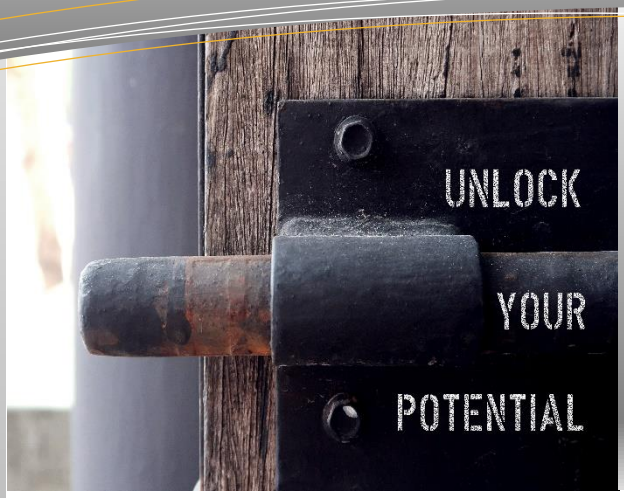
Unlocking Hidden Plant Capacity & Optimizing Costs



Benefits

- ✓ Increase production up to 10%
- ✓ Reduce OpEx up to 15%
- ✓ Reduce Inventory Costs 5–10%
- ✓ Reduce Reactive Maintenance 10–40%

Resulting in:

- ✓ Business Case Achieved
- ✓ High Client/Owner Satisfaction
- ✓ Competitive $ Per Unit of Production
- ✓ Resiliency During Business Downturns

What is Hidden Plant Capacity?

The hidden plant represents the maximum amount of additional production or capacity that can be unlocked without any capital investment. Production availability losses due to unplanned and planned maintenance activities represent the largest component of this hidden plant capacity for most continuous processing facilities.

Asset Management Initiative Challenges

According to ReliabilityWeb and other industry leading sources, “up to 70% of all reliability improvement efforts will fail.” To avoid this, it is paramount that we understand, manage, and mitigate the downside risks associated with implementing asset management initiatives to unlock hidden plant capacity and optimize costs.

To ensure that these downside risks are managed appropriately, we must address these challenges when implementing asset management initiatives:

- Gain leadership buy-in and support concerning production growth and cost reduction opportunities by demonstrating an effective approach or roadmap and quantifying a compelling value proposition for these opportunities
- Accurately identify production and cost critical equipment and associated failure mechanisms.
- Calculate/analyze the cost-to-benefit ratio by simulating these opportunities in an environment that closely matches plant realities before risking implementation.
- Implement only opportunities in the plant that provide high investment returns and avoid opportunities that produce diminished or negative returns.
- Utilize tools and techniques that enable data-driven decision making in contrast to subjective and emotionally driven decision making.
- Prioritize and execute initiatives based on impact and implementation difficulties, i.e., seek and find low-hanging fruit.

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Approach to Unlock Hidden Plant Capacity & Optimize Costs

Phoenix Engineered Solutions Inc. (PES) implements a proven, well-established approach that effectively understands, manages, and mitigates the downside risks associated with implementing asset management initiatives aimed at unlocking hidden plant capacity and optimizing costs. The following steps detail this approach (see Figure 1):

Step 1: Build the Reliability Availability Maintainability (RAM) model relevant to the operate and maintain (O&M) phase of the plant.

Step 2: Simulate production growth and cost reduction opportunities through multiple iterations of the model.

Step 3: Prioritize and assess opportunities for accessing hidden plant capacity.

Step 4: Execute the opportunities.

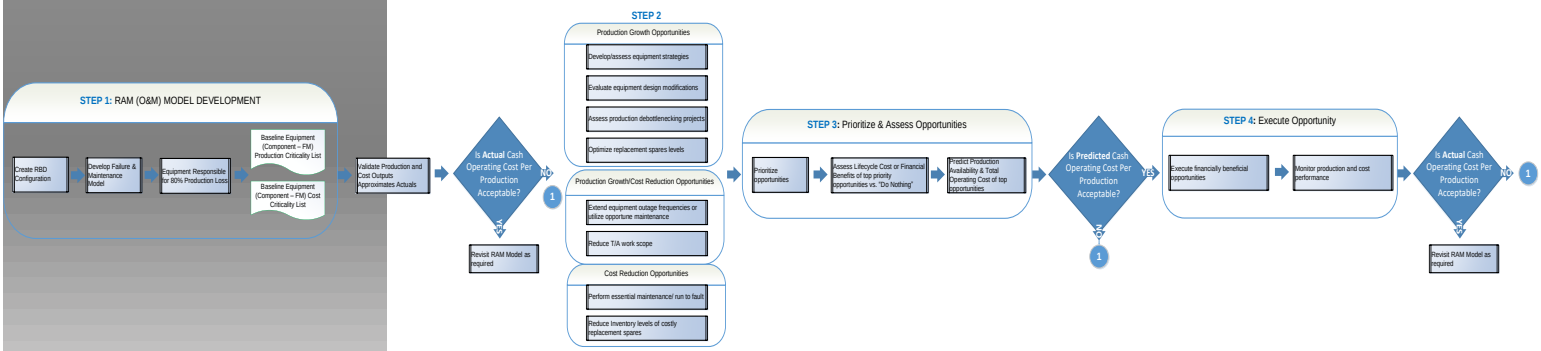
Step 5: Maintain the RAM (O&M) model evergreen.

In **Step 1 (build the RAM (O&M) model)**, we develop the model by configuring the equipment at the tag level into reliability blocks. Then, the failure rate characteristics for the equipment are assessed and the unplanned and planned maintenance activities and associated costs for executing these activities are incorporated into the model. It is worth nothing that the RAM (O&M) model is often analogous to the reliability-wise digital twin of the plant.

We then identify which equipment items are responsible for 80% production loss and accordingly distill those equipment items to its most critical components and assign its failure mechanism in the model. The simulation outputs from the RAM (O&M) model are the equipment-component production and cost criticality lists.

We proceed to Step 2 if the actual cash operating cost per production for the plant is unacceptable.

Figure 1: Approach for Unlocking Hidden Plant Capacity & Optimizing Costs



In **Step 2 (simulate production growth and cost reduction opportunities)**, the following are evaluated:

- Develop/assess equipment strategies to reduce unplanned corrective maintenance activities for production-critical equipment.
- Assess adjustment of maintenance frequencies, optimize preventative/planned maintenance activities, and optimize condition-based maintenance.
- Accurately identify production bottlenecks and implement reliability, maintainability, defect elimination, and design initiatives to mitigate these bottlenecks.
- Assess production de-bottlenecking projects to increase production.
- Reduce turnaround (T/A) work scope and/or perform essential maintenance or run to fault on non-production–critical equipment to reduce maintenance costs with negligible consequence to production.
- Optimize replacement spares levels for production-critical equipment to ensure that critical spares are readily available to execute unplanned maintenance activities.
- Reduce inventory levels of costly replacement spares based on failure rates and modes.

In **Step 3 (prioritize and assess opportunities for accessing hidden plant capacity)**, the following sequential activities are executed:

a) Prioritize mitigation opportunities based on potential impact to cash operating cost per production and implementation difficulty.

b) Using the RAM (O&M) model, assess the lifecycle costs or financial benefits of the top priority opportunities vs. the "do nothing" case.

c) Also using the RAM (O&M) model, predict the production availability and the total operating cost for the financially beneficial opportunities we identified in Step 2. If the predicted cash operating cost per production is acceptable, we proceed to Step 4.

In **Step 4 (execute the opportunities)**, we execute the financially beneficial opportunities within the plant chosen in Step 3 and monitor production and cost performance. If, after some time, we find that the resulting actual cash operating cost per production for the plant is unacceptable, we will revisit and reassess our production growth and cost reduction opportunities (Step 2).

In **Step 5 (maintain the RAM (O&M) model evergreen)**, we update the model when there are modifications in the plant to the configuration, operational logic, and the reliability and unplanned/planned maintenance activities of the main equipment, which has a notable impact on production and costs. This is important to ensure that both the RAM (O&M) model, as well as the equipment-component production and cost criticality lists output from the model are maintained prior to any forthcoming assessments.

Benefits of the Approach

This approach emphasizes applying opportunities to production and cost-critical equipment items, prioritizing the implementation of opportunities that have the highest impact and least implementation difficulty, then evaluating the financial benefits of these opportunities in a simulation environment (first and foremost) before directly risking implementing them in the plant. This low-risk approach ensures that decisions to proceed are data-driven, and subjectivity and emotions (which often are misleading) are minimized in the decision-making process. Leadership readily buys into and supports the selected opportunities as investment returns have been rigorously assessed by a process that is as close to reality as possible. In addition, the downside risk of implementing opportunities that produce diminishing or negative returns have been greatly minimized.

Historically, this approach has provided the following benefits to operating plants:

- ✓ Increase production by up to 10%
- ✓ Reduce operational expenditures by up to 15%
- ✓ Reduce inventory cost by 5–10%
- ✓ Reduce reactive maintenance by 10–40%

About Phoenix Engineered Solutions Inc.

Phoenix Engineered Solutions Inc. is a consultancy and engineering firm based out of Edmonton, Alberta, Canada. Our firm provides engineered solutions and services to ensure operational readiness of projects and improve asset reliability, integrity, and sustaining costs within operating plants.

Contact Us

Regan Pooran, P.Eng.

Operations Manager

(780) 719 0589

rpooran@phoenixengineeredsolution.com

Phoenix Engineered Solutions Inc.

4908 75 Ave
Edmonton, Alberta
Canada
T6L 2X8
www.phoenixengineeredsolutions.com