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PERFORMANCE EXCELLENCE FOR GREENFIELD PROJECTS

*An opportunity to enhance profits and
reduce lost time in new facilities!*

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Introduction

Perhaps the singular most damaging mistake in industry today is the common practice of overlooking Asset Management concepts during the design, construction and start-up of green-field facilities. Many companies have developed Asset Management Strategies for their brown-field operations but are unaware of the process for developing an effective approach to Asset Management in new projects. The global cost of this poor management practice is truly astronomical. The main issues are:

- Typically companies will assign experienced managers to establish the new organization and business processes for the new site. However, while there are many managers with experience in managing operations and maintenance (O&M) in existing facilities, very few have ever had the experience of organizing and starting up a new facility.
- The challenge of implementing an effective strategy is misunderstood as Executives envision bringing a group of experienced people to run the new site. The truth is that we will recruit people from all over the planet with many different backgrounds and paradigms for O&M. They will all want to do things from their on experience; the Change Management challenge is significant.

New facilities experience excessive unplanned downtime resulting in excessive costs and loss of critical production due to quality and quantity issues. These losses can be avoided by establishing the elements of Performance Excellence (Operational Excellence plus Organizational Excellence) prior to facility start-up.

This concept / process is extremely critical in the Middle East & North Africa (MENA) today, where the current crude oil

market is delivering a huge influx of cash into the region. Companies in the region are using the opportunity to invest heavily in the expansion of existing industrial facilities as well as in the development of new facilities and new industries. These industries can be very competitive in global markets due to their geographical location, the low cost of expatriate labor from third world countries, and the very low cost of energy in countries where crude oil is produced at a an average cost of approximately 2.5 US Dollars per barrel and is burned in boilers to generate electricity and desalinate seawater.

Examples include news from the Saudi Arabian Oil Company and the Saudi Electricity Company:

ABU DHABI (Dow Jones)—“The Saudi Arabian Oil Company (Saudi Aramco), the world’s largest oil company by production, will spend as much as \$45.3 billion between 2007 and 2011 as part of an investment program that will see crude oil production capacity increase by almost a third and refining capacity by about 35%, a company official said late Sunday. Saudi Aramco will spend the largest part of its capital expenditure program worth \$26.6 billion on expanding crude production capacity by 2.95 million barrels a day to more than 12 million b/d by the end of 2011, Nabilah Al Tunisia, manager at Saudi Aramco’s project support-and-controls department, told the Eighth Annual Middle East Refining Conference organized by The World Refining Organization in Abu Dhabi.

The remainder of the expenditure program, \$18.7 billion, will flow into the development of natural gas, natural gas liquids and ethane resources, and into refining, exploration, shipping and support, Al Tunisia said. Saudi Aramco’s worldwide refining capacity will increase by more than a third to six million barrels in the next five years, Al Tunisia said. Investments into the downstream sector will include the Ras Tanura integrated refining and petrochemical complex, and new export refineries in Yanbu, at the Red Sea, and in Jubail, located on the Persian Gulf, that will meet product specifications in markets with stringent environmental regulations such as the U.S. and Europe.”

BEIRUT (Zawya Dow Jones) - “Saudi Electricity Co., the country’s biggest power generator, said Wednesday it plans to spend 27.64 billion Saudi riyals (\$7.41 billion) on new projects in 2008. SEC allocated SAR12 billion for power generation projects, SAR10 billion for transmission and SAR4.78 billion for distribution, the company said in a statement on the Saudi bourse website. SEC plans to

boost power generation power capacity by 2,669 megawatts, it said. SEC, owned 81.24% by the government, plans to generate 6,100 megawatts and add 1,090 kilometers of transmission lines over the 2006-2010 period, according to ABQ Zawya data.”

Similar investments are in progress in Qatar, The UAE, Oman, Kuwait and other Middle East & North Africa (MENA) countries.

Operational Excellence (OPEX)

The Capacity Management Triangle at Figure 1 depicts the elements of developing and implementing proper processes and establishing Operational Excellence (OpEx) in new facilities. The Designing for RAM Process (reliability, availability, maintainability) in Stage 1 of Capacity Planning will provide early warning of issues that will have significant impact on the operability and maintainability of the new facility. The RAM Assessment will identify defects and provide the facility owners with an opportunity to take corrective action during design and construction or to prepare to mitigate the situation during start-up and operation. The term “Reliability” is defined as the probability that an asset will function as intended over a specified period of time under a specified set of conditions. Availability, on the other hand, is the percent of time an asset will function as intended. “Maintainability,” refers to the effort required to keep or return equipment to the condition needed for it to perform its intended function. Reliability and maintainability work together to determine Availability which in turn provides opportunity to enhance Asset Utilization (AU).

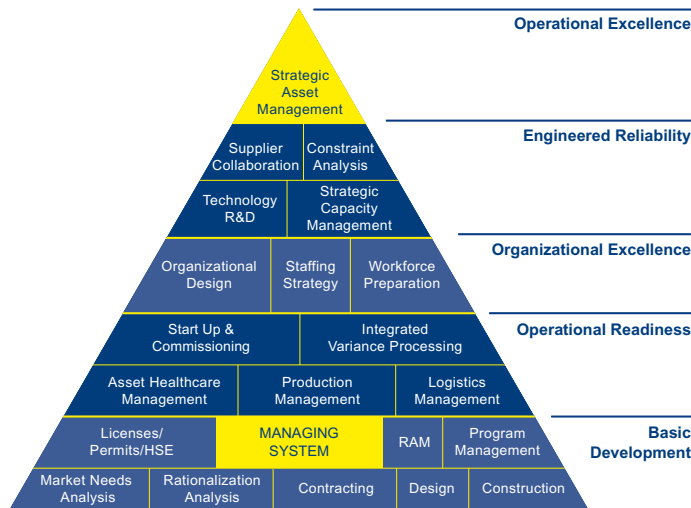


Figure 1 - Capacity Planning

Planning for future operations is just as important as the RAM Process. Establishing asset criticality, maintenance tasking, and spare parts inventory during the construction phase will assure a smooth start-up of the new facility as well as accelerated achievement of consistent operation at or above design capacities. At this point we should also

develop organization structure, recruiting requirements, on-boarding plans, critical spares assessment, and a training needs analysis.

The Roadmap to Success

But where do we start? Operating practices? Maintenance practices? Design? Reviewing academic studies, discussions with consultants, and the results of benchmarking indicate that the “lost Asset Utilization (AU) opportunity” is about evenly divided among problems in Operations, Maintenance and Design. Most companies have initially concentrated on improving reliability of existing plants. This allowed us to defer capital investment. Shifting the focus to new facilities during the Design – Construct – Startup & Operate cycle can return huge benefits in terms of lost production control. Improving the design process permits maintenance and operability issues to be understood early, facilitating training and other preparation before operation. Reducing or eliminating problems designed into the facility, facilitates a smooth start up and early operations consistency, allowing operators and maintainers to attack remaining problems in a more focused fashion.

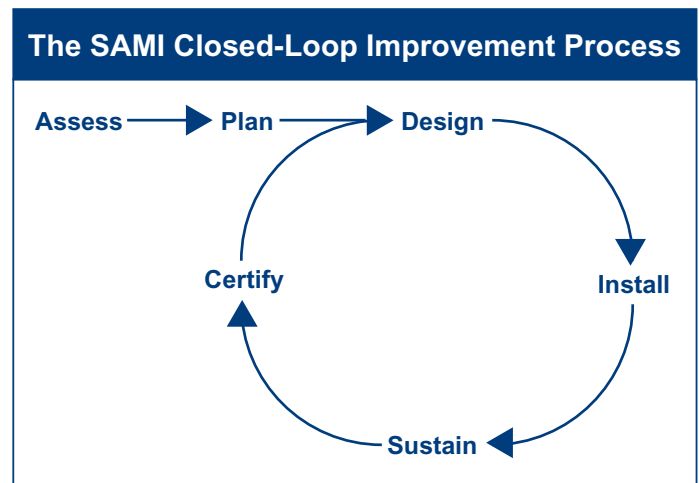


Figure 2 - AP/DISC Process

Project Mentality Vs. Operating Mentality

During project design and construction, there exists a “project mentality” which focuses on facility start-up and operation as the end objective. Management’s thought processes are all focused around delivering the project within specification, on-time and within budget. A serious mental shift is required when moving to a sustained operating mentality. The AP/DISC Process (Figure 2) is designed to help us make the transition in a structured approach that will make sure we think of plant start-up as a beginning instead of the end objective.

We begin during the project design or early construction by conducting an Assess & Plan Phase using the Capacity Triangle (Figure 1) as a guideline and following the proven AP/DISC Process depicted in Figure 2. The Assessment

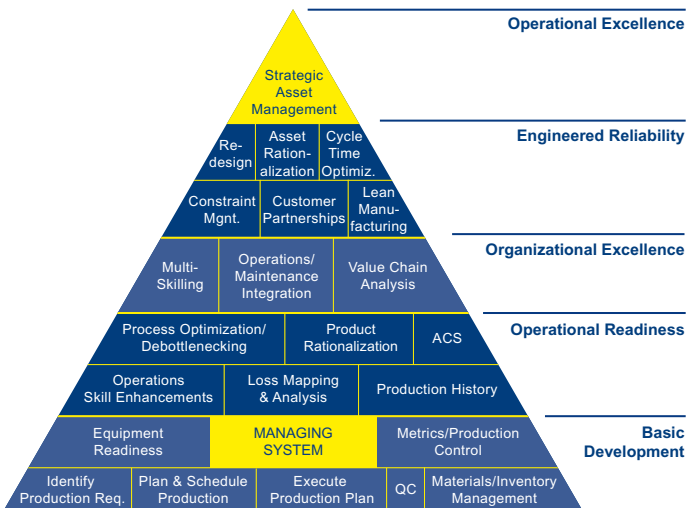


Figure 3 - Production Management

identifies gaps between the current operations planning and a world class standard. We then develop a Plan to close the gaps and a Business Case for doing so. Once the Plan is accepted by management, we proceed to the AP/DISC Design Phase and design the business processes and organization for the new facility based on the SAMI Pyramid for Asset Healthcare, Logistics Management, and Production Management. This Design Phase should begin as soon as there is sufficient staff onboard, but no later than twelve months before facility start-up.

During the last six months of Project Construction (six months prior to start-up) we begin to Install the business processes, asset database, asset tasking, spare parts and BOM's. Three months prior to start-up we train everyone on the site, establish KPI baselines and tracking mechanisms and coach the organization through achieving sustainability. Having achieved all of this, we can now expect a smooth transition from Project Mentality to Operational Mentality and expect to achieve a stable operating facility very quickly. The activities that are required to be addressed are outlined by project phase below.

Project Design – AP/DISC Assess & Plan

During the project design we have the opportunity to assess the planning for operation of the new facility and to evaluate any design issues that will have a negative impact on operations and maintenance of the new facility. Some of the activities will include:

- Conduct a RAM assessment of the design and publish a report highlighting any required action items
- Conduct an organizational design including roles & responsibilities and job descriptions and create the staffing plan
- Conduct O&M Team recruitment and onboarding
- Develop the Managing System for the startup & operations Phase
- Review and select an ERP (enterprise resource

- planning) system or AMS (asset management system) for the facility
- Create Expectations, Goals and Measures for the Project through the sustainable operations phase
- Validate the project business case and identify enhancement opportunities
- Develop and begin implementation of the Asset Management Strategy

Project Construction – AP/DISC Design

During the project construction we work with the new O&M Team to design all of the business processes, key performance indicators, roles and responsibilities, training plans and materials, and more that will be required to be in place at plant start-up. The activities will include:

- Design the work management system for maintenance and operations including KPI's
- Conduct workforce preparation & training on new processes, systems, and equipment
- Design asset data structures and configure, install and test the ERP or AMS system, load asset and parts data and design reports
- Conduct Simplified Reliability Centered Maintenance (SRCM) study to establish asset criticalities and maintenance strategies.

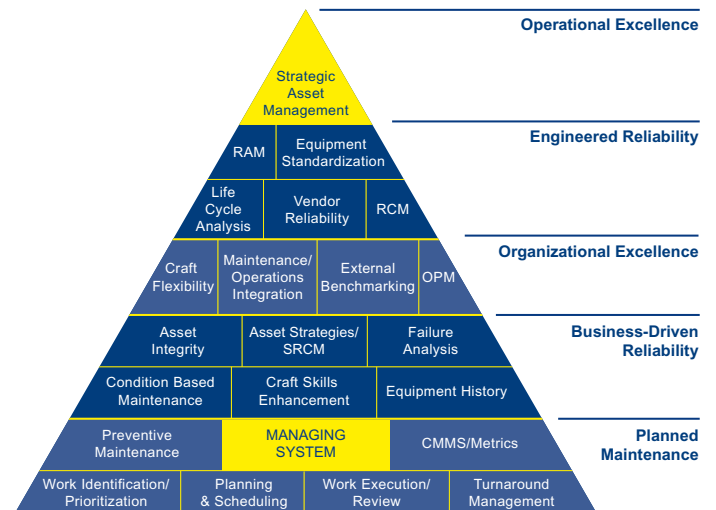


Figure 4 - Asset Healthcare

- Develop spare parts and maintenance materials requirements and plan proper receiving documentation and storage
- Acquire, document and store spare parts and maintenance and operating materials
- Conduct a Work Process Design for the Operations Phase that covers:
 - Production Management, Figure 3
 - Asset Healthcare Management, Figure 4
 - Logistics Management, Figure 5

Project Startup – AP/DISC Install

- Install and Integrate the business processes designed during construction
- Train the entire staff and management in the new processes and information systems
- Establish key performance indicators, target values, and tracking mechanism
- Train the entire staff on the business processes and metrics

Facility Operations: AP/DISC Sustain & Certify

Following start-up, it is necessary to continue coaching the O&M Team in the new processes and managing system, remembering that although they may have years of experience, they come from diverse backgrounds and will have a tendency to revert to their previous paradigm until the new way is sustainable. Activities will include:

- Coach all staff and management in the new processes until they are sustainable
- Adjust processes, KPI's, reporting, etc. as necessary
- Track KPI's and financial performance against targets; validate the business case
- Utilize the CARAT Database to certify sustainability

Organizational Excellence (Orgex)

Remember, to achieve Performance Excellence we must develop OrgEx as well as OpEx:

“Performance Excellence = OpEx + OrgEx”

During the pre-operations phase of the project, we have the perfect opportunity to achieve this challenging change in Management Team behaviors as well as to establish an effective, functional Managing System. From the OrgEx Model at Figure 6, we see that there are two components of Organizational Excellence, the Managing System and Behavioral Excellence:

This begins during the Assess & Plan Phase of the AP/DISC Process described above. We work with the management team in workshops and individual sessions to assess experience levels, attitudes, and leadership characteristics. During the Assessment we develop a plan to design and implement a formal, effective managing system based on effective goal setting and decision making using real data and performance indicators as opposed to the opinions of various members of the Management Team.

“OrgEx = Managing System + Behavioral Excellence”



Figure 6 - OrgEx Model

Develop The Managing System

A “Managing System” is an internalized philosophy that that must be woven into the basic fabric of the business. The Managing System is the umbrella process by which all of the business processes within an organization are integrated in to a structured approach to transform the higher level vision and strategies into unit tactics and then cascade these tactics into individual actions, goals and responsibilities, and include the processes of:

- setting direction,
- establishing goals,
- developing plans,
- initiating action
- documenting results,
- reviewing performance,
- identifying barriers, and
- taking corrective action

We need to integrate business functions to eliminate discord. We will establish Key performance Indicators (KPI's) that emphasize process measures to track performance. Business objectives will be established and cascaded down to the lowest organization element to assure alignment throughout the facility. We develop reward systems and assign accountability to assure that our actions align to

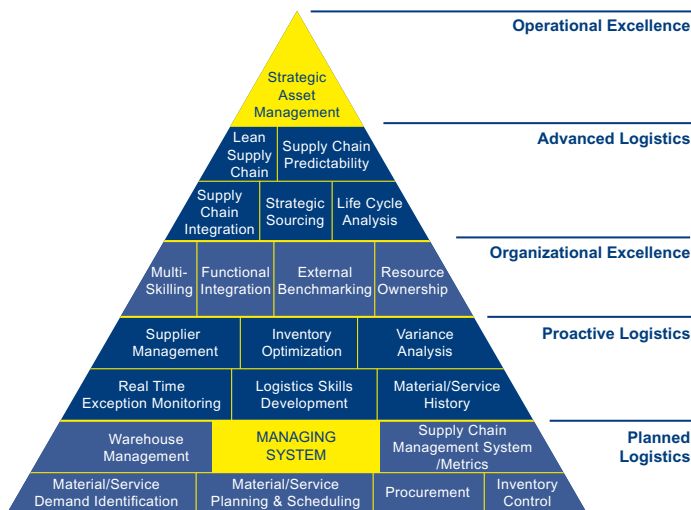


Figure 5 - Logistics Management

established business goals. The purpose of the Managing System is to provide a systematic approach for the effective application of the “Plan, Do, Check, Act” management model. The effective application of this model assures that the organization has the capacity & skills to examine their progress and to take timely corrective actions.

Develop The Management Team

But, what about the Management Team? We cannot expect to achieve Performance Excellence unless we develop the management of the new facility into a true high performance team with a shared vision of the future, shared values, and a deep commitment to the owner company’s value system and procedures. We need to be pro-active about establishing Behavioral Excellence in an effective Management Team. Typically the owners will bring together managers for the new facility that are unknown to one another, as they come from various organizations within the owners’ company as well as from other sources outside the company. Once this team is assimilated, we have an excellent opportunity to develop them into an effective Management Team with an effective Managing System and shared values prior to facility start-up.

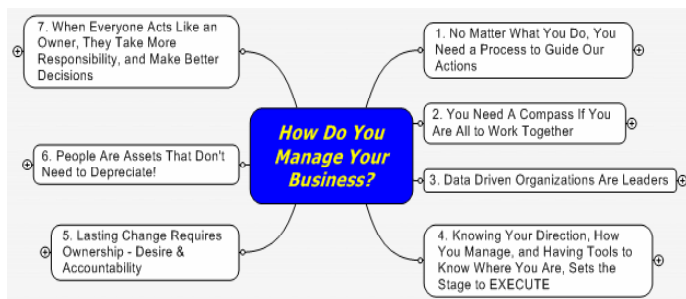


Figure 7 - Managing System

In Conclusion

In the beginning we introduced the premise that “the singular most damaging mistake in industry today is the common practice of overlooking Asset Management concepts during the design, construction and start-up of green-field facilities. Many companies have developed Asset Management Strategies for their brown-field operations but are unaware of the process for developing an effective approach to Asset Management in new projects. The global cost of this poor management practice is truly astronomical.”

This seems more unreasonable when you consider that the cost of establishing Performance Excellence during the pre-startup phase of a Greenfield Project is typically three tenths of a per cent (.3%) or less of the total project cost. The typical return on investment (ROI) from establishing Performance Excellence during the pre-operations phase is millions of dollars in the first year of operation and continues as an annual benefit into subsequent years of operation.