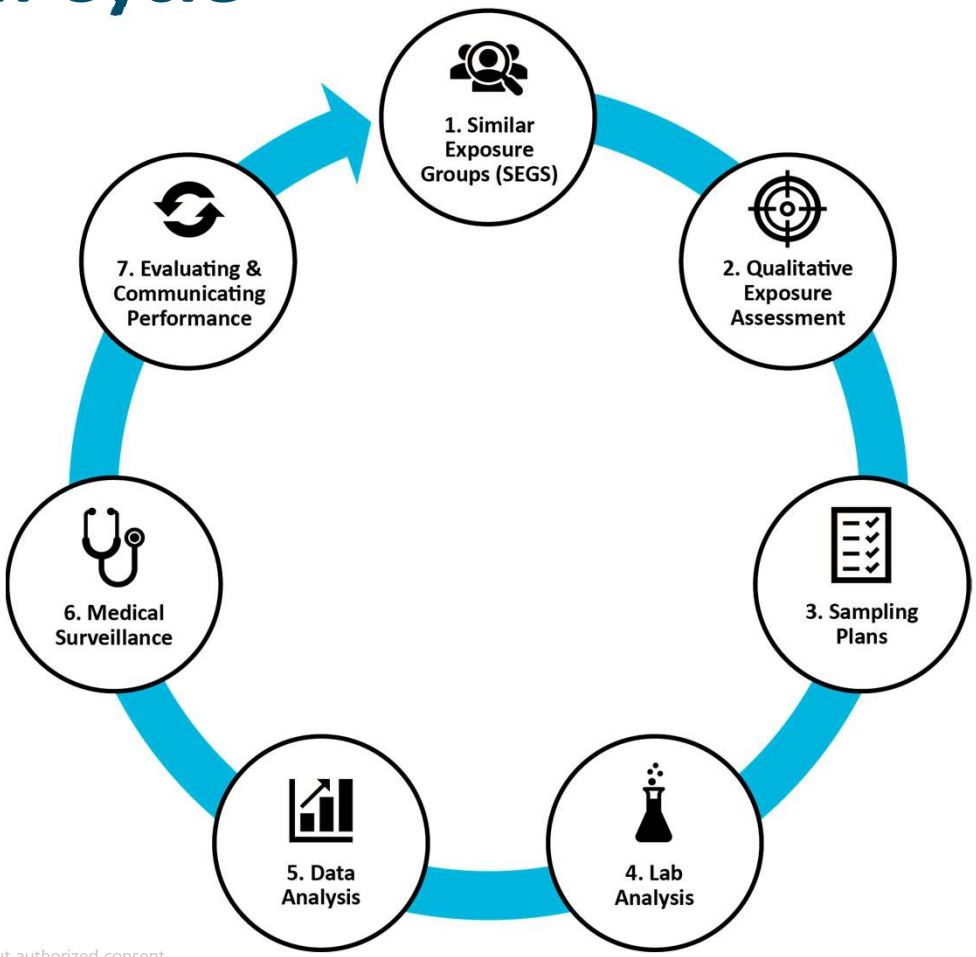
- Baby boomers retiring
- IH positions not being refilled
- IH absorbed by other EHS professionals
- Less IH professionals managing IH programs
  - Role split up, managed by generalists, or outsourced
- Reactive, compliance-based programs



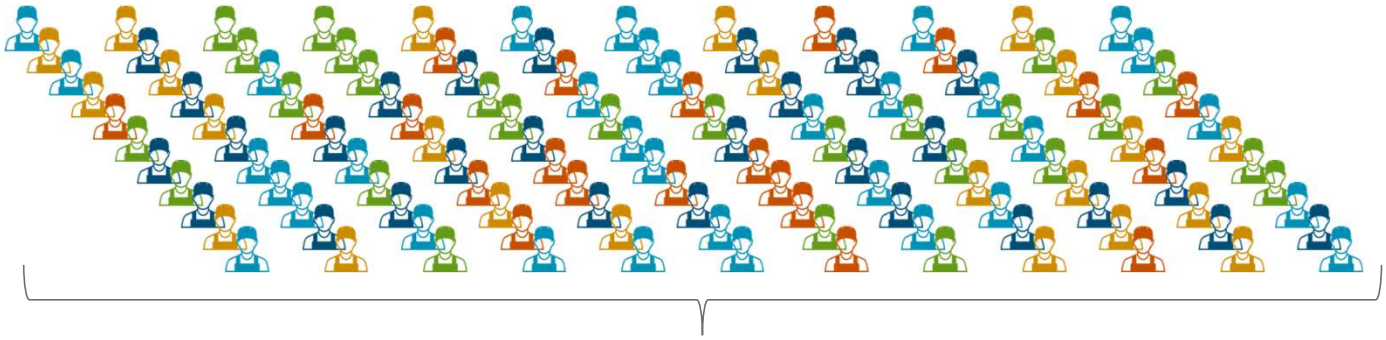
Opportunities

- Rethink how IH programs are managed
- Incorporate IH into risk-based processes
- Reduce dependency on sampling/analysis
- Improve communications & and show the value of Industrial Hygiene

The IH Program Cycle



1. Similar Exposure Groups (SEGs)



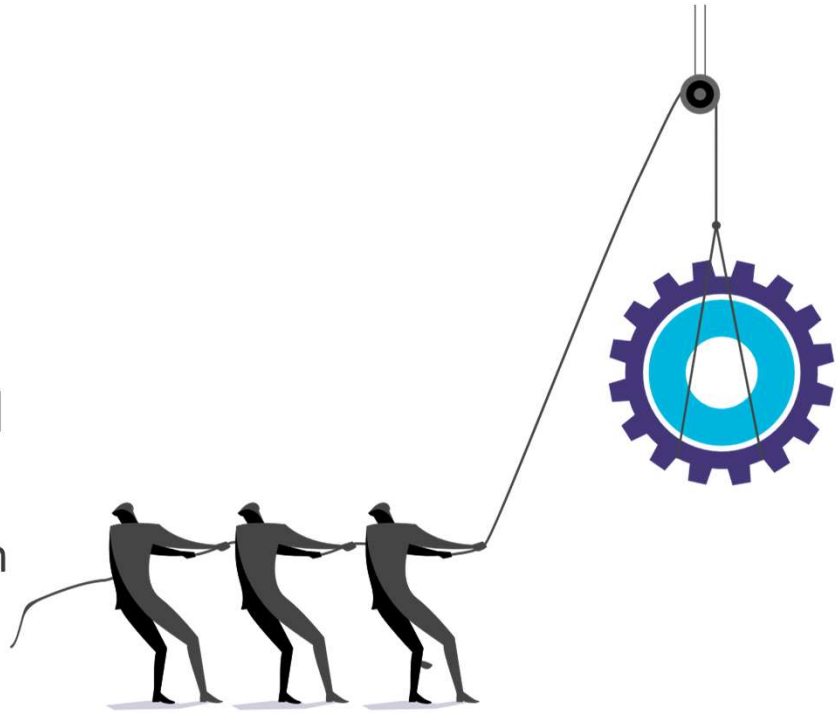
Department: Maintenance
Job: Maintenance Tech

Department: Reformer Unit
Job: Operator

Department: Coker Unit
Job: Operator

How To Develop Your SEGs

- What common jobs/roles can workers be grouped in?
  - Operator, maintenance, electrician, pipefitter
- What tasks create potential health risks?
  - Welding, liquid sampling, opening vessels
- Does their equipment/tools affect their level of exposure?
  - New paint booth with good ventilation *verses* an old one with 10% of the needed ventilation
- List potential stressors of concern



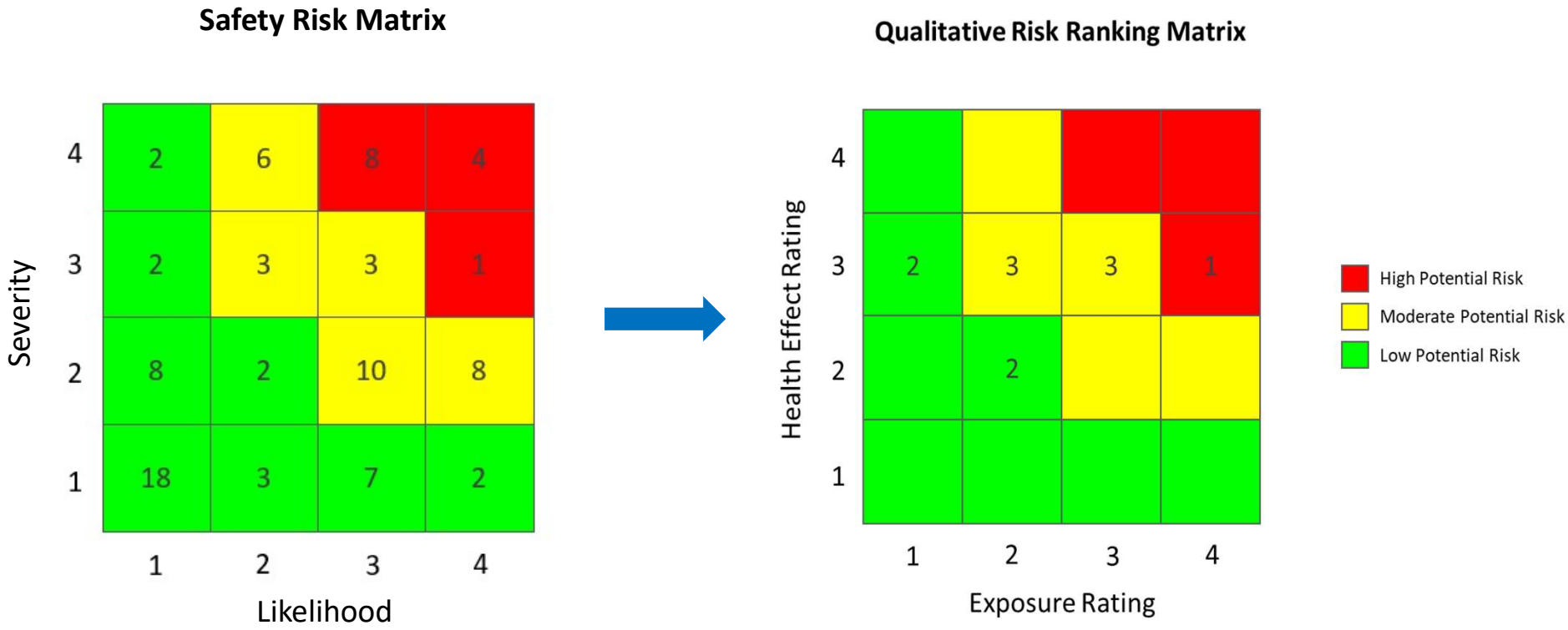
Deliverable

Location	Job	Task	Stressors
Alky Unit	Operator	Routine Work Duties	Noise, Hydrofluoric Acid
Coker Unit	Operator	Routine Work Duties	Benzene, Hydrogen Sulfide
Maintenance	Pipefitter	Welding	Iron, Lead
Maintenance	Maintenance Technician	Gasket Replacement	Asbestos
Reformer Unit	Operator	Routine Work Duties	Noise, Benzene
Reformer Unit	Operator	Liquid Sampling	Benzene
Tank Farm	Operator	Gauging	Benzene

2. Qualitative Exposure Assessments

Fancy term for risk assessment

Jump on the Bandwagon

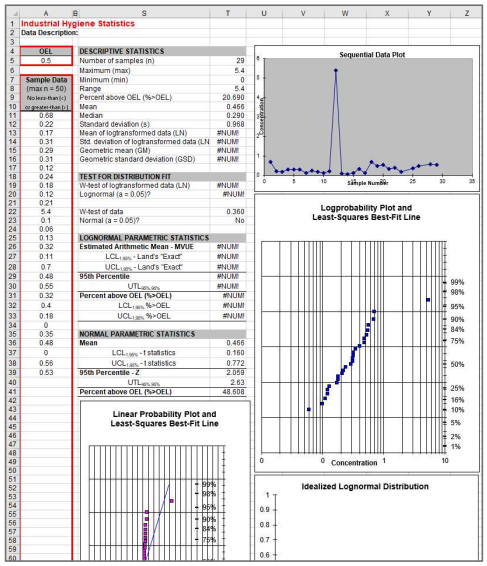


Exposure Rating

- No data: Professional judgement of “typical” exposure risk

Exposure Rating
1: < 10% of the OEL
2: Between 10% and 50% of the OEL
3: Between 50% and 100% of the OEL
4: > 100% of the OEL

- Available data: Which statistic?
  - Normal VS lognormal distribution?
  - AM & SD - VS - GM & GSD
  - 95th Percentile
  - 95%/95% Point Estimate
  - %>OEL
- Decide & document



Health Effect Rating

- Set by a toxicologist
- Referenced
  - GHS health category
  - HMIS health code
  - NFPA health code
- Bands based on OEL numbers
- Occupational Exposure/Hazard Banding
- Best estimate based on AIHA's definitions

Health Effect Rating
1: Reversable health effects of concern
2: Severe, reversable health effects of concern
3: Irreversible health effects of concern
4: Life-threatening or disabling injury or illness

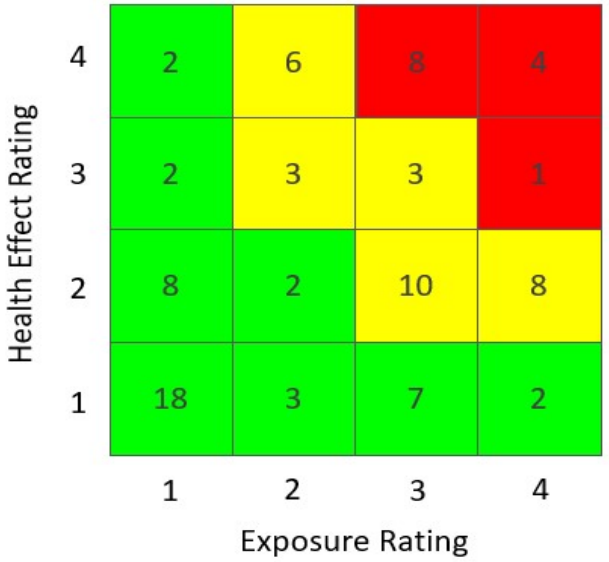
More Complex Exposure Assessment Variables

Risk Rating = Exposure Rating X Health Effect Rating

Exposure Rating	Health Effect Rating
Frequency	Component Percentage Ranking
Durations	Quantity Handled
Control Technology Factor	Substance HER
Toxicity Component Rank	Dermal Exposure Risk
Vapor Pressure	Carcinogen
Dispersion Rating	Particle Size
Uncertainty Factor	Particle Shape
Number of Employees in SEG	Solubility
Quantity Handled	

AIHA's Exposure Assessment Strategy

Exposure Rating	Health Effect Rating
1: < 10% of the OEL	1: Reversable health effects of concern
2: Between 10% and 50% of the OEL	2: Severe, reversable health effects of concern
3: Between 50% and 100% of the OEL	3: Irreversible health effects of concern
4: > 100% of the OEL	4: Life-threatening or disabling injury or illness

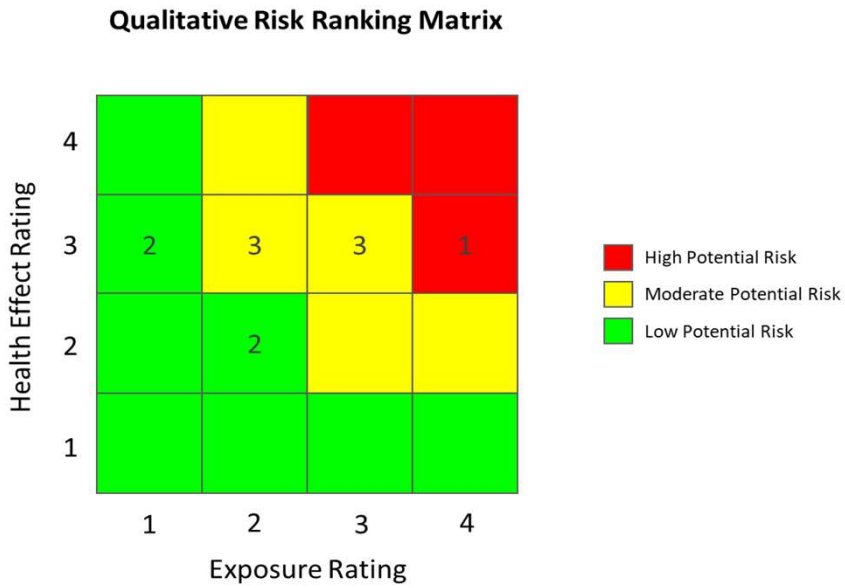


How to Perform QEAs

Location	Job	Task	Stressors	Exposure Rating		Health Effect Rating		Risk Rating
Alky Unit	Operator	Routine Work Duties	Hydrofluoric Acid	1	X	3	=	3
Alky Unit	Operator	Routine Work Duties	Noise	3		3		9
Coker Unit	Operator	Routine Work Duties	Benzene	1		3		3
Coker Unit	Operator	Routine Work Duties	Hydrogen Sulfide	2		2		4
Maintenance	Pipefitter	Welding	Iron	2		2		4
Maintenance	Pipefitter	Welding	Lead	2		3		6
Maintenance	Maintenance Technician	Gasket Replacement	Asbestos	2		3		6
Reformer Unit	Operator	Routine Work Duties	Noise	3		3		9
Reformer Unit	Operator	Routine Work Duties	Benzene	2		3		6
Reformer Unit	Operator	Liquid Sampling	Benzene	4		3		12
Tank Farm	Operator	Gauging	Benzene	3		3		9

Deliverable

- Risk assessments completed for SEGs & their stressors
- Concise, consistent presentation
  - Current risks
  - What IH is and our value
  - Justification for controls/PPE
- Prioritize resources for additional sampling



3. Sampling Plans

Plan your work and work your plan

Why Collect Samples?

- Common reasons
  - Regulatory required
  - Reactive
  - Repeat last year's plan
- Should have direct impact on your IH program
- Where do I need more data to know what the true exposure risk is?

How To Determine Needs for Sampling Plans

Location	Job	Task	Stressors	Exposure Rating	Health Effect Rating	Risk Rating		Uncertainty Rating		Info Gather Priority Rating
Tank Farm	Operator	Gauging	Benzene	3	3	9	X	2	=	18
Coker Unit	Operator	Routine Work Duties	Hydrogen Sulfide	2	2	4		2		8
Maintenance	Pipefitter	Welding	Lead	2	3	6		1		6
Maintenance	Pipefitter	Welding	Iron	2	2	4		1		4
Alky Unit	Operator	Routine Work Duties	Hydrofluoric Acid	1	3	3		1		3
Alky Unit	Operator	Routine Work Duties	Noise	3	3	9		0		0
Coker Unit	Operator	Routine Work Duties	Benzene	1	3	3		0		0
Maintenance	Maintenance Technician	Gasket Replacement	Asbestos	2	3	6		0		0
Reformer Unit	Operator	Routine Work Duties	Noise	3	3	9		0		0
Reformer Unit	Operator	Routine Work Duties	Benzene	2	3	6		0		0
Reformer Unit	Operator	Liquid Sampling	Benzene	4	3	12		0		0

<u>Uncertainty Ratings</u>

0 = Certain

1 = Uncertain

2 – Highly Uncertain

Deliverable

Location	Job	Task	Stressors	# Sampled Planned	Scheduled Completion Date	# Samples Taken	% Complete
Tank Farm	Operator	Gauging	Benzene	8	7/1/2021	2	25%
Coker Unit	Operator	Routine Work Duties	Hydrogen Sulfide	4	12/31/2021	2	50%
Maintenance	Pipefitter	Welding	Lead	4	12/31/2021	1	25%
Maintenance	Pipefitter	Welding	Iron	5	12/31/2021	0	0%
Alky Unit	Operator	Routine Work Duties	Hydrofluoric Acid	3	12/31/2021	1	33.3%

6 of 24 or 25% of Annual Site Plan Competed

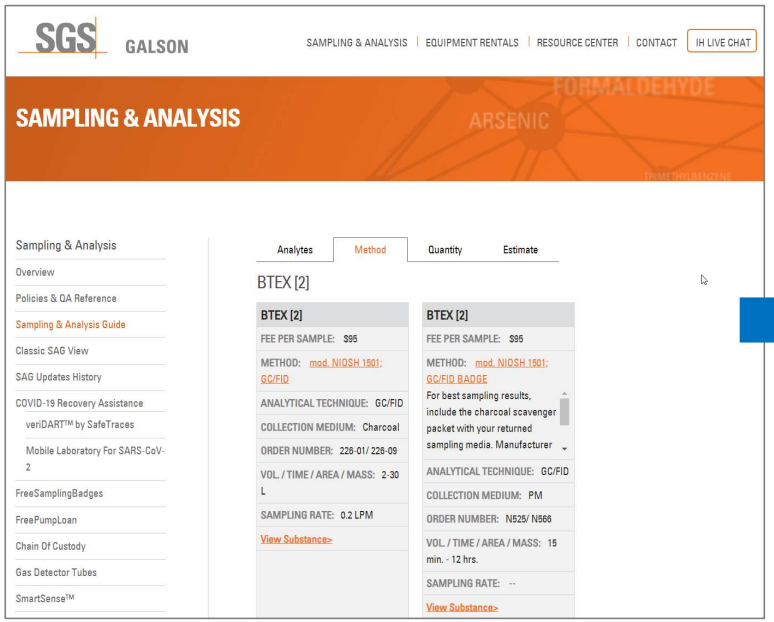
4. Lab Analysis

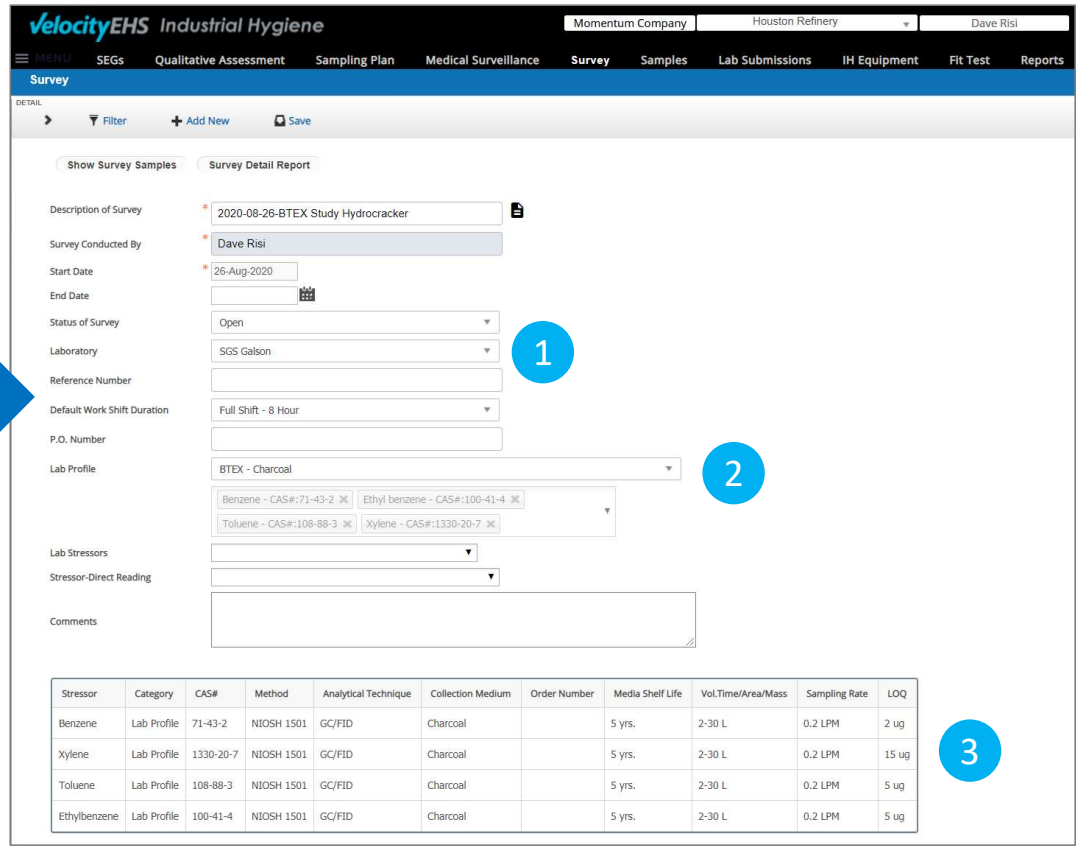
The unknown partner

Selection Criteria

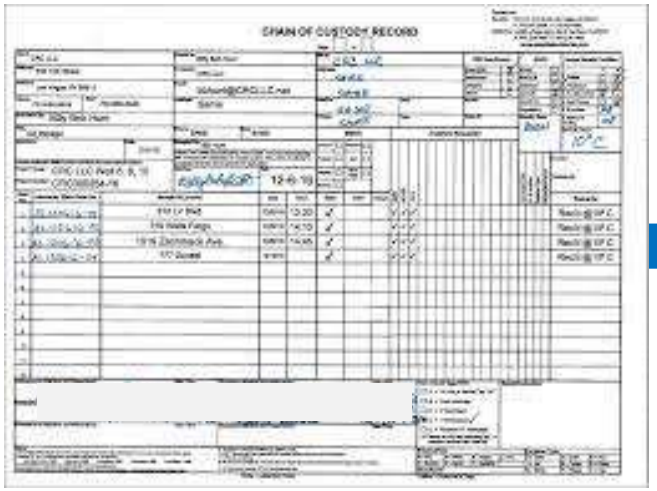
- Select the best lab(s)
  - Accreditations (AIHA LAP, ELLAP, EMLAP)
  - Local verses far away
  - CIH support
  - Equipment loan
  - Customer service
- Online sampling guide and COC
- Lab interface available

Sampling & Analytical Guides





Deliverable



VelocityEHS Industrial Hygiene | Momentum Company | Houston Refinery | Dave Risi

MENU | SEGs | Qualitative Assessment | Sampling Plan | Medical Surveillance | Survey | Samples | Lab Submissions | IH Equipment | Fit Test | Reports

Lab Submissions

DETAIL | Filter | Save | Print | Accept | Reject

Company	: Momentum Company	Site	: Houston Refinery	Survey Start Date	:
Survey	: 2020-08-26-BTEX Study Hydrocracker	Survey Conducted by	: Dave Risi	Reference Number	:
Phone	: +1(312)881-2010	Email	: drisi@ehs.com	Date submitted to Lab	: 26-Aug-2020

Sample : 2020-08-26-001 **Sample Type :** Personal **Date :** 26-Aug-2020 **Media :** 42569124 **Volume :** 84 L **Duration :** 420 min(s)

						Mass			Concentration		
Analyte	CAS No.	Analytical Method	LOD	Text Result	Comments	Operator	Result	UOM	Operator	Result	UOM
Benzene	71-43-2	NIOSH 1501				=	0.08	MG	=	0.12	PPM
Ethylbenzene	100-41-4	NIOSH 1501				=	0.94	MG	=	1.2	PPM
Toluene	108-88-3	NIOSH 1501				=	0.96	MG	=	2.2	PPM
Xylene	1330-20-7	NIOSH 1501				=	4.1	MG	=	5.6	PPM

Sample : 2020-08-26-002 **Sample Type :** Personal **Date :** 26-Aug-2020 **Media :** 42569125 **Volume :** 844 L **Duration :** 422 min(s)

						Mass			Concentration		
Analyte	CAS No.	Analytical Method	LOD	Text Result	Comments	Operator	Result	UOM	Operator	Result	UOM
Benzene	71-43-2	NIOSH 1501				=	0.081	MG	=	0.102	PPM
Ethylbenzene	100-41-4	NIOSH 1501				=	0.95	MG	=	1.25	PPM
Toluene	108-88-3	NIOSH 1501				=	2.1	MG	=	4.5	PPM
Xylene	1330-20-7	NIOSH 1501				=	1.9	MG	=	4.9	PPM

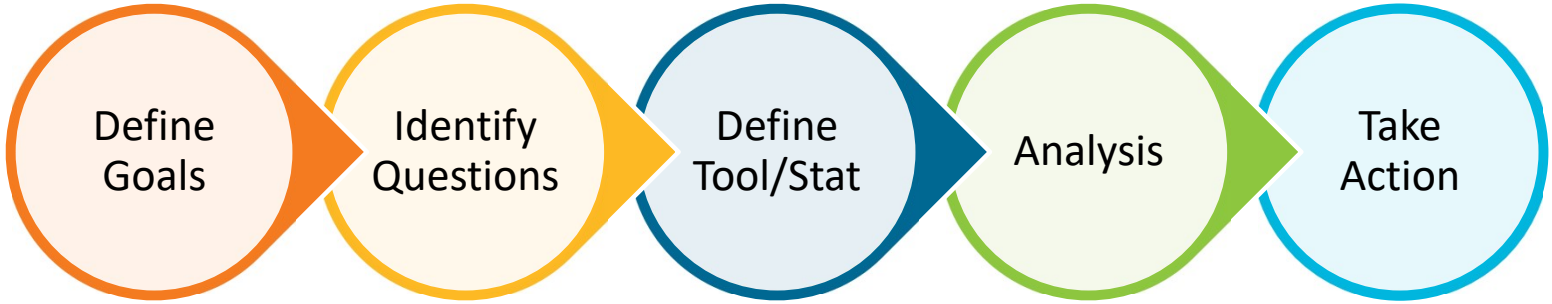
Sample : 2020-08-26-003 **Sample Type :** Personal **Date :** 26-Aug-2020 **Media :** 42569126 **Volume :** 848 L **Duration :** 424 min(s)

						Mass			Concentration		
Analyte	CAS No.	Analytical Method	LOD	Text Result	Comments	Operator	Result	UOM	Operator	Result	UOM
Benzene	71-43-2	NIOSH 1501				=	0.098	MG	=	0.115	PPM
Ethylbenzene	100-41-4	NIOSH 1501				=	1.2	MG	=	1.8	PPM
Toluene	108-88-3	NIOSH 1501				=	1.28	MG	=	1.89	PPM
Xylene	1330-20-7	NIOSH 1501				=	4.1	MG	=	5.9	PPM

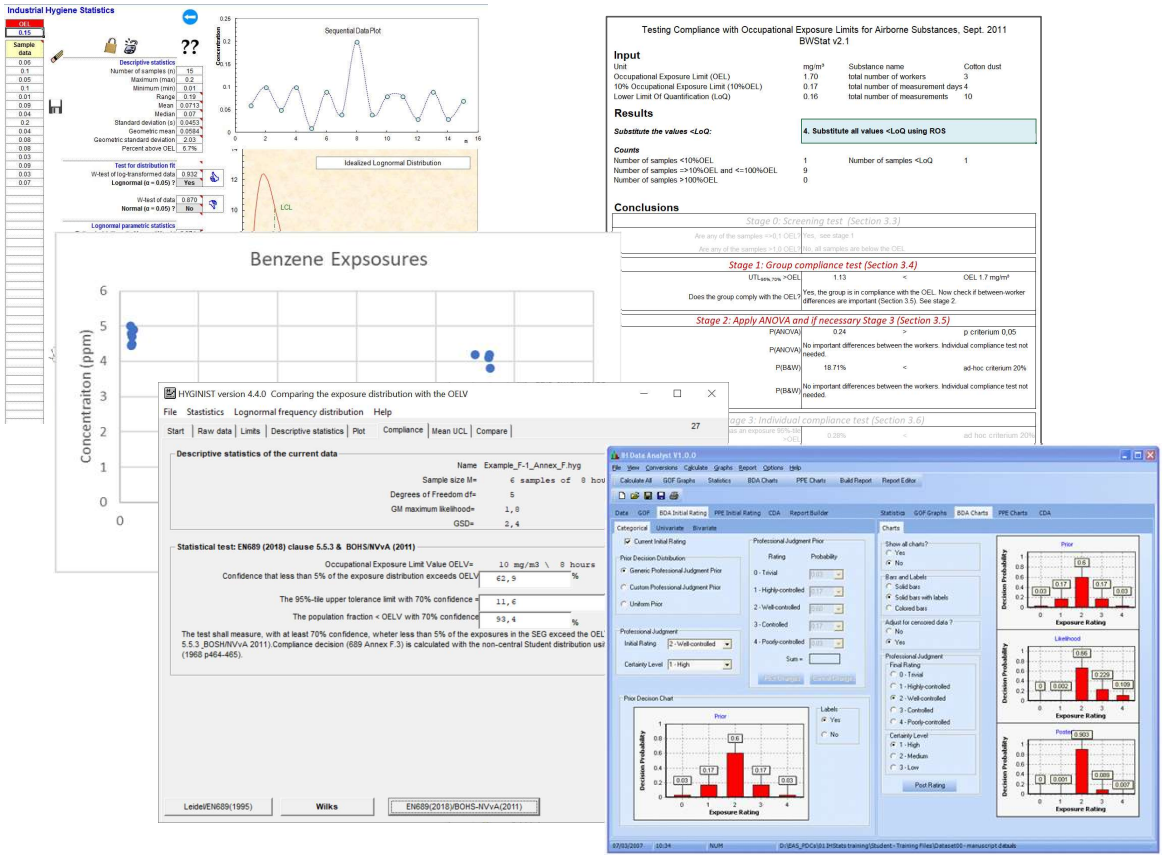
5. Data Analysis

It’s simpler than you think

Correct Process

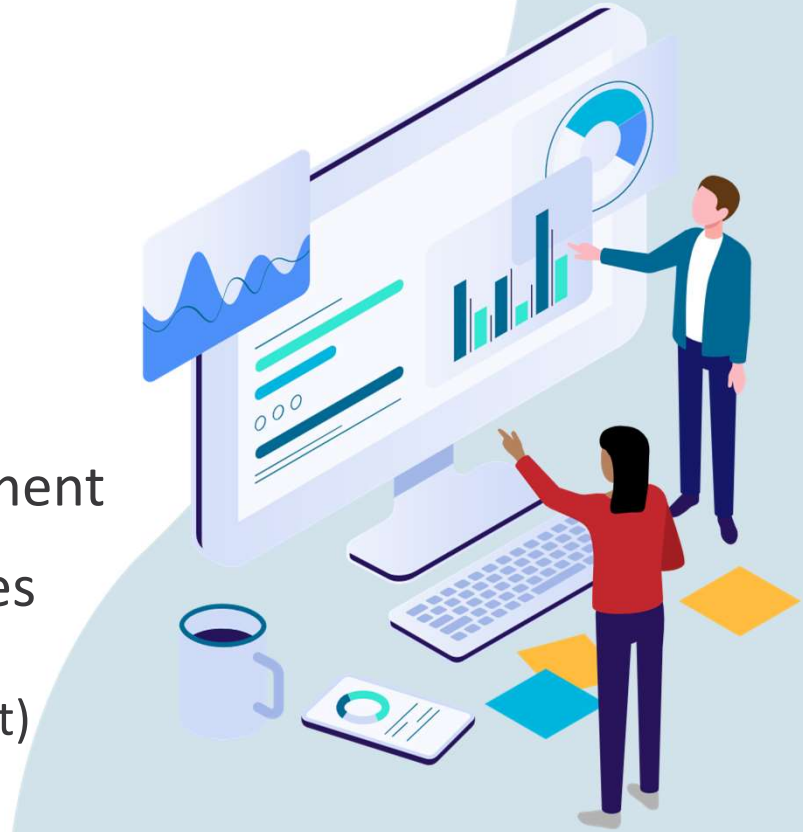


Statistics



How To Perform Data Analysis

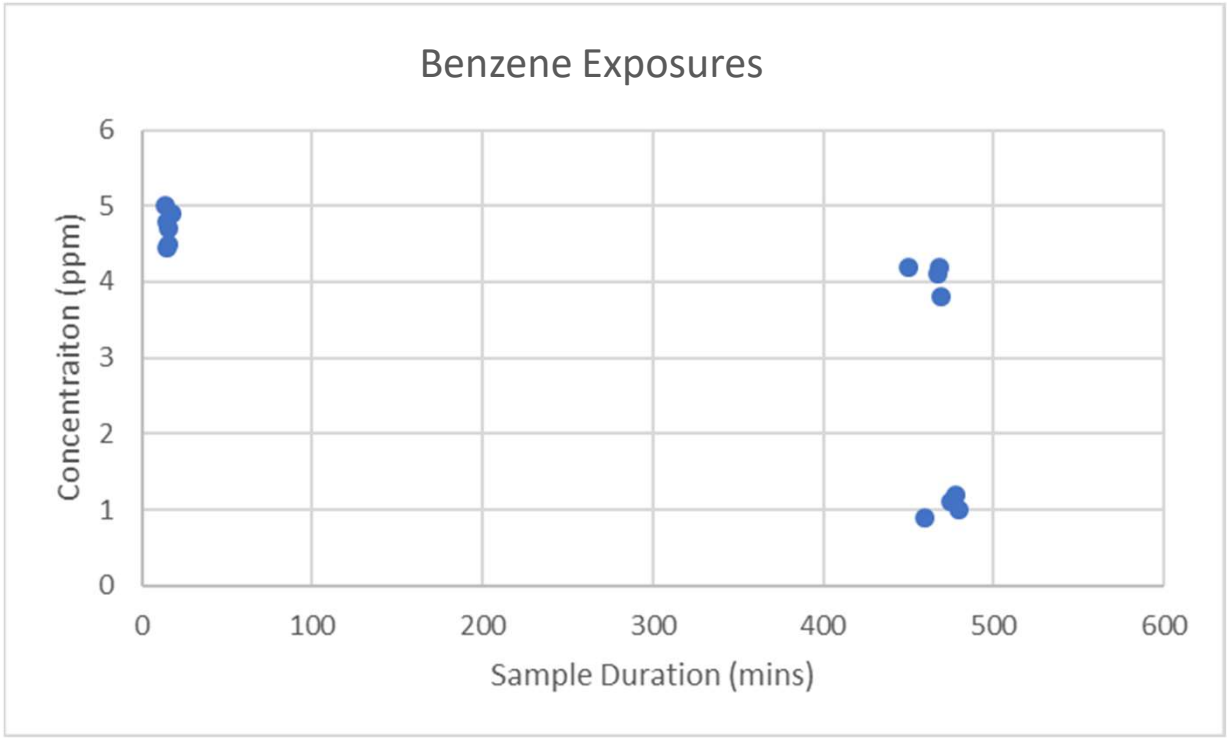
- Define your goals
  - SEG confirmation
  - Exposure rating confirmation
  - Compliance
  - Control verification
  - Identify SEGs for MSPs
- Determine best method for each assessment
- Perform analysis and document outcomes
  - Take action
  - Insufficient data (not enough, not consistent)
  - ID where additional data is needed



SEG Confirmation

Are my SEGs homogeneous/similar?

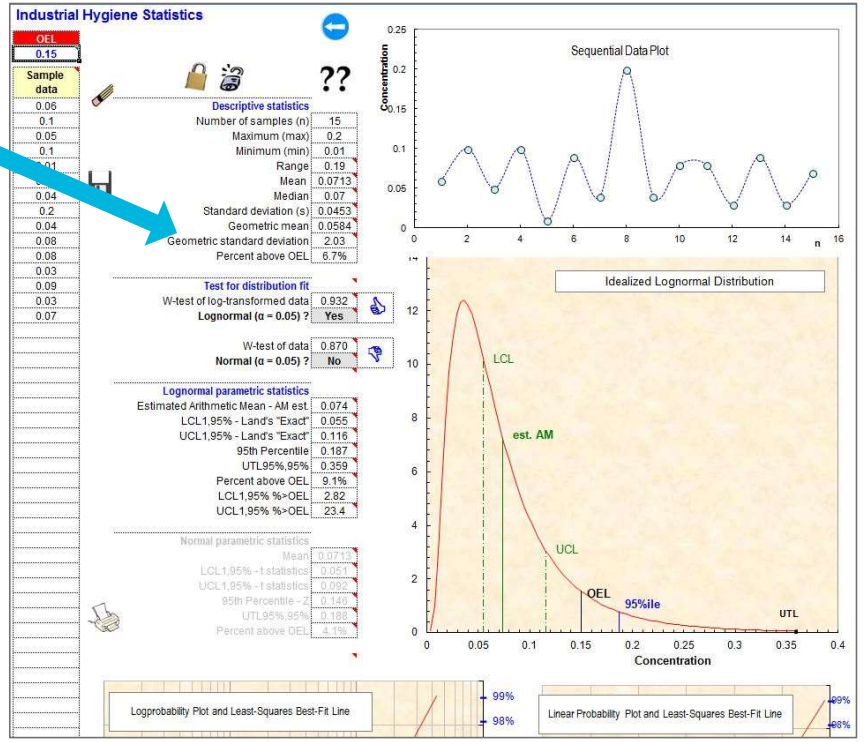
SEG Confirmation: Scatter Diagram



SEG Confirmation: Geometric Standard Deviation

- GSD < 3 is generally considered a good indicator of the SEG homogeneity
  - *A Strategy for Assessing and Managing Occupational Exposures.* 4th ed. AIHA

- IHSTAT tool is free to download



Exposure Rating

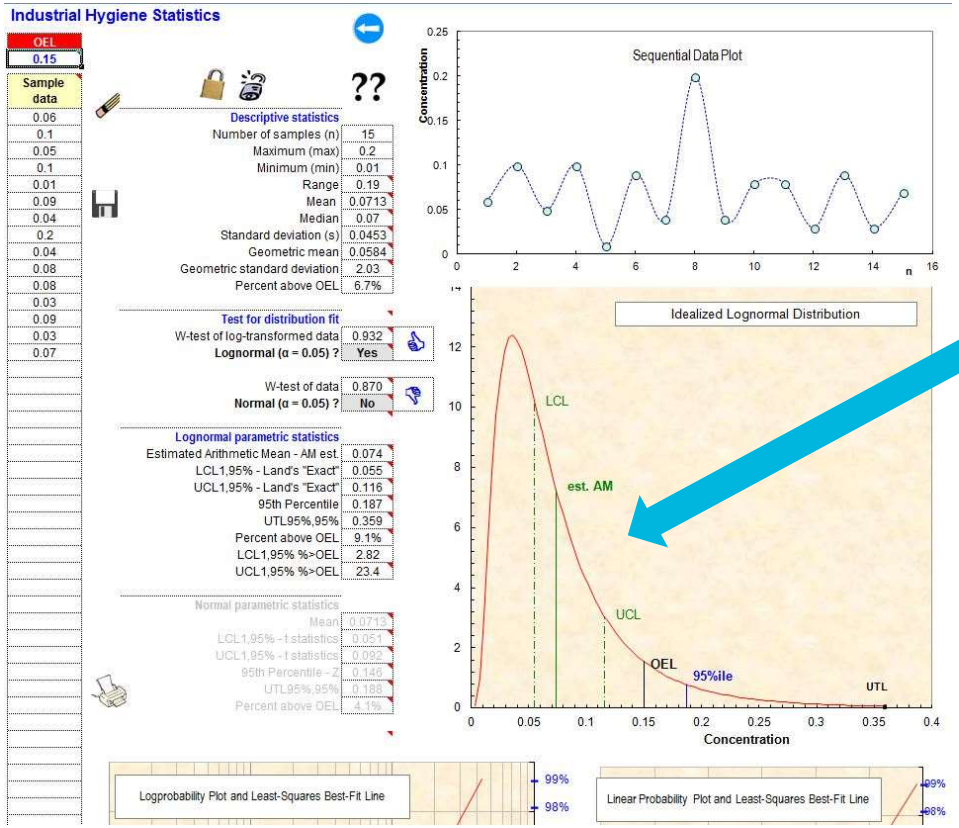
Does my QEA exposure rating correlate with my sample data?

Review: Exposure Rating

Location	Job	Task	Stressors	Exposure Rating		Health Effect Rating		Risk Rating
Alky Unit	Operator	Routine Duties	Hydrofluoric Acid	1	X	3	=	3
Alky Unit	Operator	Routine Duties	Noise	3		3		9
Coker Unit	Operator	Routine Duties	Benzene	1		3		3
Coker Unit	Operator	Routine Duties	Hydrogen Sulfide	2		2		4
Maintenance	Pipefitter	Welding	Iron	2				
Maintenance	Pipefitter	Welding	Lead	2		3		6
Maintenance	Maintenance Technician	Gasket Replacement	Asbestos	2		3		6
Reformer Unit	Operator	Routine Duties	Noise	3		3		9
Reformer Unit	Operator	Routine Duties	Benzene	2		3		6
Reformer Unit	Operator	Liquid Sampling	Benzene	4		3		12
Tank Farm	Operator	Gauging	Benzene	3		3		9

Exposure Rating
1: < 10% of the OEL
2: Between 10% and 50% of the OEL
3: Between 50% and 100% of the OEL
4: > 100% of the OEL

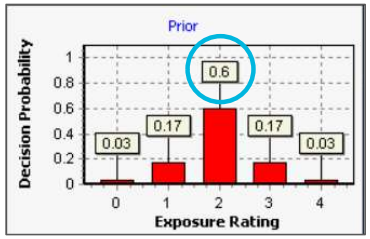
Geometric Mean

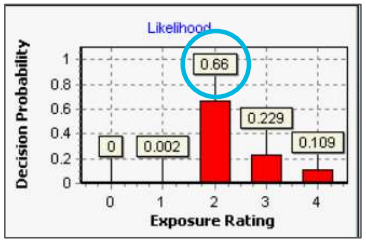


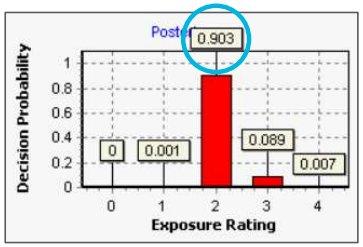
1: < 10% <u>of Geometric Mean</u>
2: >10%, but <50%
3: >50, but <100%
4: >100%

Bayesian Statistical Analysis

- Descriptive statistics
- Compliance statistics
- Bayesian statistics
- Goal: Less samples to have certainty







EXPOSTATS BAYESIAN CALCULATOR

STATISTICAL TOOLS FOR THE INTERPRETATION OF INDUSTRIAL HYGIENE DATA

EASi Exposure Assessment Solutions, Inc.

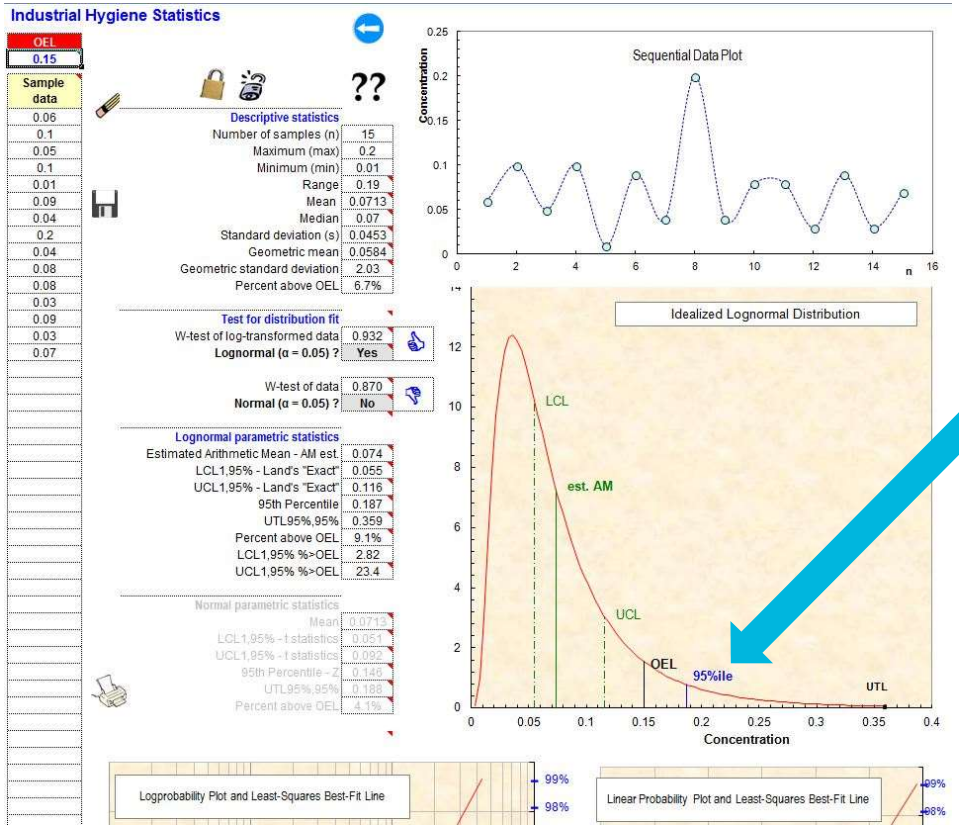
90% confidence that the “true” exposure rating is a 2

VelocityEHS®

Exposure Compliance

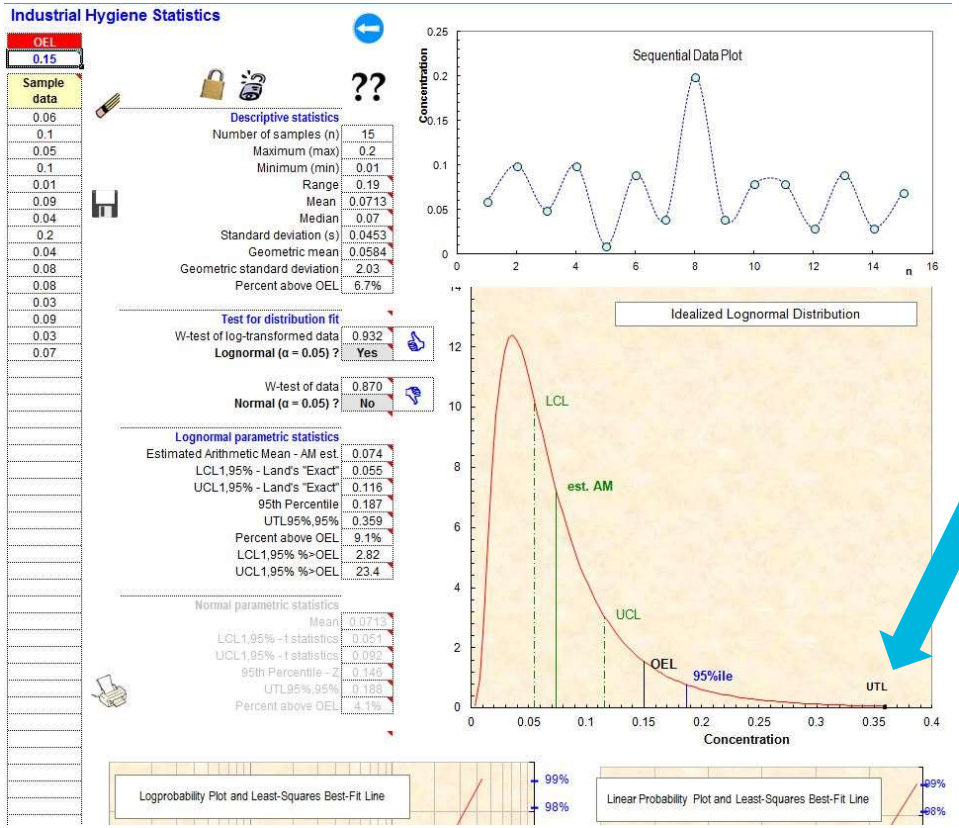
Are we in compliance with the OELs?

95th Percentile



1: < 10% <u>of 95th Percentile</u>
2: >10%, but <50%
3: >50, but <100%
4: >100%

95% / 95% UTL



1: < 10% <u>of 95/95 UTL</u>
2: >10%, but <50%
3: >50, but <100%
4: >100%

6. Medical Surveillance

Who needs what test, when - with precision

6. Medical Surveillance

Hearing Conservation Program

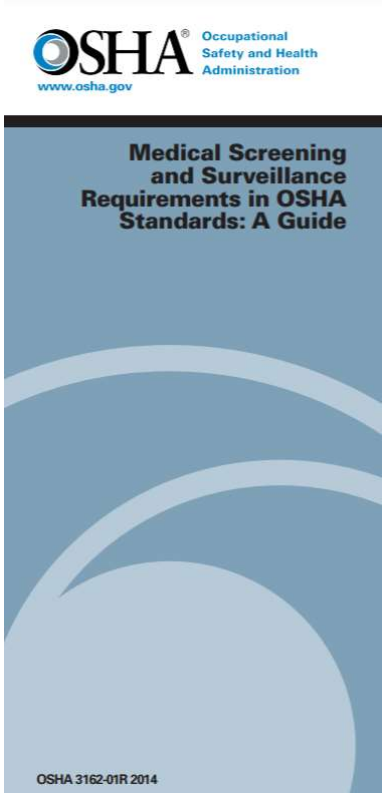
Department: Maintenance
Job: Maintenance Tech

Department: Reformer Unit
Job: Operator

Department Coker Unit
Job: Operator

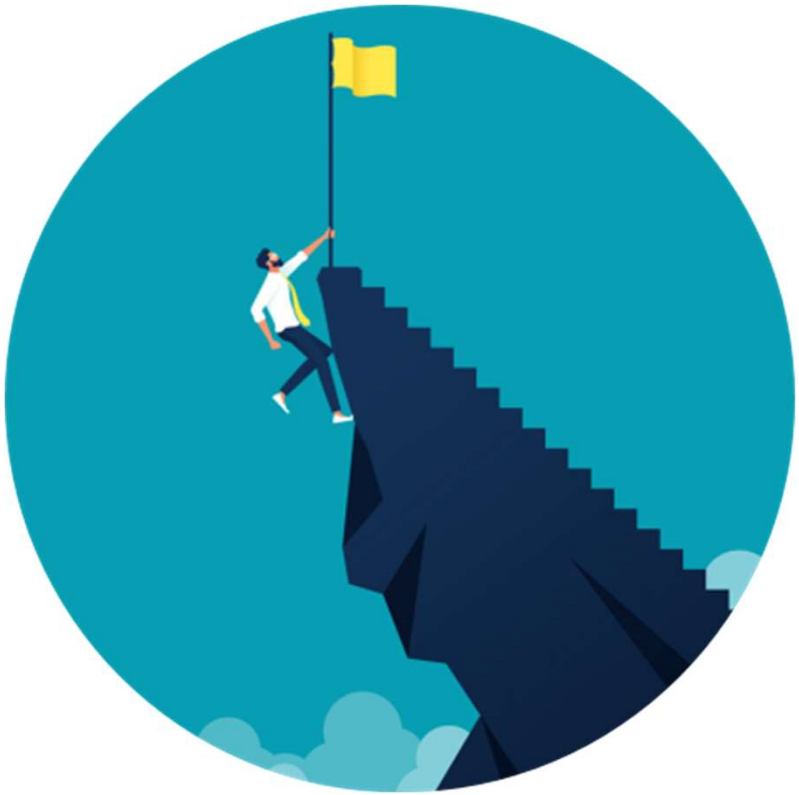
How To Establish Medical Surveillance Programs

- Define applicable MSPs for your workplace
  - Medical activities and their frequencies
- Define thresholds
  - Noise exposures exceeding 85dBA
- Define SEGs that exceed thresholds
- Biggest challenge is keeping list of personnel in each program up to date



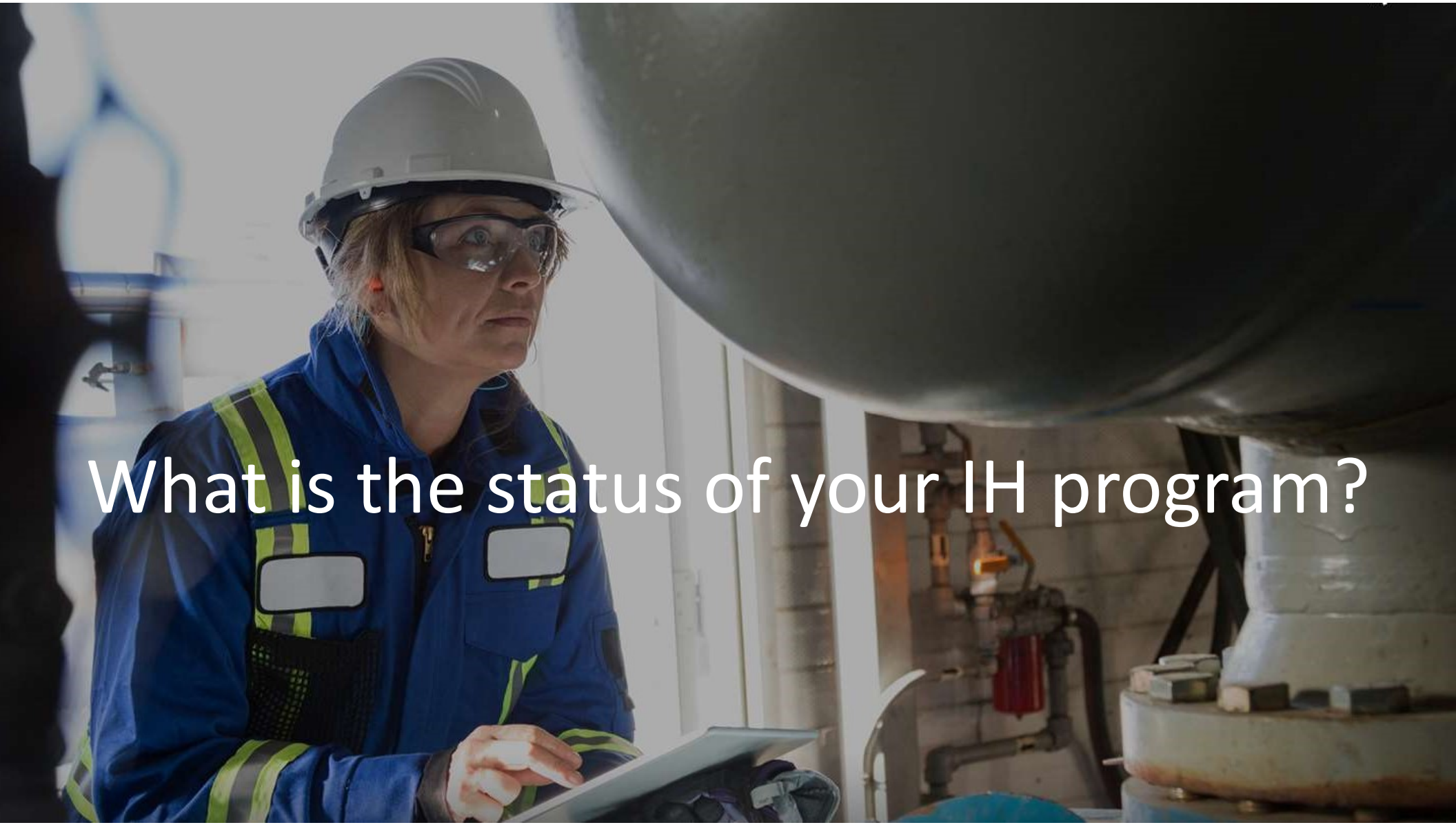
Compliance Without Over Testing

- Compliance with regulations
- Reduces cost from over testing
- Reduces liability from over testing

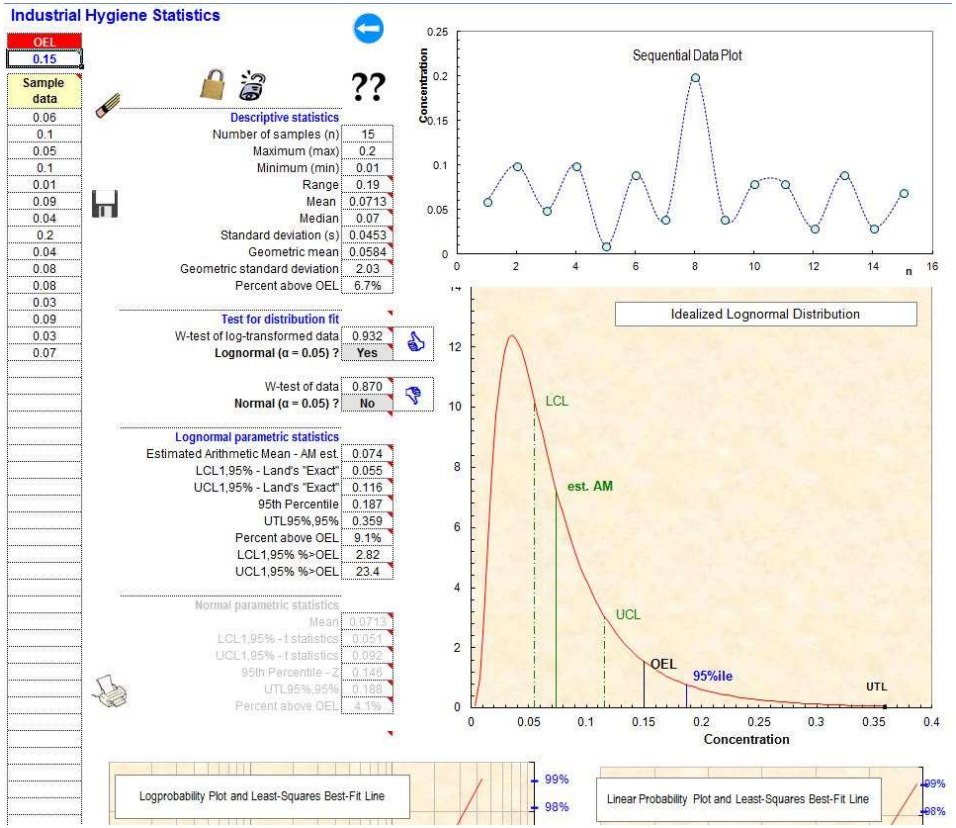


7. Evaluating & Communicating Performance

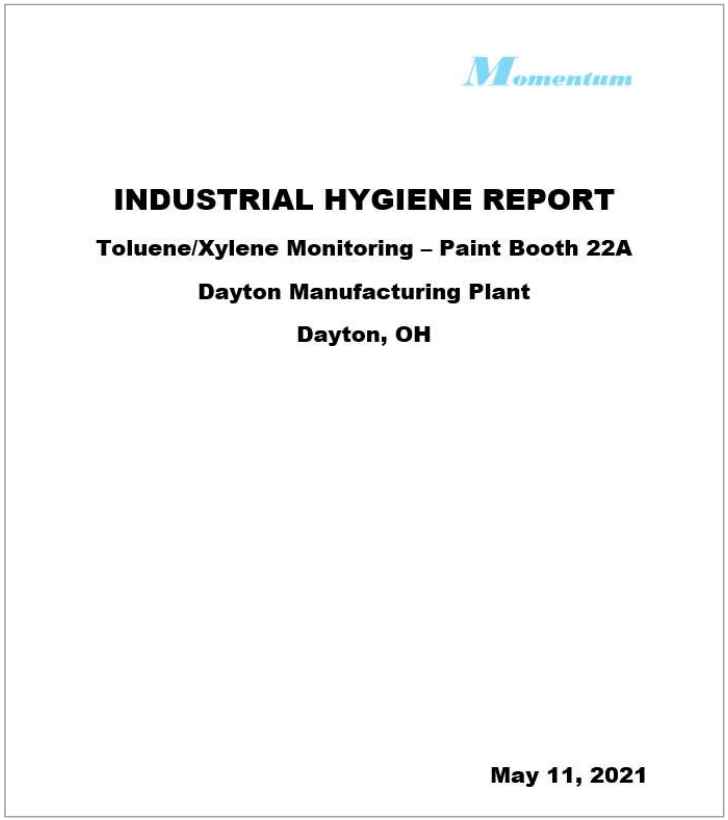
Let’s get out of our black boxes!


What is the status of your IH program?

Analysis VS Communication



Documentation VS Communication



Momentum

INDUSTRIAL HYGIENE REPORT

Toluene/Xylene Monitoring – Paint Booth 22A

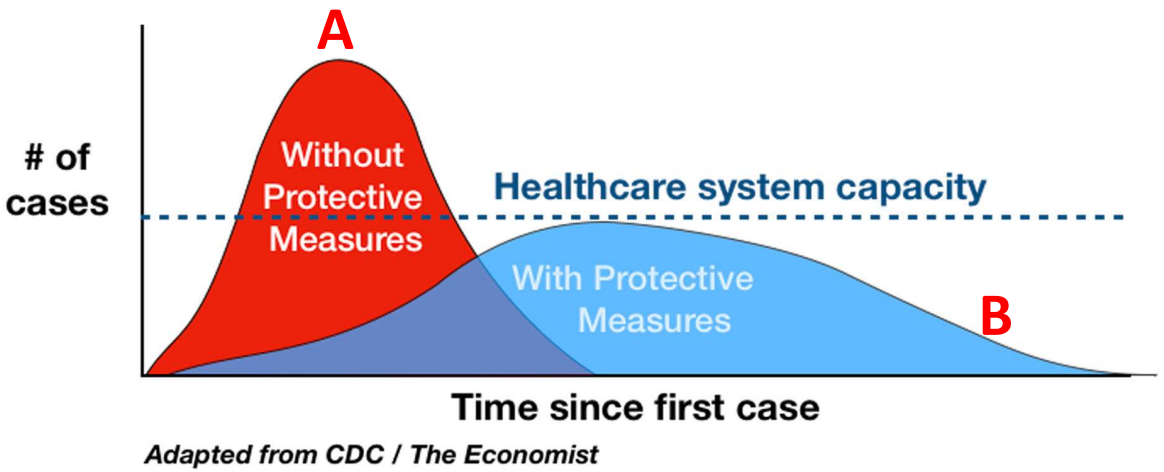
Dayton Manufacturing Plant

Dayton, OH

May 11, 2021

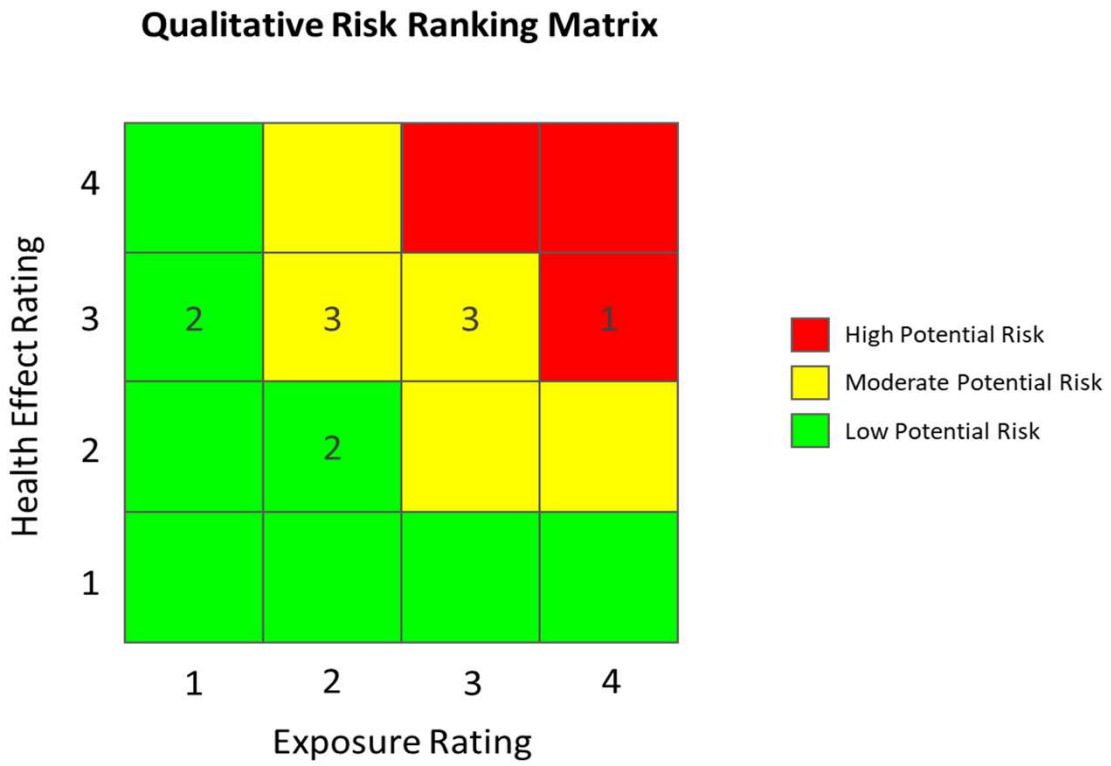
Date	Sample Number	Department	Job	Task	Sample Type	Stressor	TWA
26-Aug-2020	2020-08-26-004	Hydrocracker	Operator	Routine Duties	Personal	Benzene	0.13 PPM
						Ethylbenzene	1.88 PPM
						Toluene	5.4 PPM
						Xylene	10.2 PPM
26-Aug-2020	2020-08-26-002	Hydrocracker	Operator	Routine Duties	Personal	Benzene	0.102 PPM
						Ethylbenzene	1.25 PPM
						Xylene	4.9 PPM
26-Aug-2020	2020-08-26-003	Hydrocracker	Operator	Routine Duties	Personal	Benzene	0.115 PPM
						Ethylbenzene	1.8 PPM
						Toluene	1.89 PPM
						Xylene	5.9 PPM
26-Aug-2020	2020-08-26-001	Hydrocracker	Operator	Routine Duties	Personal	Benzene	3.15 PPM
						Ethylbenzene	0.7 PPM
						Toluene	1.28 PPM
						Xylene	3.27 PPM

Simplify The Message!

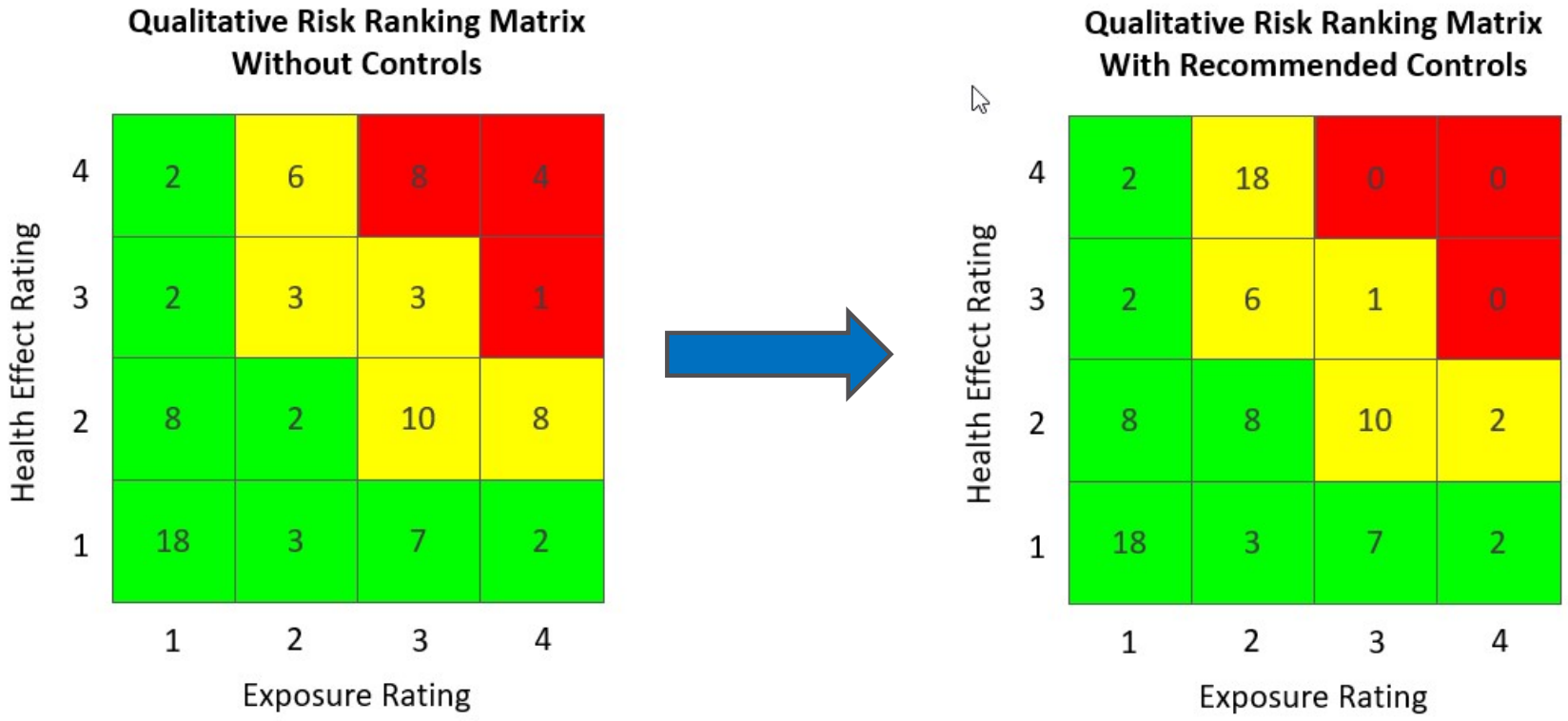


Adapted from CDC / The Economist

One Method To Show Status



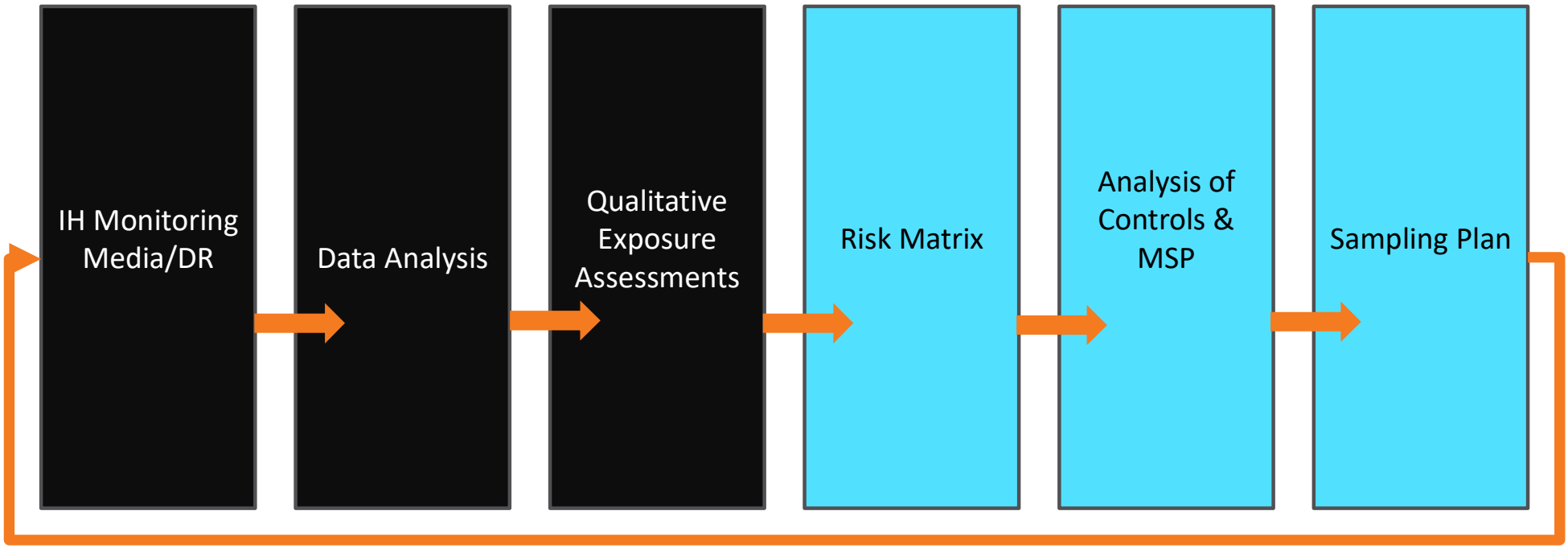
Communicating Benefits of Controls



Recommending New Controls

- Present options
- Data for each option
  - Price
  - ROI
  - Breakeven
  - Level of effectiveness
  - Impact on production, quality, etc.

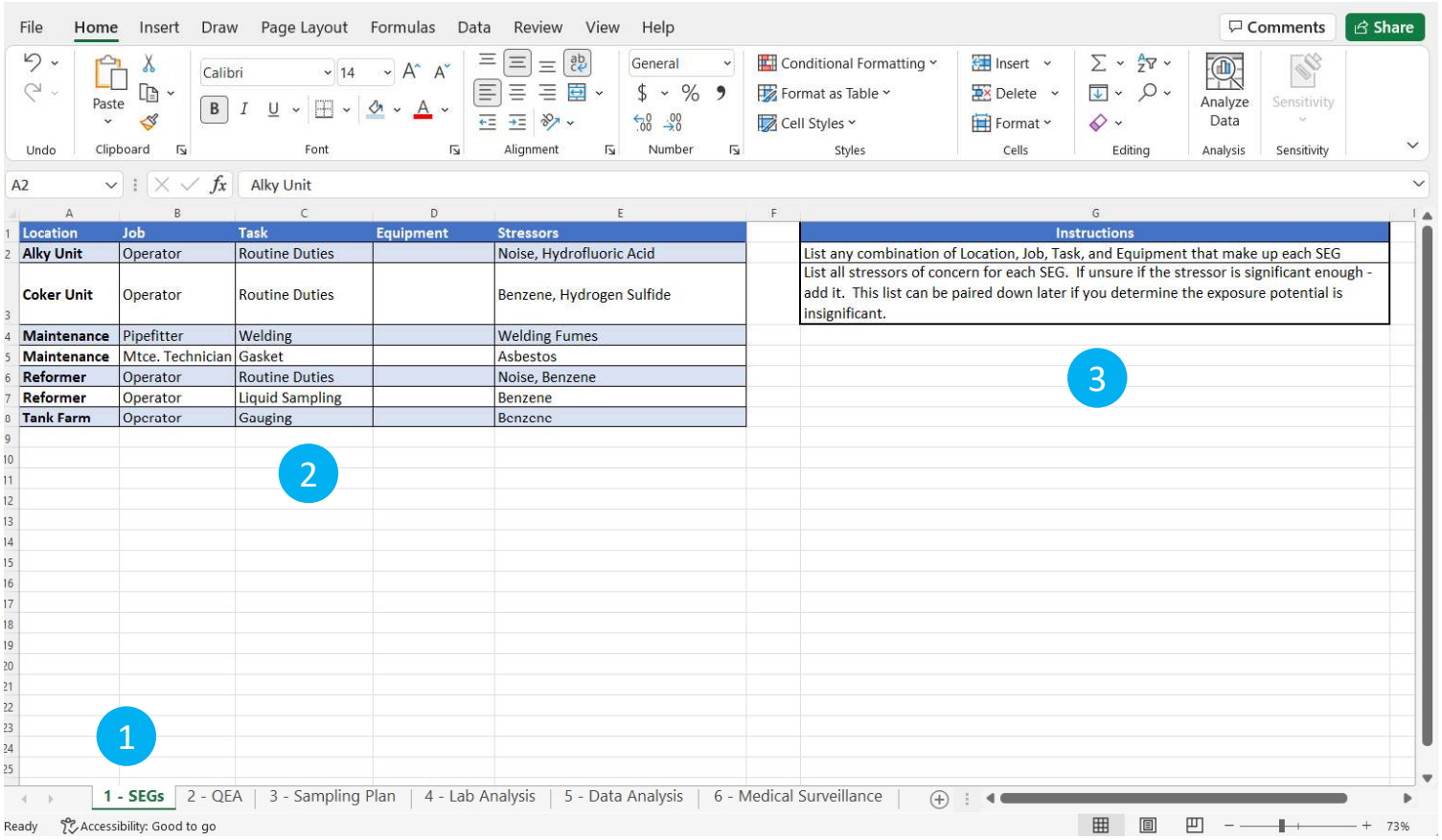
Blackbox & Communication Tools



Summary

- Move from a compliance to a risk-based mindset
- Standardize your SEGs & QEA methodology
- Sample with a purpose
- Engage and “partner” with your laboratory
- Educate & engage for a two-way communication
- Simplify the message
- Be viewed as a contributor to the business or you won’t be…

Data Collection Forms



Location	Job	Task	Equipment	Stressors
Alky Unit	Operator	Routine Duties		Noise, Hydrofluoric Acid
Coker Unit	Operator	Routine Duties		Benzene, Hydrogen Sulfide
Maintenance	Pipefitter	Welding		Welding Fumes
Maintenance	Mtce. Technician	Gasket		Asbestos
Reformer	Operator	Routine Duties		Noise, Benzene
Reformer	Operator	Liquid Sampling		Benzene
Tank Farm	Operator	Gauging		Benzene

Instructions
List any combination of Location, Job, Task, and Equipment that make up each SEG
List all stressors of concern for each SEG. If unsure if the stressor is significant enough - add it. This list can be paired down later if you determine the exposure potential is insignificant.

Thanks for attending!

Scan this QR code to learn more about VelocityEHS or for the session materials.

Follow VelocityEHS on LinkedIn: www.linkedin.com/company/velocityehs

Questions?

drisi@EHS.com