



March 2014

**Carmagen. Partnering in Engineering Excellence.**

## Top Ten Ways to Improve Reliability and Control Maintenance Costs

By Walter Lambertin

Decisions regarding reliability and maintenance can have a measurable impact on both maintenance costs and reliability in any plant. The following lists ten key areas that can help you achieve positive results.

### 1. Create Area Teams

Area teams consisting of Operations, Maintenance, Technical, and Inspection representatives should be assigned for each production area. These teams should be accountable for both reliability and maintenance costs. Monthly meetings with Senior Management track actual performance versus targets established for the areas.

### 2. Establish Task Driven Budget Controls

Maintenance budgets are often developed based on past experience. Zero-based budgets should be developed based on specific tasks planned for the area. A central contingency fund should be established and be controlled by Senior Management to minimize each area building in individual contingency. Area teams should be accountable for completion of defined tasks as well as maintenance expenditures.

### 3. Define Equipment Degradation Mechanisms

Equipment degradation mechanisms should be identified for all critical equipment. These mechanisms should include process (catalyst deactivation, fouling, coking, etc.), corrosion/mechanical deterioration mechanisms, as well as legal/corporate policies which limit equipment performance and could lead to shutdowns.

### 4. Implement Equipment Surveillance Programs

On-stream equipment surveillance programs designed to monitor the progress of identified degradation should be implemented. Results should be analyzed to predict expected maintenance intervention timing and allow timely planning and budgeting.

### 5. Implement a Rigorous "Bad Actor" Program

Any item of equipment which has a mean time between repair (MTBR) significantly below the average for its class of equipment should be identified as a "Bad Actor." Senior Management should assign responsibility and provide adequate resources to analyze and attempt to resolve the root cause of these bad actors.

## Work Highlights

### Mechanical Engineering

- As part of the Owner's Project Management team, reviewed and commented on the detailed piping drawings prepared by the contractor for a major offshore project being engineered in Korea. This work was done in the contractor's office over an approximate six week period.

### Process, Operations & Safety

- Performed a preliminary assessment of a tower's internals containing structured packing, reviewed operating data, performance, and hydraulics at current and future/expanded operation for a plant located in Australia.
- Assisted a licensor with various FCC modifications for an overseas refinery, with ongoing support on the implementation of selected design improvements, such as cyclone replacements, riser, feed injectors, etc.
- Provided process development consultation regarding GTL wax hydroisomerization/hydrocracking and slurry phase reactor/reaction engineering.

### Reliability & Maintenance

- A reliability review was made of a mixer vessel installed in a pharmaceutical plant to determine its suitability for continued service until its planned replacement. The mixer had previously experienced some damage during operation and had been repaired. After review by mechanical, materials, and reliability engineers, it was concluded that the mixer could remain in service for the intended period.

## 6. Establish Work Selection Methodology

It is necessary to establish a cost benefit methodology which is risk-based to minimize doing low priority work at the expense of more significant activities.

## 7. Improve Maintenance Planning Procedures

Turnaround (T/A) planning requires adequate time to develop cost effective and efficient maintenance plans. To accomplish this, a multi-cycle (8 – 10 year) strategic plan establishes the timing for unit shutdowns. Each T/A should have a T/A basis memorandum defining reasons for the T/A, major work expected, oil-out and oil-in expectations, expected costs and performance expectations after start-up. Milestone charts defining scope/cost controls, pre-T/A equipment surveillance, contracting and execution activities should be developed. A detailed critical path analysis defines key milestones which can be monitored on a daily basis during the outage. For major T/As, this process should start at least 15 months in advance of oil-out.

## 8. Minimize Emergency Work

Emergency work is disruptive to efficient planning/execution and should be limited to 5 – 10% of routine maintenance activities. Each emergency activity should be justified based on the consequences and probabilities versus executing this work on a planned basis.

## 9. Extend Run Length for Critical Units

Run length can be extended by understanding the limiting equipment which drives the need to shutdown. Often, T/A intervals are based on past practice rather than specific equipment limitations. A detailed analysis of equipment degradation combined with a comprehensive on-stream surveillance program can result in long runs.

## 10. Optimize “Calendar Based” Maintenance Programs

Many maintenance activities are conducted at planned intervals based on past experience and have been in place for many years. Little effort is made to adjust these intervals once they have been established. A comprehensive review of these calendar based activities analyzing “condition found” and “work required” can result in interval extensions, thus reducing maintenance costs without impairing reliability.

### About the Author

*Walter Lambertin has over 40 years experience in refinery technical support positions in the maintenance, mechanical, and materials engineering areas. He has extensive experience in refinery technical organization, mechanical and technical procedures, reliability and maintenance programs, and cost effective work practices. Walt has developed and assisted in the implementation of cost-effective general maintenance and turnaround best practices worldwide.*

*Please contact Vince Carucci ([vcarucci@carmagen.com](mailto:vcarucci@carmagen.com)) if you'd like more information on Carmagen's expertise in this area.*

