Value Based Maintenance
An Optimized Approach

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Agenda

- Embracing Cultural Shift
- Maintenance Optimization
- VBM Implementation Process
- How is VBM Different?
- Jacob’s Value Added Attributes
- VBM Program Overview
- Project Results
- Benefits

Embracing a **Cultural Shift**

- A desired culture that uses cost-effective maintenance strategies to advance safety and reliability. Senior facility leaders must drive the necessary behavioral changes to support the shift from a culture of low to zero-tolerance for equipment failures to a value-based maintenance culture that is appropriately tolerant for low-consequence failures.
- A value proposition (vision of excellence) where overall costs are reduced through establishing an appropriate balance between the maintenance performed on facility equipment and its impact to facility safety and reliability.

- Ref: NEI EP 17-03b

Maintenance **Optimization**

Maintenance Strategies

Reactive: Fix when broken

Time or Interval Directed Maintenance (e.g. vendor recommendations)

Equipment Condition Directed Maintenance

Reduction/ Elimination of Maintenance Burden Based on Eliminating Root Cause

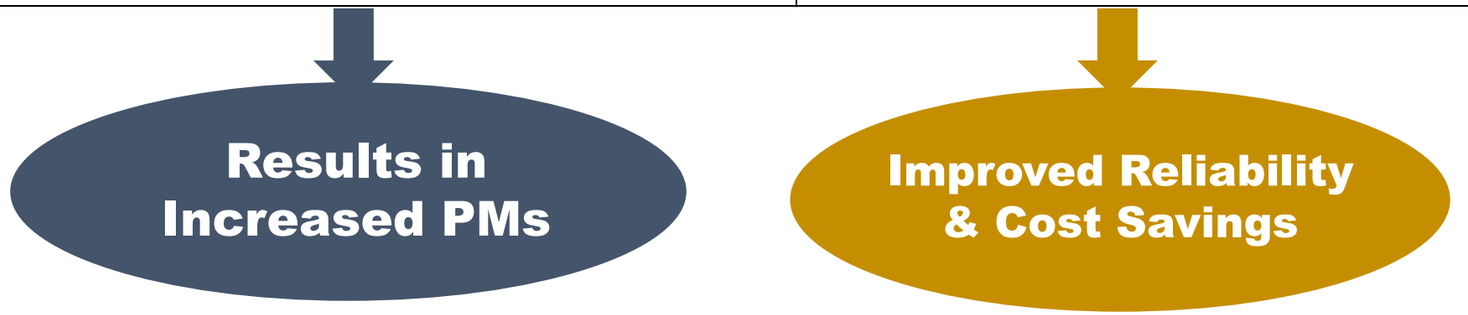
Maintenance **Optimization**

The **investment balance** of the four maintenance strategies

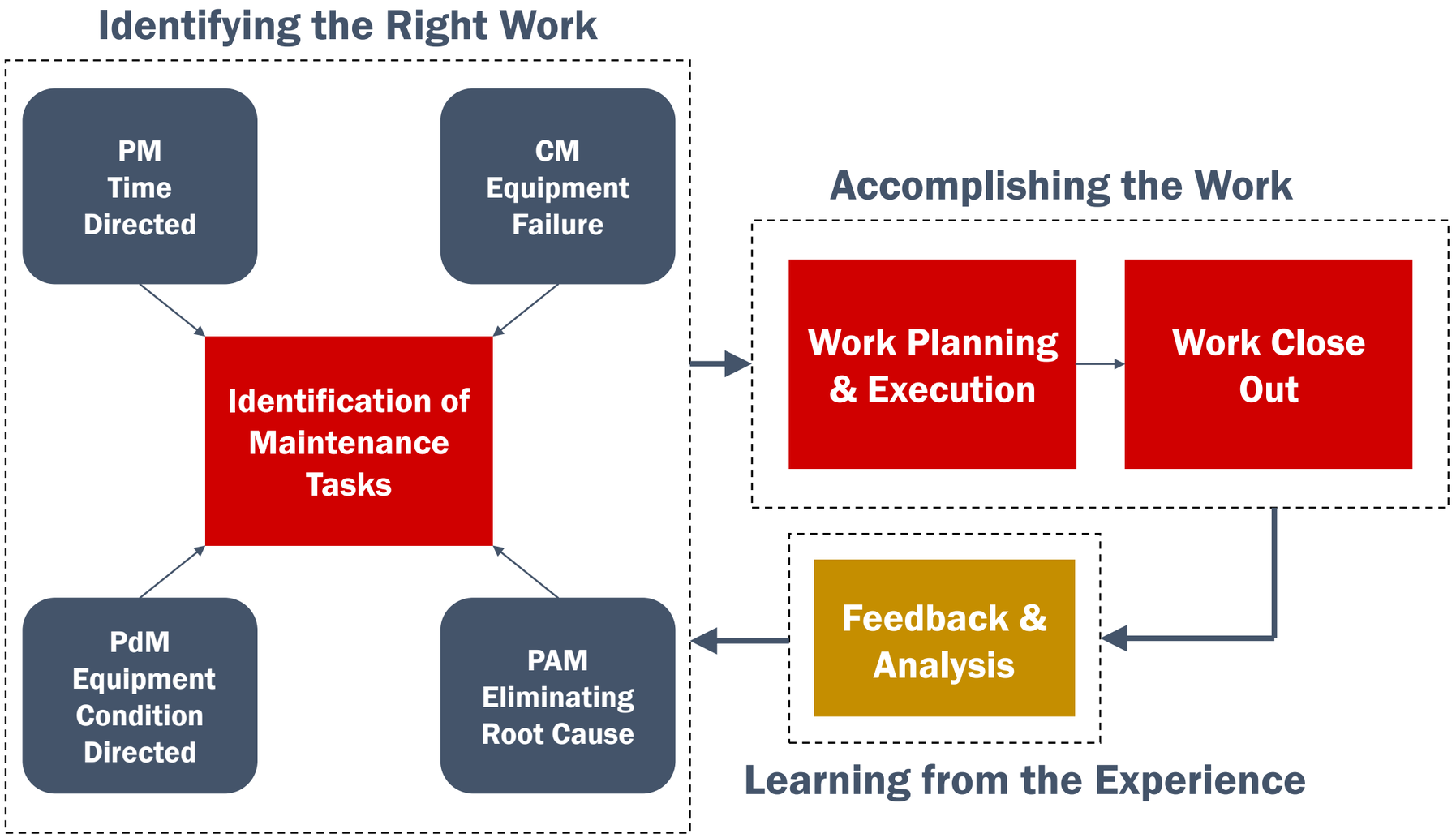
Integrates all **financial, process, maintenance and diagnostic data** into the decision-making process

Maintenance **Optimization**

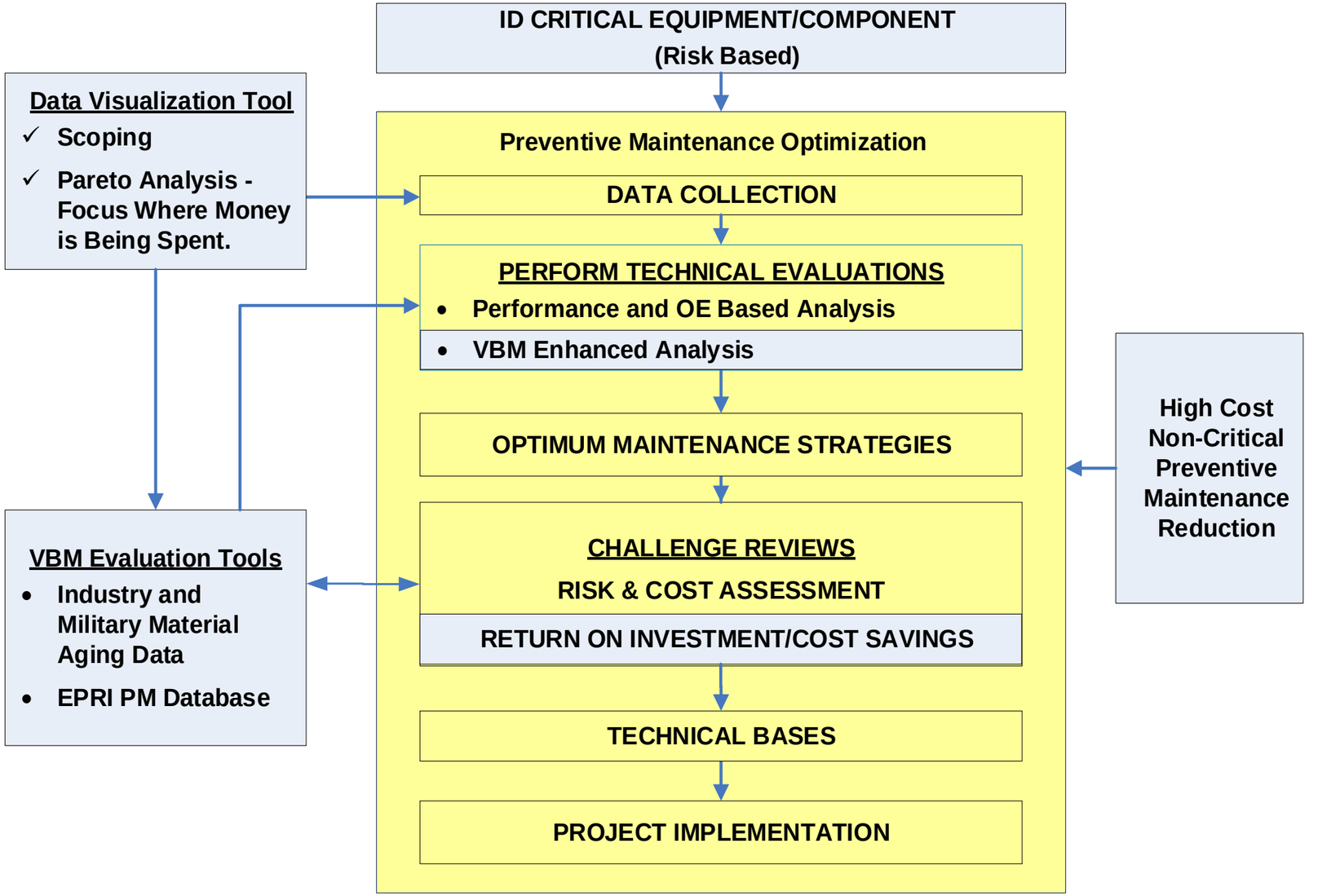
INDUSTRY TEMPLATE APPROACH	JACOB'S TARGETED ANALYTICAL APPROACH
• Well Defined PM Tasks Based on Experience and Qualified Resource • Good Starting Point • Subjective Application • Limited Functional and/or Aging Analysis • Evaluations Generic in Nature • Not Manufacturer/Model Specific • Non-Risk Based	• Risk Based Approach • Plant Specific Equipment Evals (i.e. functional & environmental) • Equipment Aging and Material Analyses Using Existing Aging, Material, and Diagnostic Test Data • Manufacturer/Model Specific Group Evaluations (Economies of Scale) • Produces technically robust and better results



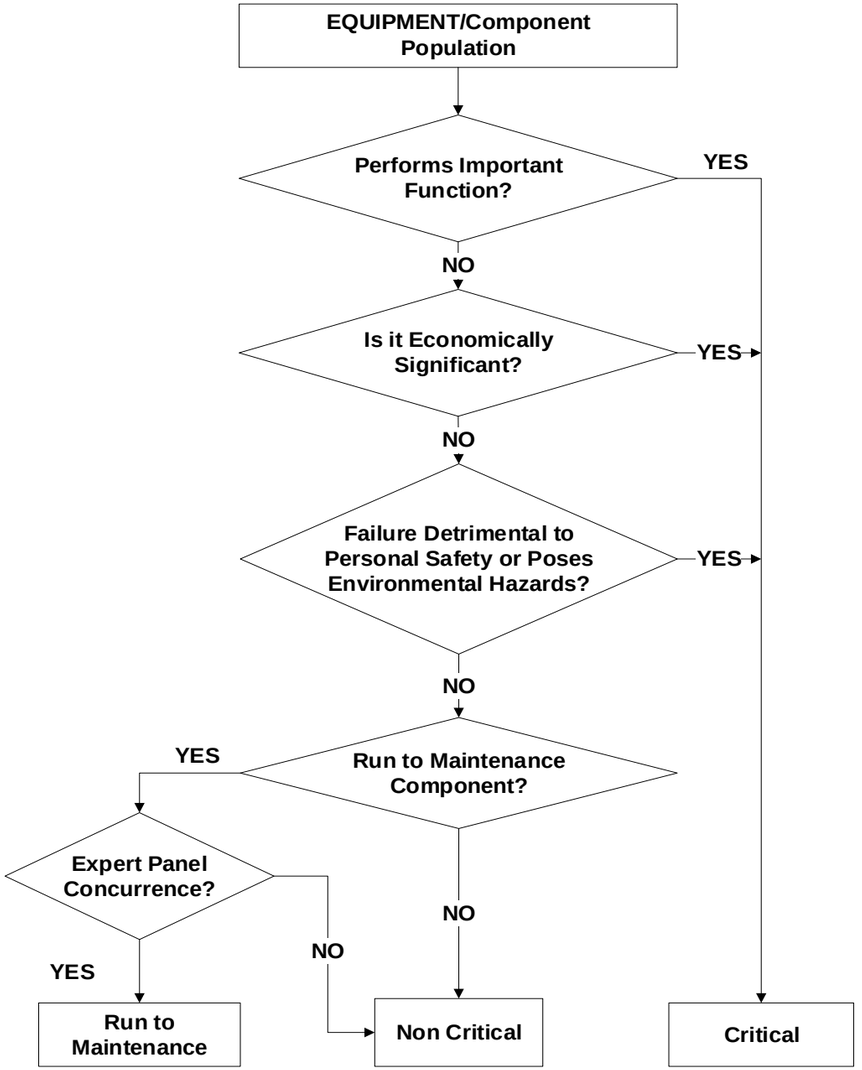
Maintenance **Optimization**



VBM **Implementation**



VBM **Implementation**



VBM **Implementation**

Issue

There are a large number of high cost, high frequency, resource-intensive PMs performed on non-critical equipment (or component groups) without a return value in equipment reliability.

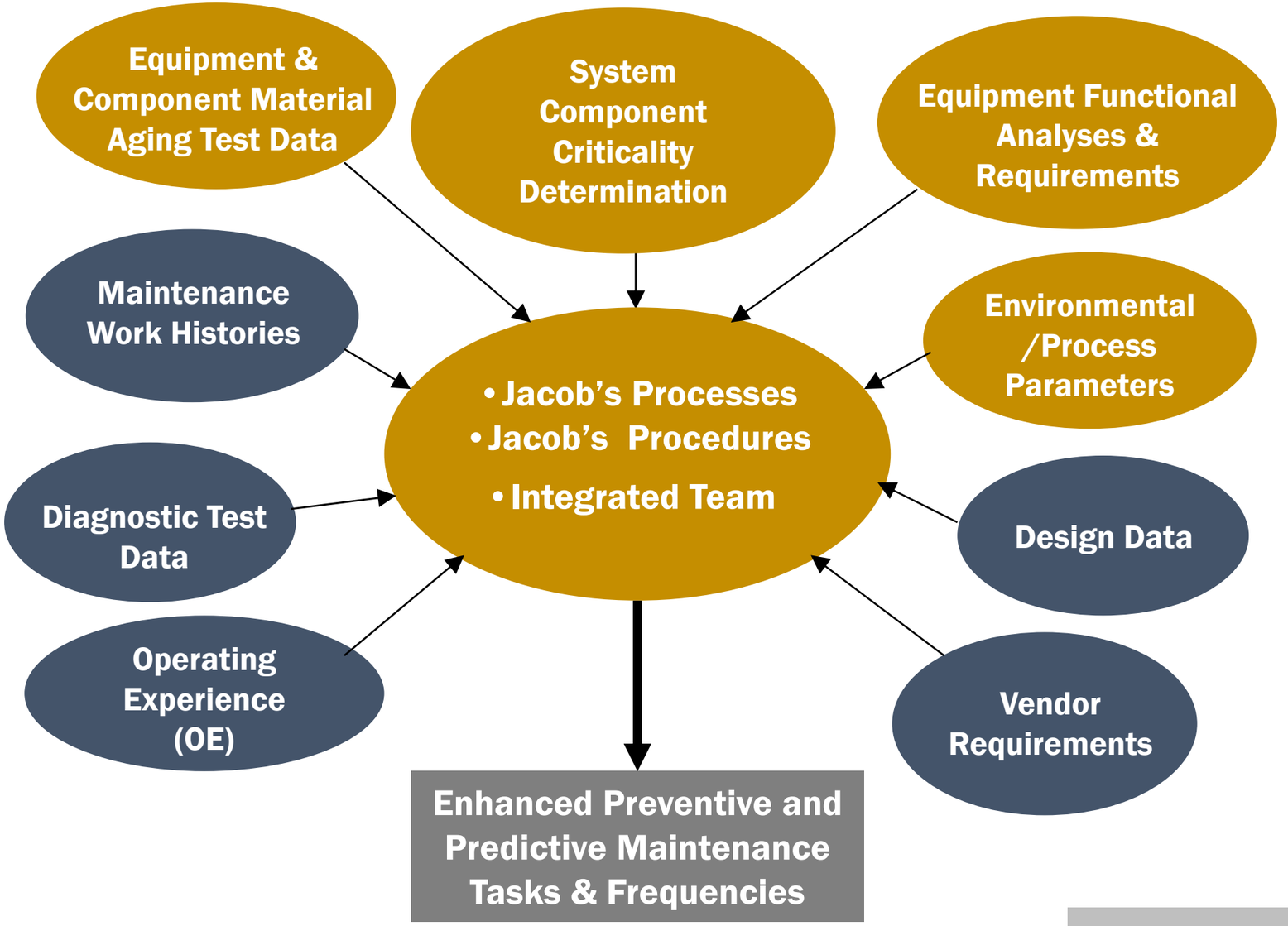
Efficiency Improvement Opportunity

Identifying highest cost, non-critical PMs, and then evaluating for value-based PM task and frequency optimization.

How is VBM **Different?**

- Risk based equipment criticality determination
- Facility specific equipment evaluations (i.e. functional, environmental, and alternative material analyses)
- Wearable/degradable parts (e.g. seals, plastics, diaphragms) sensitive to temperature effects over time
- Leveraging existing facility specific/industry component aging, material, and diagnostic test data
- PM intervals can be more precisely established (i.e. extended) with engineering technical evaluations
- Reduces/eliminates unnecessary intrusive maintenance
- Documented technical bases

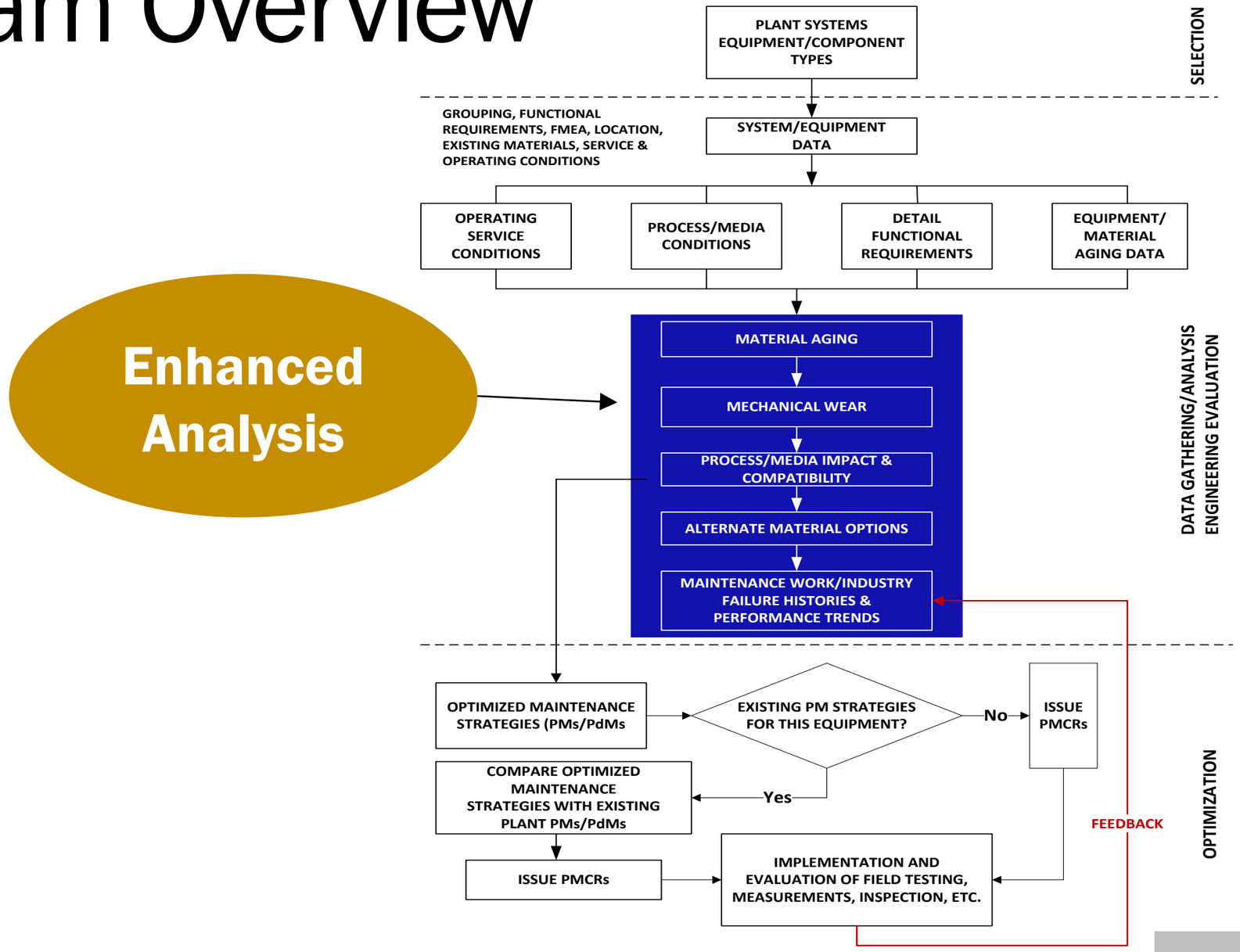
VBM **Attributes**



Typical Industry Activities

VBM Added Value

VBM Program Overview



Project **Results**

EXECUTIVE SUMMARY				
No	**PROJECTS**	**INVESTMENT**	**PAYBACK**	**SAVINGS ***
1A	Pilot Pneumatic Operated Valves (Project Scope: 22)	$67,200	< 12 Months	> $645,000
1B	Pneumatic Operated Valves (Project Scope: 650)	$280,000	< 12 Months	> $9,000,000
2	Control Relays (Project Scope: 393)	$83,000	< 21 Months	> $1,000,000
3	Diaphragm Valves (Project Scope: 59)	$60,000	< 12 Months	> $1,200,000

Project **Results**

Pneumatic Operated Valves

Project Scope

√ Risk Informed Categorization
√ Phase 1: Pilot Project Outage Valves for 22 AOVs
√ Phase 2: Awarded Full Scope for 650 AOVs

Value to Client

- For pilot project, reduced outage maintenance burden by 60% for AOVs
- Provided Sound Engineering Technical Bases
- Improved Equipment Reliability by Addressing Aging and Minimized Unnecessary Maintenance/Rework
- Reduced Long-Term Maintenance Costs (~$9.7M)
- Project Payback Within One Year

Note: EPRI templates were previously applied to the Valve Population.

Benefits

- Improved focus on critical equipment
- Reduction in outage scope and durations
- Reduced overall total maintenance costs
- Improved reliability and safety
- Quick payback on investments

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