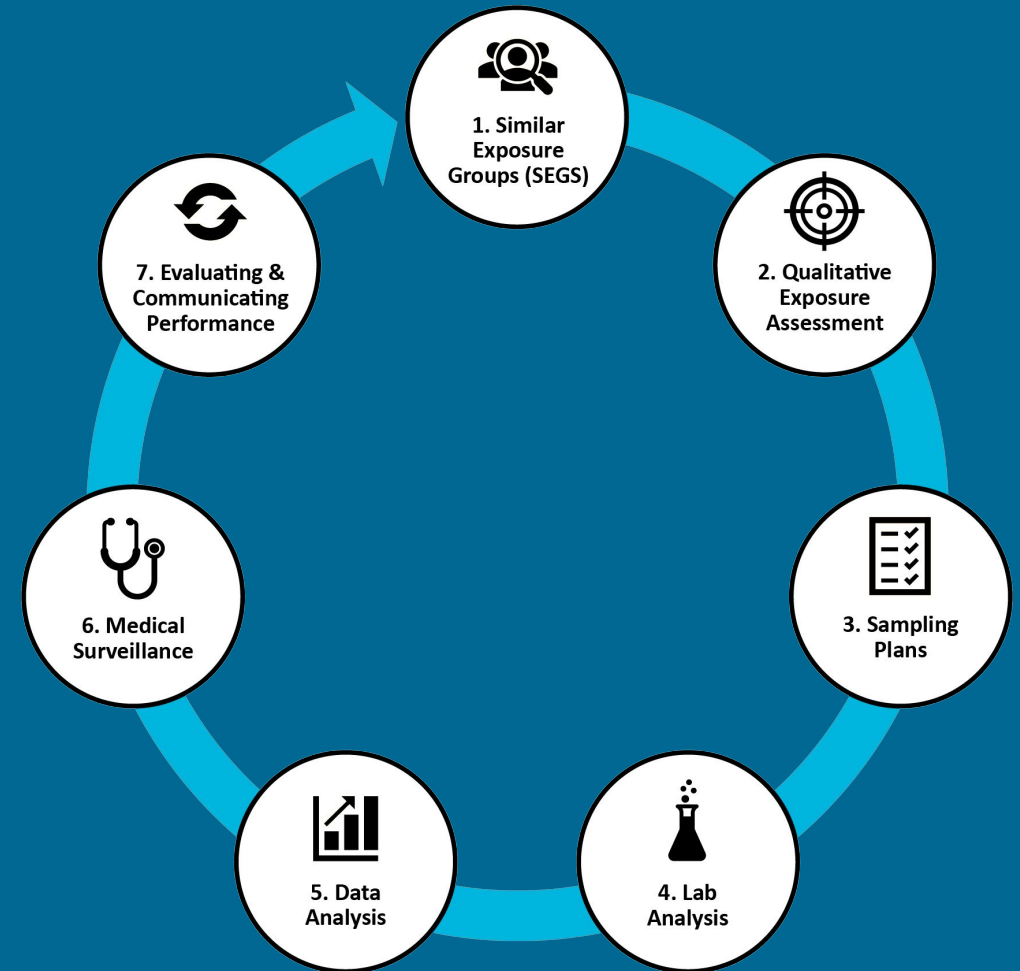


7 Steps to Improve Your Industrial Hygiene Program

Presented by: Dave Risi, CIH, CSP



Dave Risi, CIH, CSP

- 30+ years in EHS (20+ in EHS software)
- Principal Solution Strategist for VelocityEHS' Industrial Hygiene software solution
- Current member of the AIHA Technology Initiative Specialty Interest Group and ASSPs IH Practice Specialty



Contact Dave:
drisi@ehs.com



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



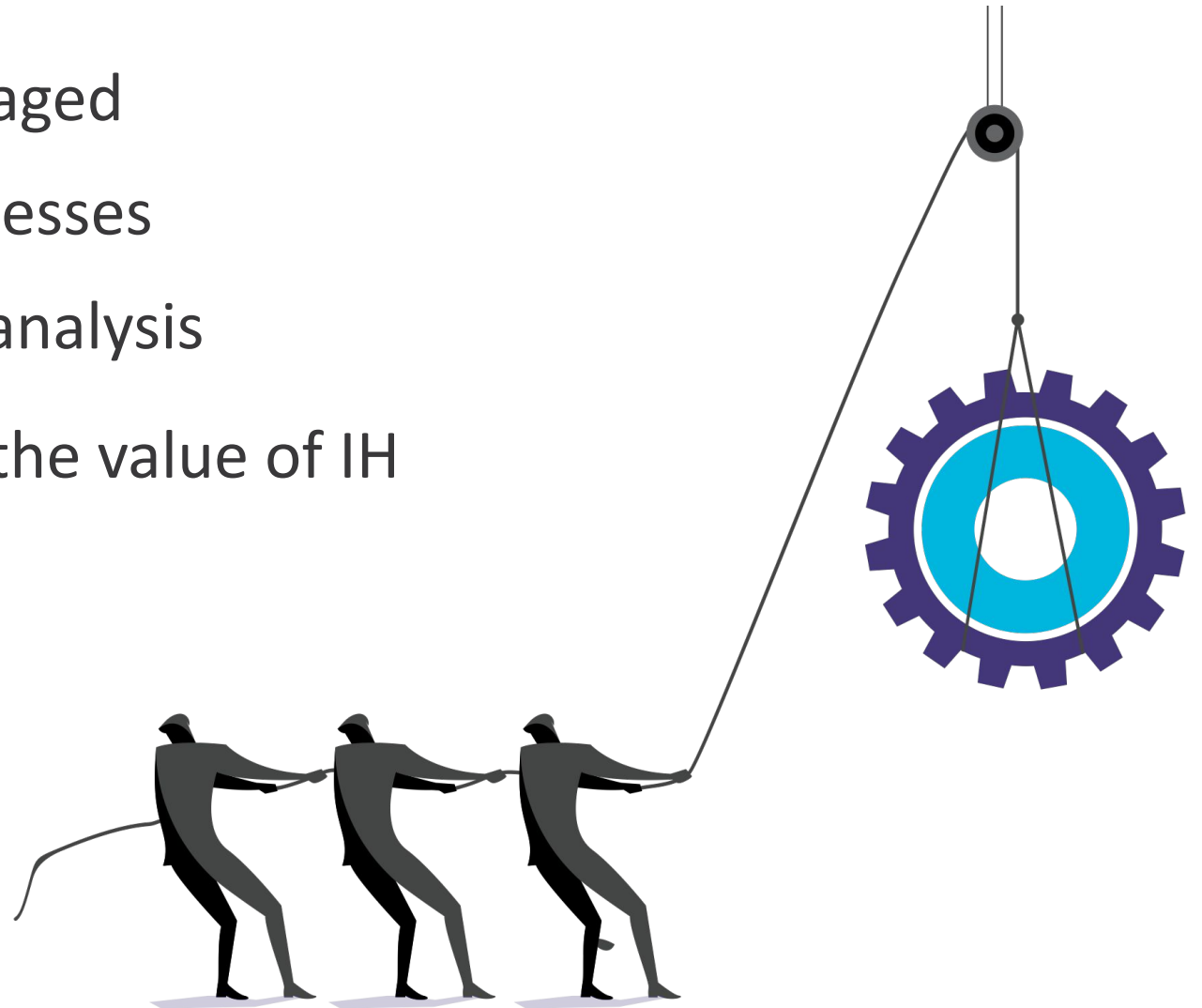
Current Trends in the IH Profession

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

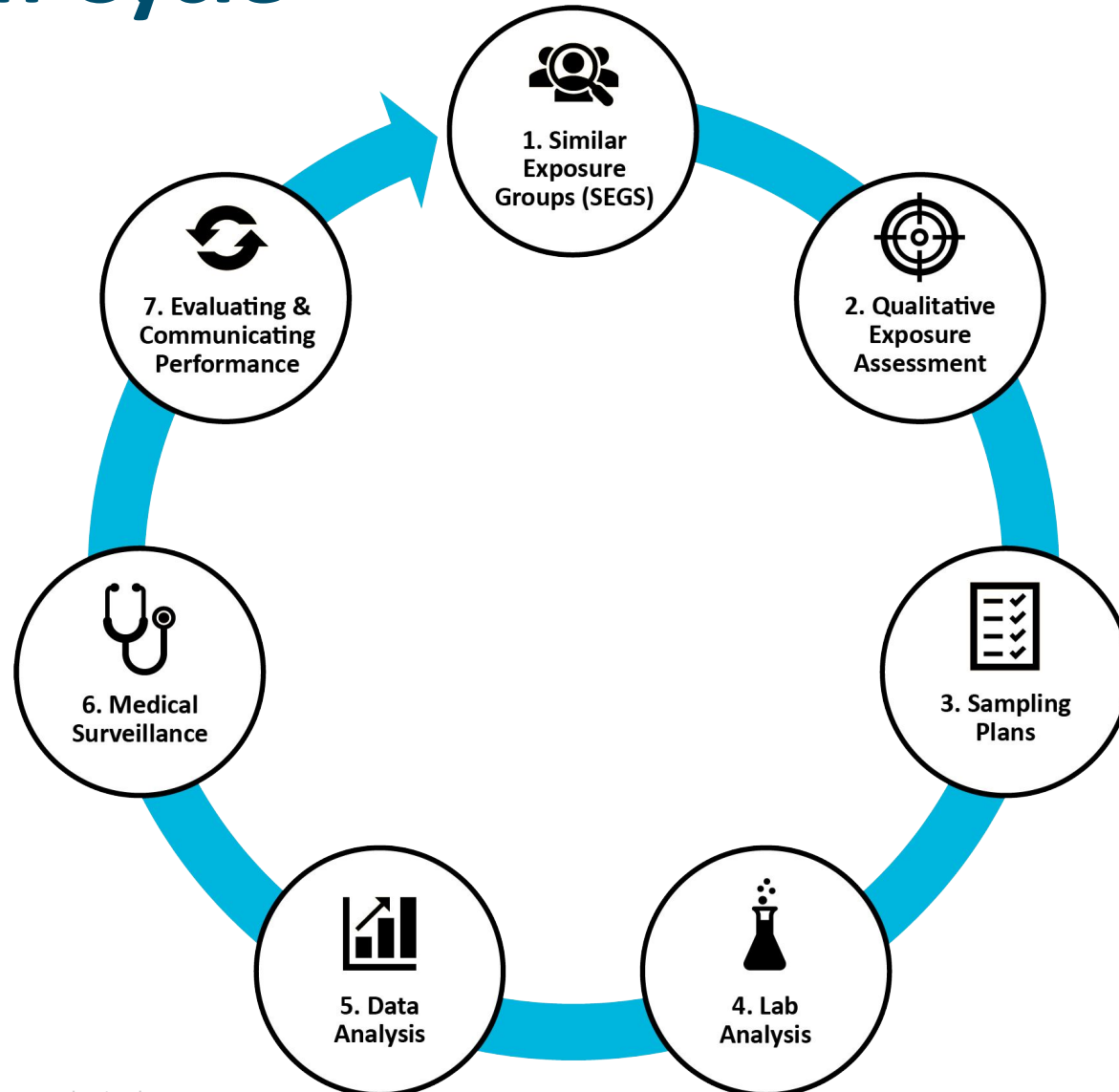


Opportunities

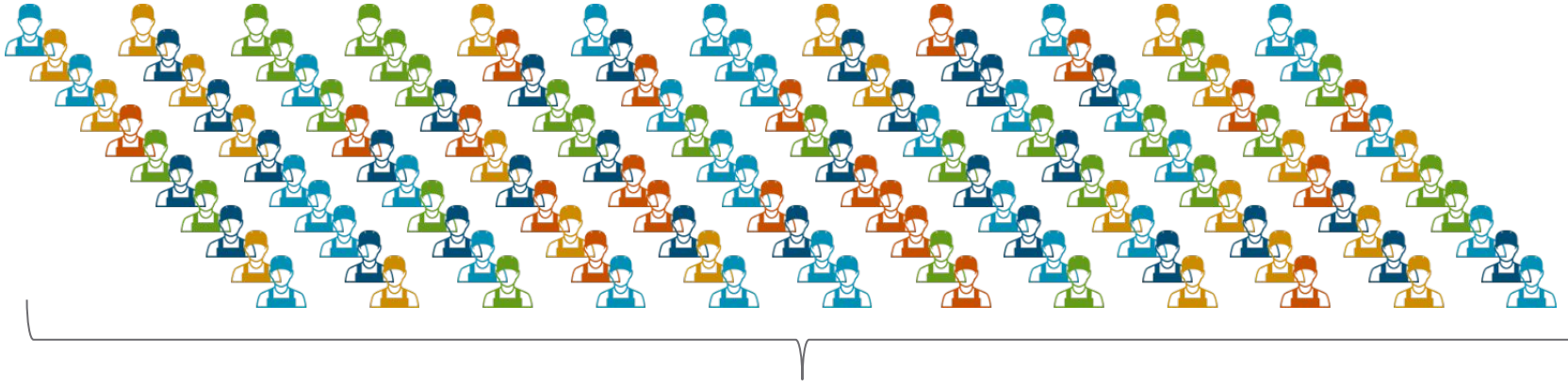
- Rethink how IH programs are managed
- Incorporate IH into risk-based processes
- Reduce dependency on sampling/analysis
- Improve communications & show the value of IH



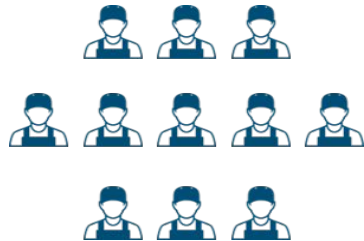
The IH Program Cycle



1. Similar Exposure Groups (SEGs)



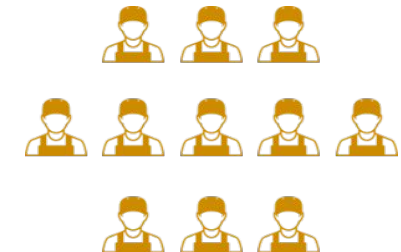
Department: Maintenance
Job: Maintenance Tech



Department: Reformer Unit
Job: Operator



Department: Coker Unit
Job: Operator



How To Develop Your SEGs

- Observe the workers at your site
- 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
- What stressors are workers potentially exposed to routinely or while performing tasks?
 - Noise, benzene, asbestos, lead



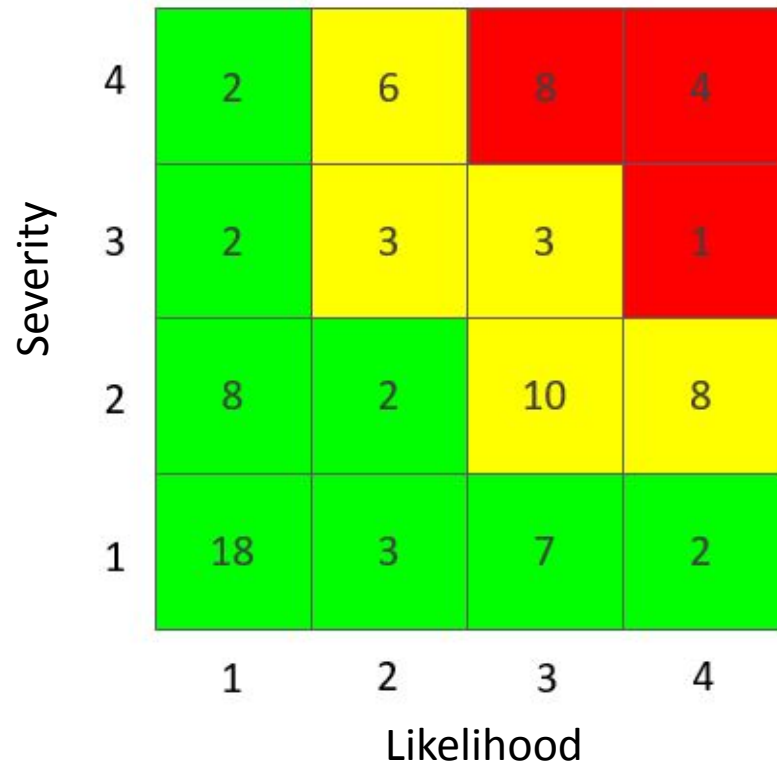
Deliverable

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

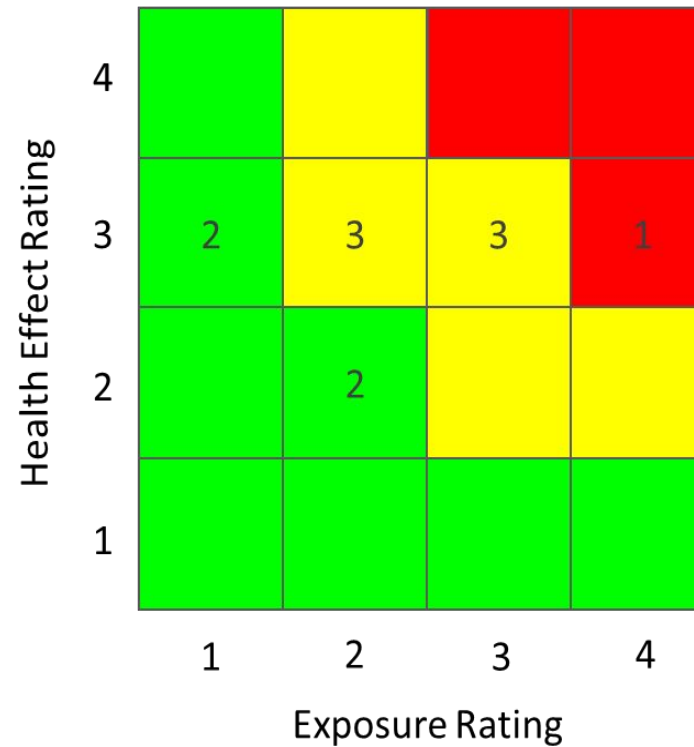


2. Qualitative Exposure Assessments

Safety Risk Matrix



Qualitative Risk Ranking Matrix



- High Potential Risk
- Moderate Potential Risk
- Low Potential Risk



Exposure Rating

- No data: Professional judgement of “typical” exposure risk
- Available data: Which statistic?
 - Normal VS lognormal distribution?
 - AM & SD - VS - GM & GSD
 - 95th Percentile
 - 95%/95% Point Estimate
 - %>OEL
- Decide & document

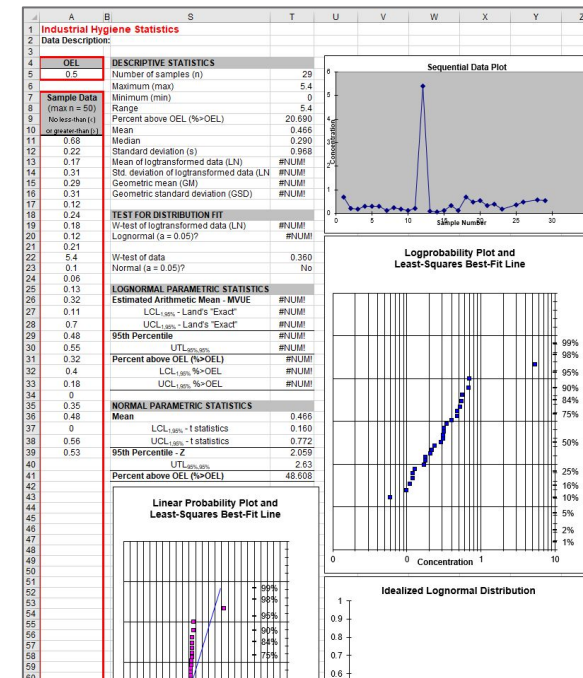
Exposure Rating

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



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: Reversible health effects of concern
2: Severe, reversible health effects of concern
3: Irreversible health effects of concern
4: Life-threatening or disabling injury or illness



How to Perform QEAs

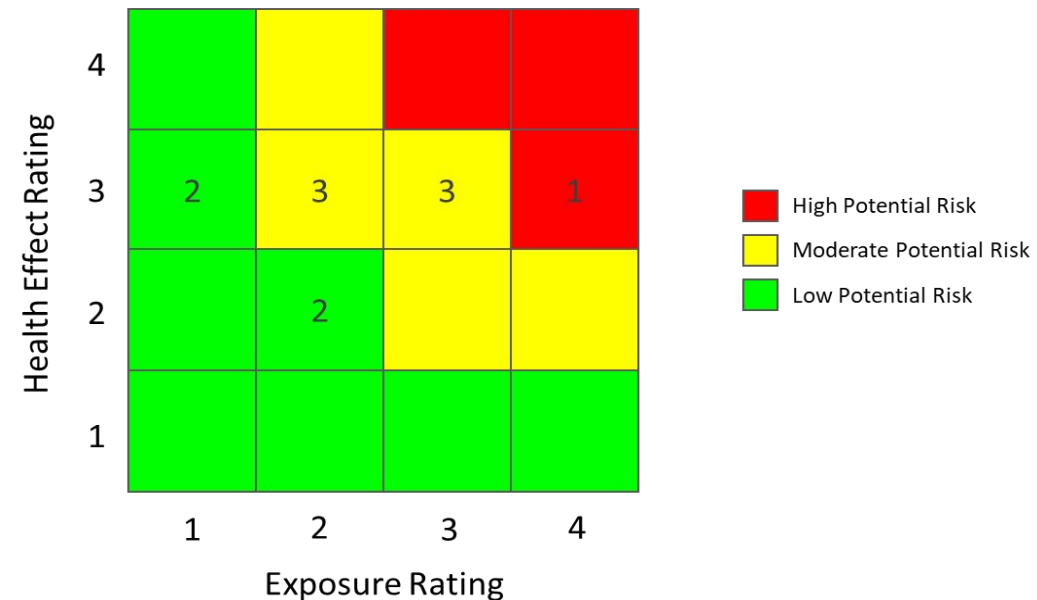
Location	Job	Task	Stressors	Exposure Rating	Health Effect Rating	Risk Rating
Alky Unit	Operator	Routine Work Duties	Hydrofluoric Acid	1	3	3
Alky Unit	Operator	Routine Work Duties	Noise	3	3	9
Coker Unit	Operator	Routine Work Duties	Benzene	1	3	3
Coker Unit	Operator	Routine Work Duties	Hydrogen Sulfide	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

Qualitative Risk Ranking Matrix



3. Sampling Plans

- How do you decide what to sample?
 - Regulation required
 - Reactive
 - Repeat last year's plan
- Data you collect should have direct impact on your IH program
- Where do I need more data to know where 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

Uncertainty Ratings

0 = Certain

1 = Uncertain

2 – Highly Uncertain



Deliverable

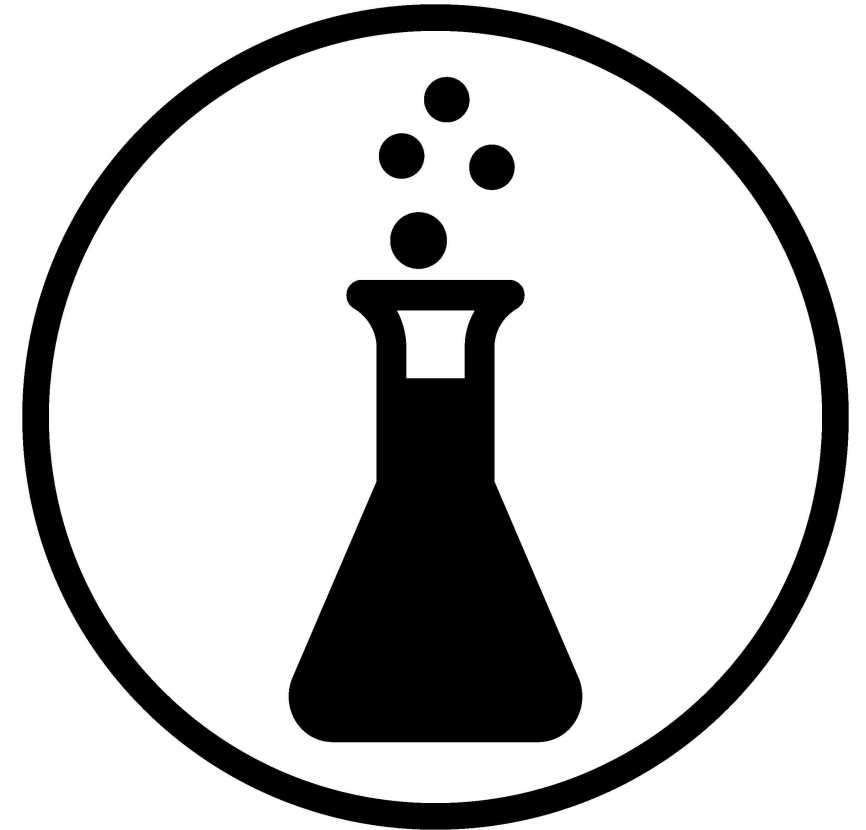
Location	Job	Task	Stressors	# Sampled Planned	Scheduled Completion Date	# Samples Taken	% Complete
Tank Farm	Operator	Gauging	Benzene	8	7/1/2021	2	25%
Coker Unit	Operator	Routine Work Duties	Hydrogen Sulfide	4	12/31/2021	2	50%
Maintenance	Pipefitter	Welding	Lead	4	12/31/2021	1	25%
Maintenance	Pipefitter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



4. Lab Analysis

- 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



Deliverable

SGS GALSON | SAMPLING & ANALYSIS | EQUIPMENT RENTALS | RESOURCE CENTER | CONTACT | IH LIVE CHAT

SAMPLING & ANALYSIS

Samplings & Analysis

- Overview
- Policies & QA Reference
- Samplings & Analysis Guide
- Classic SAG View
- SAG Updates History
- COVID-19 Recovery Assistance
 - veriDART™ by SafeTraces
 - Mobile Laboratory For SARS-CoV-2
- FreeSamplingBadges
- FreePumpLoan
- Chain Of Custody
- Gas Detector Tubes
- SmartSense™

Analytes	Method	Quantity	Estimate
BTEX [2]			
FEE PER SAMPLE: \$95	METHOD: mod_NIOSH 1501: GC/FID	ANALYTICAL TECHNIQUE: GC/FID	COLLECTION MEDIUM: Charcoal
ORDER NUMBER: 226-01/ 226-09	VOL. / TIME / AREA / MASS: 2-30 L	SAMPLING RATE: 0.2 LPM	View Substance>
BTEX [2]			
FEE PER SAMPLE: \$95	METHOD: mod_NIOSH 1501: GC/FID BADGE	ANALYTICAL TECHNIQUE: GC/FID	COLLECTION MEDIUM: PM
ORDER NUMBER: N525/ N566	VOL. / TIME / AREA / MASS: 15 min. - 12 hrs.	SAMPLING RATE: --	View Substance>

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

Survey

DETAIL | Filter | Add New | Save

Show Survey Samples | Survey Detail Report

Description of Survey: 2020-08-26-BTEX Study Hydrocracker

Survey Conducted By: Dave Risi

Start Date: 26-Aug-2020

End Date: [Calendar Icon]

Status of Survey: Open

Laboratory: SGS Galson

Reference Number: [Empty]

Default Work Shift Duration: Full Shift - 8 Hour

P.O. Number: [Empty]

Lab Profile: BTEX - Charcoal

Stressors: Benzene - CAS#:71-43-2, Ethyl benzene - CAS#:100-41-4, Toluene - CAS#:108-88-3, Xylene - CAS#:1330-20-7

Lab Stressors: [Empty]

Stressor-Direct Reading: [Empty]

Comments: [Text Area]

Stressor	Category	CAS#	Method	Analytical Technique	Collection Medium	Order Number	Media Shelf Life	Vol.Time/Area/Mass	Sampling Rate	LOQ
Benzene	Lab Profile	71-43-2	NIOSH 1501	GC/FID	Charcoal		5 yrs.	2-30 L	0.2 LPM	2 ug
Xylene	Lab Profile	1330-20-7	NIOSH 1501	GC/FID	Charcoal		5 yrs.	2-30 L	0.2 LPM	15 ug
Toluene	Lab Profile	108-88-3	NIOSH 1501	GC/FID	Charcoal		5 yrs.	2-30 L	0.2 LPM	5 ug
Ethylbenzene	Lab Profile	100-41-4	NIOSH 1501	GC/FID	Charcoal		5 yrs.	2-30 L	0.2 LPM	5 ug



Deliverable

U.S. NUCLEAR REGULATORY COMMISSION
REQUEST FOR ANALYSIS AND CHAIN OF CUSTODY
LABORATORY USE ONLY

Basinford Nuclear Generating Station

11
10 H₂O Samples
1 H₂O Sample 1st/IL

Gene Bonardo

12/2/05
12/7/05
12/7/05

12005-010

649



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

Lab Submissions

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)

Analyte	CAS No.	Analytical Method	LOD	Text Result	Comments	Mass			Concentration		
						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)

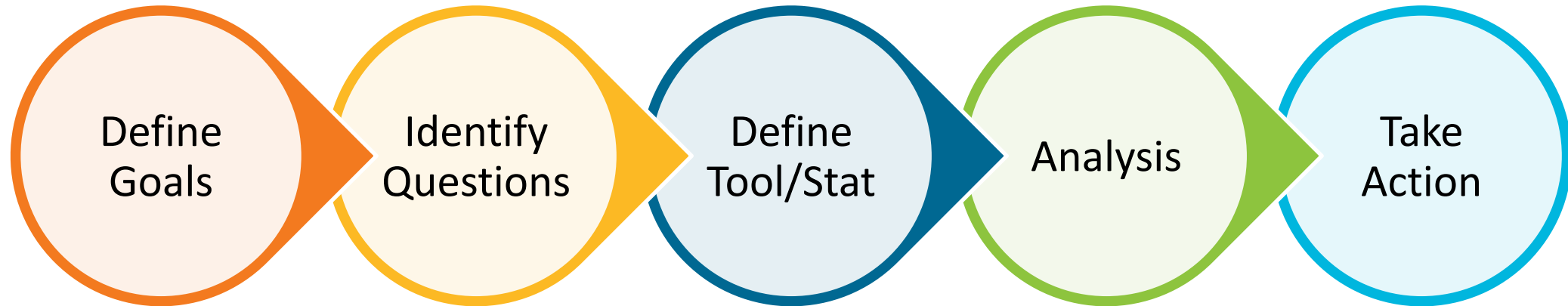
Analyte	CAS No.	Analytical Method	LOD	Text Result	Comments	Mass			Concentration		
						Operator	Result	UOM	Operator	Result	UOM
Benzene	71-43-2	NIOSH 1501				=	0.081	MG	=	0.102	PPM
Ethylbenzene	100-41-4	NIOSH 1501				=	0.95	MG	=	1.25	PPM
Toluene	108-88-3	NIOSH 1501				=	2.1	MG	=	4.5	PPM
Xylene	1330-20-7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

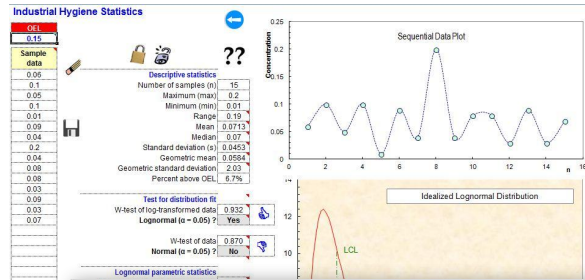
Analyte	CAS No.	Analytical Method	LOD	Text Result	Comments	Mass			Concentration		
						Operator	Result	UOM	Operator	Result	UOM
Benzene	71-43-2	NIOSH 1501				=	0.098	MG	=	0.115	PPM
Ethylbenzene	100-41-4	NIOSH 1501				=	1.2	MG	=	1.8	PPM
Toluene	108-88-3	NIOSH 1501				=	1.28	MG	=	1.89	PPM
Xylene	1330-20-7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



Step 5: Data Analysis



Statistics



HYGINIST version 4.4.0 Comparing the exposure distribution with the OEL

File Statistics Lognormal frequency distribution Help

Start | Raw data | Limits | Descriptive statistics | Plot | Compliance | Mean UCL | Compare

27

Descriptive statistics of the current data

Name	Example_F-1_Annex_F_hyg
Sample size M=	6 samples of 8 hours
Degrees of Freedom df=	5
GM maximum likelihood=	1, 0
GSD=	2, 4

Statistical test: EN689 (2018) clause 5.5.3 & BOHS/NVvA (2011)

Occupational Exposure Limit Value OELV = 10 mg/m³ 8 hours

Confidence that less than 5% of the exposure distribution exceeds OELV = 2, 9 %

The 95%-ile upper tolerance limit with 70% confidence = 11, 6

The population fraction < OELV with 70% confidence = 93, 4 %

The test shall measure, with at least 70% confidence, whether less than 5% of the exposures in the SEG exceed the OEL 5.5.3_BOHS/NVvA (2011). Compliance decision (689 Annex F.3) is calculated with the non-central Student distribution test (1988 p464-465).

Leide/EN689(1995) | Wilks | EN689(2018)/BOHS-NVvA(2011)

Testing Compliance with Occupational Exposure Limits for Airborne Substances, Sept. 2011
BWStat v2.1

Input

Unit	mg/m ³	Substance name	Cotton dust
Occupational Exposure Limit (OEL)	1.70	total number of workers	3
10% Occupational Exposure Limit (10%OEL)	0.17	total number of measurement days	4
Lower Limit Of Quantification (LoQ)	0.16	total number of measurements	10

Results

Substitute the values <LoQ: 4. Substitute all values <LoQ using ROS

Counts

Number of samples <10%OEL	1	Number of samples <LoQ	1
Number of samples >10%OEL and <=100%OEL	9		
Number of samples >100%OEL	0		

Conclusions

Stage 0: Screening test (Section 3.3)

Are any of the samples >= 1 OEL? Yes, see stage 1
Are any of the samples > 10 OEL? No, all samples are below the OEL

Stage 1: Group compliance test (Section 3.4)

U_{T(95%,75%)>OEL} 1.13 < OEL 1.7 mg/m³

Does the group comply with the OEL? Yes, the group is in compliance with the OEL. Now check if between-worker differences are important (Section 3.5). See stage 2.

Stage 2: Apply ANOVA and if necessary Stage 3 (Section 3.5)

P(ANOVA) 0.24 > p criterion 0.05
No important differences between the workers. Individual compliance test not needed.

P(B&W) 18.71% < ad-hoc criterion 20%
No important differences between the workers. Individual compliance test not needed.

Stage 3: Individual compliance test (Section 3.6)

Are an exposure 95% tile > OEL? 0.28% < ad-hoc criterion 20%

B1 Data Analyst V1.0.0

File View Conversions Calculate Graphs Report Options Help

Calculate All GOF Graphs Statistics BDA Charts PPE Charts CDA

Data GOF BDA Initial Rating PPE Initial Rating CDA Report Builder

Category | Univariate | Bivariate

Current Initial Rating

Prior Decision Distribution: Generic Professional Judgment Prior

Professional Judgment Prior

Rating	Probability
0 - Trivial	0.03
1 - Highly-controlled	0.17
2 - Well-controlled	0.69
3 - Controlled	0.17
4 - Poorly-controlled	0.03

Sum =

Professional Judgment: Initial Rating: 2 - Well-controlled, Certainty Level: 1 - High

Prior Decision Chart

Decision Probability vs. Exposure Rating

Labels: Yes, No

Charts

Show all charts? Yes

Bars and Labels: Solid bars, Solid bars with labels, Colored bars

Adjust for censored data? No, Yes

Professional Judgment: Final Rating: 0 - Trivial, 1 - Highly-controlled, 2 - Well-controlled, 3 - Controlled, 4 - Poorly-controlled

Certainty Level: 1 - High, 2 - Medium, 3 - Low

Post Rating

Decision Probability vs. Exposure Rating (Post Rating)

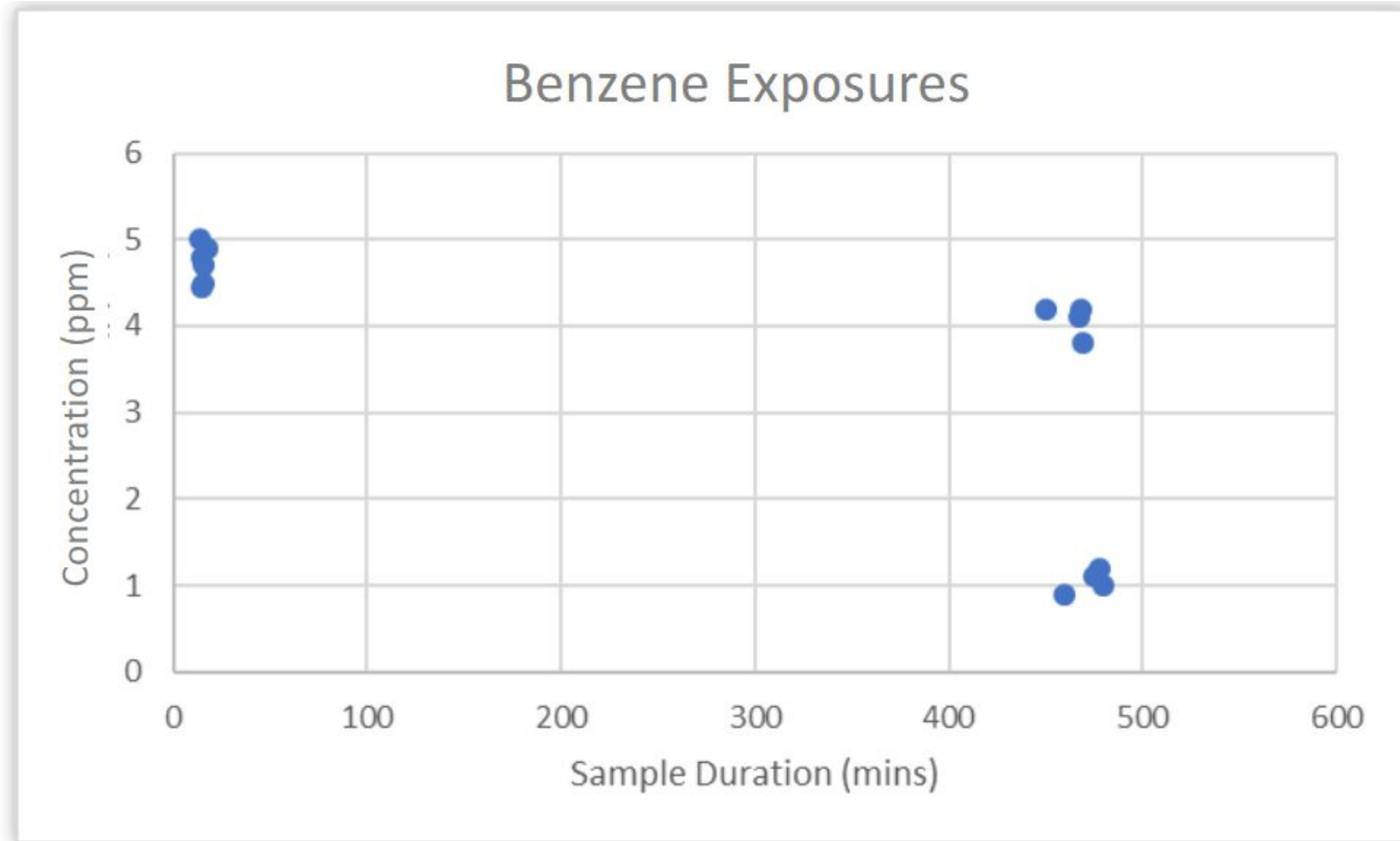


How To Perform Data Analysis

- 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

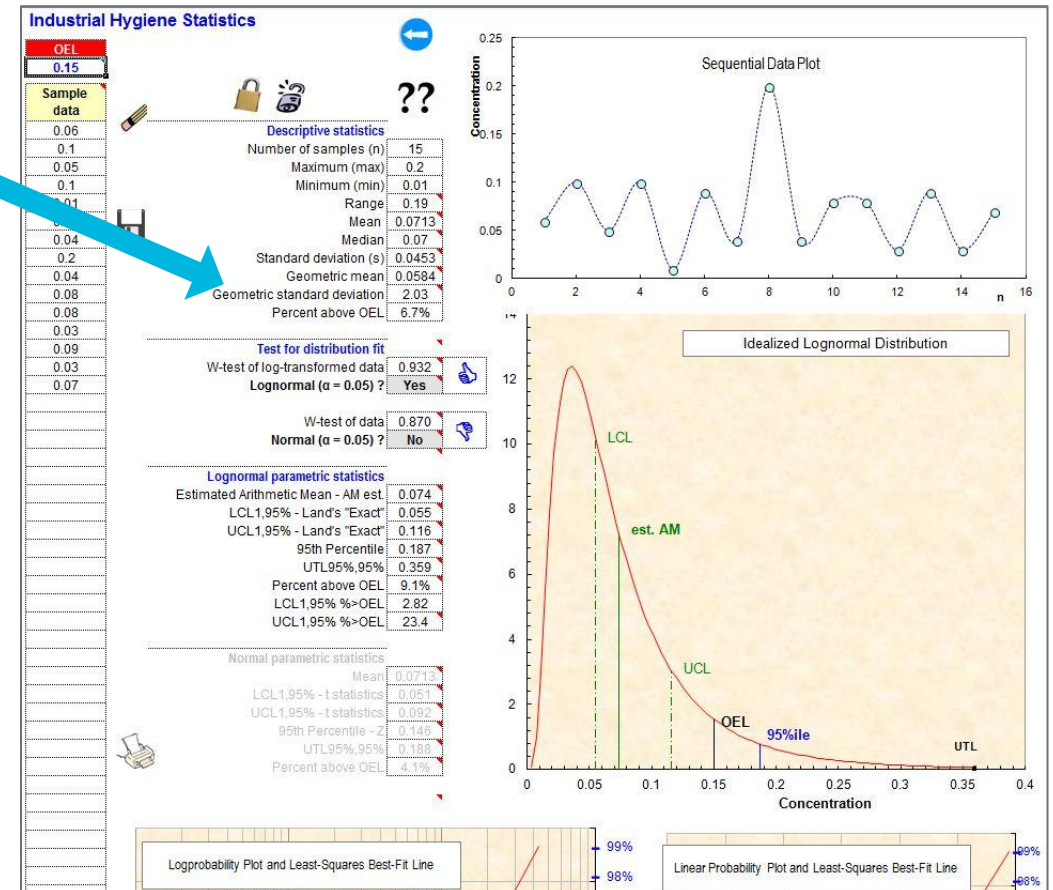


Example: SEG Confirmation – Scatter Diagram

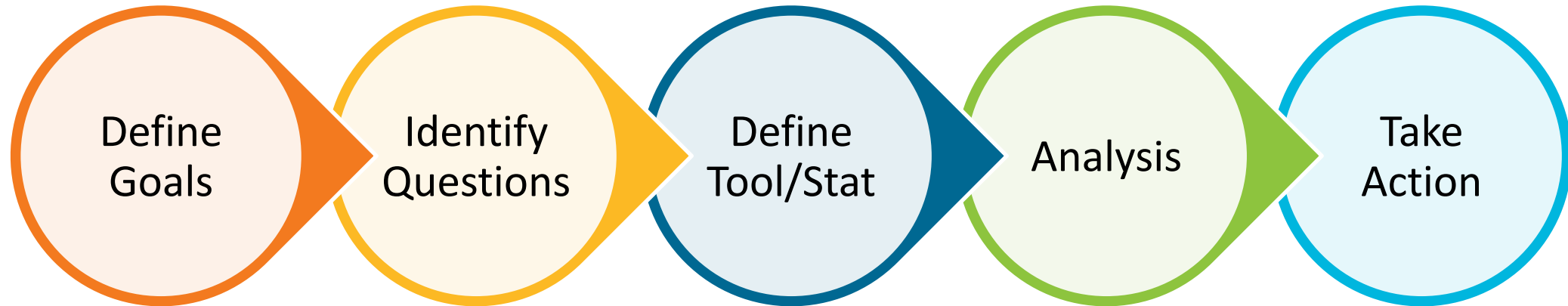


Example: SEG Confirmation - IHSTAT Tool

- GSD < 3 is generally considered a good indicator of the SEG homogeneity
 - *A Strategy for Assessing and Managing Occupational Exposures*. 4th ed. AIHA
- Analysis tool – not for presentations
- Free to download



Why Are We Doing Analysis?

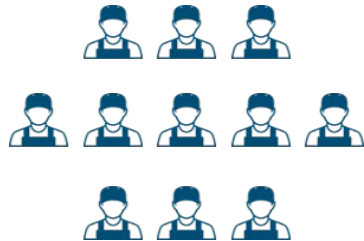


6. Medical Surveillance

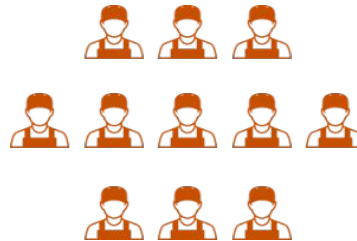


Hearing Conservation Program

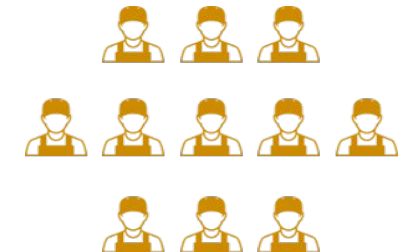
Department: Maintenance
Job: Maintenance Tech



Department: Reformer Unit
Job: Operator

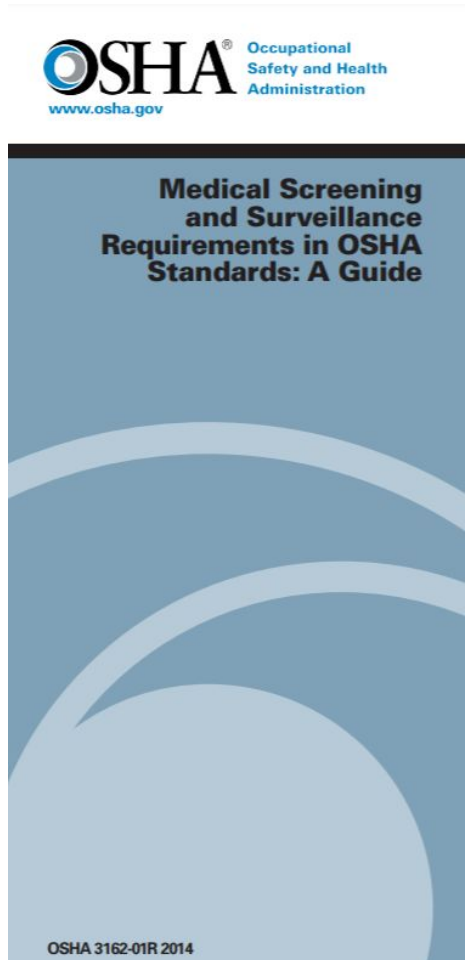


Department Coker Unit
Job: Operator



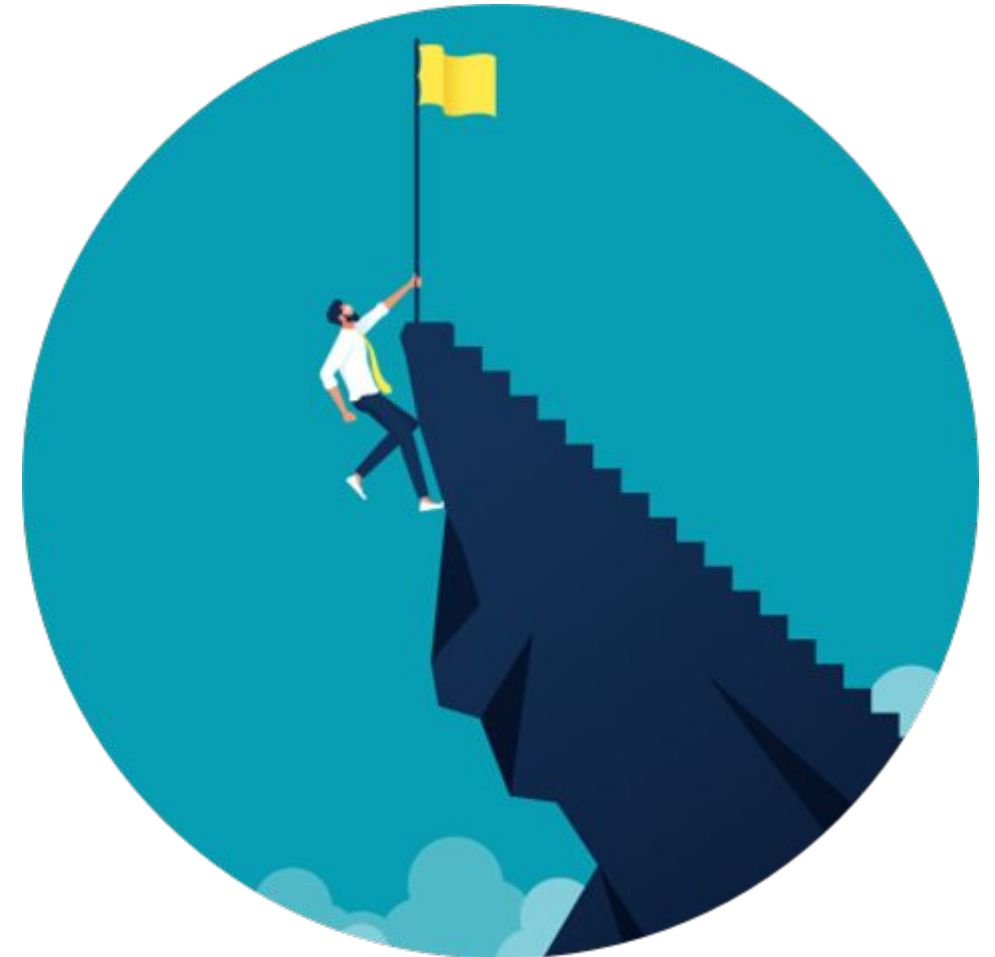
How To Establish Medical Surveillance Programs

- 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

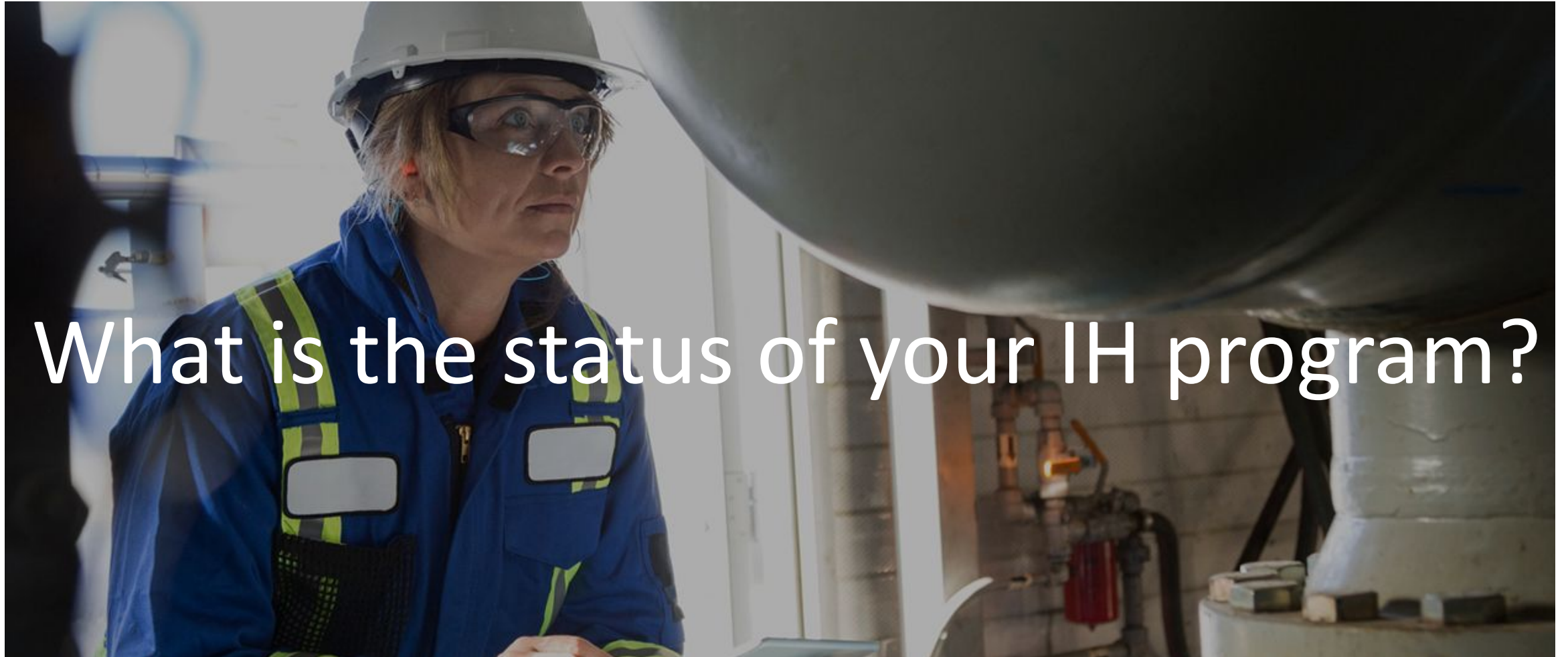


Compliance Without Over Testing

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



7. Evaluating & Communicating Performance

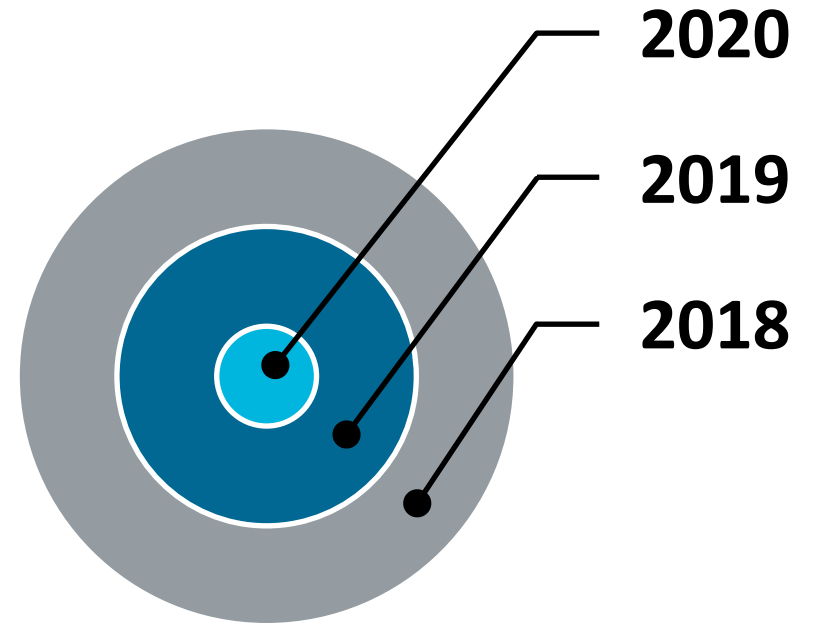
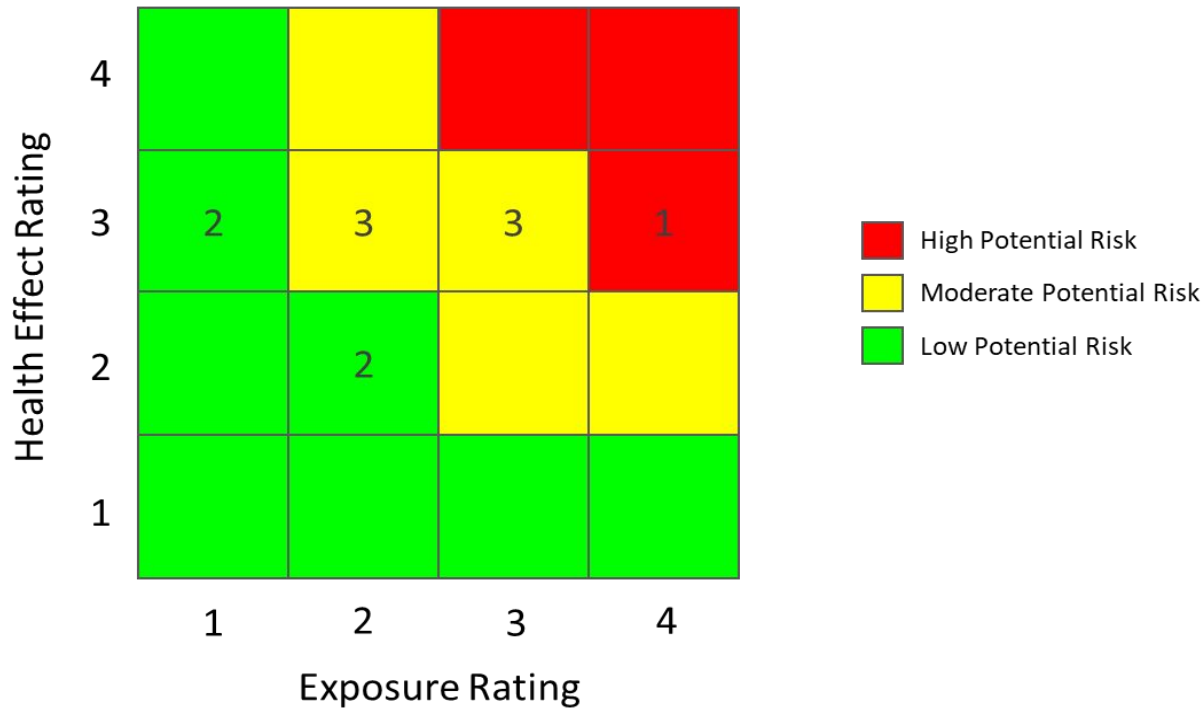


What is the status of your IH program?

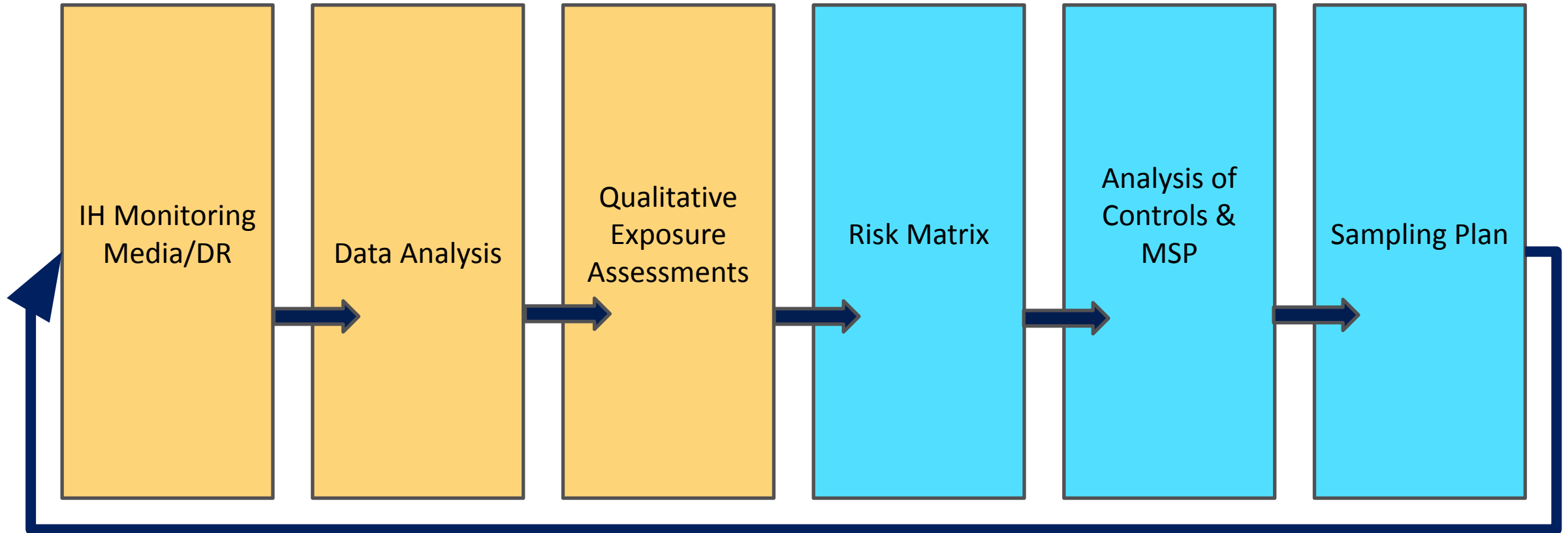


Precision Of Our Risk Identification

Qualitative Risk Ranking Matrix



How Do We Get More Precise?

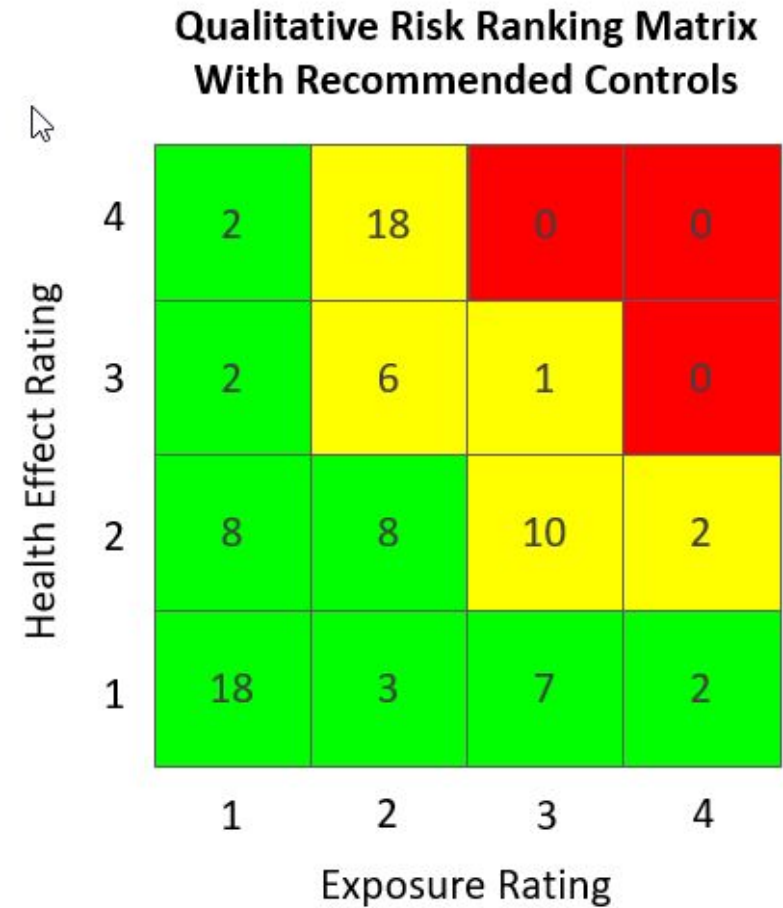
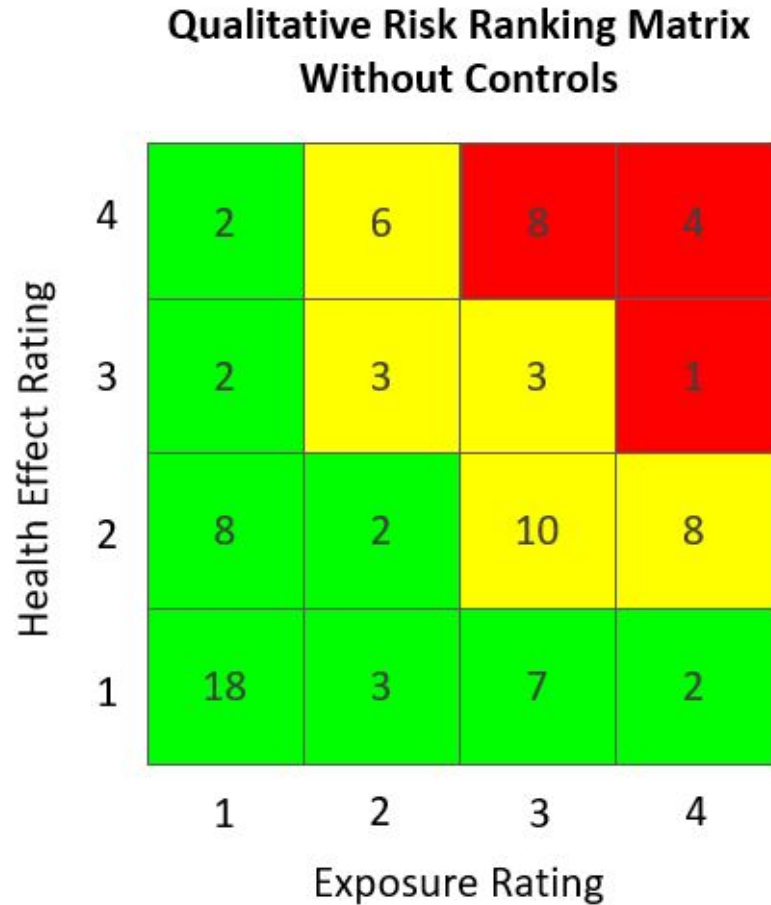


Communication With Workers & Management

- From documentation
 - Data table posted in work area
 - Employee notification letters
 - IH monitoring report
- To communication
 - Consistent graphical presentation of the results
 - Risk matrix
 - Engage & collaborate on controls (Kaizen)



Communication Using The Risk Matrix



Recommending New Controls

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



Summary

- Move from a compliance mindset to a risk-based IH program
- Standardize on your SEGs & QEA methodology
- Sample with a purpose
- Engage and “partner” with your laboratory
- Educate, engage, make it a two-way communication
- Simplify the message through a risk matrix (not stats)
- Be viewed as a contributor to the business or you won't be...



Questions?



Contact Dave
drisi@ehs.com

