Toward Developing Key Performance Indicators (KPIs) for Desalination Processes

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The Aim of This Work

- Introduce the KPIs principles.
- Utilize the strategic objectives and goals for operating desalination plants in effective manner
  - to develop viable strategic plan,
  - set initiatives and programs
  - to achieve certain objectives and goals in the field of water desalination.
- Use operational performance measures to identify the applicable and appropriate KPIs.
Overview

- Introduction
- Development of Strategic Plan
- Desalination Issues / Saudi National Water Plans
- Development of Desalination KPIs
- Conclusions
Introduction

- KPI is a key part of a strategic management system.
- KPIs provide information into whether strategies are working, and programs, objectives and goals are accomplished.
- KPI can be defined as a measurable value that is used to demonstrate how effectively strategic goals or objectives are achieved.
- Characteristics of KPI:
  - Counted (number, percentage or currency, ...).
  - Compared (optimal, acceptable or unacceptable, benchmark, ...).
  - Evidence (clear with specific meaning, ...).
  - Specified time.
Introduction

- Indicator Basic Requirements:
  - indicators should represent targets effectively,
  - they should be simple and easy to interpret,
  - they should be able to indicate time trends,
  - they should “respond” to changes within or outside the organization,
  - the relevant data collection and data processing should be easy,
  - they should be updated easily and quickly.
Introduction

- Successful KPIs rely on effective objectives and goals.
- Objectives and goals need to be SMART to be effective.
  SMART: specific, measurable, achievable, relevant, and time-bound.
- Such as:
  - Specific (simple, sensible, significant).
  - Measurable (meaningful, motivating).
  - Achievable (agreed, attainable).
  - Relevant (reasonable, realistic, and resourced, results-based).
  - Time bound (time-based, time limited, time/cost limited, timely, time-sensitive).
Development of Strategic Plan

- The basic aim of strategic planning is to establish definitively the nature and character of an organization and the sector that it represents and to manage its future development.

- A strategic plan: integrated set of strategic goals and operational objectives and activities needed to achieve a desired result: an organization’s “mission” or “vision”.

- Characteristics of strategic planning:
  - It considers the environment in which an institution operates.
  - Provides a mid-term framework for the organization's operation.
  - It is a dynamic process.
  - It is the basis for the allocation of resources.
Development of Strategic Plan

- Strategic Planning vs. Long-range Planning
- Long-range planning = development of a plan of action to accomplish a goal or set of goals over a period of several years.

<table>
<thead>
<tr>
<th>Strategic Planning</th>
<th>Conventional Planning</th>
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<tbody>
<tr>
<td><strong>External focus.</strong></td>
<td>Internal focus by the chief procurement officer (CPO).</td>
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<tr>
<td><strong>Process oriented- a stream decisions by the chief executive officer (CEO).</strong></td>
<td>Product oriented- e.g. the approved Master Plan.</td>
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<td><strong>Dynamic and change oriented.</strong></td>
<td>Emphasizes stability.</td>
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<td><strong>Innovation and creativity.</strong></td>
<td>Relies on tried and tested.</td>
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<tr>
<td><strong>Vision of the future that guides decision-making.</strong></td>
<td>Blueprint for the future that is to be carried out.</td>
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</table>
Development of Strategic Plan

- SWOT analysis is used to assess the strengths, weaknesses, opportunities, and threats that are strategically important to the organization.
- SWOT analysis is included in the strategic plan as supporting documentation.
- The strategic planning process steps are outlined as in the Table.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Actions</th>
</tr>
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<tbody>
<tr>
<td>Setting strategic issues</td>
<td>• Setting strategic (priority) issues.</td>
</tr>
<tr>
<td></td>
<td>• Consolidating a list of strategic issues.</td>
</tr>
<tr>
<td>Establishing strategic goals</td>
<td>• One strategic goal to be determined for each of the strategic issues.</td>
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<tr>
<td></td>
<td>• To analyze each of the strategic goals against SMART criteria.</td>
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<td></td>
<td>• Development of a final strategic goals list (up to 3-5 goals max.).</td>
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<tr>
<td>Establishing strategic programs</td>
<td>• To establish a list of programs/activities needed to realize the goal.</td>
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<td></td>
<td>• To determine carriers and deadlines/dates of implementation for each of the programs/activities.</td>
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<tr>
<td>Determining priorities</td>
<td>• Determining prioritization criteria.</td>
</tr>
<tr>
<td></td>
<td>• Sorting programs/activities in accordance with the criteria established.</td>
</tr>
<tr>
<td></td>
<td>• Determining of the final programs/activities list according to priorities.</td>
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</table>
Desalination Issues / Saudi National Water Plans

- An early "Assessment and Strategic Plan" of the water sector was carried by Ministry of Economy and Planning in 2010 in collaboration with GTZ International services/Dornier Consulting.

- National Water Strategy 2014 (NWS 2014) - the ministry of Water and Electricity (MOWE) with technical assistance provided by The World Bank. The National Water Strategy of 2014 was not officially approved.

- Unified Water Strategy (UWS) for the GCC countries for the Years 2015-2035.
  - To develop a comprehensive and unified water strategy for the GCC countries for the next twenty years.
  - To establish an office of strategic management in the GCC countries to implement, update the unified water strategy.
Desalination Issues / Saudi National Water Plans

- The Saudi Arabia National Water Strategy 2030 was prepared by Booz Allen Hamilton. It is composed of a vision, strategic objectives, programs, and associated initiatives.
- This vision statement can be further detailed into five strategic objectives, as follows.

  - **Ensure** continuous access to adequate quantities of safe water, under normal operations and during emergency situations.
  - **Enhance** water demand management across all uses.
  - **Deliver** cost-effective and high-quality water and wastewater services, accounting for affordability.
  - **Safeguard** and optimize the use of water resources, while preserving the local environment for the highest benefit of the Saudi society in this generation and the future.
  - **Ensure** water sector competitiveness and positive contribution to the national economy through promoting effective governance, private sector participation, localization of capabilities and innovation.
Desalination Issues / Saudi National Water Plans

- Saline Water Conversion Corporation (SWCC) Strategic Goals
  1. **Customer Service**: Satisfy the needs of our clients by supplying them with desalinated seawater and electricity and deliver reliable services with the highest quality.
  2. **Financial Sustainability**: achieve the highest economic return by increasing revenues and reducing cost.
  3. **Operational Effectiveness**: Ensure quality and efficiency in terms of production and operations.
  4. **Human Resources**: Develop, motivate, and build national competencies within a work environment characterized by fairness, teamwork, responsibility and loyalty.
  5. **Economic Development**: Contribute effectively in developing and indigenizing know how in the field of desalination.
  6. **Safety And Security**: Comply with the best practices of safety and security.
  7. **Environmental Sustainability**: Comply with environmental rules and regulations.
Development of Desalination KPIs

- The performance of a given desalination plant is a measure of its efficiency for producing water.
- It is a measure of how efficient and economical the plant is in meeting its objective in producing the design quantity and quality of water by using specific indicators.
- However, there are no standard indicators for evaluating desalination plants performance.
- KPI should reflect how efficient and economic a plant is in meeting its objective in producing the design quantity and quality of water. This may include:
  - Availability Factor.
  - Reliability.
  - Unit product cost.
  - Capacity Factor (CF).
  - Thermal efficiency.
  - Recovery Ratio.
  - Product quality.
Development of Desalination KPIs

- The following indicators and criteria offer practical measures for the evaluation of the efficient operation of desalination plants.

<table>
<thead>
<tr>
<th>KPI</th>
<th>Criteria</th>
</tr>
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<tbody>
<tr>
<td>Plant life</td>
<td>Commercial operation date and condition indicator.</td>
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<tr>
<td>Product Quality</td>
<td>Quality parameters including turbidity, pH, hardness, TDS and chloride.</td>
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<tr>
<td>Plant Availability</td>
<td>Percentage of time at which the plant is available for operation.</td>
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<tr>
<td>Production Capacity</td>
<td>Plant's ability in meeting annual demand.</td>
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<tr>
<td>Gain Output Ratio (MSF)</td>
<td>Energy efficiency indicator.</td>
</tr>
<tr>
<td>Loss Time injury Frequency Rate (Safety)</td>
<td>Rate of occurrence of workplace incidents that result in lost time.</td>
</tr>
<tr>
<td>PM-CM Ratio</td>
<td>Preventive Maintenance (PM) hours / Corrective Maintenance (CM) hours.</td>
</tr>
<tr>
<td>Non-Fuel O&amp;M Costs</td>
<td>Costs / m³ (manpower, chemicals, maintenance, spare parts etc.).</td>
</tr>
<tr>
<td>Environmental legislation</td>
<td>Environmental preparedness, indicator.</td>
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</table>
Conclusions

- KPIs are part of a strategic management system. KPIs provide information whether strategies are working, and programs, objectives and goals are accomplished.
- Strategic plan identifies goals, strategies, objectives and key performance indicators.
- General overview of desalination issues which were indicated in various Saudi national water plans were highlighted.
- Eventually desalination KPIs were listed which include and not limited to: Availability Factor, Capacity Factor, Recovery Ratio, Reliability, Thermal Efficiency, Product Quality and Unit Product Cost.
- In the development of key performance indicators (KPIs) for desalination processes, benchmarks and targets should be specified.
- Targets must be specific and time-bound.

Thank You