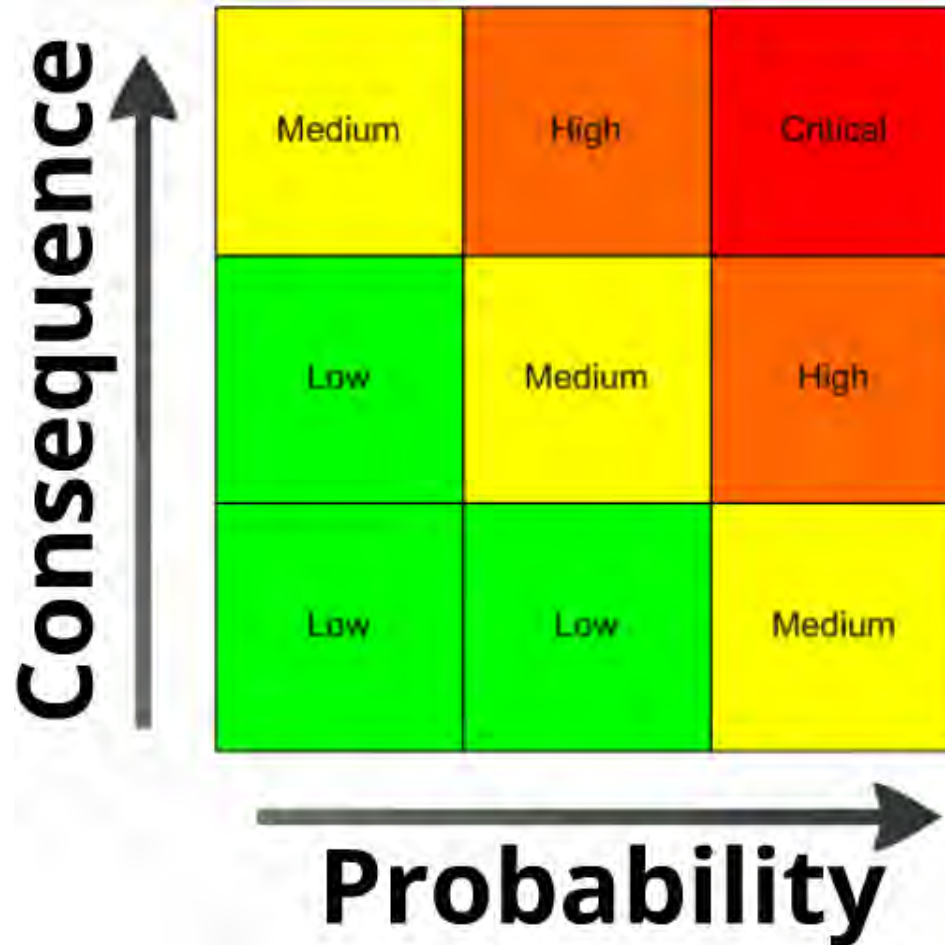# Comparison of Tank Risk-Based Inspection (RBI) Methodologies

Pinnacle Asset Integrity Services

Mauricio Olivares
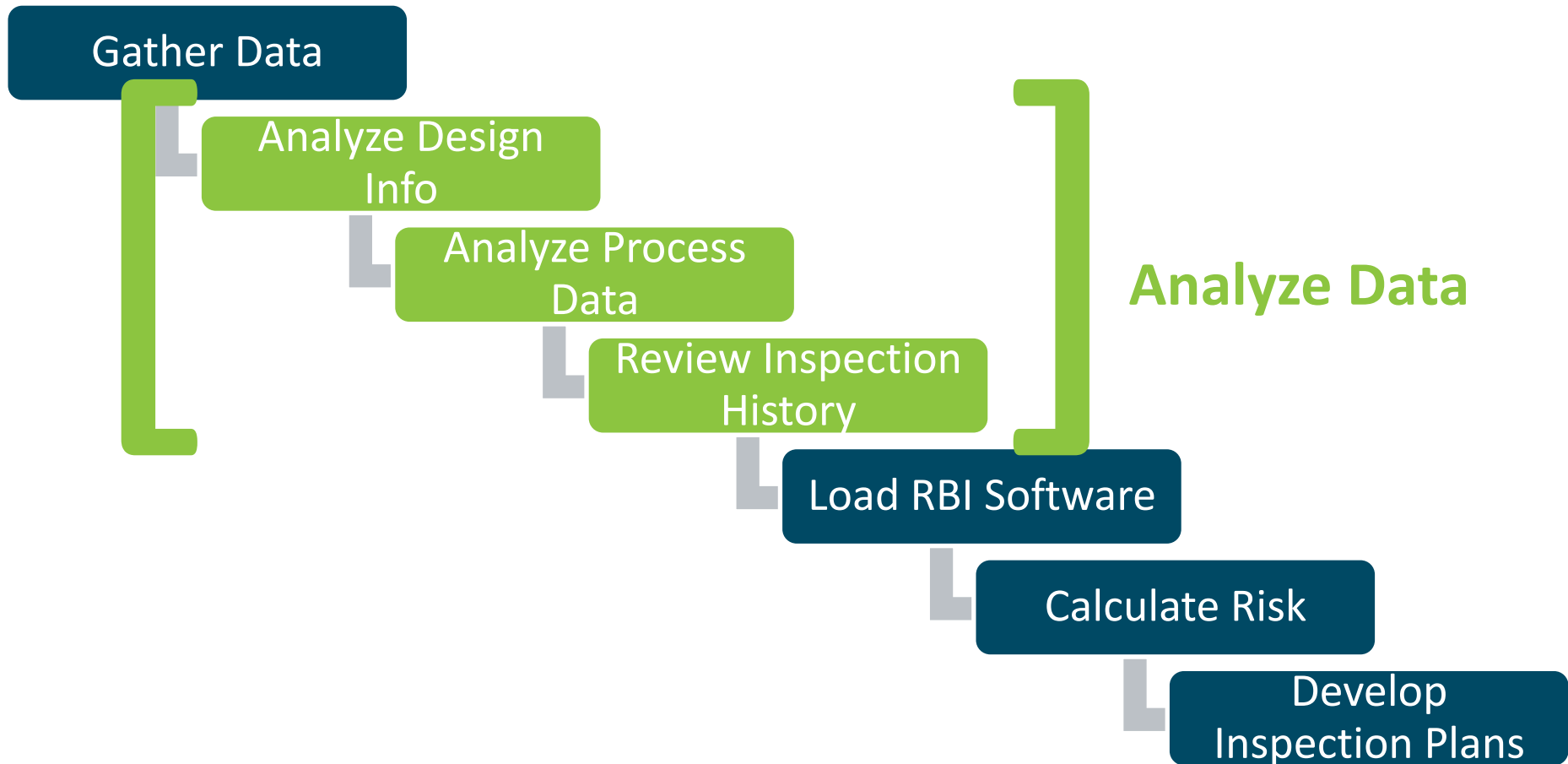
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- Complicated, expensive, time consuming
- Need a program to manage inspections
  - Rule-based
  - Risk-Based Inspection plan

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Risk = Probability x Consequence

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How to perform RBI Assessment

Gather Data

Analyze Design Info

Analyze Process Data

Review Inspection History

Analyze Data

Load RBI Software

Calculate Risk

Develop Inspection Plans

Qualitative

Quantitative

Semi-Quantitative

Weibull

Qualitative

- Engineering assessment
- Conservative assumptions

Quantitative

- Based on API 581
- ar/t -> Percent wall loss
- Detailed CoF

Semi-Quantitative

- ar/t -> Percent wall loss

- Relies on data for PoF

- More qualitative CoF

Weibull

- No damage factor table (no ar/t)

- Probability distribution used to determine Mean Time to Failure

- Found in API 581

Methodology Comparison

	Qualitative	Quantitative	Semi-Quantitative	Weibull
Level of Assessment	Less detailed	Very detailed	Detailed	Detailed
Data Requirement	Low	High	Medium	Medium
Time Requirement	Low	High	Medium	Medium

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- Strength:
  - Useful when missing data or low on resources
- Weakness:
  - High level assessment

- Strength:
  - Very comprehensive assessment

- Weakness:
  - Trade off between effort and detailed assessment may not be evident

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- Strength:
  - Compromise between qualitative and quantitative
- Weakness:
  - Some may feel more comfortable following API 581

- Strength:
  - Weibull distribution most powerful statistical distribution to calculate Mean Time to Failure

- Weakness:
  - Not as well known

- Large Gulf Coast Refinery
  - 226 tanks
  - Tank inspections range between 10-20 year intervals
  - 15 tanks per year
  - 46 overdue tanks

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Reduce risk

- 34 Tanks = $18MM

Optimize cost

- Reduced inspection budget by $7MM/year (50% reduction)

Increase compliance

- Zero overdue tanks in 4 years

- Methodology selection is dependent upon:
  - Facility requirements
  - Quantity/quality of data
  - Resource availability

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