







When's the best time for a Capital Project to get support in establishing R&M goals and helping R&M stakeholders prepare an implementation plan to ensure compatibility with business objectives?

*It's never too early.*

## Physical Asset Management for Capital Projects

### What is Physical Asset Management for Capital Projects?

A work process that ensures reliability and maintenance are considered during project development so that new facilities will achieve the levels of reliability, availability, and maintainability needed for economic success. The process can be applied to grassroots facilities and plant upgrades.

### What are the Objectives of the Work Process?

The first objective is to ensure that the inherent reliability imparted to the design is compatible with the business objectives and is accomplished at minimum investment cost. The second objective is to ensure the plant will have competitive maintenance cost and operates at minimum life cycle cost. The program also provides direction, focus, and benefits to other areas.

### What is the Work Process?

A systematic approach, consisting of five major activities, which is implemented during all phases of project development. The process starts at the screening stage and ends with plant commissioning. The activities are:

- C Management Support
- C Project R&M Goals
- C R&M Program
- C Program Implementation
- C Measure Success



## How is the Work Process Implemented?

The R&M Goals are the basis for the specific reviews and activities defined in the R&M Program, which are performed by R&M specialists with support from others. The process is continuous with interactions at all project phases. Checklists are used to ensure a consistent work process.

## How Successful is the Work Process?

The results are facilities whose overall life cycle cost is less and have better availability. An example is a grassroots refinery that made an additional capital investment of 10% for improved reliability and better maintainability. The results were an average reduction of 36% in maintenance cost and a 29% reduction in unplanned downtime.

## Will Project Cost Increase and Schedule Lengthen?

If the work process is implemented in a timely manner with the right resources, and the project business objectives are the basis for decision-making, the schedule should not be jeopardized nor the project cost increased.

## How Can Carmagen Engineering, Inc. Help You Apply the Work Process?

- C Review and explain the work process and help the R&M stakeholders prepare an implementation plan.
- C Assist in developing the Project R&M Goals based on defined project business objectives.
- C Work with R&M stakeholders in preparing and R&M Program for the project that supports the Project R&M Goals.
- C Assist in identifying critical equipment and systems that need individual R&M objectives.
- C Participate in key reliability and maintainability reviews.
- C Help develop a plan for preparing equipment management plans.
- C Assist in developing a program to ensuring the R&M objectives were achieved.

*All the right people in all the right places.*

**CARMAGEN**  
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Whether it's a refinery cogeneration project, a new biofuels pilot plant, or air pollution control and wastewater treatment at a petrochemical facility, permitting and regulatory support can be a huge challenge.

*We're up to it.*

## Permitting and Regulatory Support

### Experience Counts

Carmagen's team has demonstrated extensive expertise in a variety of environmental engagements including:

- Permitting and Regulatory Support
- Air Pollution Control
- Wastewater Treatment
- Solid and Hazardous Waste Treatment/Remediation

Our services include technology and process assessments, permitting, planning and design. We assist in preparing permit documents, project execution plans and equipment specifications, as well as assisting in defining environmental compliance requirements, performing safety reviews and project audits.

### Permitting and Regulatory Support Services

<ul style="list-style-type: none"> <li>○ Perform assessments of existing and proposed regulatory requirements</li> <li>○ Prepare air permit applications</li> <li>○ Prepare wastewater/stormwater, sewer extension permit applications</li> <li>○ Prepare hazardous waste permit applications</li> </ul>	<ul style="list-style-type: none"> <li>○ Identify and prepare associated permit documents (trial burn plans, delisting petition, closure/post closure plans, RI/FS, Subpart X)</li> <li>○ Perform regulatory technology analyses (BACT, MACT, LAER, BAT, etc.)</li> <li>○ Develop risk management plans</li> <li>○ Provide support at agency and/or public meetings</li> </ul>
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### Typical Projects Performed By Our Specialists

<ul style="list-style-type: none"> <li>○ Preparation of permit applications and permit support documents for refinery cogeneration projects.</li> <li>○ Analysis of release mitigation designs and process safety management plans for anhydrous ammonia storage and delivery systems servicing Selective Catalytic Reduction (SCR) units.</li> <li>○ Evaluation of Thermal Oxidizer units to service a new pharmaceutical pilot plant facility and comply with new pharmaceutical MACT regulations.</li> <li>○ Evaluation of alternative technologies to prevent vapor phase carbon break-through at a vitamin production facility. (To address Consent Order requirements.)</li> </ul>	<ul style="list-style-type: none"> <li>○ Preparation of permit applications and support documents for new and upgrades of existing refinery, chemical, petrochemical and pharmaceutical, power and government facilities.</li> <li>○ Surveyed facility, identified current and past hazardous waste activities, and prepared applicable hazardous waste, air and wastewater permit applications. (To address Consent Order for government facility.)</li> <li>○ Evaluated alternative technologies to upgrade wastewater discharges and back-up sulfur recovery plant inefficiencies at a petroleum refinery. (To address Consent Order requirements.)</li> </ul>
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