

# Driving Process Safety Improvement Through Mechanical Integrity Excellence

Process Equipment Reliability Database



# Mechanical Integrity – Key to Process Safety

- Consistent process safety performance requires excellence in mechanical integrity (MI) systems
- The best MI systems are based on quality, verifiable data:
  - From your operations
  - Consistent across industry
  - Statistically validated and verifiable
- Can you imagine an industry-wide database of high quality, statistically validated data?

# The Solution is PERD

- Imagine that your maintenance & reliability data is automatically uploaded, compared against whole-industry data, and made available to you with clear, statistically validated guidance
- It's not your imagination, it's **PERD**

"A rising tide lifts all boats". As the PERD boat rises, all participants will reap the benefits.

# The Solution is PERD

- PERD provides:
  - **Practical** approach and **Consistent** work processes for data collection
    - Sound theoretical foundation based on engineering fundamentals
  - **Efficient** software tools for data submission
    - S/W dedicated for use by participating companies
  - **Quality assurance** for data analysis
    - Identification and analysis of outliers
    - Defensible and auditable results



# How do you measure up?

- Are your loss prevention systems providing the performance you expect?
- Have changes to asset and mechanical integrity improved or decreased process reliability?
- How do you get the most effectiveness from your mechanical integrity/maintenance program for your effort and expense?

# What you need

- Leverage existing IT and MI systems to collect and submit data
  - Reduce cost and complexity
- Networking/benchmarking opportunity to understand where you are relative to industry
  - Identify “low hanging fruit” to drive immediate impact
  - Identify and eliminate non-value added tasks
- Consistent approach to ensure “apples” to “apples” comparison
  - Understand where expended resources are providing the greatest benefit

# How PERD Improves Your Performance and Efficiency

## Layer of Protection Analysis (LOPA)

| Initiation    | Event        | Process Element Integrity and HAZOP | Existing Protective Elements | Residual Event Frequency | Individual P-I and ROP  | Identify OHS and HSE    | Overall P-I and ROP |
|---------------|--------------|-------------------------------------|------------------------------|--------------------------|-------------------------|-------------------------|---------------------|
| High Pressure | Overpressure | Pressure Control System             | Pressure Control System      | 1.0E-05                  | Pressure Control System | Pressure Control System | 1.0E-05             |
| High Pressure | Overpressure | Pressure Control System             | Pressure Control System      | 1.0E-05                  | Pressure Control System | Pressure Control System | 1.0E-05             |

## Safety Requirement Specification (SRS)

**SIS (Safety)**      **SIL (Environment)**      **AL (Asset)**  
 1                      N/A                      NA

**P&ID Numbers:**  
 X-100-0300 and 1

**Safety Function Description**  
 On detection of high pressure at pipeline inlet (100% voting) the SIS will initiate closure of downstream block valve (XV-1) to prevent pipeline rupture. High pressure trip will be initiated by the following:

1. PT-101 (Inlet Pipeline (P-201) Pressure) > 650 psi

When a trip condition is detected the SIS will initiate the following events:

1. Close XV-1, P-201 Inlet Block Valve
2. Send soft signal XV38337 to the DCS indicating a trip was initiated

The P-201 Inlet Block Valve is a spring return Block Valve, which is normally closed to open, spring return Block Valve actuated by a single solenoid (SV-1) that vents air when de-energized by the SIS. Open valve requires manual reset of the solenoid after the solenoid is energized.

Everything begins with the hazards identification and risk analysis

PERD

and ends with robust safety system layers

## Calculations

| Customer ID | Project ID         | Location                | At per test        |
|-------------|--------------------|-------------------------|--------------------|
| 0200        | 020                | Department of Oil Solar | High Pressure Trip |
| Function ID | Function Name      | Function Name           | Function Name      |
| PT-101      | High Pressure Trip | High Pressure Trip      | High Pressure Trip |
| Target      | 1                  | 10.00                   | 0.0100             |
| Results     | 0.0000             | 1                       | 0.0100             |



Industry Device pass/fail rate data



## Test Results

| Device ID | Test Date  | Test Result | Test Description        |
|-----------|------------|-------------|-------------------------|
| SV-1      | 2023-10-01 | Pass        | High Pressure Trip Test |
| SV-2      | 2023-10-01 | Fail        | High Pressure Trip Test |

Device Failure Report

Device List

## Proof Test Procedure

| TASK                    | STEPS  | INFORMATION |
|-------------------------|--|-------------|
| Verify P-I-101 to SV-1  | 1. Verify P-I-101 to SV-1  |             |
| High Pressure Trip Test | 1. Field Operator will bypass solenoid SV-1 to allow test equipment to be energized. |             |
| High Pressure Trip Test | 2. DCS Operator will set High Pressure Trip test setpoint to 650 psi.                |             |
| High Pressure Trip Test | 3. "Warning" Do not proceed if OHS A-300A is present.                                |             |
| High Pressure Trip Test | 4. Gradually increase test pressure to 650 psi and hold for 10 minutes.              |             |
| High Pressure Trip Test | 5. Maintain test pressure for 10 minutes.  |             |
| High Pressure Trip Test | 6. Return test equipment and return solenoid to normal.                              |             |
| High Pressure Trip Test | 7. Field Operator will bypass solenoid SV-1 to allow test equipment to be energized. |             |

CREATED BY DR. ANGELA SUMMERS, SIS-TECH SOLUTIONS

# Immediate Benefits of PERD

- More effective / efficient Mechanical Integrity/maintenance, greater reliability, and fewer incidents, with a very small investment via:
  - Access to fundamental technical information
  - Access to work process knowledge
  - Replacement of data mining (costly) activity with on-going integrated data harvesting
  - Support for applications/IT communication
  - Support for data analysis provided by leading academics
  - Facilitation of efficient high quality trusted data development

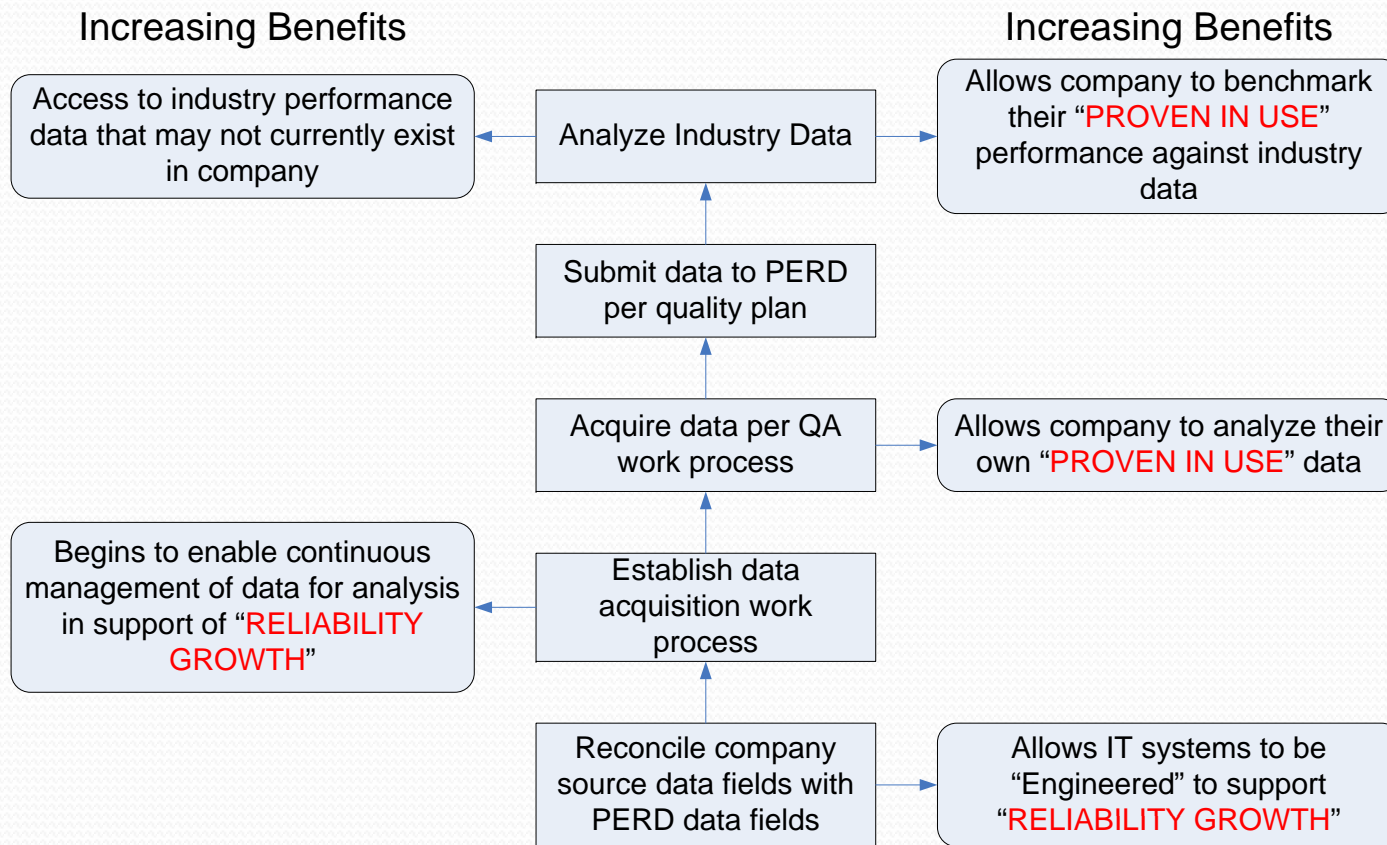
# Longer term PERD benefits

- Yields information and data to support:
  - Selection of equipment (Proven in use)
  - Reliability analysis
  - Quantitative risk assessment
  - IEC 61511 compliance
- Data collection becomes part of operating culture eliminating “fire fighting” mentality

# Longer term PERD benefits

- Benchmark company performance versus industry
  - Learning opportunity
    - Work processes and MI systems
  - Continuous improvement
    - Owner/operators and manufacturers
  - Customer satisfaction
    - Product stewardship
  - Reliability growth
    - Improved performance at lower cost

# PERD Ladder of Success



# In Summary

- PERD provides you a roadmap to improved performance whereby you can:
  - Improve Information Systems Effectiveness
  - Create Value
  - Minimize unforeseen losses
  - Improve Regulatory Compliance Effectiveness

## Enroll Now!!



# Questions / Discussion