Business Perspective

Improving Operational Value in Membrane Desalination Plants

Schneider Electric Business Value Insight

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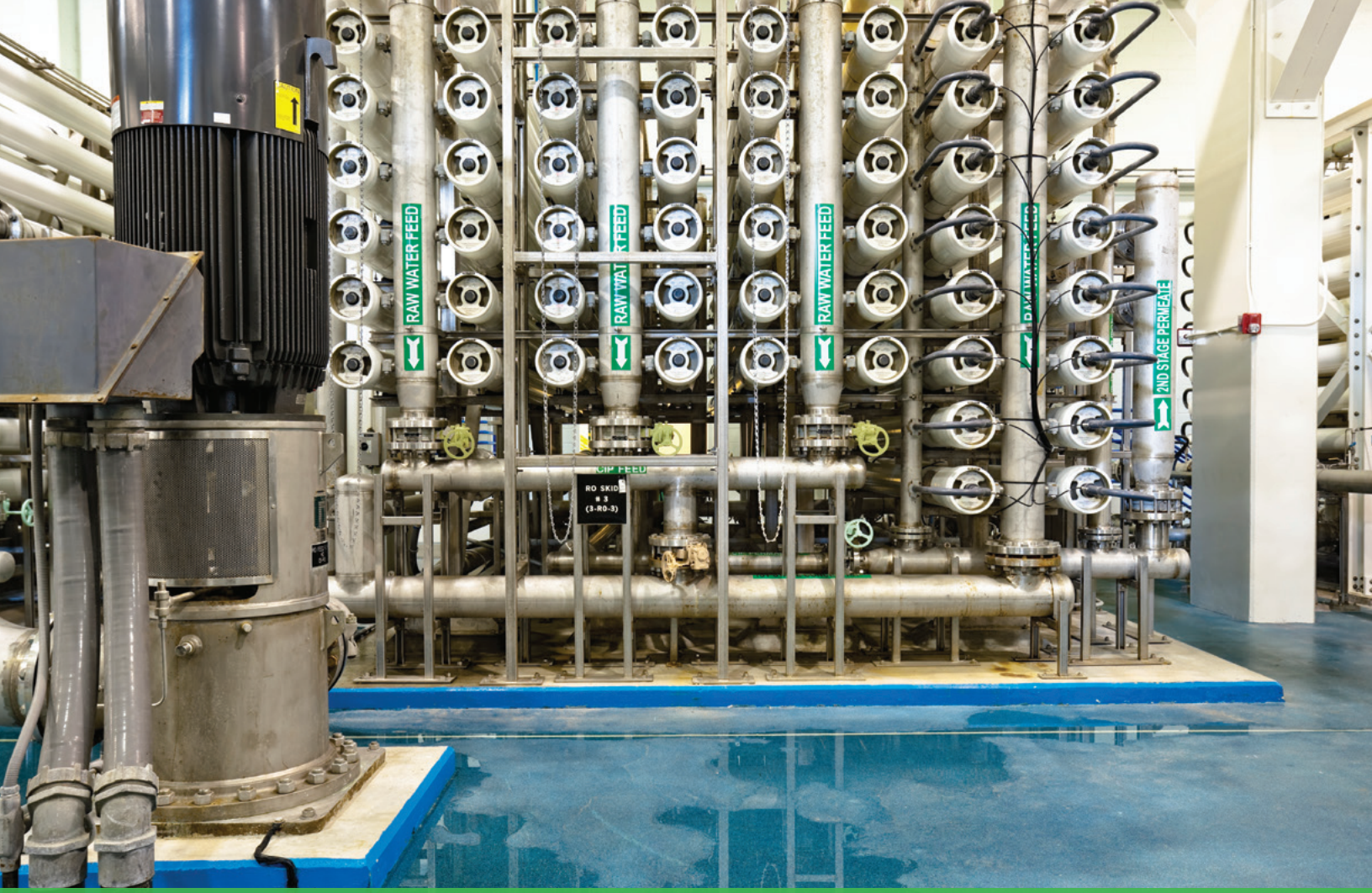

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Introduction

Water has the ultimate value proposition: it is necessary for life to survive, and still more for life to thrive. It is a product for which every living thing is a customer. As such, new clean water sources are becoming some of the most valuable commodities in the world; consequently, desalination of sea water is one of the fastest growing segment of the water markeplace.

Membrane desalination plants are typically throughput-limited and energy-intensive operations. There is a great need for operational value improvements (OVIs) based on real-time measurement and control of energy cost and production value of these operations.

Installing new automation systems is not enough. Utilizing effective processes designed to measure and improve operational value in real time are essential to the success of any automation and control project. Without said processes, the desired results are difficult to achieve, and frequently yield no improvement at all.

However, when effectively applied, automation and control technologies can drive significant OVI. Experience has demonstrated that improvements of 1% to 3% in production value and reductions of 3% to 5% in energy and material costs can be expected. The resulting recovered revenue can be $2M per year, per membrane plant.

What is Operational Value?

Operational value is a measurement of real-time factors that affect a plant's value.

Operational value is expressed for a given timeframe as:

Incremental Production Value Improvements
\+ Incremental Energy Cost Reductions
\+ Incremental Material Cost Reductions
= Operational Value

Note that labor cost is not included as it is a fixed cost that typically does not change in real time.

Changes made to processes that directly impact a plant's value are **operational value improvements (OVI)**.

Process for Driving Operational Value Improvements in Membrane Desalination Plants: Measure – Empower – Improve

Schneider Electric has developed a simple, highly effective process for maximizing operational value through automation and control. The process consists of three steps:

1. Measure: Develop real-time measurements of operational value across the plant
2. Empower: Use that data to empower personnel to make informed decisions
3. Improve: Develop specific improvement initiatives to drive incremental operational value

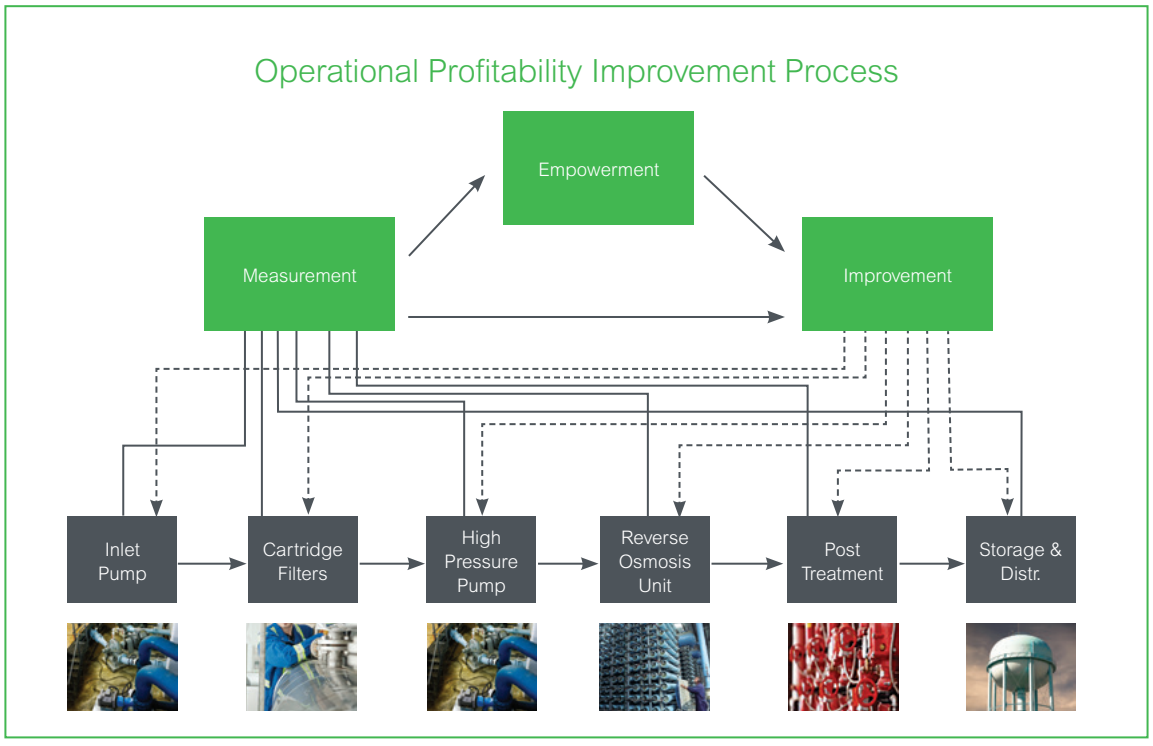

Figure 1

Although this process may appear self-evident, the first two steps (measurement and personnel empowerment) are seldom utilized for desalination automation and control projects. Perhaps the stumbling block has been in measuring operational value in real time, down to the process unit level. Project engineers often believe that business factor measurement is the domain of accounting, and plant accountants tend to focus on measuring monthly results for the plant as a whole.

The net result is that business value is not measured in a manner that enables empowerment or recognizes improvements in processes. This is a critical shortcoming of automation projects. Without an effective, real-time business value measurement system in place, it is difficult to execute projects that deliver quantifiable impact to value.

Step 1: Measure

Today's cost accounting systems fall short because they measure too slowly (typically monthly) and too broadly (typically plant wide). What is required is a real-time accounting system that collects data at the process unit or subunit level, utilizing the plant's installed instrument base in conjunction with variables from the enterprise resource planning system, and executes real-time accounting models based on that data. This will result in accounting measurements aligned with the way plant accountants report results, executing in real time via the automation system. Historizing these measurements into a standard process historian provides a plant-wide, real-time accounting (RTA) system.

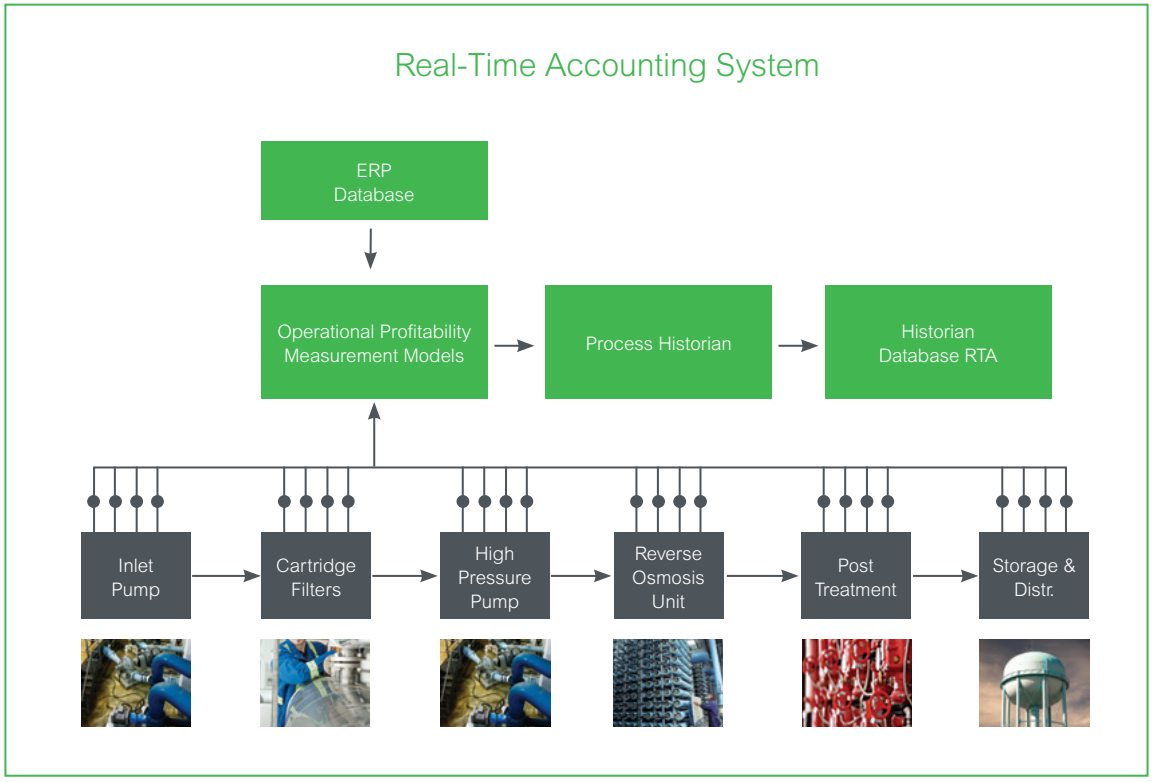

Figure 2

Step 2: Empower

Once the RTA system is developed, installed and executing, the data can empower plant personnel with the exact metrics they need to determine the effect their actions have on operational value. Building real-time performance dashboards that utilize the RTA measurements provides a simple-but-effective framework to guide every person in their daily activities. Since humans learn most effectively by feedback control, these dashboards become online, real-time learning systems.

This type of feedback provides one of the most effective performance improvement opportunities in desalination operations and helps drive significant operational value increases. But more than this, real-time performance dashboards increase morale, as empowered employees can see how they are directly contributing to the success of the plant.

Step 3: Improve

With RTA systems and a framework for empowerment in place, the operation must identify and execute value-generating improvements. These improvements might include operator training, control strategy redesign, advance process control or dynamic process optimization. Because these programs are informed by RTA and executed by empowered operators, their effect on the value will be quantifiable. Guessing or hoping become problems of the past; the exact value of each initiative will be clearly demonstrable, enabling desalination plant management to focus on those actions and activities that have the greatest potential to improve value.

The measure – empower – improve process for desalination plant automation and control projects may be simple, but within its simplicity lies the key to unlocking heretofore unrealized operational value. When implemented across entire enterprises, gains in operational value will soon follow.

Measure-Empower-Improve and the Continuous Improvement Process

Industrial companies have, with mixed results, implemented a variety of continuous improvement (CI) processes over the past 30 years. Programs such as Total Quality Management (TQM), Six Sigma and Lean Manufacturing have demonstrated that the CI mindset can lead to significant improvements. Almost all CI programs share the desire to drive improvements through both projects and daily work. Unfortunately, many of the traditional CI programs have only succeeded in project improvement, while few have affected daily work. Both are required to optimize the performance of an enterprise, and both can be realized through the measure – empower – improve process.

Almost any CI leader will confirm that the key to successful continuous improvement is establishing effective performance measurements. Once RTA measurements are installed and operating, a simple process for CI projects (as shown in Figure 3) can be deployed, utilizing these metrics as the basis for success.

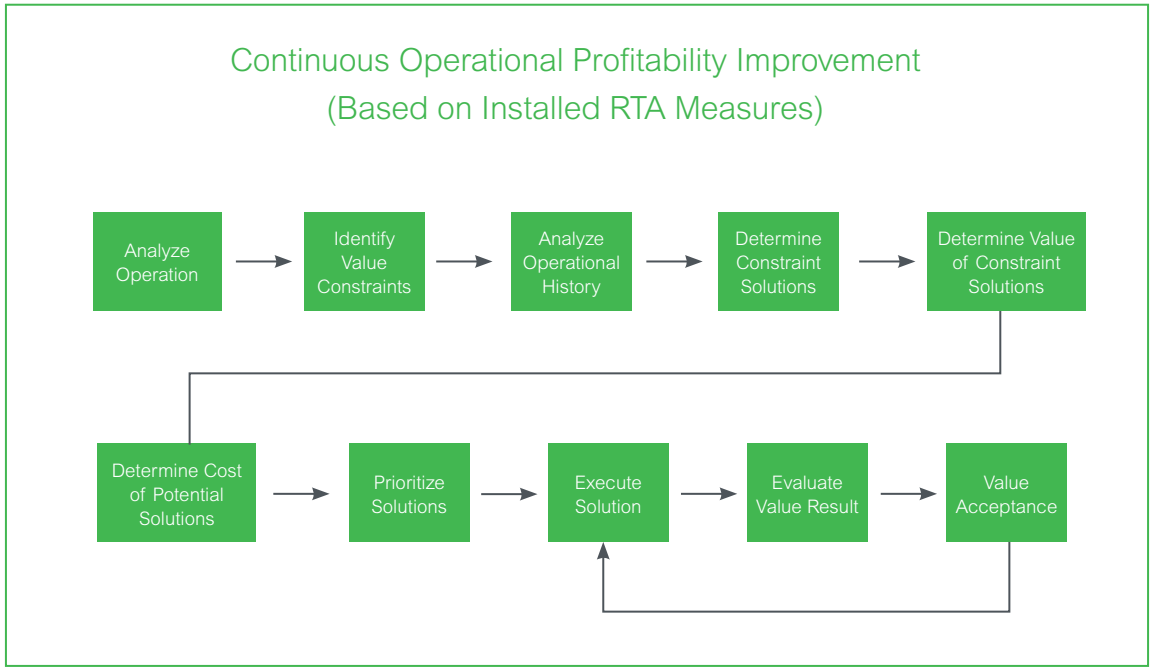

Figure 3

Project Improvements via the CI Process

CI teams must first analyze the operation using RTA metrics to locate constraints to value. Once identified, potential solutions for overcoming each constraint—and the cost/benefit ratio of doing so—can be determined through analysis of the impacted RTA measurements, already presented in appropriate financial units. If there are multiple proposed improvement solutions covering multiple constraints, they are prioritized based on the estimated cost and potential benefit of each. At this point the continuous improvement process can start in earnest by executing the highest priority solution, evaluating the value generated and gaining management acceptance for the value. Subsequent value solutions on the priority list can be executed sequentially, realizing increased value with each improvement.

Daily Work Improvement via the CI Process

Making continuous improvements to daily work has traditionally been much more challenging than to projects. But, as has been previously mentioned, the real-time performance dashboards of the empowerment step actually provide the ideal environment for CI in daily work, as individuals are empowered to refine their workload and generate maximum value.

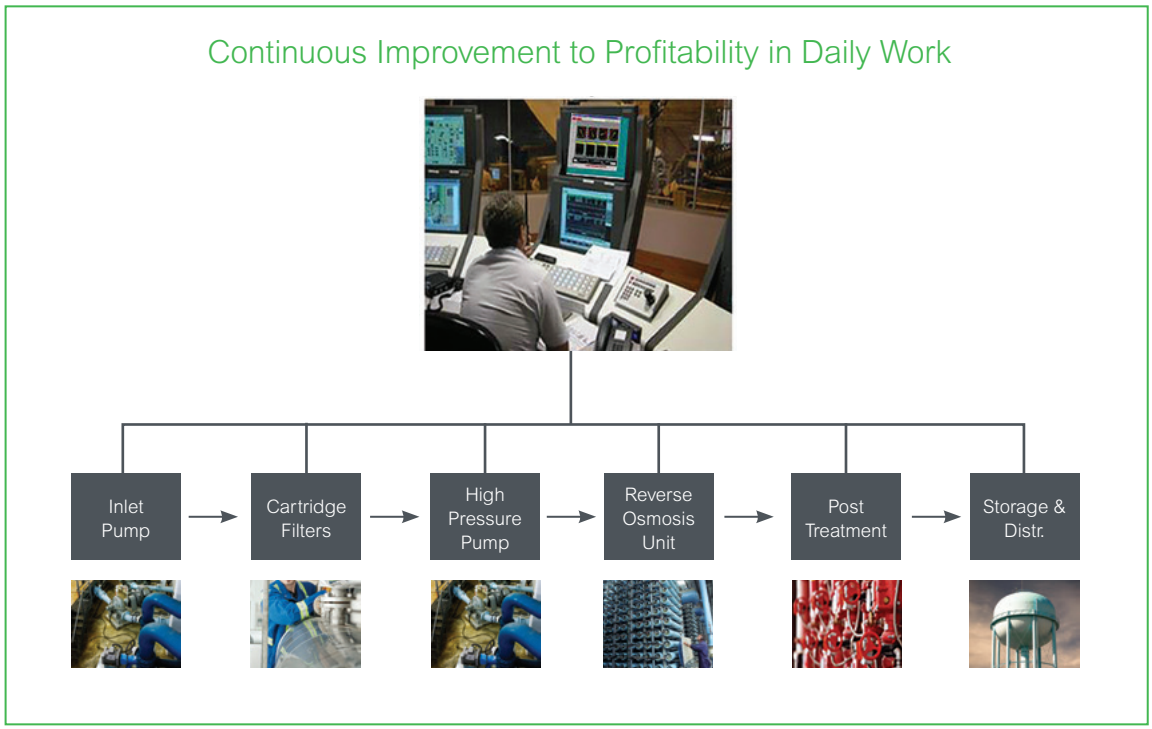

Figure 4

Together, improvements to process and daily work provide desalination plants the capability to maximize operational value.

Conclusion

Automation solutions have been applied in desalination plants for many decades. But many executives have expressed disappointment with the actual value realized by these systems. The problem is not the technology; it is the approach to application. Rather than specifically focusing on improving revenue, most industrial automation projects in desalination plants are focused on the application of new technology, regardless of the actual benefit. This has to change for businesses to enjoy the available OVI.

Schneider Electric has developed an effective process for driving continuous operational value improvement, the tools to underpin the process and the talent to partner with desalination operations to help them realize the tremendous untapped potential value.

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