REVERE ELECTRIC SUPPLY CO.
Messenger of Service

The Modernization Continuum

"Connecting the Plant for Business Success"

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INTRODUCTION

In today's competitive manufacturing industry it is now more important than ever to make use of technology in the manufacturing process to drive out costs and increase revenue. The most common objectives that manufacturers strive for are:

- Increased machine uptime
- Improved quality of final product with a reduced number of defects
- Higher production rates driven by efficiencies
- Lower energy costs
- Improved material costs
- Increased personnel productivity and safety
- Supply Chain control and optimization
- Regulatory compliance
- Standardization on new technologies to drive legacy and proprietary systems out of service and make it easier to manage and maintain

The Modernization Continuum is a life cycle process that manufacturers can use as a guide to drive toward a Connected Plant that uses technology to enhance the manufacturing process driving higher production while minimizing costs to stay competitive. This paper talks about the phases of the continuum and setting goals to drive toward the maximum benefit, whatever that might be, necessary to be competitive.

The Modernization Continuum

Simplistically the Modernization Continuum is the progression of elements necessary to modernize your plant and operations to make use of technological advancements for Business Success.

The continuum is having an end vision in mind and planning appropriately to drive a successful modernization process from pilot to completion. Customer plant operations are usually in Phases 1 through 3 of the continuum, as will be described later this section. The goal is to take advantage of the technological benefits of monitoring, managing and acting upon the data that is available from the varying plant machines to improve processes and reduce costs in the manufacturing process. The Modernization Continuum is a phased approach with each phase having a specific purpose, set of outcomes and targeted goals to drive toward. By taking a pragmatic approach to each phase manufacturers can realize real outcomes, understand ROI and apply it to other areas of the plant.

Phase 1

The first phase of the continuum is Machine Automation. How do you move from manual to automated machines and by doing that will it reduce your overall costs over time while increasing production. You should have very specific goals for Machine Automation. Think about the end game which could be 20% higher production as an example. An important consideration is to make sure your new automated machine is Ethernet enabled so that it can be ultimately controlled electronically in the future to lower labor costs.

Make sure you define specific goals in this phase and make them measurable. At the end of the phase you should be able to compare cost of investment for upgrades and modernization against outcomes and determine the Return on Investment (ROI) and timeframe for which it did happen or will happen. Some examples are below:

- More consistent output (Quality improvement = Time & reduced defects)
- Higher machine production rates due to less human interaction (Increased production = Number of Units equating to increased revenue)
- Trackable machine performance metrics (Measured through metering reducing costs of unused machine time)
- Automated safety features (Higher Individual and Plant Safety)
- Preventative maintenance (More timely and more easily tracked)
- Use of Industry standards to protect investments

Phase 2:

The second phase of the continuum is Smart Machine Modernization. As discussed in phase one you should have very specific goals in this phase. Things to think through during this phase are much like in phase one make sure you are thinking about a future where all devices can talk to each other which makes for a robust eco system of interaction and integration.

You will want to have the capability to do predictive as well as preventative maintenance. Predictive being the preferred measurement for success such that you can predict failures before they happen and turn unplanned downtime into routinely planned downtime.

Smart Machine Modernization involves technology advances for each machine that add items such as:

- Servos, Drives, Sensors, and Controls to assist in managing the machine and will enhance operation and safety
- IP Enables Devices added to machines to allow for greater integration between the sensors, drives, servos, and controls
- Controller interfaces to view machine data, define production parameters, troubleshoot, and report
- Interoperability of the technology and its standard communication language and applications

Example of goals for Phase 2 are:

- Interactive consistent output (Machine can determine when it is out of specification stopping production reducing defects immediately thus adding additional quality increases)
- Trackable machine performance metrics (Measurable gathering of performance metrics, and the creation of alarms for proactive measures)
- Interactive safety features (Machine can determine when to shutdown for safety)
- Move toward predictive maintenance by tracking and measuring
- Ability to integrate and expand as the business grows
- Use of Industry standards to protect investments

Phase 3

The third phase of the continuum is Plant and Machines Network. Things to think through during this phase are industry standards, device connectivity, redundancy, robustness, and separation of control traffic and enterprise network traffic.

Plant and Machines Network goals involve the proper network infrastructure and considerations should be:

- EtherNet/IP OT infrastructure implemented throughout the plant for greater control of machines and data flows
- Production line automation controlled from a central location
- Network infrastructure segmentation for security and resiliency
- Structured Cabling for ease of moves, add and changes as well as expansion
- Phased approach to minimize costs over the lifecycle of modernization

This phase puts the infrastructure, security and flexibility in place to be able to collect data and control the lines easily.

Phase 4

The fourth phase of the continuum is Machine Data Collected and Stored. This decision is as important as putting the correct network infrastructure in place. Determining whether to have an Industrial Data Center in the plant, put your data in the cloud or even have it across the firewall into the enterprise side has ramifications associated with each decision that has security, cost and management considerations.

Key goals in this phase for consideration:

- Use of industry standard computer equipment and software
- Ability to collect store and distribute data in industry standard databases
- Automated processes for collecting data that enables manufacturing and management
- Automatic machine record keeping
- Virtualization

Phase 5

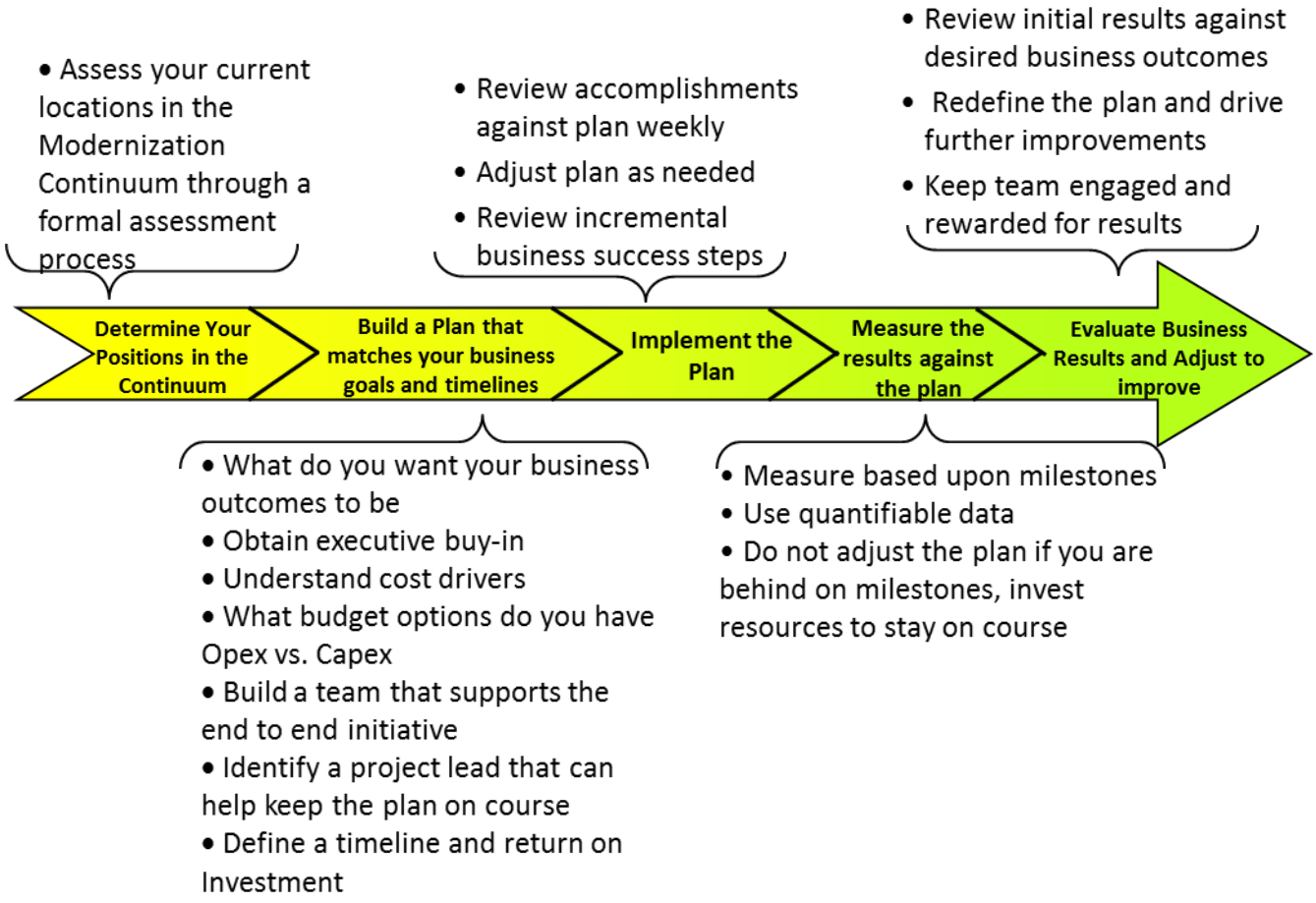
The fifth phase of the continuum is Business Analytics and Decisions. Determining how to use the data collected across all aspects of the organization from machine maintenance to supply chain decisions.

Consideration of the following is key:

- Data customized, visualized and distributed securely across the organization enabling business efficiencies from the plant floor into the executive suite.
- Business analytics that allow management and refinement of the Modernization Continuum
- Connection to ERP for enhanced supply chain management
- 24 x7 monitoring and management of data to meet all regulatory requirements
- Predictive decision making driving uptime and higher levels of production

PATH TO THE CONNECTED PLANT

Many manufacturers use Six Sigma as a process improvement system to drive toward improved processes in a very disciplined manner. The Modernization Continuum is no different as planning is paramount to success in driving toward the Connected Plant which in turn will deliver the type of business results necessary to stay competitive in the global manufacturing market place. The diagram below references a process and ideas on how to plan through the phases with business results being the key to success. This is a much simplified diagram but gives you an idea of how to think through the process, goals, measurements and staying the course necessary to gain better business success in manufacturing.



No matter what phases you are in Revere can assist you moving in and out of each phase in a process that allows you to invest pragmatically and incrementally to achieve your long term goals and initiatives driving toward a competitive offering no matter the competition.